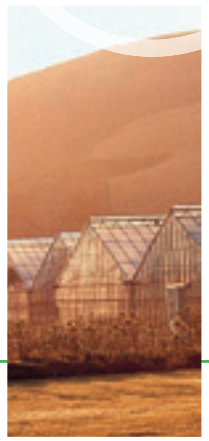


Humidity

HD 2101.1
HD 2101.2

HD2101.1 AND HD2101.2 HYGRO-THERMOMETERS

The **HD2101.1** and **HD2101.2** are portable instruments with a large LCD display. They measure relative humidity and temperature using a Pt100 sensor or thermocouple humidity/temperature combined probe. Temperature only is measured by immersion, penetration air or contact probes. The sensor can be a Pt100 or Pt1000.
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 HD2101.2 is a **datalogger**. It stores up to 38,000 samples which can be transferred from the instrument connected to a PC via the RS232C and USB 2.0 serial ports. The storing interval, printing, and baud rate can be configured using the menu. Both models are fitted with an RS232C serial port and can transfer the acquired measurements in real time to a PC or to a portable printer.
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 that can also be excluded.

The instruments have IP66 protection degree.

INSTRUMENT TECHNICAL CHARACTERISTICS

Instrument

Dimensions (Length x Width x Height)	185x90x40mm
Weight	470g (complete with batteries)
Materials	ABS, rubber
Display	2x4½ digits plus symbols Visible area: 52x42mm

Operating conditions

Operating temperature	-5…50°C
Storage temperature	-25…65°C
Working relative humidity	0…90%RH without condensation
Protection degree	**IP66**

Power

Batteries	4 1.5V type AA batteries
Autonomy	200 hours with 1800mAh alkaline batteries
Power absorbed with instrument off	20µA
Mains	Output mains adapter 12Vdc / 1000mA

Measuring unit	*°C - °F - %RH - g/kg - g/m³ - hPa - J/g - Td Tw - DI - NET*
Security of stored data	Unlimited, independent of battery charge conditions

Time

Date and time	In real time
Accuracy	1min/month max drift

*Measured values storage - model **HD2101.2***

Type	2000 pages containing 19 samples each
Quantity	Total of 38000 samples
Storage interval	1,5,10,15,30s; 1,2,5,10,15,20,30min; 1hour

Serial interface RS232C

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 1,5,10,15,30s; 1,2,5,10,15,20,30min; 1hour

*USB interface - model **HD2101.2***

Type	1.1 - 2.0 electrically isolated

Connections

Input module for the probes	8-pole male DIN45326 connector
Serial interface	8-pole MiniDin connector
USB Interface	Mini USB type B
Mains adapter	2-pole connector (positive at centre)

Measurement of relative humidity by Instrument

Measurement range	0…100%RH
Resolution	0.1%RH
Accuracy	±0.1%RH
Drift after 1 year	0.1%RH/year


HD2101.2


CP23

Measurement of temperature by Instrument

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

Relative humidity and temperature probes using SICRAM module

Model	Temperature sensor	Working range		Accuracy	
		%RH	Temperature	%RH	Temp
HP472ACR	Pt100	0…100%RH	-20°C…+80°C	±1,5%RH (10…90%RH) ±2,0%RH (in the remaining range) for T= 15…35°C ---------- ±(1,5+1.5% of the displayed value) %RH in the remaining temperature range	±0.3°C
HP572ACR	Thermocouple K	0…100%RH	-20°C…+80°C		±0.5°C
HP473ACR	Pt100	0…100%RH	-20°C…+80°C		±0.3°C
HP474ACR	Pt100	0…100%RH	-40°C…+150°C		±0.3°C
HP475ACR	Pt100	0…100%RH	-40°C…+150°C		±0.3°C
HP475AC1R	Pt100	0…100%RH	-40°C…+180°C		±0.3°C
HP477DCR	Pt100	0…100%RH	-40°C…+150°C		±0.3°C
HP478ACR	Pt100	0…100%RH	-40°C…+150°C		±0.3°C

Common characteristics

Relative humidity

Sensor	Capacitive
Measuring range	0÷100%RH
Temperature drift @ 20°C	Max 0.02%RH/°C
Response time %RH at constant temperature	10sec (10÷80%RH; air speed=2m/s) at constant temperature

Temperature with sensor Pt100

Temperature drift @ 20°C	0.003%/°C

Temperature with thermocouple K - HP572ACR

Temperature drift @ 20°C	0.02%/°C

Same specifications reported above apply for **HP480** probe (for measuring humidity of the air in pipes), with the following exceptions:

HP480		
Temperature	Measuring range	-40…+60°C
Humidity	Dew point	-40…+60°C DP
Environmental Conditions	Working temperature	-40…+60°C
	Working pressure	16bar max

TECHNICAL DATA OF PROBES AND MODULES EQUIPPED WITH INSTRUMENT

Temperature probes Pt100 sensor with SICRAM module

Model	Type	App. range	Accuracy
TP472I	Immersion	-196°C…+500°C	±0.25°C (-196°C…+300°C) ±0.5°C (+300°C…+500°C)
TP472I.0 *1/3DIN - Thin film*	Immersion	-50°C…+300°C	±0.25°C
TP473P.I	Penetration	-50°C…+400°C	±0.25°C (-50°C…+300°C) ± 0.5°C (+300°C…+400°C)
TP473P.0 *1/3DIN - Thin film*	Penetration	-50°C…+300°C	±0.25°C
TP474C.I	Contact	-50°C…+400°C	±0.3°C (-50°C…+300°C) ±0.5°C (+300°C…+400°C)
TP474C.0 *1/3DIN - Thin film*	Contact	-50°C…+300°C	±0.3°C
TP475A.0 *1/3DIN - Thin film*	Air	-50°C…+250°C	±0.3°C
TP472I.5	Penetration	-50°C…+400°C	±0.3°C (-50°C…+300°C) ±0.6°C (+300°C…+400°C)
TP472I.10	Penetration	-50°C…+400°C	±0.30°C (-50°C…+300°C) ±0.6°C (+300°C…+400°C)
TP49A.0 *Class A - Thin film*	Immersion	-70°C…+250°C	±0.3°C (-70°C…-50°C) ±0.25°C (-50°C…+250°C)
TP49AC.0 *Class A - Thin film*	Contact	-70°C…+250°C	±0.3°C (-70°C…-50°C) ±0.25°C (-50°C…+250°C)
TP49AP.0 *Class A - Thin film*	Penetration	-70°C…+250°C	±0.3°C (-70°C…-50°C) ±0.25°C (-50°C…+250°C)
TP875.I	Globethermometer Ø150mm	-30°C…+120°C	±0.25°C
TP876.I	Globethermometer Ø 50mm	-30°C…+120°C	±0.25°C
TP87.0 *1/3DIN - Thin film*	Immersion	-50°C…+200°C	±0.25°C
TP878.0 *1/3DIN - Thin film* TP878.1.0 *1/3DIN - Thin film*	For solar panel	+4°C…+85°C	±0.25°C
TP879.0 *1/3DIN - Thin film*	For compost	-20°C…+120°C	±0.25°C

Common characteristics

Temperature drift @ 20°C 0.003%/°C

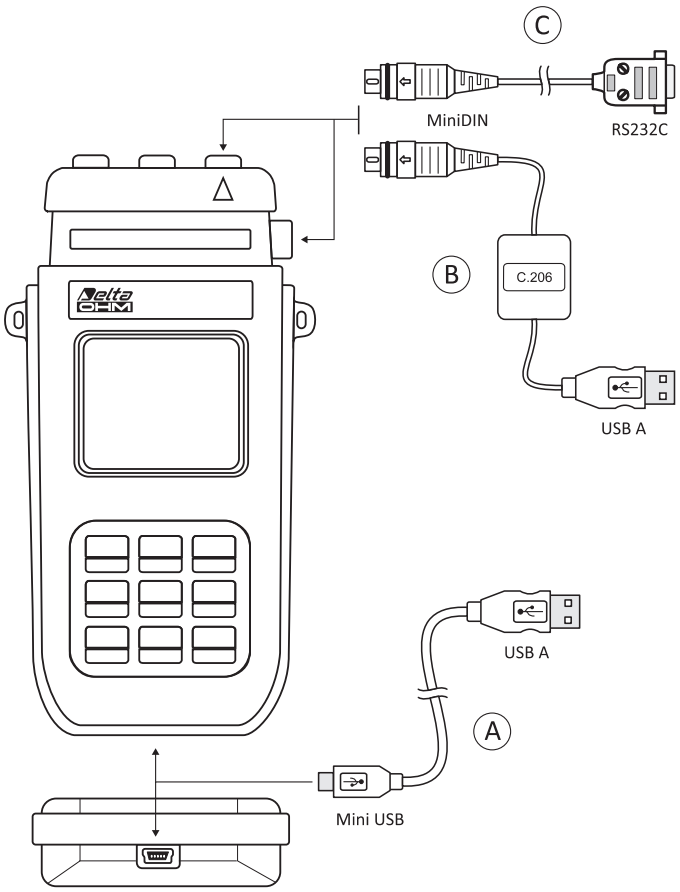
4 wire Pt100 and 2 wire Pt1000 Probes

Model	Type	Application range	Accuracy
TP47.100.0 *1/3DIN - Thin film*	Pt100 4 wires	-50…+250°C	1/3DIN
TP47.1000.0 *1/3DIN - Thin film*	Pt1000 2 wires	-50…+250°C	1/3DIN
TP87.100.0 *1/3DIN - Thin film*	Pt100 4 wires	-50…+200°C	1/3DIN
TP87.1000.0 *1/3DIN - Thin film*	Pt1000 2 wires	-50…+200°C	1/3DIN

Common characteristics

Temperature drift @ 20°C

Pt100	0.003%/°C
Pt1000	0.005%/°C



A All models of the portable data logger series **HD21 .... 2** have been implemented with a new serial miniUSB port type HID (Human Interface Device). To connect to the PC with the USB cable Type A - Mini USB B-type code CP23, **it is not required to install any USB drivers**.

B For connecting the **HD21..1** models to the USB port of a PC, USB/serial converter **C.206** is available.
The converter is provided with its own drivers that have to be installed before connecting to the PC. (see the details in the CDRom provided with the converter).

C All models are fitted with a serial RS232C port using MiniDIN connector. It can be used for connecting to a RS232C serial port of a PC or to the HD40.1 portable printer with the cable HD2110CSNM.

ORDER CODES

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

HD2110CSNM: 8-pole connection cable MiniDin - 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.

CP23: Connection cable USB 2.0 connector type A - Mini USB type B

DeltaLog9: Software for download and management of the data on PC using Windows operating systems.

SWD10: Stabilized power supply at 230Vac/12Vdc-1000mA mains voltage.

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

Relative humidity and temperature probes complete with SICRAM module

HP472ACR: %RH and temperature combined probe, dimensions Ø 26x170 mm. 2 m connecting cable.

HP572ACR: %RH and temperature combined probe, **K thermocouple sensor**. Dimensions Ø 26x170 mm. 2 m connecting cable.

HP473ACR: %RH and temperature combined probe. Dimensions: handle Ø 26x130 mm, probe Ø 14x120 mm. 2m connecting cable.

HP474ACR: %RH and temperature combined probe. Dimensions: handle Ø 26x130 mm, probe Ø 14x215 mm. 2m connecting cable.

HP475ACR: %RH and temperature combined probe. 2 m connecting cable. Handle Ø 26x110 mm. Stainless-steel tube Ø 12x560 mm. Terminal tip Ø 14x75 mm.

HP475AC1R: %RH and temperature combined probe. 2 m connection cable. Handle Ø 26x80 mm. Stainless steel stem Ø 14x480 mm.

HP477DCR: %RH and temperature combined sword probe. 2 m connecting cable. Handle Ø 26x110 mm. Probe tube 18x4 mm, length 520 mm.

HP478ACR: %RH and temperature combined probe. Dimensions Ø 14x130 mm. 5m connection cable.

HP480: Probe for the measurement of air humidity in pipes. 2m connecting cable. 1/4" Italian Standard quick coupling. AISI 304 measuring chamber.

Temperature probes complete with SICRAM module

TP472I: Wire wound Pt100 sensor, immersion probe. Stem Ø 3 mm, length 300 mm. Cable length 2 m.

TP472I.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3 mm, length 230 mm. Cable length 2 m.

TP473P.I: Wire wound Pt100 sensor, penetration probe. Stem Ø 4mm, length 150 mm. Cable length 2 m.

TP473P.0: Thin film Pt100 sensor, penetration probe. Stem Ø 4mm, length 150 mm. Cable length 2 m.

TP474C.I: Wire wound Pt100 sensor, contact probe. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 m.

TP474C.0: Thin film Pt100 sensor, contact probe. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 m.

TP475A.0:, Thin film Pt100 sensor, air probe. Stem Ø 4mm, length 230mm. Cable length 2 m.

TP472I.5: Thin film Pt100 sensor, penetration probe. Stem Ø 6mm, length 500 mm. Cable length 2 m.

TP472I.10: Thin film Pt100 sensor, penetration probe. Stem Ø 6mm, length 1000mm. Cable length 2 m.

TP49A.0: Thin film Pt100 sensor, immersion probe. Stem Ø 2,7mm, length 150mm. Cable length 2 m. Aluminium handle

TP49AC.0: Thin film Pt100 sensor, contact probe. Stem Ø 4mm, length 150mm. Cable length 2 m. Aluminium handle

TP49AP.0: Thin film Pt100 sensor, penetration probe. Stem Ø 2,7mm, length 150mm. Cable length 2 m. Aluminium handle

TP875.I: Wire wound Pt100 sensor, 150mm diameter globe-thermometer equipped with handle. Cable length 2 m.

TP876.I: Wire wound Pt100 sensor, 50mm diameter globe-thermometer equipped with handle. Cable length 2 m.

TP87.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3 mm, length 70 mm. Cable length 2 m.

TP878.0: Thin film Pt100 sensor, contact probe for solar panels. Cable length 2 m.

TP878.1.0: Thin film Pt100 sensor, contact probe for solar panels. Cable length 5 m.

TP879.0: Thin film Pt100 sensor , penetration probe for compost. Stem Ø8mm, length 1000mm. Cable length 2m.

Temperature probes without SICRAM module

TP47.100.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3mm, length 230mm. Connection cable 4 wires with connector, length 2 m.

TP47.1000.0: Thin film Pt1000 sensor, immersion probe. Probe's Stem Ø 3mm, length 230mm. Connection cable 2 wires with connector, length 2 m.

TP47: Module for the connection of Pt100 4-wire and Pt1000 2-wire probes.

TP87.100.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3mm, length 70mm. 4-wires connection cable with connector, length 1 m.

TP87.1000.0: Thin film Pt1000 sensor, immersion probe. Stem Ø 3mm, length 70mm. 2-wires connection cable with connector, length 1 m.

Accessories

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

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

Protection for humidity probes Ø 26 M24x1,5

P1: Stainless steel 200µ grid protection for probes Ø 26 mm.

P2: 20µ sintered polyethylene PE protection for probes Ø 26 mm.

P3: 20µ sintered bronze protection for probes Ø 26 mm.

P4: 20µ sintered PE complete cap for probes Ø 26 mm.

Protection for humidity probes Ø 14 M12x1

P6: 10µm sintered complete protection made of AISI 316 stainless steel for probes Ø 14 mm.

P7: 20µm sintered complete protection made of PTFE for probes Ø 14 mm.

P8: 20µm stainless steel grid and Pocan protection for probes Ø 14 mm.

HP480 - T480.1 - S.TC2.480.2 PROBES FOR THE MEASUREMENT OF THE DEW POINT IN COMPRESSED AIR SYSTEMS

Compressed air is used for several purposes, many of which require compressed air with low a humidity level, and so comes the need to know the dew point (Dew Point - DP) of water vapour in the compressed air that circulates in the system.
The **HP480, T480.1** and **S.TC2.480.2** 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.

The probes 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.
All models are 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.
The probes are available for different instruments that can be connected:

HP480: **Interchangeable** probe with SICRAM module. Can be connected to any of the portable instruments **HD2101.1, HD2101.2, HD2301.0, DO2003** and **DO9847.**

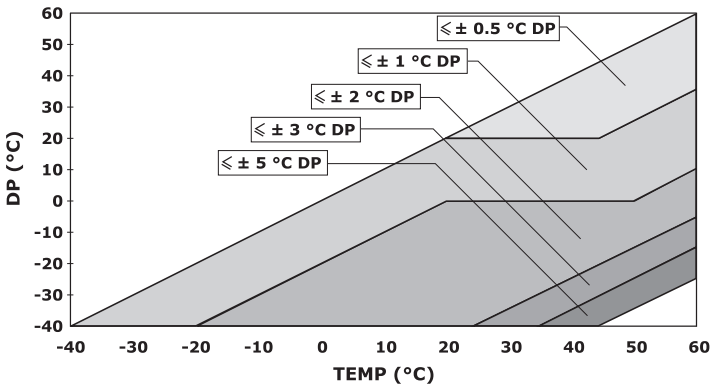
T480.1: Probe **connected directly to the instrument**. It is used with the transmitters for humidity and temperature of the series and **HD4977T..** and **HD4877T ...**

S.TC2.480.2: **Interchangeable** probe with **SICRAM 2** module. It can be connected to the transmitters of the series **HD2817T**.. and **HD2717T**...

SPECIFICATIONS

Relative humidity	
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
Temperature	
Sensor	Pt100
Measuring range	-40…+60 °C
Accuracy	± 0,25 °C
Dew point	
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…-20 °C DP) ± 1,5 °C DP (-20…0 °C DP) ± 1 °C DP (0…+20 °C DP) ± 0,5 °C DP (+20…+60 °C DP)
Accuracy (@ T = -40…+60 °C)	See graph 1

General features	
Regulation of the air flow	From 0,2 to 3 l/min
Cable length	2m
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	Up to 16 bar
Protection degree	IP65

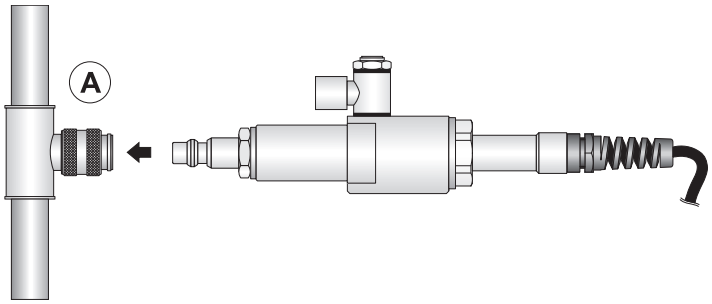


Graph 1: accuracy of the dew point measurement (DP)

INSTALLATION

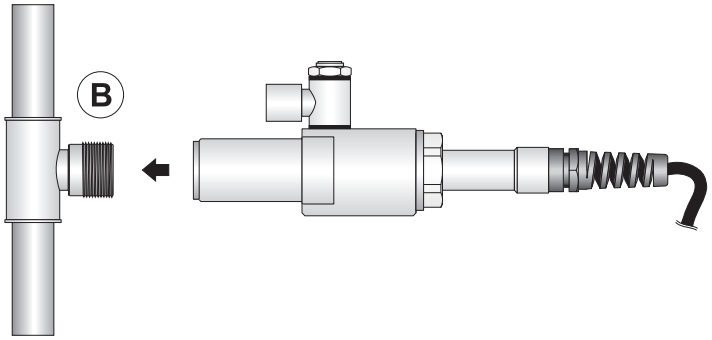
The probe can be connected to the compressed air in three ways:
A. by using the measuring chamber with a quick coupling;
B. by using the measuring chamber with a threaded G 1/4" connection;
C. directly (without measuring chamber) with a threaded G 1/2" connection.

Connection with measuring chamber and quick coupling:



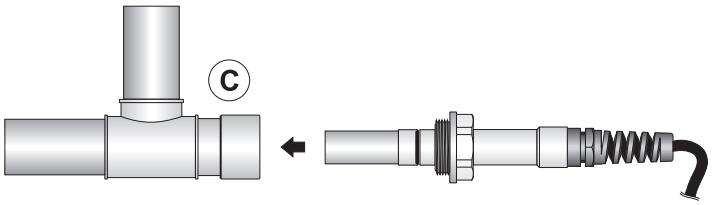
To connect with quick coupling, you can use one of the standard 1/4" couplings provided. Other couplings than those supplied can be used, provided that they have a G 1/4" thread on the side that fits into the probe.

Connection with measuring chamber and threaded connection:



For the connection by treaded 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.

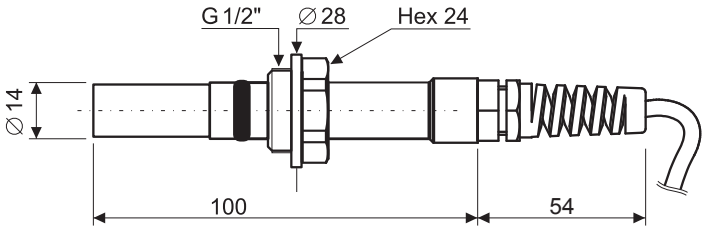
Direct connection (without measuring chamber) and threaded connection:



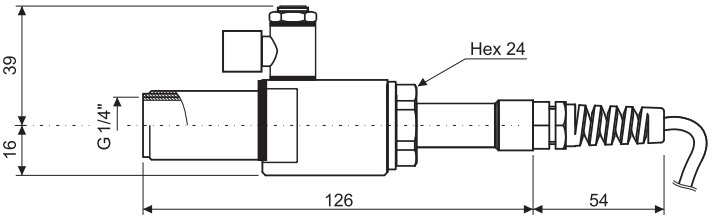
For direct connection of the probe, use a fitting with internal G 1/2" thread on the side which will be placed in the probe. The connection must be airtight. When installing or removing the probe, it is necessary to depressurize the system. Ensure that the probe does not obstruct the normal flow of air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

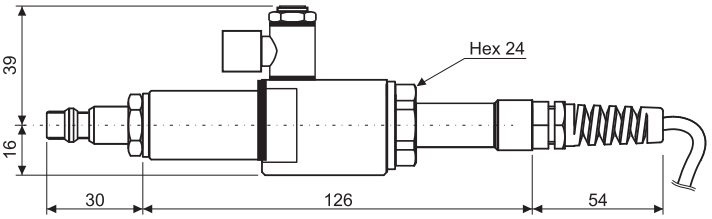
Dimensions (mm) of the probe without measuring chamber:



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



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



ORDERING CODES:

HP480: Interchangeable temperature and 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). For portable instruments **HD2101.1, HD2101.2, HD2301.0, DO2003 and DO9847.**

T480.1: Humidity and temperature probe, **connected directly to the instrument.** 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). For humidity and temperature transmitters of the series **HD4877T…** and **HD4977T…**

S.TC2.480.2: Interchangeable humidity and temperature probe, complete with **SICRAM 2** 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). For the transmitters of the series **HD2717T…** and **HD2817T…**

HD 2301.0

HD2301.0
HYGRO-THERMOMETER

The **HD2301.0** is a portable instrument with a large LCD display. It measures relative humidity and temperature using a Pt100 sensor or thermocouple humidity/temperature combined probe. Temperature only is measured by immersion, penetration, air or contact probes. The sensor can be a Pt100 or Pt1000. 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 that can also be excluded. **The instruments have IP67 protection degree.**

INSTRUMENT TECHNICAL CHARACTERISTICS

Instrument

Dimensions (Length x Width x Height)	140x88x38mm
Weight	160g (complete with batteries)
Materials	ABS
Display	2x4½ digits plus symbols Visible area: 52x42mm

Operating conditions

Operating temperature	-5…50°C
Storage temperature	-25…65°C
Working relative humidity	0…90%RH without condensation
Protection degree	**IP67**

Power

Batteries	3 1.5V type AA batteries
Autonomy	200 hours with 1800mAh alkaline batteries
Power absorbed with instrument off	< 20µA

Measuring unit °C - °F - %RH - g/m³ - Td - hPa

Connections

Input module for the probes	8-pole male DIN45326 connector

Measurement of relative humidity by Instrument

Measurement range	0…100%RH
Resolution	0.1%RH
Accuracy	±0.1%RH
Drift after 1 year	0.1%RH/year

Measurement of temperature by Instrument

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

Relative humidity and temperature probes using SICRAM module

Model	Temperature sensor	Working range		Accuracy	
		%RH	Temperature	%RH	Temp
HP472ACR	Pt100	0…100%RH	-20°C…+80°C	±1,5%RH (10…90%RH)	±0.3°C
HP572ACR	Thermocouple K	0…100%RH	-20°C…+80°C	±2,0%RH (in the remaining	±0.5°C
HP473ACR	Pt100	0…100%RH	-20°C…+80°C	range) for T= 15…35°C	±0.3°C
HP474ACR	Pt100	0…100%RH	-40°C…+150°C	----------	±0.3°C
HP475ACR	Pt100	0…100%RH	-40°C…+150°C	±(1,5+1.5% of the	±0.3°C
HP475AC1R	Pt100	0…100%RH	-40°C…+180°C	displayed value) %RH	±0.3°C
HP477DCR	Pt100	0…100%RH	-40°C…+150°C	in the remaining	±0.3°C
HP478ACR	Pt100	0…100%RH	-40°C…+150°C	temperature range	±0.3°C

Common characteristics
Relative humidity

Sensor	Capacitive
Measuring range	0÷100%RH
Temperature drift @ 20°C	Max 0.02%RH/°C
Response time %RH	10sec (10÷80%RH; air speed=2m/s) at constant air temperature

Temperature with sensor Pt100

Temperature drift @ 20°C	0.003%/°C

Temperature with thermocouple K - HP572ACR

Temperature drift @ 20°C	0.02%/°C

Same specifications reported above apply for **HP 480** probe (for measuring humidity of the air in pipes), with the following exceptions:

HP480		
Temperature	Measuring range	-40…+60°C
Humidity	Dew point	-40…+60°C DP
Environmental Conditions	Working temperature	-40…+60°C
	Working pressure	16bar max

TECHNICAL DATA OF PROBES AND MODULES EQUIPPED WITH INSTRUMENT
Temperature probes Pt100 sensor with SICRAM module

Model	Type	App. range	Accuracy
TP472I	Immersion	-196°C…+500°C	±0.25°C (-196°C…+300°C) ±0.5°C (+300°C…+500°C)
TP472I.0 *1/3DIN - Thin film*	Immersion	-50°C…+300°C	±0.25°C
TP473P.I	Penetration	-50°C…+400°C	±0.25°C (-50°C…+300°C) ± 0.5°C (+300°C…+400°C)
TP473P.0 *1/3DIN - Thin film*	Penetration	-50°C…+300°C	±0.25°C
TP474C.I	Contact	-50°C…+400°C	±0.3°C (-50°C…+300°C) ±0.5°C (+300°C…+400°C)
TP474C.0 *1/3DIN - Thin film*	Contact	-50°C…+300°C	±0.3°C
TP475A.0 *1/3DIN - Thin film*	Air	-50°C…+250°C	±0.3°C
TP472I.5	Penetration	-50°C…+400°C	±0.3°C (-50°C…+300°C) ±0.6°C (+300°C…+400°C)
TP472I.10	Penetration	-50°C…+400°C	±0.30°C (-50°C…+300°C) ±0.6°C (+300°C…+400°C)
TP49A.0 *Class A - Thin film*	Immersion	-70°C…+250°C	±0.3°C (-70°C…-50°C) ±0.25°C (-50°C…+250°C)
TP49AC.0 *Class A - Thin film*	Contact	-70°C…+250°C	±0.3°C (-70°C…-50°C) ±0.25°C (-50°C…+250°C)
TP49AP.0 *Class A - Thin film*	Penetration	-70°C…+250°C	±0.3°C (-70°C…-50°C) ±0.25°C (-50°C…+250°C)
TP875.I	Globethermometer Ø150mm	-30°C…+120°C	±0.25°C
TP876.I	Globethermometer Ø 50mm	-30°C…+120°C	±0.25°C
TP87.0 *1/3DIN - Thin film*	Immersion	-50°C…+200°C	±0.25°C
TP878.0 *1/3DIN - Thin film* TP878.1.0 *1/3DIN - Thin film*	For solar panel	+4°C…+85°C	±0.25°C
TP879.0 *1/3DIN - Thin film*	For compost	-20°C…+120°C	±0.25°C

Common characteristics
Temperature drift @ 20°C 0.003%/°C

4 wire Pt100 and 2 wire Pt1000 Probes

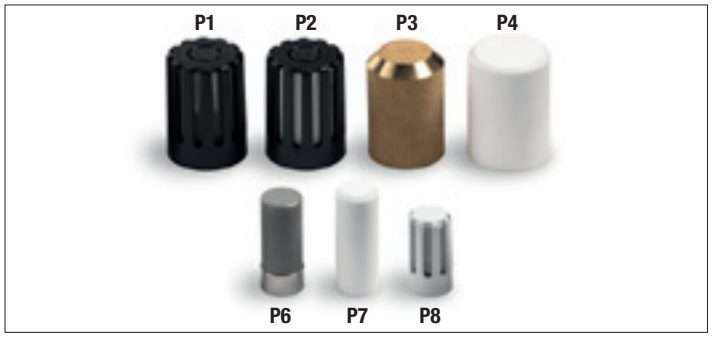
Model	Type	Application range	Accuracy
TP47.100.0 *1/3DIN - Thin film*	Pt100 4 wires	-50…+250°C	1/3DIN
TP47.1000.0 *1/3DIN - Thin film*	Pt1000 2 wires	-50…+250°C	1/3DIN
TP87.100.0 *1/3DIN - Thin film*	Pt100 4 wires	-50…+200°C	1/3DIN
TP87.1000.0 *1/3DIN - Thin film*	Pt1000 2 wires	-50…+200°C	1/3DIN

Common characteristics
Temperature drift @ 20°C
Pt100 0.003%/°C
Pt1000 0.005%/°C

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

Relative humidity and temperature probes complete with SICRAM module
HP472ACR: %RH and temperature combined probe, dimensions Ø 26x170 mm. 2 m connecting cable.
HP572ACR: %RH and temperature combined probe, **K thermocouple sensor**. Dimensions Ø 26x170 mm. 2 m connecting cable.
HP473ACR: %RH and temperature combined probe. Dimensions: handle Ø 26x130 mm, probe Ø 14x120 mm. 2m connecting cable.
HP474ACR: %RH and temperature combined probe. Dimensions: handle Ø 26x130 mm, probe Ø 14x215 mm. 2m connecting cable.
HP475ACR: %RH and temperature combined probe. 2 m connecting cable. Handle Ø 26x110 mm. Stainless-steel tube Ø 12x560 mm. Terminal tip Ø 14x75 mm.
HP475AC1R: %RH and temperature combined probe. 2 m connection cable. Handle Ø 26x80 mm. Stainless steel stem Ø 14x480 mm.
HP477DCR: %RH and temperature combined sword probe. 2 m connecting cable. Handle Ø 26x110 mm. Probe tube 18x4 mm, length 520 mm.
HP478ACR: %RH and temperature combined probe. Dimensions Ø 14x130 mm. 5m connection cable.
HP480: Probe for the measurement of air humidity in pipes. 2m connecting cable. 1/4" Italian Standard quick coupling. AISI 304 measuring chamber.

Temperature probes complete with SICRAM module
TP472I: Wire wound Pt100 sensor, immersion probe. Stem Ø 3 mm, length 300 mm. Cable length 2 m.
TP472I.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3 mm, length 230 mm. Cable length 2 m.
TP473P.I: Wire wound Pt100 sensor, penetration probe. Stem Ø 4mm, length 150 mm. Cable length 2 m.
TP473P.0: Thin film Pt100 sensor, penetration probe. Stem Ø 4mm, length 150 mm. Cable length 2 m.
TP474C.I: Wire wound Pt100 sensor, contact probe. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 m.
TP474C.0: Thin film Pt100 sensor, contact probe. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 m.
TP475A.0: Thin film Pt100 sensor, air probe. Stem Ø 4mm, length 230mm. Cable length 2 m.
TP472I.5: Thin film Pt100 sensor, penetration probe. Stem Ø 6mm, length 500 mm. Cable length 2 m.



TP472I.10: Thin film Pt100 sensor, penetration probe. Stem Ø 6mm, length 1000mm. Cable length 2 m.
TP49A.0: Thin film Pt100 sensor, immersion probe. Stem Ø 2,7mm, length 150mm. Cable length 2 m. Aluminium handle
TP49AC.0: Thin film Pt100 sensor, contact probe. Stem Ø 4mm, length 150mm. Cable length 2 m. Aluminium handle
TP49AP.0: Thin film Pt100 sensor, penetration probe. Stem Ø 2,7mm, length 150mm. Cable length 2 m. Aluminium handle
TP875.I: Wire wound Pt100 sensor, 150mm diameter globe-thermometer equipped with handle. Cable length 2 m.
TP876.I: Wire wound Pt100 sensor, 50mm diameter globe-thermometer equipped with handle. Cable length 2 m.
TP87.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3 mm, length 70 mm. Cable length 2 m.
TP878.0: Thin film Pt100 sensor, contact probe for solar panels. Cable length 2 m.
TP878.1.0: Thin film Pt100 sensor, contact probe for solar panels. Cable length 5 m.
TP879.0: Thin film Pt100 sensor , penetration probe for compost. Stem Ø8mm, length 1000mm. Cable length 2m.

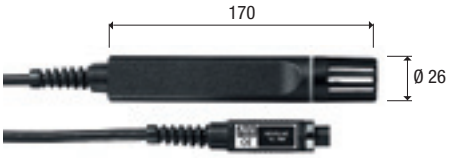
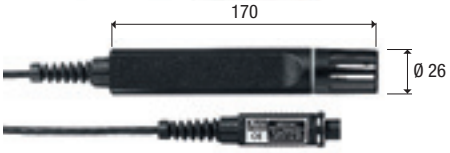
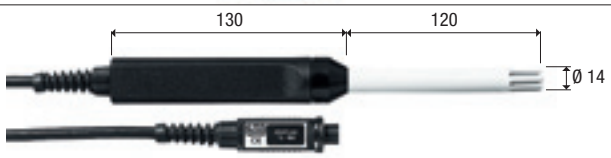
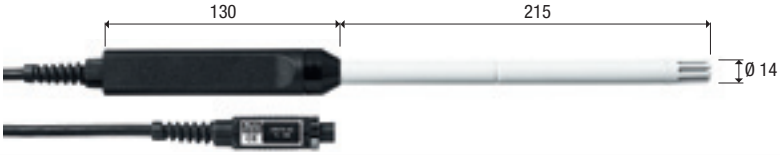
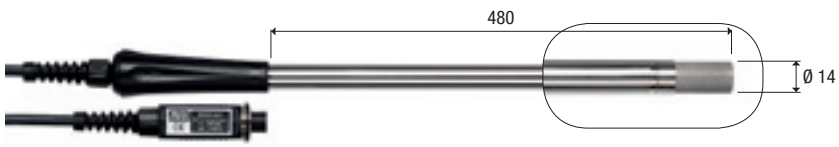
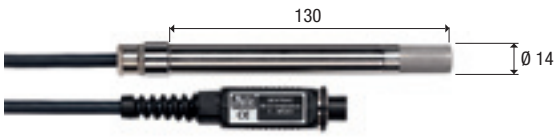
Temperature probes without SICRAM module
TP47.100.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3mm, length 230mm. Connection cable 4 wires with connector, length 2 m.
TP47.1000.0: Thin film Pt1000 sensor, immersion probe. Probe's Stem Ø 3mm, length 230mm. Connection cable 2 wires with connector, length 2 m.
TP47: Module for the connection of Pt100 4-wire and Pt1000 2-wire probes.
TP87.100.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3mm, length 70mm. 4-wires connection cable with connector, length 1 m.
TP87.1000.0: Thin film Pt1000 sensor, immersion probe. Stem Ø 3mm, length 70mm. 2-wires connection cable with connector, length 1 m.

Accessories
HD33: Saturated solution at 33.0%RH@20°C for calibration of relative humidity probes, fixing adapter M24x1.5, M12x1.
HD75: Saturated solution at 75.4%RH@20°C for calibration of relative humidity probes, fixing adapter M24x1.5, M12x1.

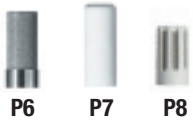
Protection for humidity probes Ø 26 M24x1,5
P1: Stainless steel 200µm grid protection for probes Ø 26 mm.
P2: 20µm sintered polyethylene PE protection for probes Ø 26 mm.
P3: 20µm sintered bronze protection for probes Ø 26 mm.
P4: 20µm sintered PE complete cap for probes Ø 26 mm.

Protection for humidity probes Ø 14 M12x1
P6: 10µm sintered complete protection made of AISI 316 stainless steel for probes Ø 14 mm.
P7: 20µm sintered complete protection made of PTFE for probes Ø 14 mm.
P8: Stainless steel 20µm grid and Pocan protection for probes Ø 14 mm.

RELATIVE HUMIDITY AND TEMPERATURE PROBES

COD.	Sensors	Range RH - Temp.	USE
HP472ACR	RH Pt100	0…100% RH -20°C…+80°C	
HP572ACR	RH TC.K		
HP473ACR	RH Pt100		
HP474ACR		0…100% RH -40°C…+150°C (-40°C…+180°C for HP475AC1R)	
HP475ACR			
HP475AC1R			
HP477DCR			
HP478ACR			
HP480	RH Pt100	0…100% RH -40°C…+60°C	

SATURATED SOLUTIONS AND PROBE PROTECTIONS

COD.			USE
HD75 HD33	Threaded ring nut M24 x 1,5 for probes Ø 26 Threaded ring nut M12 x 1 for probes Ø 14		
P1 P2 P3 P4	Ø 26	M 24x1,5	 **P1** **P2** **P3** **P4**
P6 P7 P8	Ø 14	M 12x1	 **P6** **P7** **P8**

HD 75
HD 33

HD 75, HD 33
HOW TO USE SATURATED SALT SOLUTIONS 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	


1


2


3


4


1


2


3


4


5


6


7

HD 37AB17D
HD 37B17D

HD 37AB17D, HD 37B17D
DATALOGGER
RELATIVE HUMIDITY - TEMPERATURE - CO - CO_2

HD37AB17D and **HD37B17D** instruments are **data loggers** able to measure and memorize simultaneously the following parameters:

- Relative Humidity **RH**
- Environment temperature **T**
- Carbon monoxide **CO** (**only HD37AB17D**)
- Carbon dioxide **CO_2**

HD37AB17D and **HD37B17D** instruments have the ability to investigate and monitor the indoor air quality.
Typical applications include checking air quality inside buildings occupied by people (schools, hospitals, auditoria, canteens, etc.); and work places to optimize the comfort and to generally check for small leaks of CO with danger of explosions or fire. This analysis allows the management of conditioning plants (temperature and humidity) and ventilation (recycle air/hour) in order to reach a double purpose: getting a good quality of the air in accordance with ASHRAE and IMC regulations and energy saving.
HD37AB17D and **HD37B17D** are instruments which are very useful to fight the so-called syndrome of sick building.
RH (Relative Humidity) measurement is obtained with a capacitive sensor.
T temperature is measured with a high precision NTC sensor.
The **CO** measurement (Carbon monoxide, only for **HD37AB17D**) is made by an electrochemical cell with two electrodes indicated to detect the presence of Carbon monoxide, lethal for men, in his living or working environment.
The **CO_2** measurement (Carbon dioxide) is obtained with a special infrared sensor (NDIR technology: Non-Dispersive Infrared Technology) that, thanks to the use of double filter and a special measurement techniques, guarantees accurate and stable measurements over time. The infrared sensor is equipped with a protection membrane which provides protection from dust particles and aggressive air agents to assure the sensor's long life.
HD37AB17D and **HD37B17D** are **data loggers** able to memorize the detected measurements at an interval set by the user.
HD37AB17D and **HD37B17D** are connected to the PC by ***USB*** input.
DeltaLog13 communication **software** via the USB port, designed to perform data transfer, data collection and recording and printing of all the instrument parameters and stored measurements. In addition the software allows the calibration adjustments of the RH, CO (only HD37B17D) and CO_2 sensors.
Using appropriate procedure, the Software DeltaLog13 can evaluate the parameter **% OA** (percentage of external air), according to the following formula:.

$$\%OA = \frac{X_r - X_s}{X_r - X_0} \cdot 100$$

whereas:
X_r = CO_2 in return air
X_S = CO_2 in the outlet air
X_0 = CO_2 in the external air
The power supply of the instrument is provided by a 2 Ni-MH **rechargeable** batteries package (code BAT-20), that allows 8 hours of continuous working in acquisition mode.

Acquisition frequency :

Frequency	samples per minute	maximum duration of logging limited
3 sec.	20 samples per minute	16 hours
6 sec	10 samples per minute	1 day, 9 hours
12 sec	5 samples per minute	2 days, 12 hours
15 sec	4 samples per minute	3 days, 12 hours
30 sec	2 samples per minute	6 days, 12 hours
60 sec. = 1 min.	1 samples per minute	13 days, 12 hours
120 sec. = 2 min.	1 sample every 2 minutes	27 days, 12 hours
180 sec. = 3 min.	1 sample every 3 minutes	41 days, 12 hours
240 sec. = 4 min.	1 sample every 4 minutes	55 days, 12 hours
300 sec.= 5 min.	1 sample every 5 minutes	69 days

Technical Features

Dimensions	275 mm x 45 mm x 40 mm
Weight	230 g (batteries included)
Materials	ABS
Mains power supply	Batteries charger **100-240Vac/6Vdc-1A (code SWD06)**
Batteries	Package with 2 rechargeable batteries 1.2V type AA (NiMH)
Autonomy	8 hours of continuous working in measurement mode
Current absorbed with instrument off	200µA
CO_2 temperature compensation	0°C…50°C
Operating conditions	
Working temperature	-20°C…+60°C
Storage temperature	-25°C…+65°C
Working relative humidity	0%RH ... 90%RH no condensation
Protection degree	IP30
Safety of the stored data	Unlimited
Connections	
USB interface	USB 2.0 cable B type Baudrate 460800
Batteries charger power supply (code SWD06)	2 - poles connector (positive at the centre) Output voltage: **6Vdc** Maximum current: 1600mA (9, 60 VA Max).
Measuring rate	1 sample every three seconds
Storage capacity	20000 Records Every record includes the following: - date and time - measurement of the carbon dioxide (CO_2) - measurement of the carbon monoxide CO (only HD37AB17D) - measurement of the relative humidity (RH) - measurement of the temperature (T)

Logging interval	selectable within: 3,6,12,15,30,60 seconds, 2,3,4,5 minutes The stored values represent the average value of the samples that are stored every three seconds.
Printing interval	selectable within: 3,6,12,15,30,60 seconds, 2,3,4,5 minutes The printed values represent the average value of the samples that are stored every three seconds.

Sensor Features

Relative Humidity RH

Sensor	Capacitive sensor
Sensor protection	Net filter made of stainless steel (on request filter P6 in AISI316 sintered 10µm or filter P7 in PTFE sintered 20µm)
Measurement range	0...100 % RH
Sensor working range	-20...+60°C
Accuracy	±1.5%RH (0÷90%RH) ±2%RH in the remaining range, for T=15…35°C ±(1,5+1.5%of the measured value)%RH for T= -20…+60°C
Resolution	0,1%
Thermal effects	±2% on whole temperature range
Hysteresis and repeatability	1% RH
Response time (T_{90})	< 20 sec. (air speed = 2m/sec) without filter
Long term stability	1%/year

Temperature T

Sensor type	NTC 10kΩ
Measurement range	-20...+60°C
Accuracy	±0.2°C ±0.15% of the measure
Resolution	0,1°C
Response time (T_{90})	< 30 sec. (air speed = 2m/sec)
Long term stability	0.1°C/year

Carbon monoxide CO (only HD37AB17D)

Sensor	Electro chemical cell
Measurement range	0…500ppm
Sensor working range	-5…50°C
Accuracy	±3ppm±3% of the measured value
Resolution	1ppm
Response time (T_{90})	< 50 sec.
Long term stability	5% of the measure/year
Expected life	> 5 years in normal environmental conditions

Carbon dioxide CO_2

Sensor	NDIR with a double wave length
Measurement range	0…5000 ppm
Sensor working range	-5…50°C
Accuracy	±50ppm±3% of the measurement
Resolution	1ppm
Thermal effects	0,1%f.s./°C
Response time (T_{90})	< 120 sec. (air speed = 2m/sec)
Long term stability	5% of the measure/ 5 years

Ordering codes

HD37AB17D: The kit consists of: **HD37AB17D** instrument to measure CO (Carbon monoxide), CO_2 (Carbon dioxide), RH (Relative Humidity), T (Temperature), **DeltaLog13** Software, USB cable code **CP22**, **SWD06** power supply, **BAT-2** batteries pack, instruction manual, carrying case.

HD37B17D: The kit consists of **HD37B17D** instrument to measure CO_2 (Carbon dioxide), RH (Relative Humidity), T (Temperature), **DeltaLog13** Software, USB cable code **CP22**, **SWD06** power supply, **BAT-2** batteries pack, instruction manual, carrying case.

Accessories:

VTRAP20: Instrument tripod, maximum height 270mm.

SWD06: 100-240Vac/6Vdc-1A mains voltage power supply.

BAT-20: Replacement batteries pack for HD37AB17D and HD37B17D instruments with integrated temperature sensor.

P6: Sintered stainless steel 10µ grid protection, for probes diameter 14, thread M12×1.

P7: 20µ, PTFE protection for probes diameter 14, thread M12×1.

P8: Stainless steel and Pocan 20µ protection for probes diameter 14, thread M12×1.

HD75: Saturated solution for testing the Relative Humidity with 75% HR, complete with adapter for probes diameter 14, thread M12×1.

HD33: Saturated solution for testing the Relative Humidity with 33% HR, complete with adapter for probes diameter 14, thread M12×1.

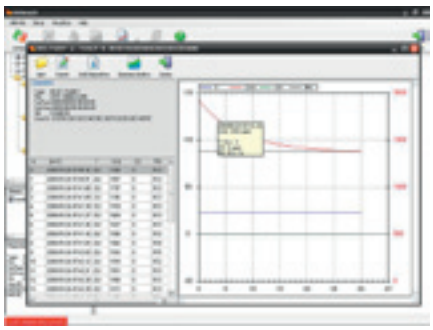
MINICAN.12A: Cylinder of nitrogen for the calibration of CO and CO_2 at 0ppm. Volume 12 litres. **With adjustment valve**.

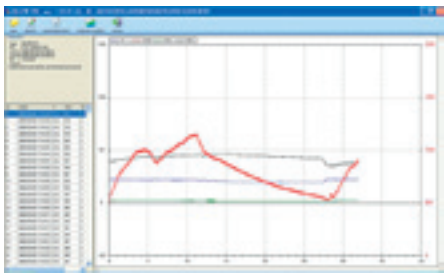
MINICAN.12A1: Cylinder of nitrogen for the calibration of CO and CO_2 at 0ppm. Volume 12 litres. **Without adjustment valve**.

ECO-SURE-2E CO: Spare CO sensor.

HD37.36: Kit connection pipe between instrument and MINICAN.12A for the calibration of CO.

HD37.37: Kit connection pipe between instrument and MINICAN.12A for the calibration of CO_2.





HD37AB1347

HD37AB1347
INDOOR AIR QUALITY MONITOR

HD37AB1347 IAQ Monitor is a tool manufactured by Delta Ohm for the analysis of air quality (Indoor Air Quality, IAQ).
The instrument simultaneously measures several parameters: **Carbon Dioxide** CO_2, **Carbon monoxide** CO, **Temperature**, **Relative humidity, atmospheric pressure** and calculates **Dew Point**, **wet bulb temperature**, **absolute humidity**, **mixing ratio**, **enthalpy**. All this is done with the **P37AB147** SICRAM probe. The SICRAM probe **P37B147** does not measure the Carbon Monoxide CO. Also combined **temperature and humidity** SICRAM probes**, Hot wire Air speed** SICRAM probes, **Vane air speed** SICRAM probes and **temperature** SICRAM probes can be connected to the instrument.
The instrument, according to a proper procedure, calculates the percentage of injection of outdoor air **(% Outside Air**) for both carbon dioxide CO_2 and temperature and **Ventilation Rate**.
HD37AB1347 **data logger** has a storage capacity of 67,600 presets for each of the two inputs divided into 64 blocks; it uses the software DeltaLog10 from version 0.1.5.0 for Windows® operating systems.
The instrument is equipped with a large dot matrix graphic display with a resolution of 160x160 points. The Reference Standards: **ASHRAE 62.1-2004, Decree Law 81/2008**. The rules apply to all enclosed spaces that may be occupied by people. Should be considered, depending on air quality, chemical contaminants, physical and biological or outdoor air flow inside inadequately purified (Ventilation Rate).
The typical applications of the instrument with the range of sensors above mentioned are:
- IAQ measure and comfort conditions in schools, offices and indoor environments.
- Analysis and study of sick building syndrome (Sick Building Syndrome) and consequences.
- Verification of HVAC system.
- Investigation of IAQ conditions in factories to optimize the microclimate and improve productivity.
- Audits in Building Automation.

*Example of an immediate printout obtained using the **HD40.1** printer*

```
========================
  Model HD37AB1347 IAQ
========================
Firm.Ver.=01.00
Firm.Date=2010/01/15
SN=12345678
ID=0000000000000000
------------------------
Probe ch.1 description
Type: CO2-C0 Fw.V0R0
Data cal.:2010/01/15
Serial N.:10010060
------------------------
Probe ch.2 description
Type: Hot wire
Data cal.:2010/01/15
Serial N.: 10010100
========================
Date=2010/01/15 15:00:00
CO2           850   ppm
C0              0   ppm
RH           39.1   %
T1           22.0   °C
Patm        1010   hPa
Va           0.00   m/s
========================
```

Instrument model

Instrument firmware version
Instrument firmware date
Instrument serial number
Identification Code

Description of the probe connected to input 1

Description of the probe connected to input 2

Date and time
Carbon Dioxide
Carbon Monoxide
Relative Humidity
Temperature
Atmospheric Pressure
Air Speed

HD37AB1347 Technical specifications

Instrument	
Dimensions (Length x Width x Height)	185x90x40 mm
Weight	470 g (batteries included)
Materials	ABS, rubber
Display	Backlit, Dot Matrix 160x160 dots, visible area 52x42 mm
Operating conditions	
Operating temperature	-5…50°C
Storage temperature	-25…65°C
Working relative humidity	0 … 85% RH without condensation
Protection degree	**IP65**
Instrument uncertainty	± 1 digit @ 20°C
Power supply	
Mains adapter (code SWD10)	12Vdc/1A
Rechargeable batteries	4 1.2V type AA batteries Ni-MH
Autonomy	20 hours with 1800mAh Ni-MH batteries (with P37AB147 probe connected)
Power absorbed with instrument off	< 45µA
Security of stored data	Unlimited
Connections	
Input for probes with SICRAM module	Two 8-pole male DIN45326 connectors
You can connect the following probes to the **Indoor Air Quality** input:	- **P37AB147** - **P37B147** - **Temperature** probes equipped with SICRAM module - **Temperature** and **Humidity** combined probes with SICRAM module
You can connect the following probes to the **Temp - Air Velocity** input:	- **Hot-Wire Sensor Air Speed** probes with SICRAM module - **Vane Air Speed** probes with SICRAM module - **Temperature** probes equipped with SICRAM module
Serial interface:	
Socket:	8-pole M12
Type:	RS232C (EIA/TIA574) or USB 1.1 or 2.0 not insulated
Baud rate:	From 1200 to 38400 baud.
Data bits:	8
Parity:	None
Stop bits:	1

Flow control:	Xon-Xoff
Cable length:	Max 15 m
USB interface	
Type	1.2 or 2.0 non insulated
Connection	MiniUSB B-Type
Memory	Divided into 64 blocks.
Storage capacity	67600 recordings per each of the 2 inputs.
Logging interval	Selectable among: 15, 30 seconds, 1, 2, 5, 10, 15, 20, 30 minutes and 1 hour.

Logging interval	Storage capacity	Logging interval	Storage capacity
15 seconds	About 11 days and 17 hours	10 minutes	About 1 year and 104 days
30 seconds	About 23 days and 11 hours	15 minutes	About 1 year and 339 days
1 minute	About 46 days and 22 hours	20 minutes	About 2 years and 208 days
2 minutes	About 93 days and 21 hours	30 minutes	About 3 years and 313 days
5 minutes	About 234 days and 17 hours	1 hour	About 7 years and 261 days

Technical specifications of the probes that can be connected to the HD37AB1347 instrument

P37AB147 and P37B147 SICRAM probes
- **P37AB147:** Measurement of CO_2 - CO - Relative Humidity - Temperature - Atmospheric Pressure.
- **P37B147:** Measurement of CO_2 - Relative Humidity - Temperature - Atmospheric Pressure.

CO_2 Carbon Dioxide

Sensor	NDIR Dual Wavelength
Measurement range	0 … 5000ppm
Sensor working range	-5 … 50°C
Accuracy	±50ppm±3% of measurement
Resolution	1ppm
Temperature dependence	0.1%f.s./°C
Response time (T_{90})	< 120 sec (air speed = 2m/sec)
Long-term stability	5% of measurement/5 years

CO Carbon Monoxide (only P37AB147)

Sensor	Electrochemical cell
Measurement range	0 … 500ppm
Sensor working range	-5 … 50°C
Accuracy	±3ppm±3% of measurement
Resolution	1ppm
Response time (T_{90})	< 50 sec
Long-term stability	5% of measurement/year
Service life	> 5 years in normal environment conditions

Relative Humidity RH

Type of sensor	Capacitive
Sensor protection	Stainless steel grid filter (upon request 10µm sintered filter P6 in AISI 316 or 20µm sintered filter P7 in PTFE)
Measurement range	0 … 100 % RH
Sensor working range	-20 … +60°C
Accuracy	±1.5%RH (0÷90% RH) ±2%RH (elsewhere) for T=15…35°C ±(1.5+1.5% of the measure)%RH for T= -20…+60°C
Resolution	0.1°C
Temperature dependence	±2% on all temperature range
Hysteresis and repeatability	1% RH
Response time (T_{90})	< 20 sec (air speed = 2m/sec) without filter
Long-term stability	1%/year

Temperature T

Type of sensor	NTC 10kΩ
Measurement range	-20 … +60°C
Accuracy	±0.2°C ±0.15% of measurement
Resolution	0.1°C
Response time (T_{90})	< 30 sec (air speed = 2m/sec)
Long-term stability	0.1°C/year

Atmospheric Pressure Patm

Type of sensor	Piezo-resistive
Measurement range	750 … 1100 hPa
Accuracy	±1.5 hPa @ 25°C
Resolution	1 hPa
Long-term stability	2hPa/year
Temperature drift	±3hPa with temperature -20 … +60°C

Relative humidity and temperature probes using SICRAM module

Model	Temp. sensor	Application range		Accuracy	
		%RH	Temperature	%RH	Temp.
HP472ACR	Pt100	0…100%RH	-20°C…+80°C	±1.5%RH (0…90% RH) ±2%RH (elsewhere) For T=15…35°C --- ±(1.5+1.5% of the measure)%RH in the remaining temperature range	±0.3°C
HP572ACR	K TC	0…100%RH	-20°C…+80°C		±0.5°C
HP473ACR	Pt100	0…100%RH	-20°C…+80°C		±0.3°C
HP474ACR	Pt100	0…100%RH	-40°C…+150°C		±0.3°C
HP475ACR	Pt100	0…100%RH	-40°C…+150°C		±0.3°C
HP475AC1R	Pt100	0…100%RH	-40°C…+180°C		±0.3°C
HP477DCR	Pt100	0…100%RH	-40°C…+150°C		±0.3°C
HP478ACR	Pt100	0…100%RH	-40°C…+150°C		±0.3°C

Common characteristics

Relative Humidity

Sensor	Capacitive
Sensor operating temperature	-20 … 80°C
Measurement range	0÷100%RH
Resolution	0.1%RH
Temperature drift @20°C	0.02%RH/°C
Response time %RH	10sec (10÷80% RH; air speed=2m/s) at constant temperature

Temperature with sensor Pt100

Resolution	0.1°C
Temperature drift @20°C	0.003%/°C

Hot-Wire Air Speed measurement probes with SICRAM module: AP471 S1 - AP471 S2 - AP471 S3 - AP471 S4

	AP471 S1 - AP471 S3	AP471 S2	AP471 S4
Type of measurements	Air speed, calculated flow rate, air temperature		
Type of sensor			
Speed	NTC thermistor	Omni directional NTC thermistor	
Temperature	NTC thermistor	NTC thermistor	
Measurement range			
Speed	0.1 … 40m/s	0.1 … 5m/s	
Temperature	-25 … +80°C	-25 … +80°C	0 … 80°C
Measurement resolution			
Speed	0.01 m/s 0.1 km/h 1 ft/min 0.1 mph 0.1 knot		
Temperature	0.1°C		
Measurement accuracy			
Speed	±0.2 m/s (0…0.99 m/s)	±0.2m/s (0…0.99 m/s)	
	±0.4 m/s (1.00…9.99 m/s)	±0.3m/s (1.00…5.00 m/s)	
	±0.8 m/s (10.00…40.0 m/s)		
Temperature	±0.8°C (-10…+80°C)	±0.8°C (-10…+80°C)	
Minimum speed	0.1 m/s		
Air temperature compensation	0…80°C		
Sensor working conditions	Clean air, RH<80 %		
Battery life	Approx. 20 hours @ 20 m/s with alkaline batteries	Approx. 30 hours @ 5 m/s with alkaline batteries	
Unit of measurement			
Speed	m/s – km/h – ft/min – mph – knot		
Flow rate	l/s - m^3/s - m^3/min - m^3/h - ft^3/s - ft^3/min		
Pipeline section for flow rate calculation	0.0001…1.9999 m^2		
Cable length	~2m		

HD40.1

Vane Air Speed measurement probes with SICRAM module: AP472 S1 - AP472 S2

	AP472 S1	AP472 S2
Type of measurements	Air speed, calculated flow rate, air temperature	Air speed, calculated flow rate
Diameter	100 mm	60 mm
Type of measurement		
Speed	Vane	Vane
Temperature	Tc K	----
Measurement range		
Speed (m/s)	0.6 … 25	0.5 … 20
Temperature (°C)	-25…+80 (*)	
Resolution		
Speed	0.01 m/s 0.1 km/h 1 ft/min 0.1 mph 0.1 knot	
Temperature	0.1°C	----
Accuracy		
Speed	±(0.4 m/s +1.5%f.s.)	±(0.4m/s +1.5%f.s.)
Temperature	±0.8°C	----
Minimum speed	0.6m/s	0.5m/s
Unit of measurement		
Speed	m/s – km/h – ft/min – mph – knot	
Flow rate	l/s - m^3/s - m^3/min - m^3/h - ft^3/s - ft^3/min	
Pipeline section for flow rate calculation	0.0001…1.9999 m^2	
Cable length	~2m	

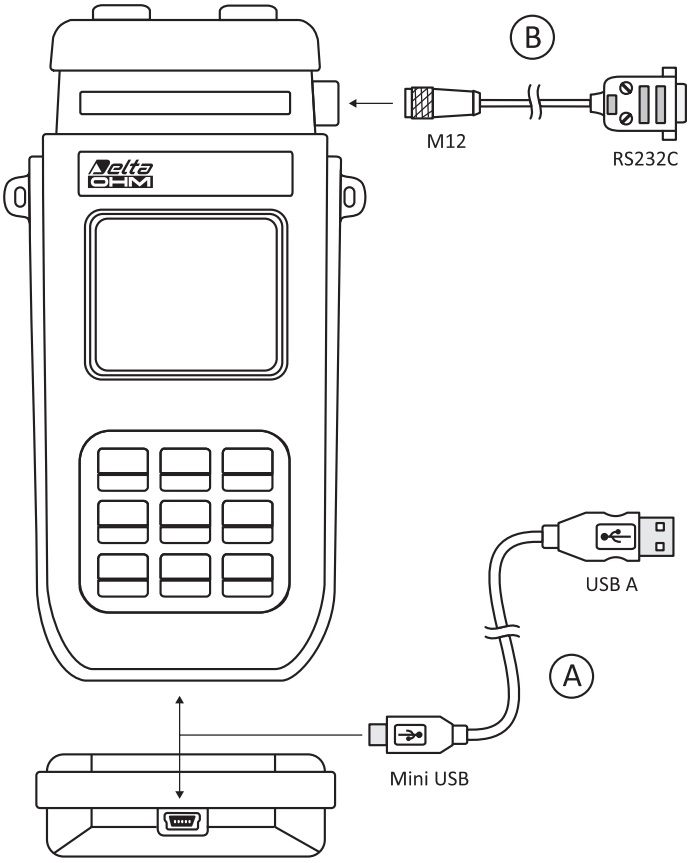
(*) The indicated value refers to the vane's working range.

Temperature probes Pt100 using SICRAM module

Model	Type	App. range	Accuracy
TP472I	Immersion	-196°C…+500°C	±0.25°C (-196°C…+300°C) ±0.5°C (+300°C…+500°C)
TP472I.0 *1/3DIN - Thin film*	Immersion	-50°C…+300°C	±0.25°C
TP473P.I	Penetration	-50°C…+400°C	±0.25°C (-50°C…+300°C) ± 0.5°C (+300°C…+400°C)
TP473P.0 *1/3DIN - Thin film*	Penetration	-50°C…+300°C	±0.25°C
TP474C.I	Contact	-50°C…+400°C	±0.3°C (-50°C…+300°C) ±0.5°C (+300°C…+400°C)
TP474C.0 *1/3DIN - Thin film*	Contact	-50°C…+300°C	±0.3°C
TP475A.0 *1/3DIN - Thin film*	Air	-50°C…+250°C	±0.3°C
TP472I.5	Penetration	-50°C…+400°C	±0.3°C (-50°C…+300°C) ±0.6°C (+300°C…+400°C)
TP472I.10	Penetration	-50°C…+400°C	±0.30°C (-50°C…+300°C) ±0.6°C (+300°C…+400°C)
TP49A.0 *Class A - Thin film*	Immersion	-70°C…+250°C	±0.3°C (-70°C…-50°C) ±0.25°C (-50°C…+250°C)
TP49AC.0 *Class A - Thin film*	Contact	-70°C…+250°C	±0.3°C (-70°C…-50°C) ±0.25°C (-50°C…+250°C)
TP49AP.0 *Class A - Thin film*	Penetration	-70°C…+250°C	±0.3°C (-70°C…-50°C) ±0.25°C (-50°C…+250°C)
TP875.I	Globethermometer Ø150mm	-30°C…+120°C	±0.25°C
TP876.I	Globethermometer Ø 50mm	-30°C…+120°C	±0.25°C
TP87.0 *1/3DIN - Thin film*	Immersion	-50°C…+200°C	±0.25°C
TP878.0 *1/3DIN - Thin film* TP878.1.0 *1/3DIN - Thin film*	For solar panel	+4°C…+85°C	±0.25°C
TP879.0 *1/3DIN - Thin film*	For compost	-20°C…+120°C	±0.25°C

Common characteristics

Temperature drift @20°C	0.003%/°C



A The HD37AB1347 uses a new serial miniUSB port HD type (Human Interface Device). **It is not necessary to install any driver** for making the connection to the PC with the USB cable type A – MiniUSB type B coded CP23**.**

B The port equipped with the M12 connector is an RS232C type that can be used for the connection to the PC or to the HD40.1 printer by using the cable HD2110RS.

ORDERING CODES

HD37AB1347: IAQ Monitor datalogger instrument complete with: **DeltaLog10** software (**from version 0.1.5.0**) for data download, monitor, and data processing on Personal Computer, BAT-40 4x1.2V type AA Ni-MH rechargeable batteries, operating manual, case. **Probes and cables have to be ordered separately.**

Carbon dioxide, carbon monoxide, relative humidity, temperature and atmospheric pressure probes with SICRAM module

P37AB147: CO_2 Carbon Dioxide, CO Carbon Monoxide, Relative Humidity RH, Temperature T and Atmospheric Pressure Patm combined probe. Dimensions 275 mm x 45 mm x 40 mm. Connection cable 2 meters long.

P37B147: CO_2 Carbon Dioxide, Relative Humidity RH, Temperature T and Atmospheric Pressure Patm combined probe. Dimensions 275 mm x 45 mm x 40 mm. Connection cable 2 meters long.

Relative humidity and temperature probes equipped with SICRAM module

HP472ACR: Combined probe %RH and temperature, dimensions Ø 26x170 mm. Connection cable 2 meters long.

HP473ACR: Combined probe %RH and temperature. Handle size Ø 26x130 mm, probe Ø 14x120 mm. Connection cable 2 meters long.

HP474ACR: Combined probe %RH and temperature. Handle size Ø 26x130 mm, probe Ø 14x215 mm. Connection cable 2 meters long.

HP475ACR: Combined probe %RH and temperature. Connection cable 2 meters long. Handle Ø 26x110mm. Stainless steel stem Ø 12x560mm. Tip Ø 14x75 mm.

HP475AC1R: Combined probe %RH and temperature. Connection cable 2 meters long. Handle Ø 26x80 mm. Stainless steel stem Ø 14x480 mm.

HP477DCR: Combined sword probe %RH and temperature. Connection cable 2 meters long. Handle Ø 26x110mm. Probe's stem 18x4mm, length 520 mm.

HP478ACR: Combined probe %RH and temperature. Dimensions Ø 14x130 mm. Connection cable 5 meters long.

Hot-wire wind speed measurement probes equipped with SICRAM module

AP471 S1: Hot-wire telescopic probe, measuring range: 0.1…40m/s. Cable 2 meters long.

AP471 S2: Omni directional hot-wire telescopic probe, measuring range: 0.1 … 5m/s. Cable 2 meters long.

AP471 S3: Hot-wire telescopic probe with terminal tip for easy position, measuring range: 0.1 … 40m/s. Cable 2 meters long.

AP471 S4: Omni directional hot-wire telescopic probe with base, measuring range: 0.1 … 5m/s. Cable 2 meters long.

Vane wind speed measurement probes with SICRAM module

AP472 S1: Vane probe with thermocouple K, Ø 100 mm. Speed from 0.6 to 20 m/s; temperature from -25 to 80°C. Cable 2 meters long.

AP472 S2: Vane probe, Ø 60mm. Measurement range: 0.5…20m/s. Cable 2 meters long.

Temperature measurement probes equipped with SICRAM module

TP472I: Wire wound Pt100 sensor immersion probe. Stem Ø 3 mm, length 300 mm. Cable 2 meters long.

TP472I.0: Thin film Pt100 sensor immersion probe. Stem Ø 3 mm, length 230 mm. Cable 2 meters long.

TP473P.I: Wire wound Pt100 sensor penetration probe. Stem Ø 4 mm, length 150 mm. Cable 2 meters long.

TP473P.0: Thin film Pt100 sensor penetration probe. Stem Ø 4 mm, length 150 mm. Cable 2 meters long.

TP474C.I: Wire wound Pt100 sensor contact probe. Stem Ø 4 mm, length 230 mm, contact surface Ø 5 mm. Cable 2 meters long.

TP474C.0: Thin film Pt100 sensor contact probe. Stem Ø 4 mm, length 230 mm, contact surface Ø 5 mm. Cable 2 meters long.

TP475A.0: Thin film Pt100 sensor air probe. Stem Ø 4 mm, length 230 mm. Cable 2 meters long.

TP472I.5: Thin film Pt100 sensor penetration probe. Stem Ø 6 mm, length 500 mm. Cable 2 meters long.

TP472I.10: Thin film Pt100 sensor penetration probe. Stem Ø 6 mm, length 1000 mm. Cable 2 meters long.

TP49A.0: Thin film Pt100 sensor immersion probe. Stem Ø 2.7 mm, length 150 mm. Cable 2 meters long. Aluminium handle.

TP49AC.0: Thin film Pt100 sensor contact probe. Stem Ø 4 mm, length 150 mm. Cable 2 meters long. Aluminium handle.

TP49AP.0: Thin film Pt100 sensor penetration probe. Stem Ø 2.7 mm, length 150 mm. Cable 2 meters long. Aluminium handle.

TP875.I: Wire wound Globe thermometer Ø 150 mm with handle. Cable 2 meters long.

TP876.I: Wire wound Globe thermometer Ø 50 mm with handle. Cable 2 meters long.

TP87.0: Thin film Pt100 sensor immersion probe. Stem Ø 3 mm with handle, length 70mm. Cable 2 meters long.

TP878.0: Thin film Contact probe for solar panels. Cable 2 meters long.

TP878.1.0: Thin film Contact probe for solar panels. Cable 5 meters long.

TP879.0: Thin film penetration probe for compost. Stem Ø 8 mm, length 1 meter. Cable 2 meters long.

Accessories:

SWD10: Stabilized power supply at 100-240Vac/12Vdc-1A mains voltage.

VTRAP20: Tripod to be fixed to the instrument, maximum height 270 mm.

HD2110/RS: Connection cable with M12 connector on instrument's side and sub D 9-pole female connector for RS232C on PC's side.

CP23: Connection cable with type B MiniUSB connector on instrument's side and USB 2.0 connector on PC's side.

HD40.1: Printer (it uses the **HD2110/RS** cable).

Accessories for HD40.1 printer:

BAT-40: Spare batteries for the HD40.1 printer with built-in temperature sensor.

RCT: Kit of four thermo-paper rolls, width 57 mm, diameter 32 mm.

Accessories for P37AB147 and P37B147 SICRAM probes:

MINICAN.12A: Nitrogen bottle for CO and CO_2 sensor calibration at 0ppm. Volume 12 liters. **With adjustment valve.**

MINICAN.12A1: Nitrogen bottle for CO and CO_2 sensor calibration at 0ppm. Volume 12 liters. **Without adjustment valve.**

ECO-SURE-2E CO: CO spare sensor (only P37AB147)

HD37.36: Kit connection tube between instrument and MINICAN.12A for CO calibration (only P37AB147).

HD37.37: Kit connection tube between instrument and MINICAN.12A for CO_2 calibration.

Accessories for Wind Speed SICRAM probes:

AST.1: Telescopic rod (fully closed 210 mm, fully open 870 mm) for AP472S1 and AP472S2 vanes.

AP 471S1.23.6: Fixed telescopic element ∅ 16 x 300 mm, M10 male thread on one side, female thread on the other side. For AP472S1, AP472S2 vanes.

AP 471S1.23.7: Fixed telescopic element ∅ 16 x 300 mm, M10 female thread on one side only. For AP472S1, AP472S2 vanes.

Accessories for Temperature-Humidity SICRAM probes:

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

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

P6: Complete protection in 10µm sintered AISI 316 for Ø 14mm probes.

P7: Complete protection in 20µm sintered PTFE for Ø 14mm probes.

P8: 20µm protection grid in stainless steel and Pocan for Ø 14mm probes, thread M12x1.

HD21AB
HD21AB17

Instrument Technical Data

Instrument	
Dimensions (Length x Width x Height)	210x90x40 mm (HD21AB) 300x90x40 mm (HD21AB17 with probe)
Weight	470 g (batteries included)
Materials	ABS, rubber
Display	Backlit, Dot Matrix 160x160 dots, visible area 52x42 mm
Operating conditions	
Operating temperature	-5…50°C
Warehouse temperature	-25…65°C
Working relative humidity	0 … 85% RH without condensation
Protection degree	IP30
Instrument uncertainty	± 1 digit @ 20°C
Power supply	
Mains adapter (code SWD10)	12Vdc/1A
Batteries	4 x 1.2V Ni-MH rechargeable batteries AA type
Autonomy	8 hours of continuous use in measure mode
Power absorbed with instrument off	< 45μA
Security of stored data	Unlimited
Serial interface:	
Socket:	mini-USB
Type:	USB 1.1 or 2.0 not insulated
Baud rate:	460800
Data bits:	8
Parity:	None
Stop bits:	1
Flow control:	Xon-Xoff
Cable length:	Max 5 m

HD21AB, HD21AB17
INDOOR AIR QUALITY MONITORS

HD21AB and **HD21AB17** IAQ Monitors are bench-top/portable instruments manufactured by **Delta Ohm** for the analysis of indoor air quality (IAQ, Indoor Air Quality).
The instruments simultaneously measure the parameters:
- **Carbon Dioxide** CO_2
- **Carbon Monoxide** CO
- **Atmospheric Pressure**

The **HD21AB17** instrument also measures:
- **Temperature**
- **Relative Humidity**

and it calculates:
- **Dew Point**
- **Wet Bulb Temperature**
- **Absolute Humidity**
- **Mixing Ratio**
- **Enthalpy**

HD21AB and **HD21AB17** are dataloggers with a memory capacity of 67600 recordings, divided in 64 blocks. They use the **DeltaLog10 software from version 0.1.5.3**.
Reference Standards: **ASHRAE 62.1 – 2004**, **Italian Legislative Decree 81/2008**. These regulations apply to all confined spaces that could be used by people. Kitchens, baths, changing rooms and swimming pools are included, due to their high humidity. You should take into account, in regard to air quality, possible chemical, physical and biological contaminants.
The instruments have a wide Dot Matrix graphic display with a resolution of 160x160 dots.
The instruments typical applications are:
- Measurement of IAQ (*Indoor Air Quality*) and comfort conditions in schools, offices and indoor spaces.
- Analysis and study of the Sick Building Syndrome, and of the resulting consequences.
- Checking the HVAC (*Heating, Ventilation and Air Conditioning*) system efficiency.
- Examination of IAQ conditions in factories to optimize microclimate and improve productivity.
- Building Automation checks.

HD21AB17

Memory	Divided in 64 blocks.
Storage capacity	67600 recordings.
Logging interval	Selectable among: 15, 30 seconds, 1, 2, 5, 10, 15, 20, 30 minutes and 1 hour.

Logging interval	Storage capacity	Logging interval	Storage capacity
15 seconds	About 11 days and 17 hours	10 minutes	About 1 year and 104 days
30 seconds	About 23 days and 11 hours	15 minutes	About 1 year and 339 days
1 minute	About 46 days and 22 hours	20 minutes	About 2 years and 208 days
2 minutes	About 93 days and 21 hours	30 minutes	About 3 years and 313 days
5 minutes	About 234 days and 17 hours	1 hour	About 7 years and 261 days

Technical data of the sensors

CO_2 Carbon Dioxide

Sensor	NDIR Dual Wavelength
Measurement range	0 … 5000ppm
Sensor working range	-5 … 50°C
Accuracy	±50ppm±3% of measurement
Resolution	1ppm
Temperature dependence	0.1%f.s./°C
Response time (T_{90})	< 120 sec (air speed = 2m/sec)
Long-term stability	5% of measurement/5 years

CO Carbon Monoxide

Sensor	Electrochemical cell
Measurement range	0 … 500ppm
Sensor working range	-5 … 50°C
Accuracy	±3ppm±3% of measurement
Resolution	1ppm
Response time (T_{90})	< 50 sec
Long-term stability	5% of measurement/year
Service life	> 5 years in normal environment conditions

Atmospheric Pressure Patm

Type of sensor	Piezo-resistive
Measurement range	750 … 1100 hPa
Accuracy	±1.5 hPa @ 25°C
Resolution	1 hPa
Long-term stability	2hPa/year
Temperature drift	±3hPa with temperature -20 … +60°C

Relative Humidity RH (HD21AB17 only)

Type of sensor	Capacitive
Sensor protection	Stainless steel grid filter (on request 10µm sintered filter P6 in AISI 316 or 20µm sintered filter P7 in PTFE)
Measurement range	0 … 100 % RH
Sensor working range	-20 … +60°C
Accuracy	±1.5%RH (0..90% RH) ±2%RH (elsewhere) for T=15…35°C ±(1.5+1.5% of the measure)%RH for T= -20…+60°C
Resolution	0.1°C
Temperature dependence	±2% on all temperature range
Hysteresis and repeatability	1% RH
Response time (T_{90})	< 20 sec (air speed = 2m/sec) without filter
Long-term stability	1%/year

Temperature T (HD21AB17 only)

Type of sensor	NTC 10kΩ
Measurement range	-20 … +60°C
Accuracy	±0.2°C ±0.15% of measurement
Resolution	0.1°C
Response time (T_{90})	< 30 sec (air speed = 2m/sec)
Long-term stability	0.1°C/year

ORDERING CODES

HD21AB: IAQ Monitor datalogger kit. It measures CO, CO_2 and atmospheric pressure. Complete with: **DeltaLog10** software (**version 0.1.5.3 and later**) for data download, monitor, and data processing on Personal Computer, 4 x 1.2V NiMH rechargeable batteries, operating manual, case. **The cables must be ordered separately.**

HD21AB17: IAQ Monitor datalogger kit. It measures CO, CO_2, atmospheric pressure, temperature and relative humidity. Complete with: **DeltaLog10** software (**version 0.1.5.3 and later**) for data download, monitor, and data processing on Personal Computer, 4 x 1.2V NiMH rechargeable batteries, operating manual, case. **The cables must be ordered separately.**

Accessories:

SWD10: Stabilized power supply at 100-240Vac/12Vdc-1A mains voltage.
CP23: Connection cable with type B MiniUSB connector on instrument's side and USB 2.0 connector on PC's side.
BAT-40: Spare batteries with built-in temperature sensor.

Accessories for CO and CO_2 sensors:

MINICAN.12A: Nitrogen bottle for CO and CO_2 sensor calibration at 0ppm. Volume 12 liters. **With adjustment valve.**
MINICAN.12A1: Nitrogen bottle for CO and CO_2 sensor calibration at 0ppm. Volume 12 liters. **Without adjustment valve.**
ECO-SURE-2E CO: CO spare sensor
HD37.36: Kit connection tube between instrument and MINICAN.12A for CO calibration.
HD37.37: Kit connection tube between instrument and MINICAN.12A for CO_2 calibration.

Accessories for Humidity sensor:

HD75: Saturated solution at 75.4%RH@20°C for calibration of relative humidity probes, ring M24x1.5 and M12x1.
HD33: Saturated solution at 33.0%RH@20°C for calibration of relative humidity probes, ring M24x1.5 and M12x1.
P6: Complete protection in 10µm sintered AISI 316 for Ø 14mm probes.
P7: Complete protection in 20µm sintered PTFE for Ø 14mm probes.
P8: 20µm protection grid in stainless steel and Pocan for Ø 14mm probes, thread M12x1.

HD21AB

HD 40.1
HD 40.2

HD 40.1, HD 40.2
PORTABLE THERMAL PRINTER

The **HD40.1** and **HD40.2** are lightweight, compact, portable thermal printers.

The HD40.1 is connected to instruments or PC through the RS232 serial input. The HD40.2 features a dual mode data reception system - RS232 serial and Bluetooth.

The Bluetooth wireless connection makes the HD40.2 printer very useful "in the field", since it does not require any physical connection to the instrument. A careful design allows you to replace the thermal paper roll in a few seconds. A four NiMH **rechargeable** battery pack provides power supply and ensures long autonomy: you can print up to 3000 lines at full charge. Standard thermal paper roll width: 57mm. Print resolution: 203 dpi. Print characters (each line): 24. Protection degree: IP40.

SPECIFICATIONS

Printing method	Thermal
Resolution	203 DPI (8 dot/mm)
Printing width	48mm centered in the paper roll
Paper roll width	57mm ... 58mm
Max. paper roll diameter	32mm
Number of columns	24
Printing speed	Up to 90 mm/sec (depending on battery charge and ambient conditions)
Sensors	Paper detection
Character set	IBM II 858 table
Printing formats	Normal or extended
Character font	1 (16 x 24 dot – 2mm x 3mm)
Thermal head durability	
Mechanism life	100 million pulses (temperature: 20...25°C)
Abrasion resistance	50km of paper (temperature: 20...25°C)
Cover group durability	2000 opening/closing cycles or more
Communication interfaces	RS232 Bluetooth (for HD40.2)
RS232 Baud rate	9600, 19200 and 38400 baud (**the factory parameter is 38400 baud**)
Bluetooth Baud rate	38400 baud (for HD40.2)
Bluetooth operating distance	Up to 10m without hindrance (for HD40.2)
Mains power supply (cod. SWD10)	100-240Vac/12Vdc-1A mains battery charger
Batteries	Four 1.2V AA rechargeable batteries (NiMH)
Printing autonomy	3000 lines 24 characters each printing one line every 10 seconds
Switch-off function	0, 5, 10 or 15 minutes
Dimensions	105mm x 165mm x 53mm
Weight	380g (with batteries and paper roll)
Material	ABS

Operating conditions

Operating temperature	0°C ... 50°C
Operating relative humidity	20%RH ... 85%RH not condensing
Storage Temperature / Relative humidity	-25°C ... +70°C / 10%RH ... 90%RH not condensing
Protection degree	IP40

Connections

Serial interface	9-pole D sub male connector
Battery charger power supply (cod. SWD10)	2-pole connector (positive in the middle)

ORDERING CODES

HD40.1: The kit includes: 24-column portable thermal printer, **serial interface RS232**, 57mm paper width, four NiMH 1.2V rechargeable batteries, SWD10 power supply, instruction manual, 5 thermal paper rolls.

HD40.2: The kit includes: 24-column portable thermal printer, **Bluetooth and serial interface RS232**, 57mm paper width, four NiMH 1.2V rechargeable batteries, SWD10 power supply, instruction manual, 5 thermal paper rolls.

The serial cable for PC/instrument connection must be ordered separately.

HD2110CSNM: RS232C 8-pole MiniDin - 9-pole D Sub female null-modem cable for connecting the printer to instruments with MiniDIN connector (HD21xx.1 and HD21xx.2 series, HD34xx.2, etc.).

9CPRS232: RS232C 9-pole D Sub female null-modem cable for connecting the printer to instrument with 9-pole D Sub connectors (Delta Ohm instruments: HD22xx.2 series, HD98569, HD25.2, etc.).

HD2110RS: RS232C 9-pole D Sub female-M12 connector cable for connecting the printer to instruments with M12 connector (HD2010…, HD2110L, …).

SWD10: 100-240Vac/12Vdc-1A Mains battery charger.

BAT.40: Spare battery pack for HD40.1 and HD40.2 printers with in-built temperature sensor.

RCT: The kit includes 4 thermal paper rolls 57mm wide and 32mm diameter.

HD 45…
HD 46…

HD45… AND HD46… SERIES
TRANSMITTERS AND REGULATORS FOR HUMIDITY, TEMPERATURE AND CO_2

The instruments of the series **HD45** and **HD46** are transmitters, indicators and regulators, to measure and control, depending on the model, the following environmental parameters:

- Relative humidity (RH)
- Ambient temperature (T)
- Carbon dioxide (CO_2)
- Dew point temperature (DP, calculated measurement)

They are suitable for monitoring indoor air quality.

A typical application is the examination of air quality in: buildings where there is crowding of people (schools, hospitals, auditoriums, cafeterias, etc.); workplaces to optimize comfort and in general to see if there are small losses CO which may cause explosions or fire. This analysis allows the adjustment of air conditioning (temperature and humidity) and ventilation (changes air/hour) in order to achieve a twofold objective: good air quality according to the ASHRAE and IMC standards and energy savings.

The measurement of RH (Relative Humidity) is obtained with a capacitive sensor. In models **HD46** ... the relative humidity and temperature sensor with their calibration data are contained within an easily replaceable module. The instrument can also calculate the information on the dew point.

The temperature T is measured with a high precision NTC sensor.

The measurement of CO_2 (carbon dioxide) is obtained with a special infrared sensor (**NDIR** technology: Non-Dispersive Infrared Technology), which, by using a double filter and a particular measurement technique, ensures accurate measurements and stable measurements over time. The presence of a protective membrane, which is spread through the air portion, protects the sensor from dust and weather. The instrument can be wall mounted and sensors are internal to the instrument.

The instruments are factory calibrated and require no further adjustment by the installer.

The instruments are wall mounted and their sensors are installed inside the housing.

There are versions with **analogue output voltage 0÷10V, current output 4÷20mA** or connectable to a PC via **RS485** with **MODBUS RTU** protocol, which allows connection of multiple transmitters on the same network.

The versions with **relay** allow to monitor the environmental parameters measured when exceeding the threshold set by the user. The operation of the relay is very versatile, having modes of activation above and below the threshold, and single or double threshold modes. The thresholds are configurable by the user throughout the whole measurement range.

The LCD display option allows simultaneous viewing of all values measured by the instrument.

The model **HD45 BVR** and the **HD45 BAR** are distinguished by their ability to indicate an immediate level of air quality, through ignition of the LED indicators associated with graphic symbols.

All the functions of the instrument can be configured quickly and intuitively through a PC.

The instruments are easy to use and yet have a complete configuration possibilities, that makes them versatile and able to meet many needs in various application fields. The instruments are supplied with a standard configuration that makes them immediately operational. Upon request, the devices can be supplied with custom configurations.

Models of the series **HD46…** can be equipped with keyboard that allows you to easily configure the instrument even without a PC connection. The models having a keypad are fitted with backlit display, activated by the touch of a button.

Models of the series **HD45…** with relay have a switch hardware that allows quick selection of the threshold between a set of preset values.

All models carry the "logging" of continuous measures, and data can be transferred to the PC.

The instruments work with 24Vac or 15…35Vdc power supply.

Technical data
Characteristics of the sensors

Relative humidity RH *(for models HD45 17…, HD46 17… and HD46 17B…)*	
Sensor	Capacitive
Measuring range	0...100 % RH -40…+85°C Dew point Td
Working range of the sensor	-40...+80°C
Accuracy	±1.5%RH (0..90%RH) ±2%RH (elsewhere) for T=15…35°C ±(1.5+1.5% of the measure)%RH for T=40…+80°C For the dew point please see the relevant table
Resolution	0,1%
Temperature dependence	2% on the whole temperature range
Hysteresis and repeatability	1%RH
Response time (T_{90})	<20 sec. (air speed = 2m/sec and stable temperature)
Long-term stability	1%/year

Temperature T *(for models HD45 17…, HD45 7B…, HD46 17… and HD46 17B…)*	
Sensor type	NTC 10kΩ
Measuring range	-30...+85°C (-22…+185°F)
Accuracy (except for models with current outputs)	±0.2°C ±0.15% of the measured value within 0…70°C ±0.3°C ±0.15% of the measured value within -30…0°C and 70…85°C
Accuracy (for models with 4÷20mA)	±0.5°C ±0.15% of the measured value within -30°C…+85°C
Resolution	0,1°C
Response time (T_{90})	<30 sec. (air speed = 2m/sec)
Long-term stability	0.1°C/year

Carbon dioxide CO_2 *(for models HD45 7B…, HD45 B…and HD46 17B…)*	
Sensor	Dual wavelength NDIR
Measuring range	0…5000 ppm
Working range of the sensor	0…50°C
Accuracy	±(50ppm+3% of the measured value) @ 20°C and 1013hPa
Resolution	1ppm
Temperature dependence	0,1%f.s./°C
Response time (T_{90})	<120 sec. (air speed = 2m/sec and stable temperature)
Long-term stability	5% of the measured value /5years

Accuracy of the dew point Td (°C)

The dew point is a calculated quantity that depends on the accuracy of the calibration of relative humidity and temperature.

Temperature (°C)	Relative humidity(%)						
		10	**30**	**50**	**70**	**90**	**100**
	-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

Characteristics of the instrument

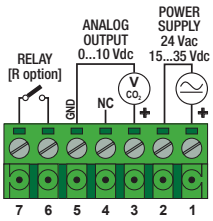
Measuring frequency	1 sample every 3 seconds
Storage capacity	2304 records
Storage interval	Selectable within 30s, 1m, and 5m The stored values represent the average values of samples collected every 3 seconds in selected storage interval.
Serial output	Serial output for USB (mini- USB/USB cable with adapter cod. RS45 or RS45I) RS485 MODBUS-RTU (only HD45…S… and HD46…S…)
Safety of stored data	Unlimited
Analogue output	0…10Vdc (R_L > 10kΩ) *(only HD45…V…and HD46…V)* 11Vdc outside the measuring range 4÷20mA ($R_{L\ MAX}$ = 400Ω) (only HD45_A and HD46_A) 22mA out of the measuring range Active current output
Relay output	Two-state *(only HD45…R and HD46…R)* Contact: max 1A @ 30Vdc resistive load
Power supply	24Vac ± 10% (50…60Hz) or 15…35Vdc
Power consumption	100 mW (except of the models with current output) 400 mW (for the models with current output)
Stabilizing time	15 minutes (to guarantee the declared accuracy)
Working temperature of the instrument	0°C ... 50°C
Working humidity of the instrument	0%RH ... 90%RH no condensate
Dimensions (LxHxW)	80 x 80 x 30 mm *(HD45.17…)* 80 x 80 x 34 mm *(HD45.B… and HD45.7B…)* 120 x 80 x 30 mm *(HD46.17…)* 120 x 80 x 34 mm *(HD46.17B…)*
Housing material	ABS
Weight	50g
Protection degree	IP30

Installation

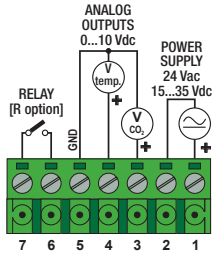
The container is easy and quick to open. Simply press the two tabs of the container to remove the front panel and have immediately available the terminal block connections and fixing holes.

Electrical connections

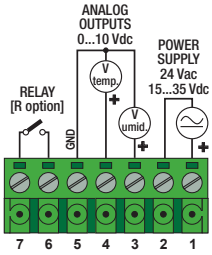
Series HD45...



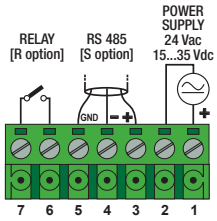
HD45 B...V
HD45 B...VR



HD45 7B...V
HD45 7B...VR

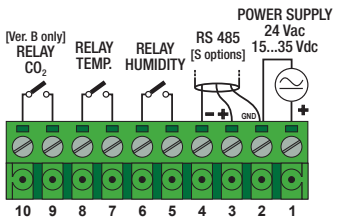


HD45 17...V
HD45 17...VR

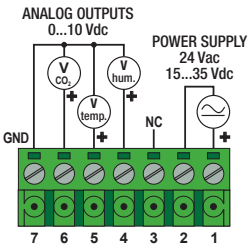


HD45...R
HD45...S
HD45...SR

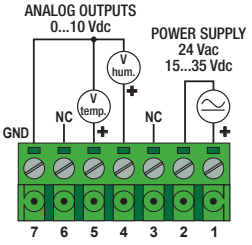
Series HD46...



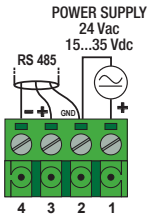
HD46...R
HD46...SR



HD46 17B...V



HD46 17...V



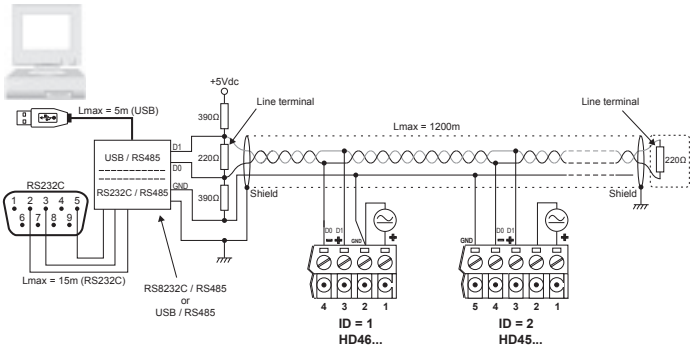
HD46...S

Configuration

The instruments are equipped with serial output easily accessible on the side of the instrument that allows you to connect to the USB port of your PC via the cable **RS45** or **RS45I** with built-in adapter, for custom configurations.
With the **RS45** cable the instrument is powered directly from the USB port of your PC, thus allowing the configuration of the instrument in the field using a laptop before installing fixed.

RS485 Connection

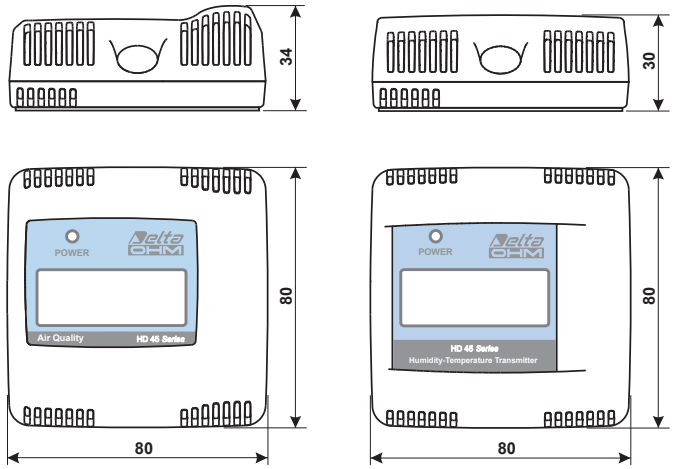
Models with RS485 output function using the **MODBUS RTU** protocol. For PC connection, insert a converter RS232C/RS485 or USB/RS485.



Dimensions of the housing

All dimensions are expressed in mm.

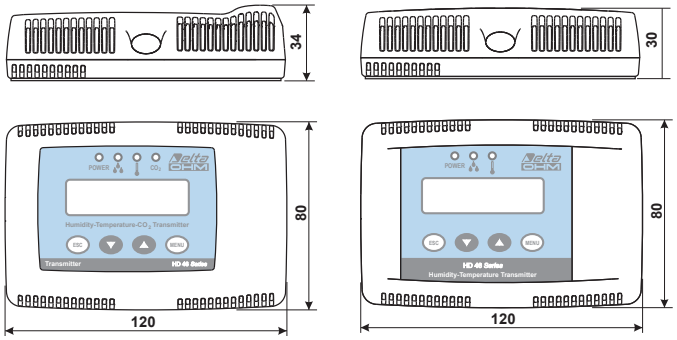
Series HD45...



HD45 B...
HD45 7B...

HD45 17...

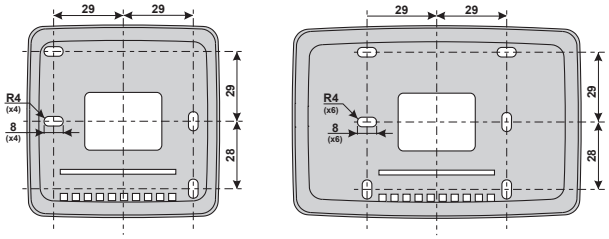
Series HD46...



HD46 17B...

HD46 17...

Fixing holes



HD45...

HD46...

Ordering codes

HD45 □□□

AVAILABLE OPTIONS

A = Analogue output 4÷20mA
V = Analog output 0÷10Vdc
S = RS485 output
R = Relay output
VR = Analog output 0÷10Vdc + relay
AR = Analog output 4÷20mA + relay
SR = RS485 + relay
It is not possible to have the analogue output when you have the RS485, and vice versa.

D = With display
No character = without display

Sensors
17 = Relative humidity + temperature
7B = Temperature + CO_2
B = CO_2

HD46 □□□

AVAILABLE OPTIONS

A = Analogue output 4÷20mA
V = Analogue output 0÷10Vdc
S = Output RS485
R = Relay output
SR = RS485 output + relay outputs
It is not possible to have the analogue output when you have the RS485, and vice versa.
Option V includes one analogue output for each measured quantity.
Options R and SR include one analogue output for each measured quantity.

D = With display
DT = With display and keyboard
No character = Without display and without keyboard
Option DT is available only together with option R or SR.

Sensors
17 = Humidity + temperature
17B = Humidity, temperature and CO_2

AVAILABLE MODELS

The instruments are available in the following versions:

HD45 17… Humidity and temperature
HD45 7B… Temperature and CO_2
HD45 B… CO_2
HD46 17B… Humidity, temperature, and CO_2
HD46 17… Humidity and temperature

Upon request it is possible to have the option with 0 ... 10Vdc analogue output (option **V**) or 4÷20mA option (option **A**) for each quantity measured by the instrument or RS485 MODBUS-RTU serial output (option **S**). There are no models with both types of output.

It is available the option with relay only (option **R**). In models **HD46 ...** there is one relay for each quantity measured by the instrument. In models **HD45 ...** there is one relay that can be associated with one of the quantities measured by the instrument.

It is possible to have the relay output (or outputs) together with serial output RS485 MODBUS-RTU (option **SR**).

The relay output together with the analogue output (option **VR** or **AR**) is available only on the models **HD45…**

All models can be supplied with LCD (option **D**).

In the series **HD46 ...** versions with relay outputs are available with display and keyboard (option **DT**)

The following table lists the available models:

Model	RH	T	CO_2	Analog output	RS485 output	Relay output	LCD	LED
HD45 17V	✓	✓		✓ (2 outputs)				Power
HD45 17A	✓	✓		✓ (2 outputs)				Power
HD45 17S	✓	✓			✓			Power
HD45 17R	✓	✓				✓ (1 output)		Power
HD45 17SR	✓	✓			✓	✓ (1 output)		Power
HD45 17VR	✓	✓		✓ (2 outputs)		✓ (1 output)		Power
HD45 17AR	✓	✓		✓ (2 outputs)		✓ (1 output)		Power
HD45 17DV	✓	✓		✓ (2 outputs)			✓	Power
HD45 17DA	✓	✓		✓ (2 outputs)			✓	Power
HD45 17DS	✓	✓			✓		✓	Power
HD45 17DR	✓	✓				✓ (1 output)	✓	Power
HD45 17DSR	✓	✓			✓	✓ (1 output)	✓	Power
HD45 17DVR	✓	✓		✓ (2 outputs)		✓ (1 output)	✓	Power
HD45 17DAR	✓	✓		✓ (2 outputs)		✓ (1 output)	✓	Power
HD45 7BV		✓	✓	✓ (2 outputs)				Power
HD45 7BA		✓	✓	✓ (2 outputs)				Power
HD45 7BS		✓	✓		✓			Power
HD45 7BR		✓	✓			✓ (1 output)		Power
HD45 7BSR		✓	✓		✓	✓ (1 output)		Power
HD45 7BVR		✓	✓	✓ (2 outputs)		✓ (1 output)		Power
HD45 7BAR		✓	✓	✓ (2 outputs)		✓ (1 output)		Power
HD45 7BDV		✓	✓	✓ (2 outputs)			✓	Power
HD45 7BDA		✓	✓	✓ (2 outputs)			✓	Power
HD45 7BDS		✓	✓		✓		✓	Power
HD45 7BDR		✓	✓			✓ (1 output)	✓	Power
HD45 7BDSR		✓	✓		✓	✓ (1 output)	✓	Power
HD45 7BDVR		✓	✓	✓ (2 outputs)		✓ (1 output)	✓	Power
HD45 7BDAR		✓	✓	✓ (2 outputs)		✓ (1 output)	✓	Power
HD45 BV			✓	✓ (1 output)				Power
HD45 BA			✓	✓ (1 output)				Power
HD45 BS			✓		✓			Power
HD45 BR			✓			✓ (1 output)		Power
HD45 BSR			✓		✓	✓ (1 output)		Power
HD45 BVR			✓	✓ (1 output)		✓ (1 output)		**4 LED CO_2 level**
HD45 BAR			✓	✓ (1 output)		✓ (1 output)		**4 LED CO_2 level**
HD45 BDV			✓	✓ (1 output)			✓	Power
HD45 BDA			✓	✓ (1 output)			✓	Power
HD45 BDS			✓		✓		✓	Power
HD45 BDR			✓			✓ (1 output)	✓	Power
HD45 BDSR			✓		✓	✓ (1 output)	✓	Power
HD45 BDVR			✓	✓ (1 output)		✓ (1 output)	✓	Power
HD45 BDAR			✓	✓ (1 output)		✓ (1 output)	✓	Power

Model	RH	T	CO_2	Analog output	RS485 output	Relay output	LCD keyboard	LED
HD46 17V	✓	✓		✓ (2 outputs)				Power
HD46 17A	✓	✓		✓ (2 outputs)				Power
HD46 17S	✓	✓			✓			Power
HD46 17R	✓	✓				✓ (2 outputs)		Power UR + T
HD46 17SR	✓	✓			✓	✓ (2 outputs)		Power UR + T
HD46 17DV	✓	✓		✓ (2 outputs)			only LCD	Power
HD46 17DA	✓	✓		✓ (2 outputs)			only LCD	Power
HD46 17DS	✓	✓			✓		only LCD	Power
HD46 17DTR	✓	✓				✓ (2 outputs)	✓	Power UR + T
HD46 17DTSR	✓	✓			✓	✓ (2 outputs)	✓	Power UR + T
HD46 17BV	✓	✓	✓	✓ (3 outputs)				Power
HD46 17BA	✓	✓	✓	✓ (3 outputs)				Power
HD46 17BS	✓	✓	✓		✓			Power
HD46 17BR	✓	✓	✓			✓ (3 outputs)		Power UR +T+ CO_2
HD46 17BSR	✓	✓	✓		✓	✓ (3 outputs)		Power UR +T+ CO_2
HD46 17BDV	✓	✓	✓	✓ (3 outputs)			only LCD	Power
HD46 17BDA	✓	✓	✓	✓ (3 outputs)			only LCD	Power
HD46 17BDS	✓	✓	✓		✓		only LCD	Power
HD46 17BDTR	✓	✓	✓			✓ (3 outputs)	✓	Power UR +T+ CO_2
HD46 17BDTSR	✓	✓	✓		✓	✓ (3 outputs)	✓	Power UR +T+ CO_2

EXAMPLES OF ORDERING CODES

HD45 7BDVR: Transmitter, indicator and regulator for temperature and CO_2. Two analogue outputs 0 ÷ 10V, one configurable relay to control temperature or CO_2.

HD45 BVR: Transmitter, indicator and regulator for CO_2. Without display, with LED indicators of the CO_2 level, with analogue output 0 ÷ 10V, with relay.

HD45 17VR: Transmitter and regulator for humidity and temperature. Without display, with two analogue outputs 0 ÷ 10V, one configurable relay to control the humidity or temperature.

HD45 17AR: Transmitter and regulator for humidity and temperature. Without display, with two analogue outputs 4÷20mA, one configurable relay to control humidity or temperature.

HD45 17DV: Transmitter and indicator for humidity and temperature. With display, two analogue outputs 0 ÷ 10V, without relay.

HD45 7BSR: Transmitter and regulator for temperature and CO_2. Without display, with RS485 output, no analogue output, with one configurable relay to control temperature or CO_2.

HD46 17BDV: Transmitter and indicator for humidity, temperature and CO_2. With display, without keyboard, with three analogue outputs 0 ÷ 10V, without relays and without RS485.

HD46 17BDTSR: Transmitter, indicator and regulator for humidity, temperature and CO_2. Display and keyboard, three relay outputs, RS485 output.

HD46 17S: Humidity and temperature transmitter. No display and no keyboard, no relays, with RS485 output.

ACCESSORIES

DeltaLog14.: Software for connecting to the PC via the serial output, for the configuration of the instrument and data download. For Windows®operating systems.

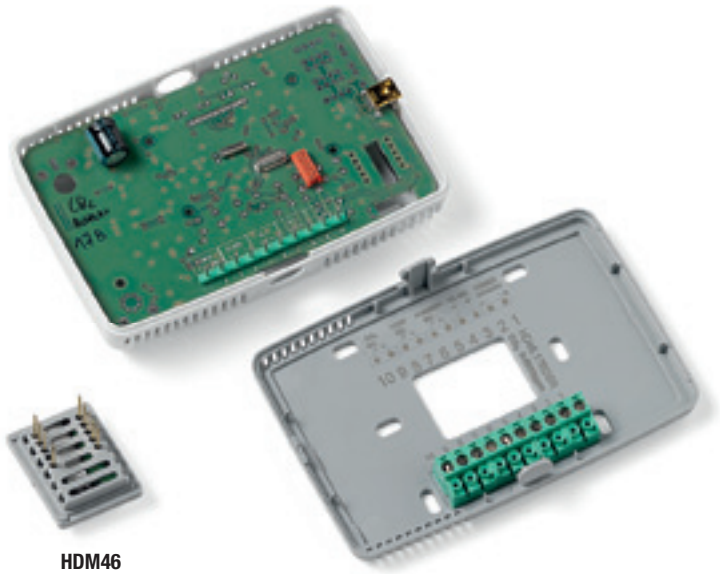
HDM46: Calibrated humidity and temperature replacement module (only for models HD46…)

RS45: Not isolated serial connection cable with built-in adapter. USB connector for PC and mini-USB connector for the serial port of the instrument. The cable powers the instrument.

RS45I: Isolated serial connection cable with built-in adapter. USB connector for PC and mini-USB connector for the serial port of the instrument. The cable does not power the instrument.

HD45TCAL: The Kit includes the **RS45** cable with built-in adapter and the CD-ROM with the **DeltaLog14** software for Windows operating systems. The cable is provided with USB connector on the PC side and mini- USB connector for the serial port of the instrument.

HD45TCALI: The Kit includes the **RS45I** cable with built-in adapter and the CD-ROM with the **DeltaLog14** software for Windows operating systems. The cable is provided with USB connector on the PC side and mini- USB connector for the serial port of the instrument.



HDM46

HD 4807T… HD 4907T…
HD 48V07T… HD 4901T…
HD 4801T… HD 4917T…
HD 48V01T… HD 4977T…
HD 4817T…
HD 48V17T…
HD 4877T…
HD 48V77T…

HD 4807T…, HD 48V07T…, HD 48S07T…, HD 4801T…, HD 48V01T…, HD 4817T…, HD 48V17T…, HD 4877T… HD 48V77T…, HD 4907T…, HD 4901T…, HD 4917T…, HD 4977T…

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 dew point. 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…20mA) or voltage (0…10V) outputs, or a serial RS485 output, depending on the model. **The models of the HD49.. series are passive transmitters** instead, and thus suitable to be inserted in a 4…20mA 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 20µm 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 three 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 or for the measure of compressed air in pipelines (HD48…T480, HD49…T480).

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 (⌀10…14mm). A 4-digit optional LCD ("L" model) allows to display the measured parameters in a continuous or sequential mode.

Technical specifications

	STANDARD RANGE	EXTENDED RANGE
Relative Humidity		
Sensor	Capacitive	
Measuring range	0…100%RH	
Accuracy @ T = 15..35°C	±1.5%UR (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
Temperature		
Measuring range	-20…+80°C	-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
Dew Point		
Sensor	Parameter calculated from relative humidity and temperature	
Measuring range	-20…+80°C DP	
Accuracy	See table TAB.1 below	
Repeatability	0.5°C DP	

Output type (depending on model)		
Models HD4807T..	Temperature	4…20mA (-20...+80°C), R_L < 500Ω 22mA outside the measuring range
Models HD4807ET..	Temperature	4…20mA (-40...+150°C), R_L < 500Ω 22mA outside the measuring range
Models HD48V07T..	Temperature	0…10Vdc (-20...+80°C), R_L > 10kΩ 11Vdc outside the measuring range
Models HD48V07ET..	Temperature	0…10Vdc (-40...+150°C), R_L > 10kΩ 11Vdc outside the measuring range
Models HD48S07T.. HD48S07ET..	Temperature	Only RS485 with MODBUS-RTU protocol
Models HD4907T..	Temperature	4…20mA (-20...+80°C), R_LMax = (Vdc-12)/0,022 22mA outside the measuring range
Models HD4907ET..	Temperature	4…20mA (-40...+150°C), R_LMax = (Vdc-12)/0,022 22mA outside the measuring range
Models HD4801T.. HD4801ET..	Relative Humidity	4…20mA (0...100%RH), R_L < 500Ω 22mA outside the measuring range
Models HD48V01T.. HD48V01ET..	Relative Humidity	0…10Vdc (0...100%RH), R_L > 10kΩ 11Vdc outside the measuring range
Models HD48S01T.. HD48S01ET..	Relative Humidity	Only RS485 with MODBUS-RTU protocol
Model HD4901T.. HD4901ET..	Relative Humidity	4…20mA (0...100%RH), R_LMax = (Vdc-12)/0.022 22mA outside the measuring range
Models HD4817T..	Relative Humidity	4…20mA (0...100%RH), R_L < 500Ω 22mA outside the measuring range
	Temperature	4...20mA (-20...+80°C), R_L < 500Ω 22mA outside the measuring range
Models HD4817TV..	Relative Humidity	4…20mA (0...100%RH), R_L < 500Ω 22mA outside the measuring range
	Temperature	4...20mA (0...+60°C), R_L < 500Ω 22mA outside the measuring range
Models HD4817ET..	Relative Humidity	4…20mA (0...100%RH), R_L < 500Ω 22mA outside the measuring range
	Temperature	4...20mA (-40...+150°C), R_L < 500Ω 22mA outside the measuring range
Models HD48V17T..	Relative Humidity	0…10Vdc (0...100%RH), R_L > 10kΩ 11Vdc outside the measuring range
	Temperature	0…10Vdc (-20...+80°C), R_L > 10kΩ 11Vdc outside the measuring range
Models HD48V17ET..	Relative Humidity	0…10Vdc (0...100%RH), R_L > 10kΩ 11Vdc outside the measuring range
	Temperature	0…10Vdc (-40...+150°C), R_L > 10kΩ 11Vdc outside the measuring range
Models HD48S17T.. HD48S17ET..	Relative Humidity Temperature	Only RS485 with MODBUS-RTU protocol
Models HD4917T..	Relative Humidity	4…20mA (0...100%RH), R_LMax = (Vdc-12)/0.022 22mA outside the measuring range
	Temperature	4...20mA (-20...+80°C), R_LMax = (Vdc-12)/0.022 22mA outside the measuring range
Models HD4917TV..	Relative Humidity	4…20mA (0...100%RH), R_LMax = (Vdc-12)/0.022 22mA outside the measuring range
	Temperature	4...20mA (0...+60°C), R_LMax = (Vdc-12)/0.022 22mA outside the measuring range
Models HD4917ET..	Relative Humidity	4…20mA (0...100%RH), R_LMax = (Vdc-12)/0.022 22mA outside the measuring range
	Temperature	4...20mA (-40...+150°C), R_L Max = (Vdc-12)/0.022 22mA outside the measuring range
Models HD4877T..	Dew Point	4...20mA (-20...+80°C DP), R_L < 500Ω 22mA outside the measuring range
	Temperature	4...20mA (-20...+80°C), R_L < 500Ω 22mA outside the measuring range
Models HD48V77T..	Dew Point	0…10Vdc (-20...+80°C DP), R_L > 10kΩ 11Vdc outside the measuring range
	Temperature	0…10Vdc (-20...+80°C), R_L > 10kΩ 11Vdc outside the measuring range
Models HD48S77T..	Dew Point Temperature	Only RS485 with MODBUS-RTU protocol
Models HD4977T..	Dew Point	4...20mA (-20...+80°C DP), R_LMax = (Vdc-12)/0.022 22mA outside the measuring range
	Temperature	4...20mA (-20...+80°C), R_LMax = (Vdc-12)/0.022 22mA outside the measuring range
Models HD4877T480	Dew Point	4...20mA (-40...+60°C DP), R_L< 500Ω 22mA outside the measuring range
	Temperature	4...20mA (-40...+60°C), R_L< 500Ω 22mA outside the measuring range

Models HD48V77T480	Dew Point	0…10Vdc (-40...+60°C DP), R_L > 10kΩ 11Vdc outside the measuring range
	Temperature	0…10Vdc (-40...+60°C), R_L > 10kΩ 11Vdc outside the measuring range
Models HD48S77T480	Dew Point	Only RS485 with MODBUS-RTU protocol
	Temperature	
Models HD4977T480	Dew Point	4...20mA (-40...+60°C DP), R_LMax = (Vdc-12)/0.022 22mA outside the measuring range
	Temperature	4...20mA (-40...+60°C), R_LMax = (Vdc-12)/0.022 22mA outside the measuring range

Power supply and connections		
	HD48..	HD49..
Power supply	16...40Vdc or 24 Vac ±10%	12...40Vdc
Electrical connections	Screw type terminal block, max 1,5mm², M16 cable gland for input cable	
General specifications		
.. TV probe working temperature	0...+60°C	
…TO, …TC probe working temperature	STANDARD RANGE	EXTENDED RANGE
	-20…+100°C	-40…+150°C
T480 working temperature	-40...+60°C	
Storage temperature	-20…+80°C	
electronics protection class	IP66	
Case dimensions	80x84x44	

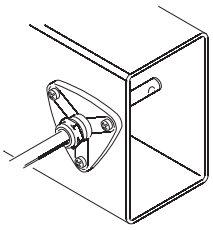
TAB.1 - Accuracy of dew point measurement:

Temperature °C \ DP °C	-20	-10	0	10	20	30	40	60	80
-20	≤±1								
-10	≤±1	≤±1							
0	≤±1	≤±1	≤±1						
10	≤±3	≤±1	≤±1	≤±1	DP LIMIT				
20	≤±4	≤±2	≤±1	≤±1	≤±1				
30	NOT SPECIFIED	≤±3	≤±1,5	≤±1	≤±1	≤±1			
40				≤±2	≤±1	≤±1	≤±1		
60				≤±5	≤±2,5	≤±2	≤±1	≤±1	
80						≤±4	≤±2	≤±1	≤±1

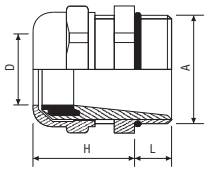
For example at 20°C a Dew Point value of 0°C DP is measured with an accuracy better than 1°C DP.

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



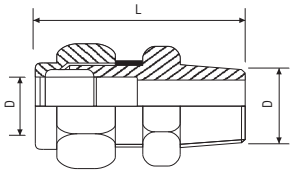
PG16 metal cable gland

D = 10…14mm

L = 6.5mm

H = 23mm

A = PG16



Universal biconical connector

L = 35mm

D = 14mm

A = 3/8"

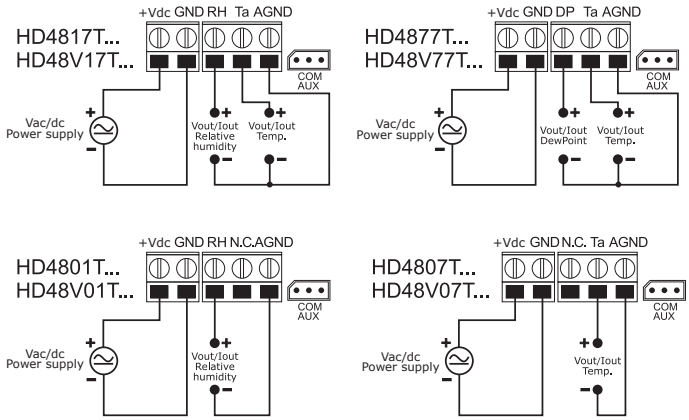
Electrical connections

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.

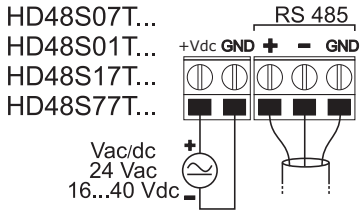
Depending on the model, the output signal is available between:

- 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.

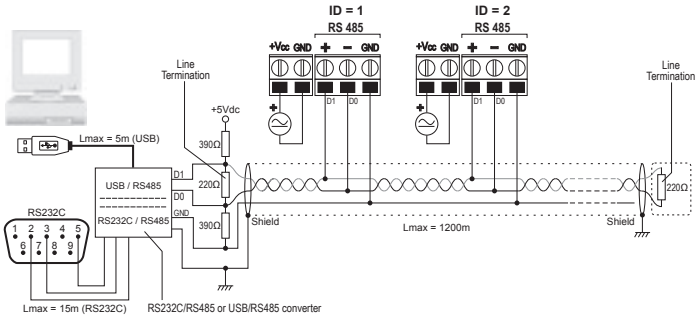


HD48.. series with RS485 output

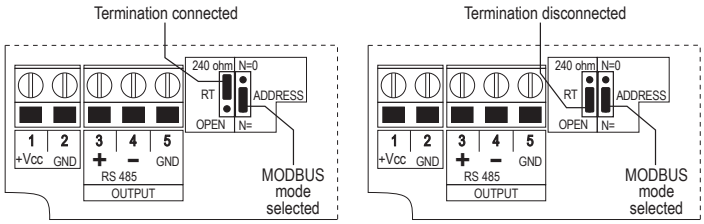
Connect the instrument as shown in the below connection schemes, the power supply terminals are marked as +Vcc and GND.



Thanks to RS485 output, several instruments can be connected to form a network, consisting of a minimum of 1 instrument to a maximum of **247**, connected in a sequence through a shielded cable with twisted pair for signals and a third wire for the common.



Line termination must be set at the two network ends. To polarize the line during nontransmission periods, resistors 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 ¼ 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 fi rst 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 mm² (AWG24) at least

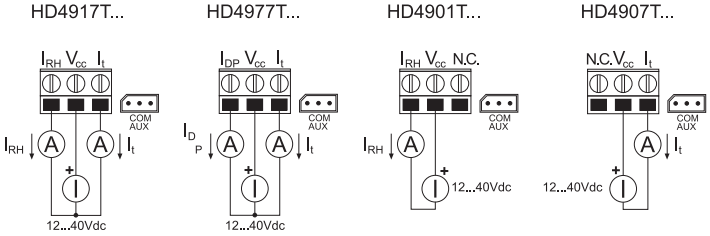
The cable maximum length depends on baud rate and cable characteristics. Typically, the maximum length is 1200m. The data line must be kept separated from any power lines in order to prevent interferences on the transmitted signal.

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. **Transmitters having the same address shall not be present in the network**. 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 and a CD- ROM for Windows® operating systems. 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 values measured by the instrument using code function 04h (Read Input Registers). Table 2 lists the variables available with the appropriate register address

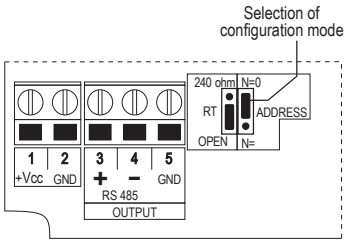
Table 2 – Modbus Registers

Address	Quantity	Format
0	Temperature in °C (x10)	Full 16 bit
1	Temperature in °F (x10)	Full 16 bit
2	Relative Humidity in % (x10)	Full 16 bit
3	Dew Point in °C (x10)	Full 16 bit
4	Dew Point in °F (x10)	Full 16 bit
5	Status register bit 0 = 1 ⇒ temperature measurement error bit 1 = 1 ⇒ relative humidity measurement error bit 2 = 1 ⇒ dew point temperature calculation error bit 3 = 1 ⇒ configuration data error	Full 16 bit

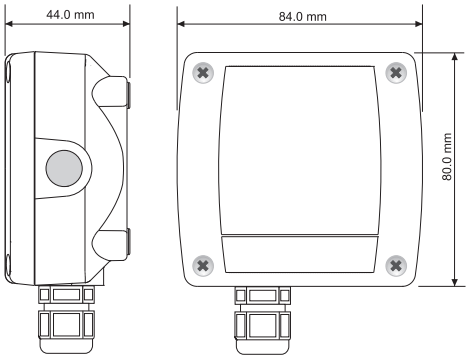
HD49.. series
Follow the connection schemes shown below, the maximum load resistance that can be connected to each 4…20mA output depends on the power supply Vcc applied, according to the relation:
RLMax = (Vcc-12)/0.022, e.g. if Vcc=24Vdc the max load is R_LMax =545 ohm.

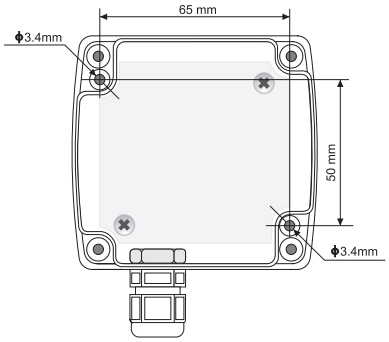


Relative humidity probe calibration
The HD48.. and HD49.. transmitters are supplied factory calibrated and ready to use. If necessary, it is possible to calibrate the relative humidity sensor using the saturated salt solutions HD75 (75% RH saturated salt solution) and HD33 (33% RH saturated salt solution) and connecting the instrument to the PC using the HD48TCAL kit.
The HD48TCAL kit includes the CP27 with incorporated convertor USB/RS232 for the transmitters connection to the PC and a CD-ROM for Windows operating systems, that guides the user in the relative humidity probe calibration procedure.
For RS485 output models use the HD48STCAL. The kit includes the RS48 with incorporated convertor USB/RS485 for the transmitters connection to the PC and a CD-ROM for Windows operating systems, that guides the user in the relative humidity probe calibration procedure.
To calibrate 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 calibration, move the short jumper back between the "ADDRESS" and "N=" indications.

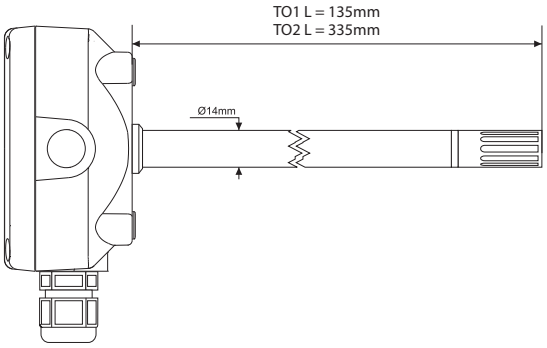


Case dimensions

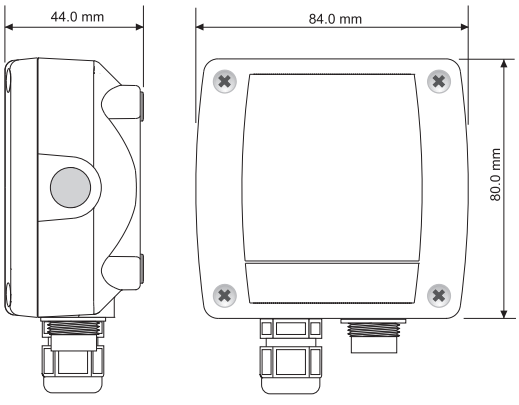


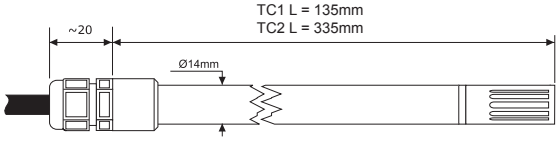


Probe dimensions:
TO series



TC series





Ordering codes

HD48 / HD49 | | | | **T / T** | | | **L / L**

L = with LCD display

Cable length
2 = 2m
5 = 5m
10 = 10m
Note: T480 version is available only with a cable 2m long.

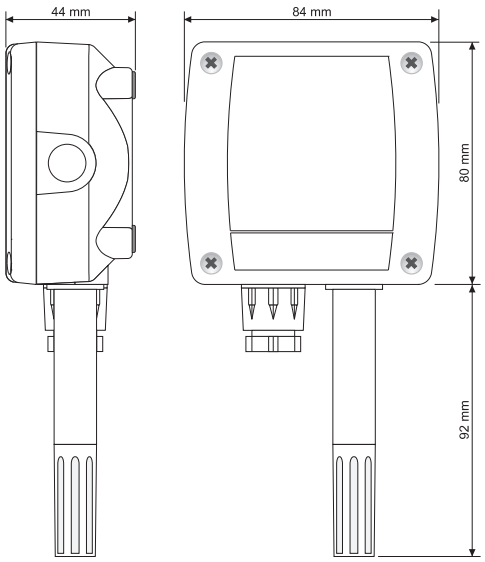
Probe type
T01 = 135mm
T02 = 335mm
TC1 = 135mm
TC2 = 335mm
TV = wall mounting Probe L=92mm
T480 = for compressed air

No sign = standard range –20…+80°C
(-40…+60°C for the T480 version)
E = extended range –40…+150°C (models TV excluded)

07 = temperature output
01 = %RH output
17 = Temperature and %RH outputs
77 = Temperature and dew point outputs

No sign = 4…20mA analogue output
V = 0…10Vdc analog output (only HD48.. models)
S = only RS485 output with MODBUS-RTU protocol
Note: Versions with analogue output have one analogue output for each measured quantity.

TV series



Ordering code examples

HD4801TV: Wall mounting digital active relative humidity transmitter.
Relative humidity range 0...100%RH. Analog output: 4…20mA (0...100%RH).
Probe working range -20...+80°C. Power supply 16...40Vdc or 24Vac.

HD4917T01: Digital passive (current loop) temperature and relative humidity transmitter for duct mounting. AISI304 steel probe, diameter 14mm and stem length 135mm, joined to the electronics enclosure.
Relative humidity range 0...100%RH, temperature range -20...+80°C.
Analog outputs: 4…20mA (0...100%RH) for RH and 4...20mA (-20...+80°C) for temperature. Probe working range -20...+80°C. Power supply 12...40Vdc.

HD4817TC25L: Digital active temperature and relative humidity transmitter with LCD display. AISI304 steel probe, diameter 14mm and stem length 335mm, connected to the electronics enclosure through a 5m cable.
Relative humidity range 0...100%RH, temperature range -20...+80°C.
Analog outputs: 4…20mA (0...100%RH) for RH and 4...20mA (-20...+80°C) for temperature. Probe working range -20...+80°C. Power supply 16...40Vdc or 24Vac.

HD48V17ETC25: Digital active temperature and relative humidity transmitter, extended range. AISI304 steel probe, diameter 14mm and stem length 335mm, connected to the electronics enclosure through a 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 16...40Vdc or 24Vac.

HD48S17TC25L: Digital active temperature and relative humidity transmitter with LCD. AISI304 steel probe, diameter 14mm and stem length 335mm, connected to the electronics enclosure through a 5m cable.
Relative humidity range 0...100%RH, temperature range -20...+80°C.
RS485 output only. Probe working range -20...+80°C. Power supply 16...40Vdc or 24Vac.

HD4877T02: Digital active temperature and dew point transmitter for duct mounting. AISI304 steel probe, diameter 14mm and stem length 135mm, joined to the electronics enclosure.
Dew point range -20...+80°C DP, temperature range -20...+80°C.
Analog outputs: 4…20mA (-20...80°C DP) for DP and 4...20mA (-20...+80°C) for temperature. Probe working range -20...+80°C. Power supply 16...40Vdc or 24Vac.

HD4977T02: Digital passive (current loop) temperature and dew point transmitter for duct mounting. AISI304 steel probe, diameter 14mm and stem length 335mm, joined to the electronics enclosure.
Dew point range -20...+80°C DP, temperature range -20...+80°C.
Analog outputs: 4…20mA (-20...+80°C DP) for DP and 4...20mA (-20...+80°C) for temperature. Probe working range -20...+80°C. Power supply 12...40Vdc.

Accessories

HD48TCAL: The kit includes the **CP27** connection cable with built-in USB/RS232 converter and CD-ROM for Windows operating systems that guides the user in the relative humidity probe calibration procedure. The cable is complete of USB connector on the PC side and a COM AUX connector on the instrument side. The kit is suitable only for analog output models.

HD48STCAL: The kit includes the **RS48** cable with built-in USB/RS485 converter and CD-ROM for Windows operating systems that guides the user in the relative humidity probe calibration procedure. The cable is complete of USB connector on the side of the PC and of 3 separate wires on the instrument part. The kit is suitable only for RS485 output models.

RS48: Cable for RS485 serial connection with buit-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.

PG16: AISI304 steel cable gland for Ø 14mm probes.

P6: 10µm sintered stainless steel protection for Ø 14mm probes.

P7: 20µm PTFE protection for Ø 14mm probes.

P8: 20µm stainless steel grid and Pocan for Ø 14mm probes.

HD 2717T…
TRANSMITTER, INDICATOR, ON/OFF REGULATOR, TEMPERATURE AND HUMIDITY DATA LOGGER WITH INTERCHANGEABLE PROBE

The instruments of the HD2717T... serie 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 three 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 POCAN (plastic material). For the measurement of dew point in compressed air systems, the S.TC2.480.2 probe can be used. The probe is factory calibrated and ready to use, it is provided with a **SICRAM2** module which stores the calibration data of the probe, allowing its 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 POCAN plastic material.	
S.TC1.2	Probe L=135mm with cable 2m. AISI304.
S.TC1.2P	Probe L=135mm with cable 2m (POCAN probe)
S.TC1.5	Probe L=135mm with cable 5m. AISI304.
S.TC1.5P	Probe L=135mm with cable 5m (POCAN probe)
S.TC1.10	Probe L=135mm with cable 10m. AISI304.
S.TC1.10P	Probe L=135mm with cable 10m (POCAN probe)
S.TC2.2	Probe L=335mm with cable 2m. AISI304.
S.TC2.2P	Probe L=335mm with cable 2m (POCAN probe)
S.TC2.5	Probe L=335mm with cable 5m. AISI304.
S.TC2.5P	Probe L=335mm with cable 5m (POCAN probe)
S.TC2.10	Probe L=335mm with cable 10m AISI304.
S.TC2.10P	Probe L=335mm with cable 10m (POCAN probe)

Probe with cable for the measurement of humidity in pipes:

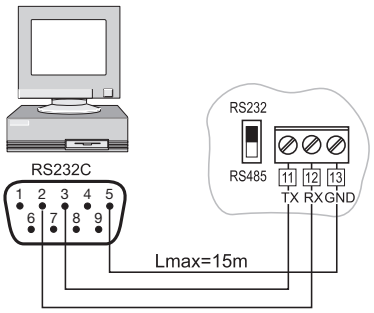
S.TC2.480.2	Length of the cable 2m. Measuring range: -40…+60°C, -40…+60°C DP 1/4" italian standard quick coupling. Working pressure up to 16bar. Measuring chamber made of AISI304.

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

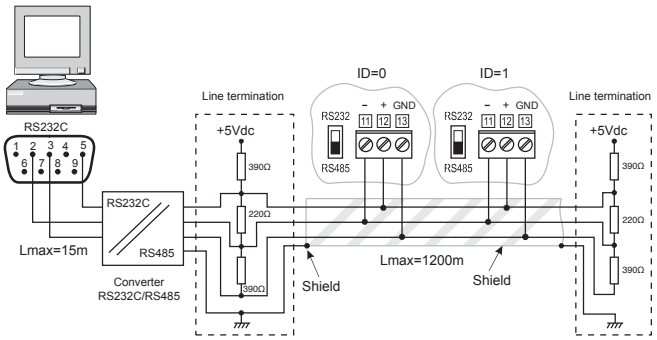
Version with display HD2717Tx.Dx

Version without display HD2717TO.0X

Horizontal probe S.TO2



PC: connection instrument with serial communication protocol RS232C.

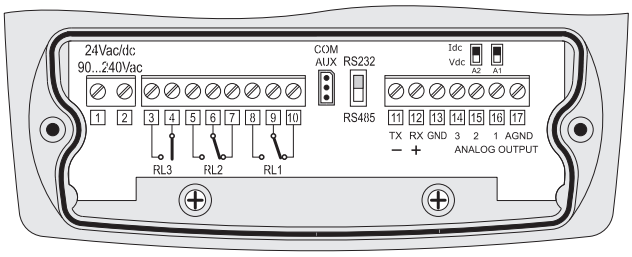


PC connection: instrument with the RS485 communication protocol for distances up to 1200 m using the RS232C/RS485 converter.

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^2, (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

Wall fastening plate.

Technical specifications (@ 24Vac and 20°C)

Inputs		
Temperature	Sensor	Pt100 classe 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^3
	Mixing ratio	0 ... 2000g/kg of dry air
	Wet bulb temperature	-50 ... +100°C
Accuracy of the measured physical quantities	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 quantities	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)

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...20mA; 0...20mA 0...10Vdc; 2…10Vdc
	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%
		90 ... 240Vac, 50…60Hz
	Average consumption	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 seconds, 2 and 4 minutes
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.
	Storage temperature	-30…+80°C
Housing	L x H x W	143x154x61
	Weight	600g
	Material	ABS
	Degree of protection	Electronics IP65

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

S.TC2.480.2		
Temperature	Measuring range	-40…+60°C
Humidity	Dew point	-40…+60°C DP
Environmental Conditions	Working temperature	-40…+60°C
	Working pressure	16bar max

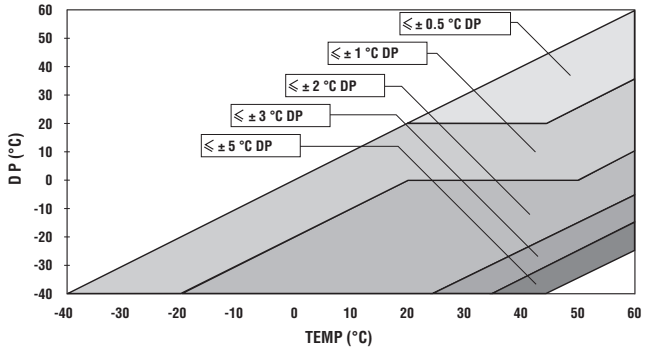
Accuracy of the calculated physical quantities

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)



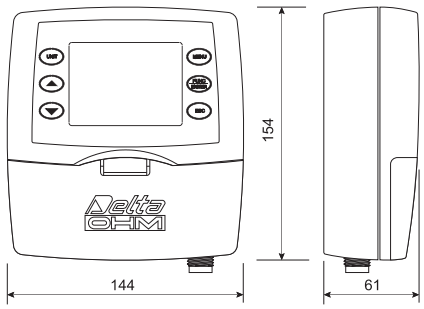
Accuracy of the absolute humidity (g/m³)

	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

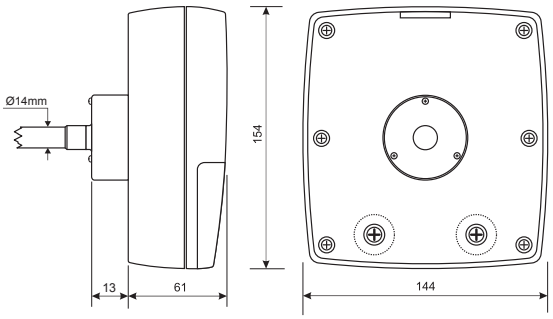
Accuracy of the mixing ratio (g/kg)

	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



Versions HD2717Tx.xx for vertical probes or with cable



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...20mA and 4...20mA) or voltage outputs (0...10Vdc and 2...10Vdc). RS232/RS485 serial ports for connection to PC. **Uses interchangeable SICRAM2** probes with microprocessor for the storage of the probe's calibration data. Power supply 24Vac/dc or universal 90...240Vac. Includes software DeltaLog12, instructions manual. (Transmitters without display are supplied with serial cable RS27).

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

Models with vertical probe (S.TV) or separated probe with cable (S.TC)

HD2717T.00: Model without display and without relay.
HD2717T.0R: Model without display, with configurable control relays (2) and alarm relay (1).
HD2717T.D0: Model with custom display, without relay.
HD2717T.DR: Model with custom display, with configurable control relays (2) and alarm relay (1).

Models for horizontal duct probe (S.TO)

HD2717TO.00: Model without display and without relay.
HD2717TO.0R: Model without display, with configurable control relays (2) and alarm relay (1).
HD2717TO.D0: Model with custom display, without relay.
HD2717TO.DR: Model with custom display, with configurable control relays (2) and alarm relay (1).

Interchangeable temperature and humidity probes with SICRAM2 module, vertical S.TV or with cable S.TC

S.TV: Vertical probe. Length of stem 130mm.
The material of the S.TC...probes can be chosen between stainless steel AISI304 or POCAN plastic material.
S.TC1.2: Probe with cable. Length of stem 135mm, length of the cable 2m. AISI304.
S.TC1.2P: Probe with cable. Length of stem 135mm, length of the cable 2m. Made of POCAN.
S.TC1.5: Probe with cable. Length of stem 135mm, length of the cable 5m. AISI304.
S.TC1.5P: Probe with cable. Length of stem 135mm, length of the cable 5m. Made of POCAN.
S.TC1.10: Probe with cable. Length of stem 135mm, length of the cable 10m. AISI304.
S.TC1.10P: Probe with cable. Length of stem 135mm, length of the cable 10m. Made of POCAN.
S.TC2.2: Probe with cable. Length of stem 335mm, length of the cable 2m. AISI304.
S.TC2.2P: Probe with cable. Length of stem 335mm, length of the cable 2m. Made of POCAN.
S.TC2.5: Probe with cable. Length of stem 335mm, length of the cable 5m. AISI304.
S.TC2.5P: Probe with cable. Length of stem 335mm, length of the cable 5m. Made of POCAN.
S.TC2.10: Probe with cable. Length of stem 335mm, length of the cable 10m. AISI304.
S.TC2.10P: Probe with cable. Length of stem 335mm, length of the cable 10m. Made of POCAN.
S.TC2.480.2: Probe with cable for the measurement of the dew point in compressed air system. Length of cable 2m. 1/4" italian quick standard coupling. Measuring chamber in AISI304.

Interchangeable temperature and humidity probe with SICRAM2 module, horizontal S.TO

S.TO1: Horizontal probe for instrument HD2717TO.xx. Length of stem 135mm. AISI304.
S.TO2: Horizontal probe for instrument HD2717TO.xx. Length of stem 335mm. AISI304.

Accessories

RS27: RS232 null-modem serial connection cable with 9 poles sub-D female connector and 3 pole connector for COM AUX port. (Included in the supply of the instruments without display).
CP27: USB to COM AUX serial converter.
DeltaLog12: Further unit of software for PC connection, data download, instrument setup, and management of an instrument network. For Windows® operative systems.
HD75: 75%RH saturated solution for checking the relative humidity sensor, complete with thread for probes with Ø 14mm and Ø 26mm.
HD33: 33%RH saturated solution for checking the relative humidity sensor, complete with thread for probes with Ø 14mm and Ø 26mm.
HD9008.21.1: Flange with support, Ø 26mm hole for the installation of S.TC probes in vertical position, 250mm distance from the wall. The probes of the series S.TC require the adapter HD9008.26/14 from Ø 26mm to Ø 14mm.
HD9008.21.2: Flange with support, Ø 26mm hole for the installation of S.TC in vertical position, 125mm distance from the wall. The probes of the series S.TC require the adapter HD9008.26/14 from Ø 26mm to Ø 14mm.
HD9008.26/14: Adapter from Ø 26mm to Ø 14mm for the supports HD9008.21.1 and HD9008.21.2, for probes of the series S.TC.
HD9008.31: Wall flange with cable outlet to fix probes with Ø 14mm.
PG16: Stainless steel gland (AISI304) for probes with Ø 14mm.
P6: 10µm sintered stainless steel protection for probes Ø 14mm. M12x1 thread.
P7: 20µm PTFE protection for probes Ø 14mm. M12x1 thread.
P8: Stainless steel 20µm grid and Pocan protection for probes Ø 14mm. M12x1 thread.

HD2717 Tx . x x

Relay
0 = without relay
R = with relay

Display
0 = without display
D = with display

Probe type
T = Model for vertical probe or with cable (S.TV, S.TC)
TO = Model for horizontal probe (S.TO)

HD 2817T…
TRANSMITTER, INDICATOR, ON/OFF REGULATOR, TEMPERATURE AND HUMIDITY DATA LOGGER WITH INTERCHANGEABLE PROBE

The instruments of the HD2817T... serie 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 three 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 POCAN (plastic material). For the measurement of dew point in compressed air systems, the S.TC2.480.2 probe can be used.
The probe is factory calibrated and ready to use, it is provided with a **SICRAM2** module which stores the calibration data of the probe, allowing its 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 large graphic backlit LCD (128x64 pixel). 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 POCAN plastic material.	
S.TC1.2	Probe L=135mm with cable 2m. AISI304.
S.TC1.2P	Probe L=135mm with cable 2m (POCAN probe)
S.TC1.5	Probe L=135mm with cable 5m. AISI304.
S.TC1.5P	Probe L=135mm with cable 5m (POCAN probe)
S.TC1.10	Probe L=135mm with cable 10m. AISI304.
S.TC1.10P	Probe L=135mm with cable 10m (POCAN probe)
S.TC2.2	Probe L=335mm with cable 2m. AISI304.
S.TC2.2P	Probe L=335mm with cable 2m (POCAN probe)
S.TC2.5	Probe L=335mm with cable 5m. AISI304.
S.TC2.5P	Probe L=335mm with cable 5m (POCAN probe)
S.TC2.10	Probe L=335mm with cable 10m. AISI304.
S.TC2.10P	Probe L=335mm with cable 10m (POCAN probe)

Probe with cable for the measurement of humidity in pipes:

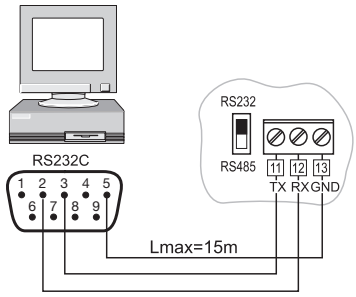
S.TC2.480.2	Length of the cable 2m. Measuring range: -40…+60°C, -40…+60°C DP 1/4" italian standard quick coupling. Working pressure up to 16bar. Measuring chamber made of AISI304.

HD2817T.Dx

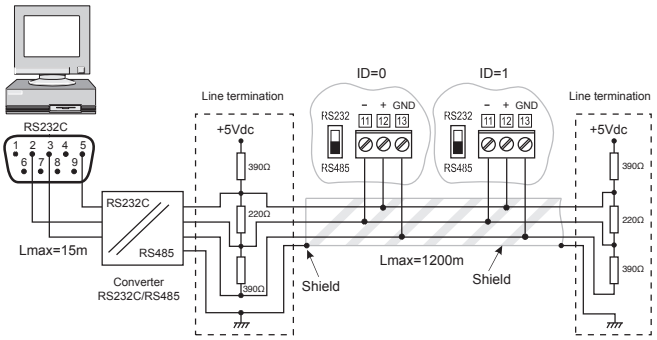
HD2817TO.Dx

Horizontal probe S.TO2

Probes complete with SICRAM2 module for instruments HD2817T0.xx AISI 304	
S.T01	horizontal probe L= 135mm
S.T02	horizontal probe L= 335mm



PC connection: instrument with serial communication protocol RS232C.

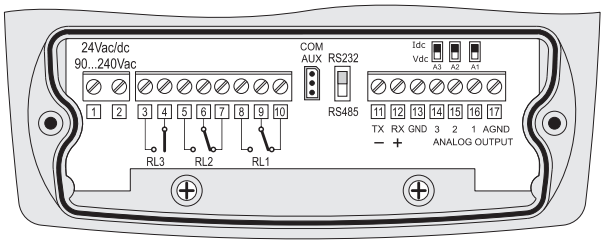


PC connection: instrument with the RS485 communication protocol for distances up to 1200 m using the RS232C/RS485 converter.

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 lien 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^2, (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

Wall fastening plate

Technical specifications (@ 24Vac and 20°C)

Inputs		
Temperature	Sensor	Pt100 classe 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^3
	Mixing ratio	0 ... 2000g/kg of dry air
	Wet bulb temperature	-50…+100°C
Accuracy of the measured physical quantity	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)

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...20mA; 0...20mA 0...10Vdc; 2…10Vdc
	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	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, from Windows 98
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.
	Storage temperature	-30…+80°C
Housing	L x H x W	143x154x61
	Weight	600g
	Material	ABS
	Degree of protection	Electronics IP65

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

S.TC2.480.2		
Temperature	Measuring range	-40…+60°C
Humidity	Dew point	-40…+60°C DP
Environmental Conditions	Working temperature	-40…+60°C
	Working pressure	16bar max

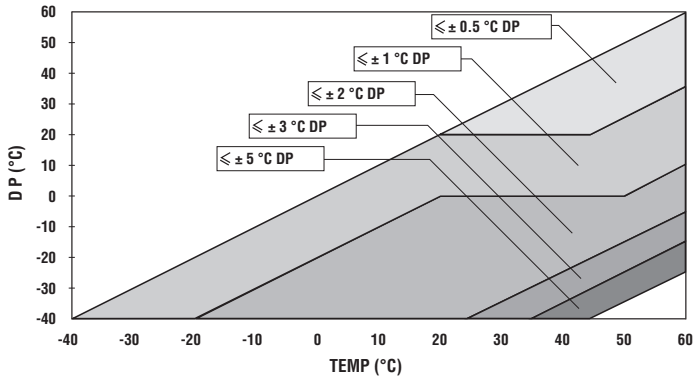
Accuracy of the calculated physical quantities

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)



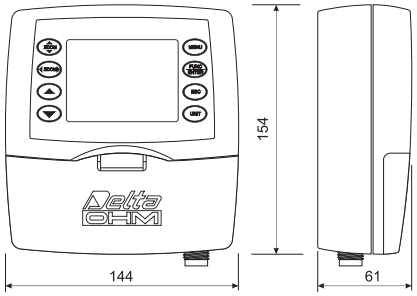
Accuracy of the absolute humidity (g/m³)

	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

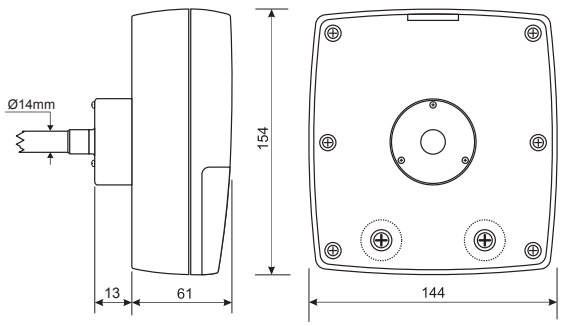
Accuracy of the mixing ratio (g/kg)

	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



Versions HD2817Tx.Dx for vertical probes TV or with cable TC



Version HD2817TO.Dx for horizontal probes

Ordering codes

HD2817T...: Transmitter, indicator, and ON/OFF regulator for temperature and humidity, with data logging functions. Fitted with 3 analogue current outputs (0...20mA and 4...20mA) or voltage outputs (0...10Vdc and 2...10Vdc). 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 software DeltaLog12, instructions manual. **Power supply, type of probe and accessories have to be specified at the moment of placing the order.**

Models with vertical probe (S.TV) or separated probe with cable (S.TC)

HD2817T.D0: Model without relay.

HD2817T.DR: Model with configurable control relays (2) and alarm relay (1).

Models for horizontal duct probe (S.TO)

HD2817TO.D0: Model without relay.

HD2817TO.DR: Model with configurable control relays (2) and alarm relay (1).

Interchangeable temperature and humidity probes with SICRAM2 module, vertical S.TV or with cable S.TC

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

The material of the S.TC...probes can be chosen between stainless steel AISI304 or POCAN plastic material.

S.TC1.2: Probe with cable. Length of stem 135mm, length of the cable 2m. AISI304.

S.TC1.2P: Probe with cable. Length of stem 135mm, length of the cable 2m. Made of POCAN.

S.TC1.5: Probe with cable. Length of stem 135mm, length of the cable 5m. AISI304.

S.TC1.5P: Probe with cable. Length of stem 135mm, length of the cable 5m. Made of POCAN.

S.TC1.10: Probe with cable. Length of stem 135mm, length of the cable 10m. AISI304.

S.TC1.10P: Probe with cable. Length of stem 135mm, length of the cable 10m. Made of POCAN.

S.TC2.2: Probe with cable. Length of stem 335mm, length of the cable 2m. AISI304.

S.TC2.2P: Probe with cable. Length of stem 335mm, length of the cable 2m. Made of POCAN.

S.TC2.5: Probe with cable. Length of stem 335mm, length of the cable 5m. AISI304.

S.TC2.5P: Probe with cable. Length of stem 335mm, length of the cable 5m. Made of POCAN.

S.TC2.10: Probe with cable. Length of stem 335mm, length of the cable 10m. AISI304.

S.TC2.10P: Probe with cable. Length of stem 335mm, length of the cable 10m. Made of POCAN.

S.TC2.480.2: Probe with cable for the measurement of the dew point in compressed air system. Length of cable 2m. 1/4" italian quick standard coupling. Measuring chamber in AISI304.

Interchangeable temperature and humidity probe with SICRAM2 module, horizontal S.TO

S.TO1: Horizontal probe for instrument HD2817TO.xx. Length of stem 135mm. AISI304.

S.TO2: Horizontal probe for instrument HD2817TO.xx. Length of stem 335mm. AISI304.

Accessories

RS27: RS232 null-modem serial connection cable with 9 poles sub-D female connector and 3 pole connector for COM AUX port. (Included in the supply of the instruments without display).

CP27: USB to COM AUX serial converter.

DeltaLog12: Further unit of software for PC connection, data download, instrument setup, and management of an instrument network. For Windows® operative systems

HD75: 75%RH saturated solution for checking the relative humidity sensor, complete with thread for probes with Ø 14mm and Ø 26mm.

HD33: 33%RH saturated solution for checking the relative humidity sensor, complete with thread for probes with Ø 14mm and Ø 26mm.

HD9008.21.1: Flange with support, Ø 26mm hole for the installation of S.TC probes in vertical position, 250mm distance from the wall. The probes of the series S.TC require the adapter HD9008.26/14 from Ø 26mm to Ø 14mm.

HD9008.21.2: Flange with support, Ø 26mm hole for the installation of S.TC in vertical position, 125mm distance from the wall. The probes of the series S.TC require the adapter HD9008.26/14 from Ø 26mm to Ø 14mm.

HD9008.26/14: Adapter from Ø26mm to Ø14mm for the supports HD9008.21.1 and HD9008.21.2, for probes of the series S.TC.

HD9008.31: Wall flange with cable outlet to fix probes with Ø 14mm.

PG16: Stainless steel gland (AISI304) for probes with Ø 14mm.

P6: 10µm sintered stainless steel protection for probes Ø 14mm.

P7: 20µm PTFE protection for probes Ø 14mm.

P8: Stainless steel 20µm grid and Pocan protection for probes Ø 14mm.

HD2817 Tx . D x

Relay
0 = without relay
R = with relay

Probe type
T = Model for vertical probe or with cable (S.TV, S.TC)
TO = Model for horizontal probe (S.TO)

HD2001
HD2001.1
HD2001.2
HD2001.3

HD 2001, HD 2001.1, HD 2001.2, HD 2001.3
INDICATORS OF TEMPERATURE, HUMIDITY, PRESSURE AND AIR SPEED ENVIRONMENTAL MEASUREMENTS WITH DIGITAL OR ANALOG OUTPUT

The devices of the HD2001 series…, according to the models, measure temperature, relative humidity, barometric pressure and air speed by hot-wire probes. All the models are provided with RS232C or RS485 serial output and the management of more than one device connected to a network. In addition, all the models are fitted with an open collector type low-activated configurable alarm output.
The HD2001.1 and HD2001.3 model have three configurable analog outputs: 4…20mA or 0…20mA current output, or 0…10Vdc or 2…10Vdc voltage output. The choice of output type is made by means of the jumpers set on the board.
Wind speed measurement is detected by the HD2001.2 model with a hot-wire probe set on the upper part of the instrument.
The large display with dual indication on all models allows one of the process variables on the first line and the temperature on the second line, to be displayed.

Tables 1 and 4 show the main characteristics of the models.

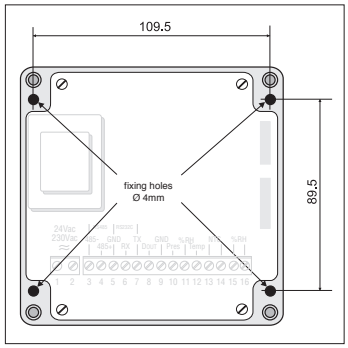


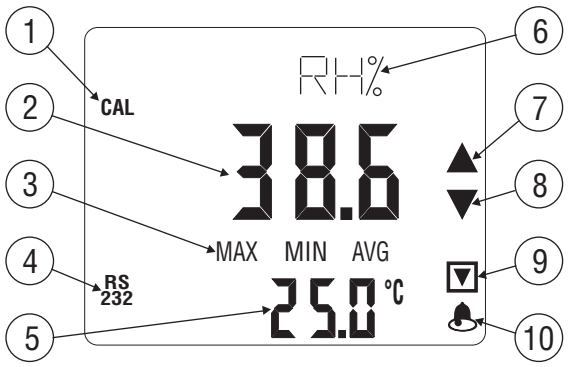
Fig.1 position of the fixing holes.

Fig.2 hot-wire probe mod. HD2001.2.

Model	Input			Output	
	Temperature % RH	Pressure	Air speed	RS232-RS485 Open collector output	Analog outputs 0…20mA, 4…20mA, 0…10Vdc, 2…10Vdc
HD2001	*	*	---	*	---
HD2001.1	*	*	---	*	*
HD2001.2	*	*	*	*	---
HD2001.3	*	---	---	*	*

Table 1

Display description



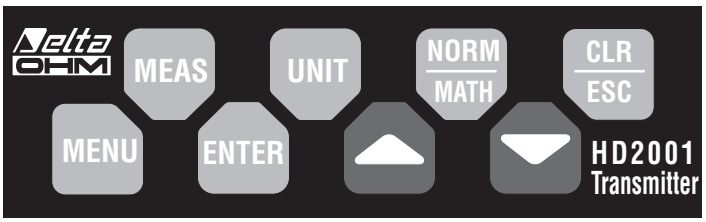
The display constantly shows the measurements of two values. While in the first line ② the value can be selected through the MEAS button, the second line ⑤ below always shows the temperature. During measurement, the first line ⑥ displays the unit of measurement of the main variable; inside the menu it provides information about the active item.
On the right-hand side of the display there are four symbols:

- The two arrows ⑦ and ⑧ are lit when the pressure measured by the barometric sensor differs at least 1 mbar from that measured 6 hours previously;
- The framed arrow ⑨ indicates the pressure drop alarm and is lit when a pressure drop occurred during the previous 6 hours which was higher than or equal to the BAR DROP value, which can be set in the menu within the range 1…9 mbar;
- The bell symbol ⑩ is lit when any of the alarms is exceeded (see paragraph "Programming the alarms").

Symbols

- CAL ① turns on during calibration of the RH sensor (see the paragraph on calibration).
- MAX MIN AVG ③ indicate that the main measurement ② reached the maximum (MAX), minimum (MIN) or average (AVG) value since last reset (see the function of the NORM/MATH button).
- RS232 ④ is turned on when the instrument is connected to a PC.

Keyboard description



MEAS By repeatedly pressing this button the main variable displayed in the first line of the display can be selected. This function is cyclic: %RH >> Barometric Pressure >> Wind speed (for the HD2001.2 model) >> %RH…
The temperature measured is always visible in the second line of the display.

UNIT This button selects the unit of measurement or the secondary variable correlated to the main variable displayed in the first line of the display.
Humidity: %RH (relative humidity %) >> g/m³ (absolute humidity) >> g/kg (mixing ratio) >> Tdew (Dew Point temperature in °C or °F).
Pressure: hPa >> kPa >> mbar.
Wind speed: m/s >> ft/min.

NORM/MATH This tool provides the chance to display the maximum (MAX), average (AVG) and minimum (MIN) value for all calculated variables from the moment the MATH button is pressed. This function memorizes the values of the previous measuring session and treats them as initial values for the new calculations. Press the CLEAR/ESC button to reset the memory.

CLR/ESC It resets the initial values during measurement of the maximum, average, minimum value. Within the menu, it allows the current function to be exited without the changes being saved.

ENTER Within the menu confirms the current selection and returns to the measurement. To confirm a parameter without exiting the menu, all that needs to be done is to display it and continue using the MENU button.

UP Within the menu, it increases the current value.

DOWN Within the menu, it decreases the current value.

MENU Using this button the instrument's menu can be accessed: the single items are described in the upper part of the display by flowing text. To modify an individual item, use the arrows; to confirm it and remain in the menu, press the MENU button; to confirm it and return to measurement, press the ENTER button.

NOTE: to help clarity, in the following explanation the terms appearing on the display are indicated by capital letters in bold (e.g. TEMP indicates the temperature, CEN means Centigrade).

1. **TEMP**erature **CEN**tigrade or **FAHR**enheit: Selection of the unit of measurement for the temperature between Centigrade or Fahrenheit.
2. **BAUD RATE**: Selection of the data transmission speed for data communication using the RS232C or RS485 serial port. Various values are available: 300, 1200, 2400, 4800 and 9600. We recommend using the maximum speed of 9600 baud.
3. **PRiNT AUTO**: 1 = YES, 0 = NO. Enables (= 1) or disables (= 0) the continuous data transmission on the serial port (continuous printing) according to a frequency equal to the interval set in the item **INTV SEC**. Date, time, temperature, relative humidity, absolute humidity, mixing ratio, dew point, barometric pressure, wind speed (in m/s or in ft/min) are printed. The units of measurement are the same as those used on the display.
4. **INT**er**V**al **SEC**onds. Print interval in seconds.
5. **YEAR**: Menu item to set the year. **The date is kept until the instrument is on**. If the instrument is turned off when not connected to a PC, the date must be reset from the keyboard. If it is connected to a PC and a power failure occurs, when reconnecting the power the PC automatically updates the instrument date without needing to use the keyboard.
6. **MON**th: Current month.
7. **DAY**: Current day.
8. **HOUR**: Current hour.
9. **ESC ZERO**s **SEC**onds, **MIN**utes: Current minutes. The seconds can be reset by pressing ESC. In order to set the hour precisely, simply set it one minute in advance and when the new minute strikes, press ESC. For example, if it is 11:20.10 and you wish to correct the time, set it to HOUR=11, MIN=21 and when the new minute strikes (21), press ESC: thus the time is synchronized to the second at 11:21.00.
10. **NUM**ber **INST**rument **ADDR**ess: Sets the identification (ID) of the instrument to be able to use it within a network. The numbers from 0 (first instrument) to 255 are available. For the details see the paragraph dealing with serial communication.
11. **SET ALaRM** 1 = YES, 0 = NO: Enables (=1) or disables (=0) the open collector low-activated alarm output. The settings submenu can be entered using the upward arrow (UP). For the details see the paragraph on alarm programming.
12. **ENaBLe CALi**bration: Enables the calibration of the relative humidity sensor. For the details see the paragraph on calibration.

Installation and connections

The instrument is set up to work indoors. The pressure and humidity sensors are set downwards so that the accumulation of dust and dirt is reduced to the minimum.
Four holes fix the container: the position of the holes is outlined in the fig.1.

Model HD2001.2

The HD2001.2 model is fitted with an omnidirectional hot-wire probe: the sensor set on the top of the probe is very delicate and must be protected with the special frame provided with the instrument. During transportation, the sensor is closed into a cylinder screwed on the end part of the probe: during installation, unscrew this cylinder and screw the protection frame in its place.
In order to measure the wind speed accurately, the instrument must be set at a certain distance from the wall using the HD2001.2.30 pole, as indicated in fig. 3.

HD2001: temperature, humidity, pressure, serial output.

HD2001.1: temperature, humidity, pressure, serial and analogue output.

Serial communication and instruments' network

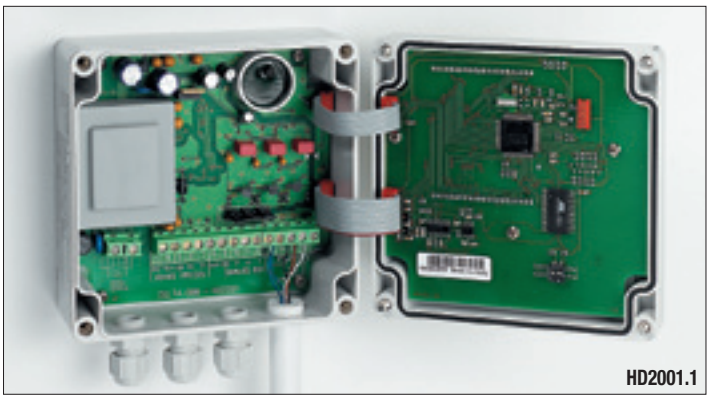
The instrument is fitted with RS232C and Multidrop RS485 serial ports for connection to a PC. Thanks to the RS485 protocol it is possible to connect more than one instrument to form a network managed by the **DeltaMet8** software provided.
The protocol is selected by using dip-switch no. 1 set on the display board.
When only one instrument is used, set at a maximum distance of 15 m from the PC, use the RS232C serial connection, as this port, unlike RS485, is present on all PCs. To cover longer distances (until 1200 m) or to create a network of instruments, the RS485 port must be used with a special RS232/RS485 converter.
A network is formed by a maximum of 256 devices tandem-connected through a shielded twisted pair cable. The first element of the network connected to the PC may use the RS232C protocol and can be an interface between the PC and the rest of the network: so using an RS232C/RS485 converter can be avoided (**only if the first instrument is less than 15 m away from the PC**).
In order that communication along the network work correctly, each instrument needs to be identified by an ID number differing from all the others. On the first start up, after commuting the protocol selection dip-switch, the ID of the instrument is automatically set to "0" if the RS232C protocol is selected, and set to "1" if the RS485 protocol is selected: using the menu item "**NUM**ber **INST**rument **ADDR**ess" these IDs can be changed and memorized in order to set up new components on the network. To maximally speed up the data transmission, we recommend using the highest baud rate available of 9600 baud: you should only reduce this value when communication problems occur.

Programming the alarms

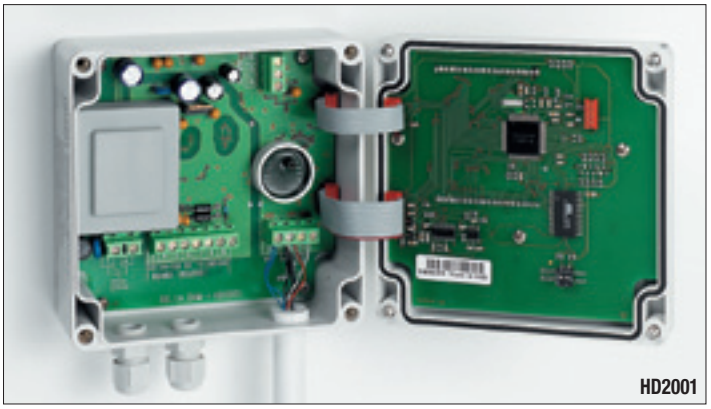
Each of the three HD2001 models… is fitted with an open collector low-activated alarm output. This output commutes when enabled if any of the limits, associated with the measurement variables of all the instrument's values, exceeds the maximum level or goes below the minimum level. The activation and deactivation of the alarm effects only the physical output and not the display indication which in contrast always remains enabled. **To avoid one of the variables intervening, simply set the limits to the extreme working limits of the measurement range**. For each physical value, except for pressure drop, the lower level (LOW) and the upper level (HIGH) with LOW smaller than HIGH must be entered.

Setting

Browse the menu items until the item SET ALaRM 1 = YES, 0 = NO: press the up arrow (UP) to access the setting of the limits. The writing changes and becomes **ReLAY ALaRM ENaBLed** (Alarm output enabled): to enable the output maintaining the previous settings, press ENTER. To enable the output and modify the settings, press MENU: after this, the lower (**LOW**) and upper (**HIGH**) alarm limits for each physical value available will be prompted. For example, "**SET TEMP**erature **LOW**" sets the minimum alarm limit of the temperature; using the arrows enter the desired value and then proceed with the MENU button to modify the other parameters. Pressing ESC, the current parameter on display is reset to the initial value.
The variables are listed in this order: temperature, relative humidity, dew point, barometric pressure, pressure drop (DROP) in the last 6 hours and, for the HD2001.2 model, wind speed.



HD2001.1



HD2001

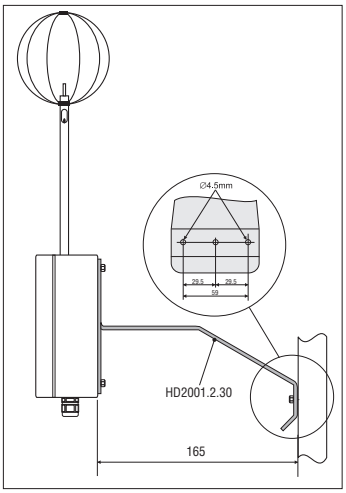


Fig.3 support for model HD2001.2

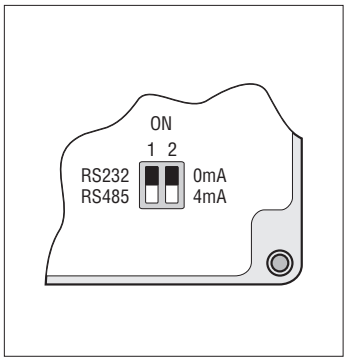


Fig.4 Selection dip switch for protocol RS232/ RS485 and analogue output.

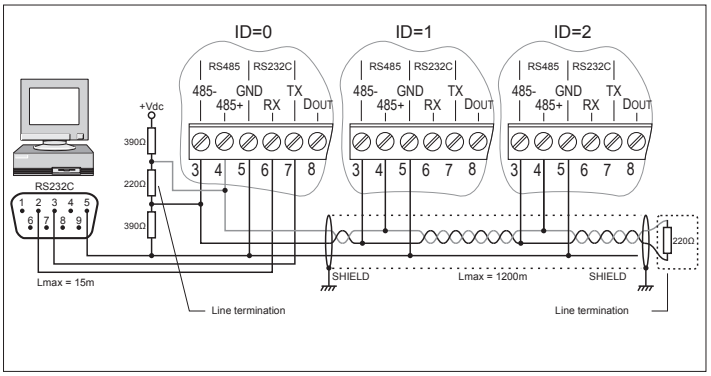


Fig.7 RS485 network in which the conversion function is performed by first instrument of the network. The instrument that is connected directly to PC is identified by the ID = 0 and must be placed no more than 15m away from the PC. If your PC does not have the RS232 connection, you must insert a USB/RS232 converter between the PC and the first instrument of the network.

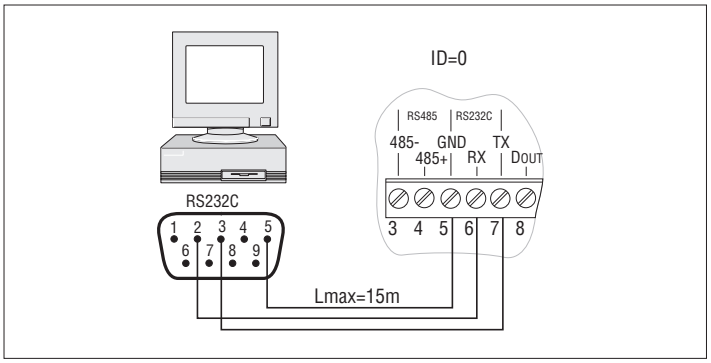


Fig.5 Connection to PC/ device with RS232C protocol.

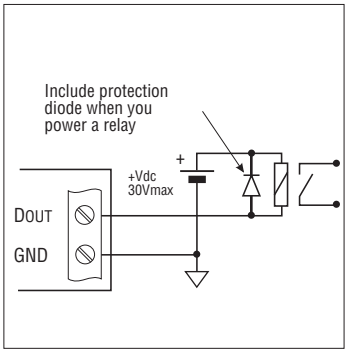


Fig.8 Typical connection for alarm relay activation

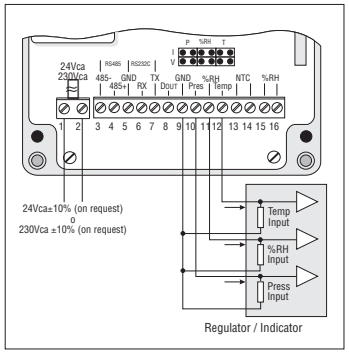


Fig.9 Connection example of the analogue output to an indicator/regulator.

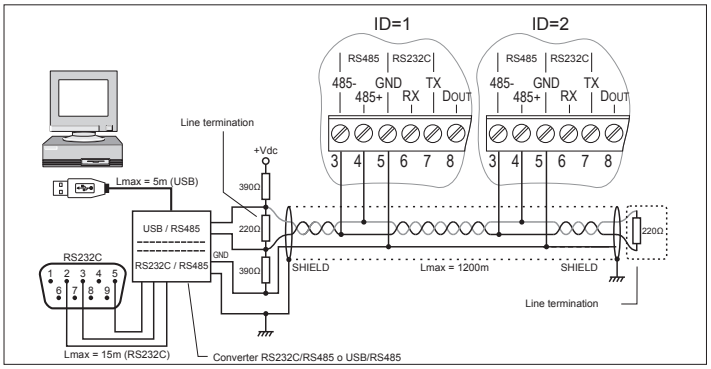


Fig.6 PC Connection with the RS485 communication protocol for distances up to 1200 m. The instruments are tandem-connected through a shielded twisted pair cable for signals and a third wire for grounding. Both ends of the network need to have resistors for impedance matching (Line terminations). To polarize the line during periods of non-transmission, resistors connected between the signal and the power line have to be used. For PC connection it is necessary to use a RS232/485 or USB/RS485 converter.

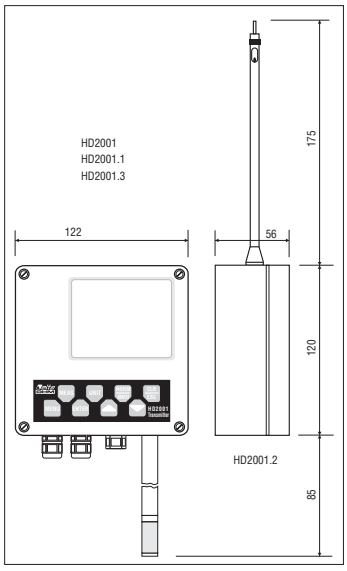


Fig.10 Dimensions.

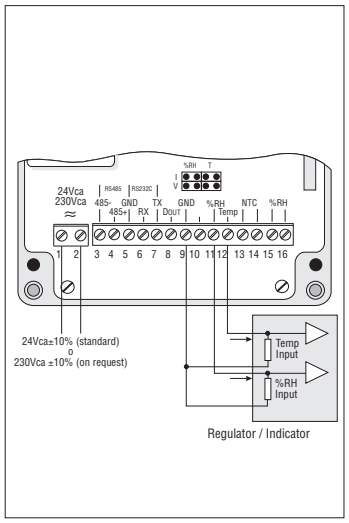


Fig.11 Connection example to an indicator/ regulator with analogue input HD2001.3.

Current and voltage analog outputs for the HD2001.1 and HD2001.3 models

The models are provided with current or voltage analog outputs, one for each value, each associated with a physical value measured by the instrument. The available outputs are 0…20mA, 4…20mA, 0…10Vdc and 2…10Vdc. The relation between output range (current and voltage) and input range is fixed: the output minimum and maximum values are associated with the minimum and maximum values of the input variables.

HD2001.1 and HD2001.3 Inputs / analog outputs ratio	
Inputs	Analog outputs
-20 … +80°C 0…100%RH 600…1100mbar	4...20mA 0...20mA 0...10Vdc 2 … 10Vdc

Table 2

The type of output is selected using dip-switch no. 2 set on the display card (see fig. 4) and the jumpers set near the analog output terminals (see fig. 9): the various combination are outlined in the following table in which the relevant output is reported according to the position of the switches.

Dip-switch no. 2	0mA	0mA	4mA	4mA
Position of the jumper	I	V	I	V
Output selected	0 … 20mA	0 … 10Vdc	4 … 20mA	2 … 10Vdc

Table 3

It is possible to use voltage or current outputs contemporarily provided that they belong in the first two columns or the last two of table 3. For example the outputs 0…20mA and 0…10Vdc or 4…20mA and 2…10Vdc can coexist, but for example, the outputs 0…20mA and 4…20mA cannot coexist. For correct functioning, **we recommend observing the load specifications concerning the analog outputs reported in the technical information**.

Calibration of the relative humidity sensor HD2001 - HD2001.1 - HD2001.3

ATTENTION: to calibrate the relative humidity sensor correctly it is fundamental to know and abide by the physical phenomena on which the measurement is based: this is the reason we recommend evaluating a new calibration carefully before intervening and, in case it is to be performed, we recommend following all that is reported below rigorously.

Calibration of the humidity sensor offset:

1. Enter the probe in the container with the saturated solution at 75% relative humidity at about 20°C. Wait at least 30 minutes.
2. Using the MENU button select the item "**EN**a**BL**e **CAL**ibration", press the UP arrow until reaching #51: the calibration procedure is started automatically.
3. The display indicates "**CAL RH**". Using the arrows, adjust the relative humidity value indicated on the display according to the temperature of the calibration salts: the value to be set is shown on the container's label of the saturated salt used.
4. Wait a few minutes to ensure the reading is stable.
5. Press ENTER to confirm this value. The instrument returns to normal measurement.
6. Remove the probe from the container and close it immediately using its lid.

Calibration of the humidity sensor slope:

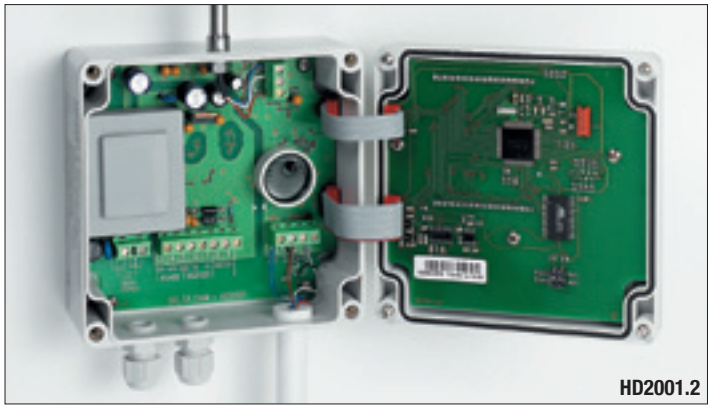
1. Enter the probe in the container with the saturated solution at 33% of relative humidity. Wait at least 30 minutes.
2. Using the MENU button select the item "**EN**a**BL**e **CAL**ibration", press the UP arrow until reaching #51: the calibration procedure is started automatically.
3. The display indicates "**CAL RH**". Using the arrows, adjust the relative humidity value indicated on the display according to the temperature of the calibration salts: the value to be set is shown on the container's label of the saturated salt used.
4. Wait a few minutes to ensure the reading is stable.
5. Press ENTER to confirm this value. The instrument returns to normal measurement.
6. Remove the probe from the container and close it immediately using its lid.

Note: the calibration of the sensor is usually carried out on both points, first at 75%RH and then at 33%RH, but can be carried out on one of the points only, to regulate a small departure at 75% or 33%, for example. On exiting calibration the instrument checks if the procedure was carried out correctly and signals any anomaly by making the CAL symbol blink. If the blinking occurs at the end of the calibration of one of the two points, it means the other point also needs calibrating.

Note: the calibration of the relative humidity of the model HD2001.2 has to be performed in a chamber with controlled humidity and temperature conditions.

HD2001.2: Temperature, humidity, pressure, air speed, RS232 / RS485 output.

HD2001.2



HD2001.2

Table 4 - Technical information (@ 24Vac and 25°C)

		HD2001	HD2001.1	HD2001.2	HD2001.3
Inputs					
Temperature	Sensor	NTC 10kΩ			
	Working range	-20 … +80°C			
	Accuracy	±0.3°C in the range 0…+70°C ±0.4°C elsewhere			
Humidity	%RH working range	0…100%RH			
	TD working range	-20 … +80°C			
	Accuracy	±1.5%RH (0…90% RH), ±2%RH (elsewhere) For T=15…35°C			
		±(1.5+1.5% of the measure)%RH in the remaining temperature range			
Pressure	Working range	600…1100mbar - 600…1100hPa - 60.0…110.0kPa			----
	Accuracy	±0.5mbar @25°C			----
	Temperature drift	<1%f.s. (zero); < 1%f.s. (span); From -20°C to +80°C			----
	Long-term stability	<1 mbar/year at 20°C			----
	Fluid contacting the membrane	Air – Non corrosive gas - **No liquids**			----
Wind speed	Type of sensor	----	----	Hot-wire	----
	Working range	----	----	0…5m/s	----
	°C working range	----	----	-20 … +80°C	----
	Accuracy	----	----	±0.15m/s @25°C	----
Outputs					
Communications	Type	RS232C and Multidrop RS485			
	Maximum Baud Rate	9600 baud			
Alarm	Type of output	Open collector (low-activated)			
	Maximum voltage	30Vdc			
	Maximum power	200mW			
Variables		Temperature, %RH, dew point TD, barometric pressure, pressure drop.		Temperature, %RH, dew point TD, barometric pressure, pressure drop and wind speed	Temperature, %RH, dew point TD
Analog	Type of outputs	---	4...20mA 0...20mA 0...10Vdc 2 … 10Vdc	---	4...20mA 0...20mA 0...10Vdc 2 … 10Vdc
	Load resistance	---	Current output: 500Ω max Voltage output: 100kΩ min	---	Current output: 500Ω max Voltage output: 100kΩ min
	Resolution	---	16bit	---	16bit
Power		24Vac ±10% 50…60Hz (230Vac ±10% on request)			
Software		DeltaMet8			
Environmental conditions	Temperature range	-20 … +80°C			
	Humidity range	0…90%RH - (without condensation)			
	Protection degree	Electronic IP67			

ORDERING CODES

HD2001: Temperature, relative humidity, barometric pressure indicator. Open collector alarm output and RS232C and RS485 PC connection. DeltaMet8 software for PC connection.

HD2001.1: Active indicator/transmitter of temperature, relative humidity, barometric pressure with selectable 0…20mA, 4…20mA, 0…10V e 2…10V outputs. Open collector alarm output and RS232C and RS485 PC connection. DeltaMet8 software for PC connection.

HD2001.2: Temperature, relative humidity, barometric pressure and wind speed indicator. Open collector alarm output and RS232C and RS485 PC connection. DeltaMet8 software for PC connection.

HD2001.3: Temperature, relative humidity active indicator/transmitter with selectable 0..20mA, 4..20mA, 0..10V and 2..10V outputs. Open collector alarm output and RS232C and RS485 PC connection. DeltaMet8 software for PC connection.

HD2001.2.30: Wall mounting support for HD2001.2.

HD75: Saturated salt solution 75% R.H. Adapter M 12x1.

HD33: Saturated salt solution 33% R.H. Adapter M 12x1

HD 9008TRR
HD 9009TRR
HD 9007

HD 9008TRR, HD 9009TRR, HD 9007
TEMPERATURE AND HUMIDITY TRANSMITTERS, MULTIPLATE RADIATION SHIELD

CHARACTERISTICS

The HD9008TRR and HD9009TRR are single block RH and temperature microprocessor transmitters, temperature configurable. The HD9008TRR is a passive transmitter with a 4…20mA output and 10…40Vdc power supply; the HD9009TRR is a transmitter with a 0…1V standard voltage output (other outputs available on demand) and 5…35Vdc power supply. Sensors are mounted at the end of a plastic tube: a capacitive humidity sensor and a Platinum temperature sensor (100Ω @0°C). The instrument can be reprogrammed by means of a key, and no jumper or potentiometer actions are required. The humidity input can be recalibrated by using two saturated solutions: the first one at 75%, the second one at 33%; the 0%RH… 100%RH relative humidity range is fixed, 4mA (or 0Vdc) correspond to 0%RH, 20mA (or 1Vdc) equal 100%RH.

Temperature standard configuration is –40…+80°C for the HD9008TRR and for the HD9009TRR, corresponding to 4…20mA and 0…1Vdc, respectively.

The user can configure the temperature output in ranges different from the standard one by means of a Pt100 simulator or of a set of fixed resistances, provided that it is included in the -40°C…+80°C range with a minimum amplitude of 25°C. Two LEDs give alarm indications (temperature exceeding set range, sensor breakage or short-circuit) and help the operator when programming.

An out-of-standard temperature operating range can be requested when placing the order.

Important Warning: probes work in the -40°C…+80°C temperature range. Outside this range data are not correct; electronics is designed to operate in this range.

SENSORS

The humidity sensor is a condenser which dielectric is made up by an hygroscopic polymer. As water dielectric constant is approximately 80, you'll get a strong change in capacity as the humidity content of this polymer changes. The advantages of this kind of sensor are: good linearity, insensitivity to temperature changes, fast response time and long-lasting life. The sensor temporary looses its accuracy if some condensation develops on its surface (the transmitted value is higher than the real one because of an increase in effective capacity).

The temperature sensor is a Platinum resistance thermometer (100Ω @0°C). The Pt100 resistance variation is transformed into a current or voltage signal, linear to temperature.

SIGNAL TRANSMISSION

The electronic circuit design provides the signal to increase linearly as humidity and temperature raise.

In presence of cables transmitting high currents or machines causing electromagnetic noises, the transmitter connection cables have to be placed in a separate raceway, or far from them, to prevent these noises. It is recommended to use a shielded cable for the connections of instruments having a voltage output (HD9009TRR).

INSTALLATION AND ASSEMBLY

Figures 1 and 2 show the connection diagram of the two models. R_{RH} and $R_{°C}$ represent the current input of any device connected to the 4…20mA loop, that is: an indicator, a controller, a data logger or a recorder. In figure 1, "Vin%RH and Vin°C" symbols have the same meaning. Accuracy in measuring does not depend on the transmitter position. However, it is suggested to install the transmitter with the sensor faced downwards (where possible) to reduce dust deposit on the sensor protection filter. The transmitter shall not be mounted next to doors, in draughtiness, in areas with scarce air circulation, or near a heat source, as heating air involves a decrease of relative humidity (the quantity of available water vapour being equal).

Protection degree: IP54.

Ensure that the sensor is compatible with the atmosphere where it is installed.

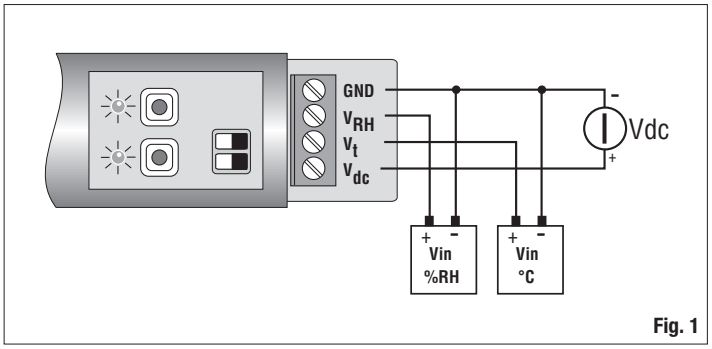


Fig. 1

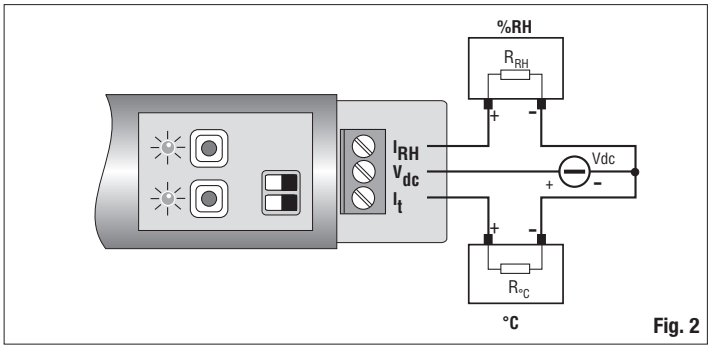


Fig. 2

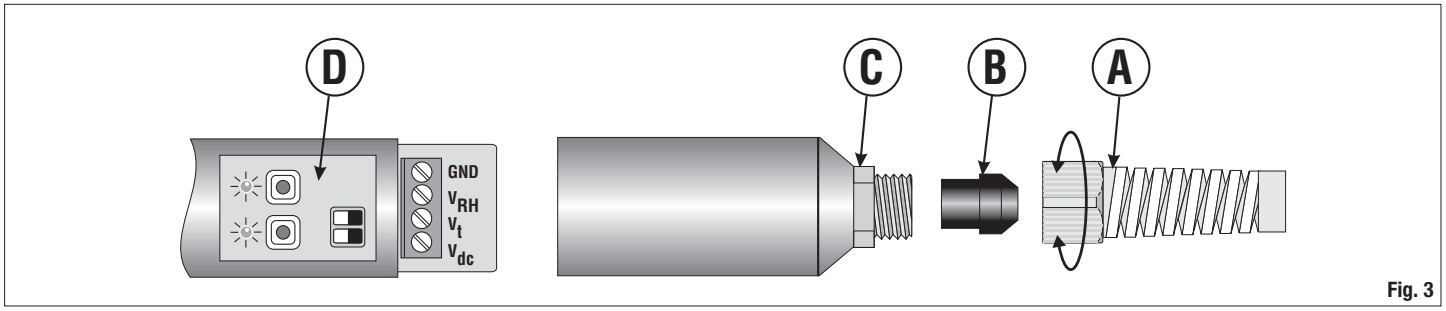


Fig. 3

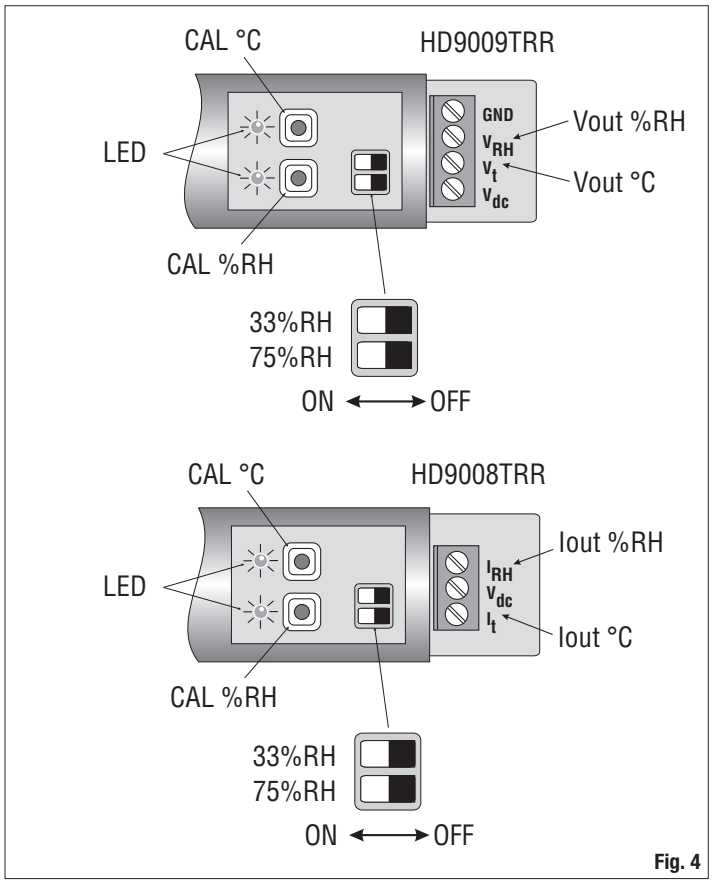


Fig. 4

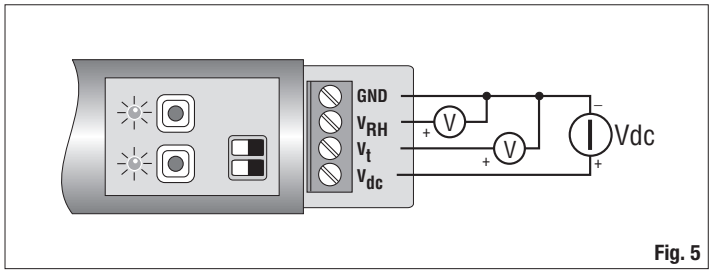


Fig. 5

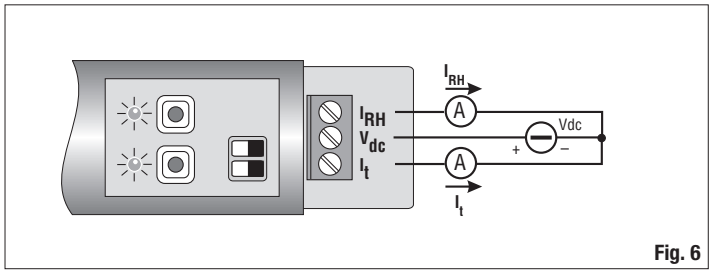


Fig. 6

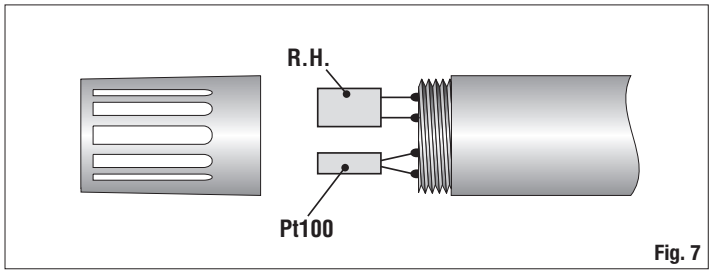


Fig. 7

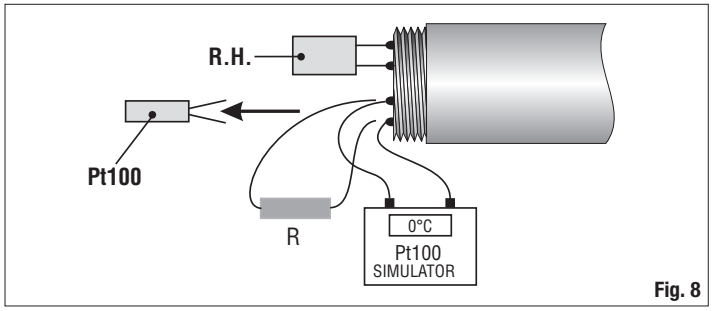


Fig. 8

Follow these procedures to access the transmitter terminal board (see fig.3):
Unscrew grommet "A", take off rubber bulb "B" and unscrew bottom "C". Insert the cable through A, B and C elements and connect it to the terminal board. Hold the cable firmly while screwing grommet "A" to avoid twisting.

Programming
HD9008TRR and HD9009TRR relative RH and temperature transmitters are factory calibrated. The HD9008TRR is provided with a 4…20mA current output, while the HD9009TR with a 0…1Vdc voltage output.
In the HD9008TRR standard configuration, 4mA correspond to 0%RH and –40°C, while 20mA equal 100%RH and +80°C.
In the HD9009TRR one, 0Vdc corresponds to 0%RH and –40°C, while 1Vdc equals 100%RH and +80°C.
The user can re-calibrate the RH probe holding the 0%…100%RH range and setting a different range for temperature, as long as it is within -40 and +80°C limits.
Figure 4 shows the transmitter programming elements.

Humidity Sensor Calibration
The following accessories are needed.
HD9008TRR model: a 10…40Vdc continuous voltage power supply, a precision ammeter with a 0…25mA min. range.
HD9009TRR: a 5…35Vdc continuous voltage power supply, a precision voltmeter with a 0…1Vdc min. range.
The calibration of the humidity sensor is carried out at two fixed points: at 75.4%RH – **always as first point** – and at 33%RH – second point.

Procedure:
1. To access the panel board, unscrew grommet "A" (see fig. 3) and hold the cable firmly to avoid twisting. Take off the rubber bulb and unscrew the bottom of the instrument.
2. Connect the wires to provide the instrument with power supply, as shown in the connection diagrams (Fig. 5: HD9008TRR and Fig.6: HD9009TRR).
3. Insert the probe in the container with the saturate solution at 75%RH and wait **30 minutes at least.** Probes and solutions have to be at the same temperature.
4. Turn 75%RH dip-switch on ON.
5. Press the CAL%RH little key and **hold it down for 5 seconds, at least,** until the corresponding LED does not flash. Now the little key can be released: the LED will remain on. A built-in sensor compensates the temperature difference of the solution compared with 20°C.
6. Turn the 75%RH dip-switch on OFF.
7. Put the probe in the container with the saturate solution at 33%RH and **wait for 30 minutes, at least.** Probes and solutions have to be at the same temperature.
8. Turn the 33%RH dip-switch on ON.
9. Press the CAL%RH small key and **hold it down for 5 seconds, at least,** until the corresponding LED is not off. Now the little key can be released.
   If the solution is at 20°C, the output will equal 9.28mA (in HD9008TRR model) and 0.330V (in HD9009TRR model).
10. Turn the 33%RH dip-switch on OFF again.
11. Re-close the instrument: re-screw the bottom, put the rubber bulb again at its place and screw the grommet: hold the cable firmly to avoid twisting it.
12. The calibration of the RH probe is finished.

Important Note: the first calibration point has to be always at 75%RH

Programming of Temperature Operating Range
The following accessories are needed.
For HD9008TRR: a 10…40Vdc continuous voltage power supply, a precision ammeter with 0…25mA minimum range.
For HD9009TRR: a 5…35Vdc continuous voltage power supply, a precision voltmeter with 0…1Vdc minimum range.
Pt100 simulator or a set of precision resistances.

Procedure:
1. To access the panel board, unscrew grommet "A" (see figure 3) and hold the cable firmly to avoid twisting. Take the rubber bulb off and unscrew the bottom of the instrument.
2. Unscrew the sensor protection filter.
3. Unsolder the Pt100 sensor (the narrowest one) and in place of it, solder the output wires or those of a Pt100 simulator or of a precision resistance, as shown in figures 7 and 8. Then wait a few seconds for the junction to get cold.
4. Set the Pt100 simulator at the temperature corresponding to the scale upper value. For example, if you want to configure the –10°C…+80°C range, the simulator has to be set at –10°C; the equivalent resistance value will be 96.09Ω. If the calibration is carried out with a fixed resistance, connect a 96.09Ω fixed resistance to the terminals to which the sensor was soldered.
5. Wait 10 seconds until the measurement becomes steady, **press the "CAL °C" key** (calibration) **and hold it down for min. 5 seconds,** until the LED first flashes (once) and then remains on.
6. Set the Pt100 simulator at the temperature value provided for the full scale. According to the above example, the simulator will be set at +80°C; the equivalent resistance value will be 130.89Ω; if the calibration is carried out with a fixed resistance, a 130.89Ω fixed resistance will have to be connected to the terminals to which the sensor was soldered.

7. Wait 10 seconds until the measurement becomes steady, **press the "CAL °C" key** (calibration) **and hold it down for min. 5 seconds,** until the LED is off. **When you release the key,** the LED will flash twice to confirm that programming took place. Now the procedure is over.
8. Check that the configuration corresponds to the requested specifications, by setting the simulator (or connecting the precision resistances) at the values corresponding to the upper and full scale value and by checking the output with the ammeter (HD9008TRR) or with the voltmeter (HD9009TRR).
9. Solder again the temperature sensor.
10. Insert again the sensor protection filter, screw the bottom, put the rubber bulb again at its place and screw the grommet holding the cable firmly to avoid twisting.
11. The temperature output programming is over.

Saturate reference solutions are available for RH calibration. Calibration is suggested every 12/18 months for instruments with continuous operation, according to the environment they are working in. **Check that the sensor and the atmosphere where it is employed be compatible, above all in case of aggressive environments** (they might corrode the sensor).

TECHNICAL DATA		HD9008TRR	HD9009TRR
Electronics Working Temperature		-40…+80°C	
Sensor Working Temperature		-40…+80°C	
Transmitter Power Supply		10...40Vdc (4…20mA)	5…35Vdc (2mA)
HUMIDITY	Capacity	300 pF typ.	
	Measuring Range	0…100%RH	
	Accuracy at 20°C	±1.5%RH (0…90%RH) ±2.0%RH (for the remaining range values)	
	Response time at 63% of final variation	3 min. with filter; 6 s without filter no thermal shock	
	Output Signal	0%RH = 4.0mA 100%RH = 20.0mA	0%RH = 0.00 Vdc 100%RH = 1.00 Vdc (*)
	Load Resistance	$R_{Lmax}=\frac{(Vdc-10)}{22mA}$	R_{inMIN}=10kΩ
TEMPERATURE	Measuring Range – Standard Configuration - (**)	-40…+80°C	-40…+80°C
	Accuracy	±0.15°C ±0.1% of measurement	
	Response time at 63% of final variation	3 Minutes; 6s without filter	
	Output Signal	-40°C = 4.0mA +80°C = 20.0mA	-40°C = 0.00 Vdc +80°C= 1.00 Vdc (*)
	Load Resistance	$R_{Lmax}=\frac{(Vdc-10)}{22mA}$	R_{inMIN}=10kΩ
Dimensions		Ø 26 x 225mm	
Cable Dimensions			
Maximum Length (***)		200m	10m
Wire Min. Section		20 AWG - 0.5mm²	20 AWG - 0.5mm²
Cable Max. Diameter		Ø5mm	Ø5mm

(*) For HD9009TRR models, 0…5Vdc, 1…5Vdc, 0…10Vdc voltage outputs can be provided on ordering for at least 5 pcs.
(**) Out-of-standard measuring ranges have to be requested when ordering or have to be re-programmed with a Pt100 simulator.
(***) Use screened cables.

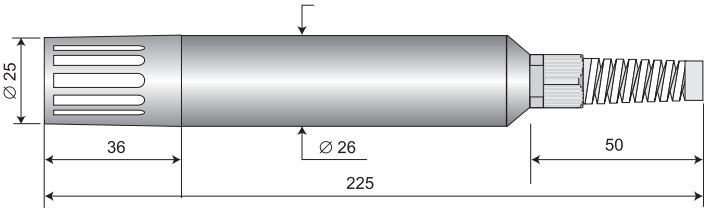
HD9007
MULTIPLATE RADIATION SHIELD

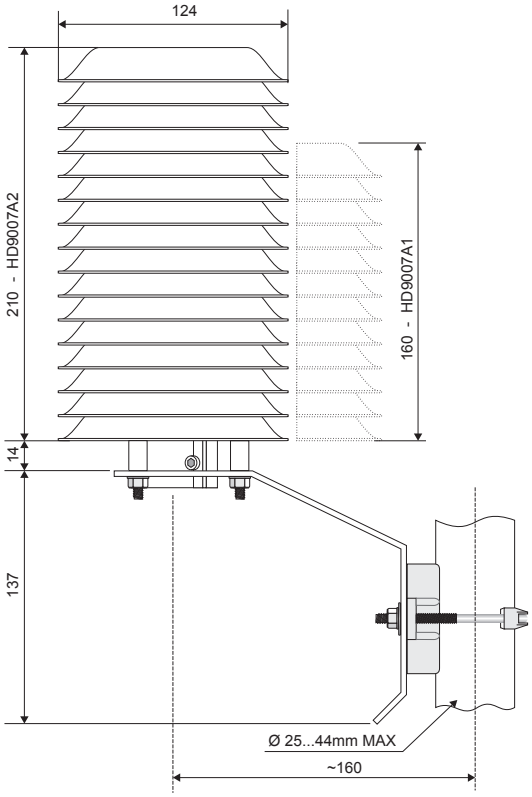
Characteristics
Luran S777K (BASF) antistatic UV-resistant thermoplastic material with low thermal conductivity and high reflection.

White power-painted, anticorodal aluminium support bracket. Stainless steel U-bar mounting bracket for shafts from 25 to 44mm.
Dimensions: external Ø : 124 mm.
Height, excluding bracket: HD9007 A1: 190 mm, weight: 640 gr.
HD9007 A2: 240 mm, weight: 760 gr.
Fixing ring nuts: Ø 25 mm to Ø 27 mm.

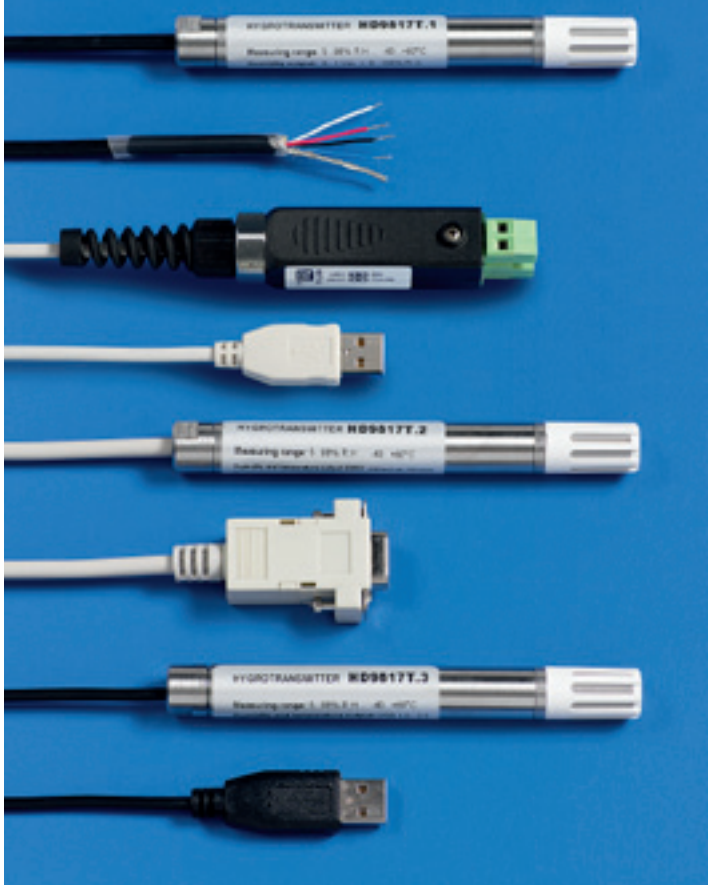
HD9007 ring-shield is suitable to protect temperature and RH/temperature sensors used in weather stations from solar radiations, rain and wind.

ORDERING CODES
HD9008TRR: dual passive RH and temperature microprocessor transmitter 4…20mA outputs in 0…100%RH and -40…+80°C ranges.
HD9009TRR: dual RH and temperature microprocessor transmitter. 0…1V output in 0…100%RH and -40…+80°C ranges.
HD9008.1: meteorological **relative humidity** transmitter. Measuring range 0…100%RH. 4mA correspond to 0%RH and 20mA to 100%RH. **Power supply 10…40Vdc**. Probe Ø 26mm, L=185mm.
HD9008TR.1: dual temperature and relative humidity transmitter. Measuring range 0…100%RH. **Temperature measurement with 2-wire Pt100 sensor.** 4mA correspond to 0%RH and 20mA to 100%RH. **Power supply 10…40Vdc**. Probe Ø 26mm, L=185mm.
HD9008TR.2: dual temperature and relative humidity transmitter. Measuring range 0…100%RH. **Temperature measurement with 4-wire Pt100 sensor.** 4mA correspond to 0%RH and 20mA to 100%RH. **Power supply 10…40Vdc**. Probe Ø 26mm, L=185mm.
HD9009TR.1: dual temperature and relative humidity transmitter. Measuring range 0…100%RH. **Temperature measurement with 2-wire Pt100 sensor.** 0Vdc correspond to 0%RH and 1Vdc 100%RH. **Power supply 5…35Vdc**. Probe Ø 26mm, L=185mm.
HD9009TR.1: dual temperature and relative humidity transmitter. Measuring range 0…100%RH. **Temperature measurement with 4-wire Pt100 sensor.** 0Vdc correspond to 0%RH and 1Vdc 100%RH. **Power supply 5…35Vdc**. Probe Ø 26mm, L=185mm.
HD9007 A1: 12-ring protection L=190 mm complete with mounting brackets.
HD9007 A2: 16-ring protection L=240 mm complete with mounting brackets.
HD75: saturated salt solution 75% R.H. with adapter M 24x1,5
HD33: saturated salt solution 33% R.H. with adapter M 24x1,5
HD9008.21.1: holder for vertical sensor, wall distance 250mm, hole Ø 26.
HD9008.21.2: holder for vertical sensor, wall distance 125mm, hole Ø 26.





HD 9817T1R
HD 9817T2R
HD 9817T3R
HD 9817TVS



HD 9817T1R, HD 9817T2R, HD 9817T3R, 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.

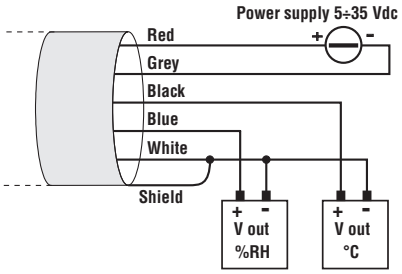
VERSIONS, OUTPUTS AND CONNECTIONS

	HD9817T1R	HD9817T1R.1	HD9817T2R
Output	0...1V = 0…100%RH 0...1V = –40…+60°C		RS232C non insulated, 2400 baud rate
Temperature sensor	Pt100	NTC 10kΩ	Pt100
Load resistance	R_L > 10kΩ		
Cable Connection	L=1,5m (7 wires + shield)		L= 2m DB9 female connector

	HD9817T2R.B	HD9817T3R	HD9817TVS
Output	RS232C non insulated, 2400 baud rate	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 resitance			R_L > 10kΩ
Cable Connection	L= 2, without connector	L= 2m USB connector type A	M12 8-pole connector. Provided with cable CP9817.3, L=3m

Connections

HD9817T1 and HD9817T1.1 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 HD9817T.1CAL 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.

HD9817T2 model with RS232C output and HD9817T3 model with USB output.

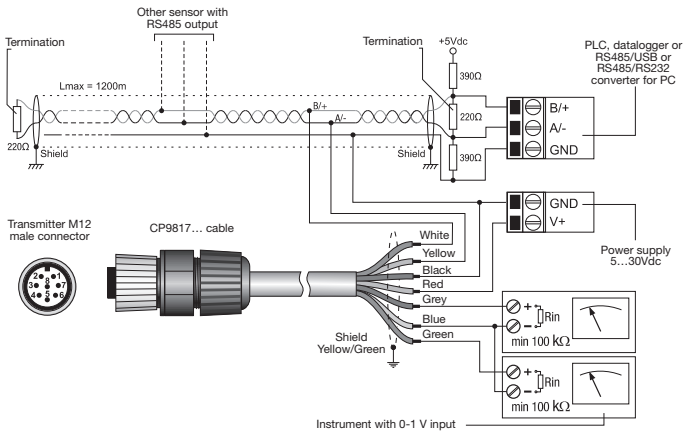
The HD9817T2 cable ends in a RS232C 9-pole subD female connector, while the HD9817T3 cable ends in a USB type A connector.
The following set of commands is available for both instruments.

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 I 063.9	It sends the current measurement (tttt.t I hhh.h) t = temperature h = RH
U0	&	International System of units
U1	&	Imperial units

Note for HD9817T3 model with USB ouput

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**. For further details, see the guide in the CDRom which is supplied with the instrument.

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. The CDRom supplied with the instruments includes a relative humidity calibration procedure. The online help describes this procedure in detail.

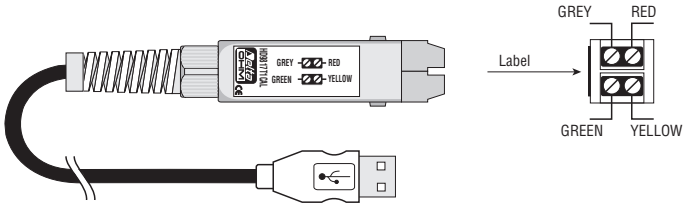
No procedure exists for temperature calibration.

To connect HD9817T1 and HD9817T1.1 models to your PC, use the HD9817T.1CAL 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, see the guide in the CDRom which is supplied with the instrument.

Please connect the **Red** (power supply positive), **Grey** (power supply negative), **Yellow** (Tx) and **Green** (Rx) wires as shown in the figure below.

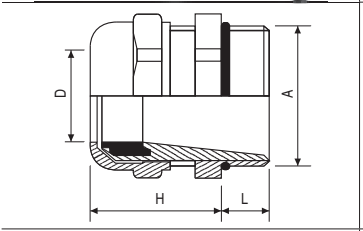
The terminal board is seen from above: in order to direct the clamps correctly, make sure that the label on the side of the module is placed as shown in the figure below.



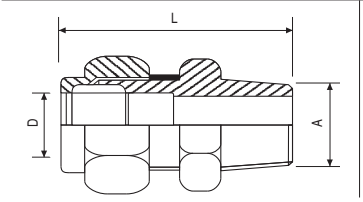
INSTALLATION NOTES

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 (⌀10…14mm) or a 3/8" universal biconical connection.

HD9008.31 Flange

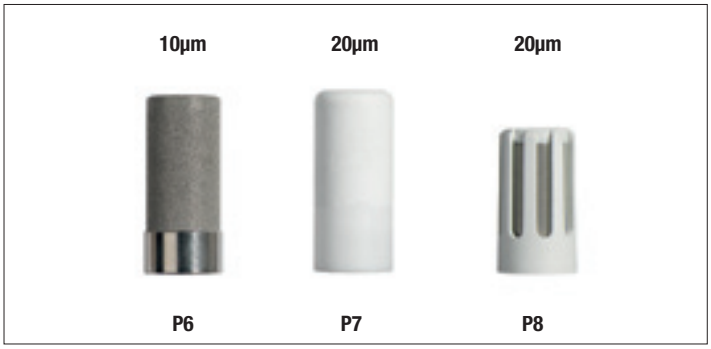


PG16.12 Metal cable gland
D = 10…14mm
L = 6.5mm
H = 23mm
A = PG16

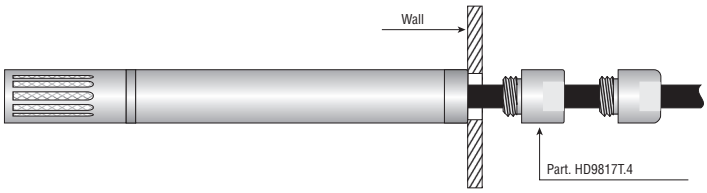


Universal biconical connector
L = 35mm
D = 14mm
A = 3/8"

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 and HD9817T1.1 versions only).



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

Electrical connection

HD9817T1 and HD9817T1.1 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.

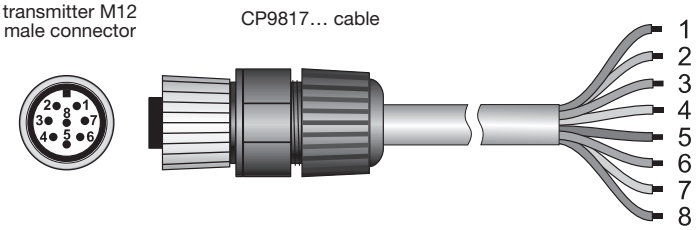
Shield = the braid is connected to the common ground (White wire).

HD9817T2 and HD9817T3 models

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

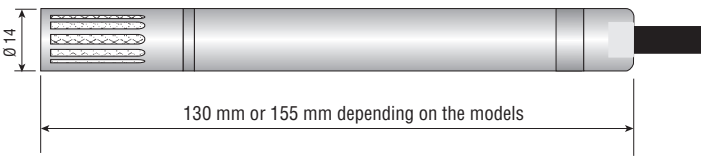
Models HD9817TVS with analog outputs 0…1Vdc and RS485 MODBUS-RTU output.

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.



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



Technical data		
HD9817T1R - HD9817T1R.1- HD9817T2R - HD9817T3R-HD9817TVS		
Relative humidity	Sensor	Capacitive
	Sensor protection	P8, stainless steel grid and PTFE, 20µ
	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 (on request, NTC 10kΩ: code HD9817T1R.1
	Measuring range	-40...+60°C
	Accuracy	±0.2°C ±0.15% of the measured value
	Long term stability	0.2°C/year
General	Power voltage	5…35Vdc
	Consumption	Typically 2mA
	Max. operating temperature	-40…+80°C (for short periods)
	Operating humidity	0…100%RH
Housing	Dimensions	Ø14x130 mm Ø14x155 mm for HD9817TVS
	Degree of protection	IP65

ORDER 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.**

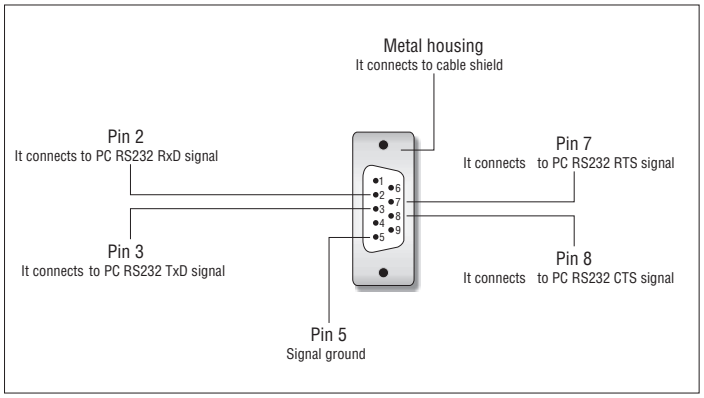
HD9817T1R.1: Dual relative humidity and temperature transmitter, NTC sensor 10kΩ. 0...1Vdc analogue outputs. Temperature measuring range -40...+60°C (-20…+80°C on request). Power supply 5...35Vdc. AISI 304 housing. Probe protection class IP65. Dimensions Ø14x130mm. Output with cable L=1,5m (7 wires + shield). Max. working temperature -40°…+80°C. **Supplied with HD9817TC software.**

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.**

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.**

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.**

HD 9817T2 - RS232 SERIAL CONNECTIONS



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 HD9817T1R.1 on request.

HD9817T1CAL: USB interface module for connecting HD9817T1R and HD9817T1R.1 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.

HD9007 A-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.

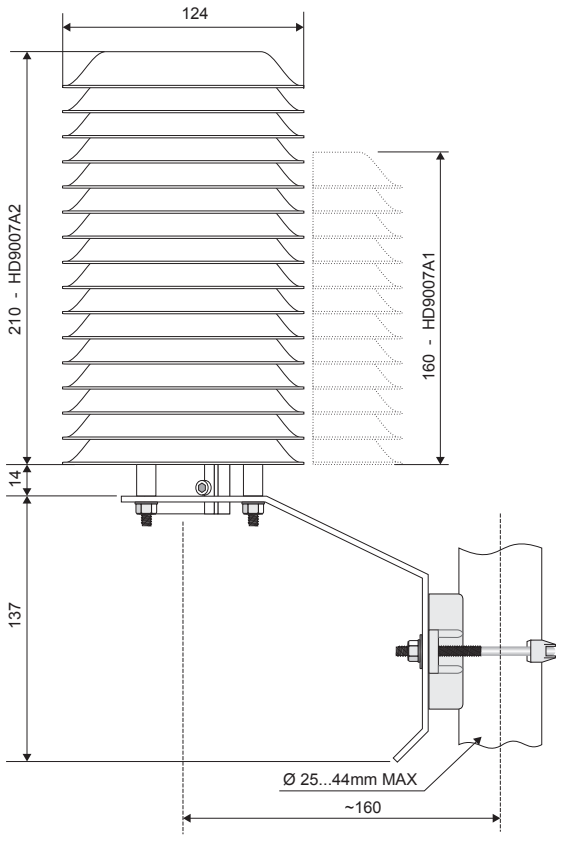
HD9007 A-2: 16 ring protection from solar radiations for Ø 26mm probes. Complete with mounting brackets. For the transmitters HD9817T the HD9007T26.2 adapter can be provided.

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

P6: 10µm sintered stainless steel protection for probes Ø 14mm, thread M 12x1.

P7: 20µm PTFE protection for probes Ø 14mm, thread M 12x1.

P8: 20µm stainless steel and Pocan grid protection, thread M 12x1.



HD 3817T…
HD 38V17T…

HD 3817T…, HD 38V17T…
ABSOLUTE HUMIDITY AND TEMPERATURE ACTIVE TRANSMITTER

The HD3817T... and HD38V17T... are double **absolute humidity** and **temperature** active transmitters with 4...20mA current or 0...10Vdc 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/m³. 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/m³ for absolute humidity and 0...200°C for temperature: The instruments come out of the factory with the 0...60g/m³ 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.

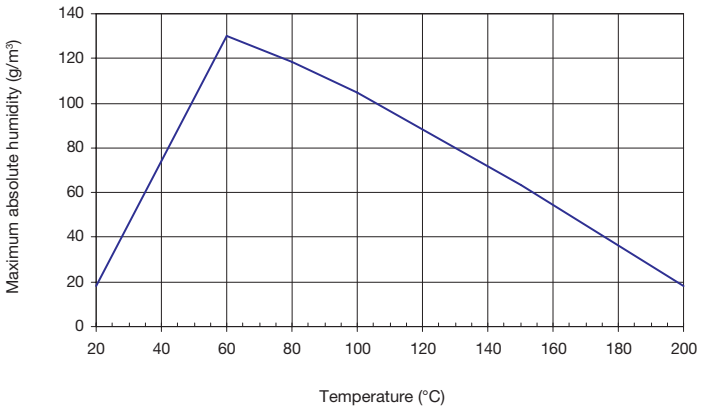
TECHNICAL INFORMATION

ABSOLUTE HUMIDITY	Type of sensor	Heat conductivity with double combined NTC.
	Sensor protection	20µm sintered bronze filter
	Measurement range	0...130 g/m³ (0...100% RH @60°C and 1013hPa) (*)
	Sensor working range	0 … +200°C
	Accuracy	±3g/m³ at 35 g/m³ and 40°C
	Startup stabilization time	120 seconds
	Response time	60 seconds with standard filter for a 63% variation of the final value
	Repeatability	±5%
TEMPERATURE	Sensors type	4 wire Pt100
	Measurement range	0 … +200°C
	Accuracy	1/3 DIN
	Response time	10 seconds for a 63% variation of the final value
Analog outputs (according to the models)	4…20mA (HD3817T...)	R_L < 500Ω
	0…10Vdc (HD38V17T...)	R_L > 10kΩ
GENERAL	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

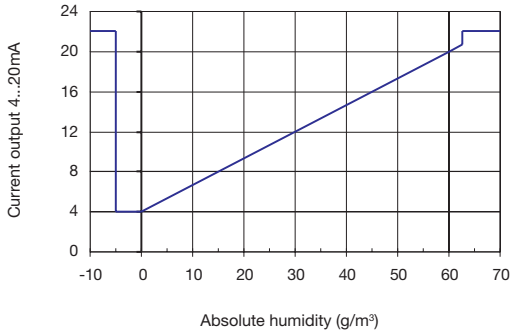
(*) **Note**: The 0...130g/m³ range is referred to a 60°C temperature. The absolute humidity maximum value varies with environment temperature according to the following diagram.

DIAGRAM OF THE ABSOLUTE HUMIDITY AND TEMPERATURE OUTPUTS

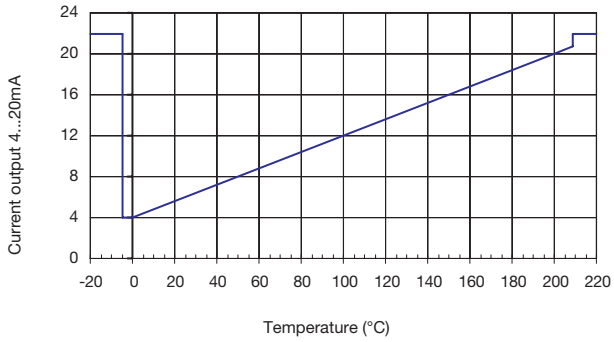
The graphs of the absolute humidity and temperature outputs are reported below.



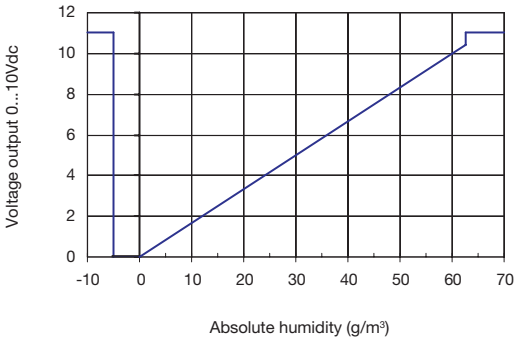
Absolute humidity (g/m³)
4...20mA current output according to 0...60g/m³ standard range



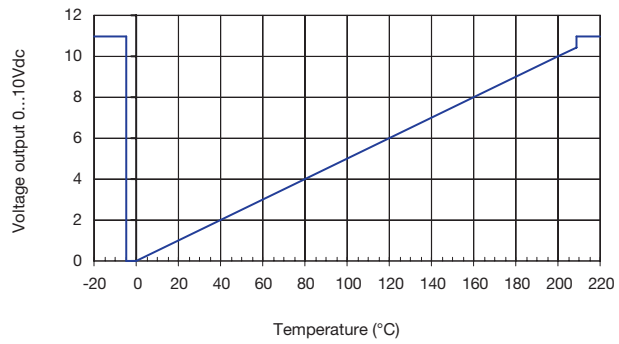
Temperature (°C)
4...20mA current output according to 0...200°C standard range



Absolute humidity (g/m³)
0...10Vdc voltage output according to 0...60g/m³ standard range

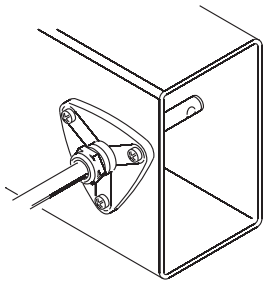


Temperature (°C)
0...10Vdc voltage output according to 0...200°C standard range

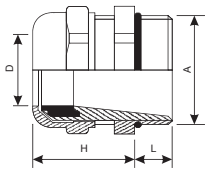


Calibration
The instruments are calibrated in the factory; no calibration is required by the user.

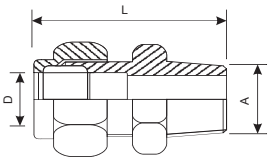
INSTALLATION NOTES
Each probe is calibrated in the factory with its transmitter: **A probe cannot be used onto another transmitter**. The transmitter has to be installed into a position with good air circulation. The probe orientation is not important.
To set the probe in a ventilation channel, into 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

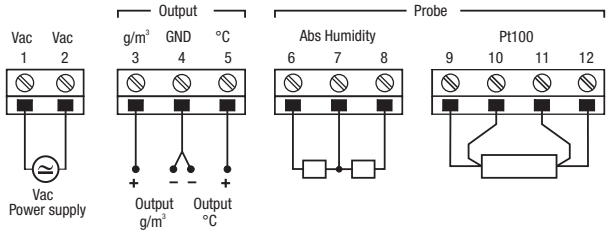


PG16.12 metallic fairlead
D = 14 mm
L = 6.5 mm
H = 23 mm
A = PG16



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

ELECTRIC CONNECTION

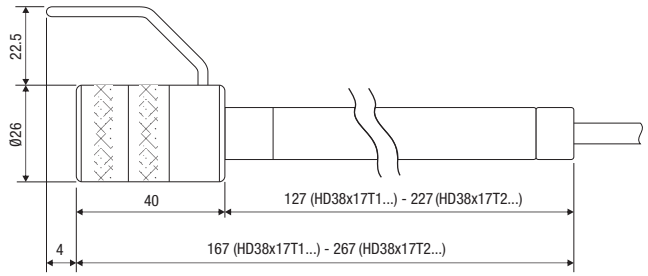


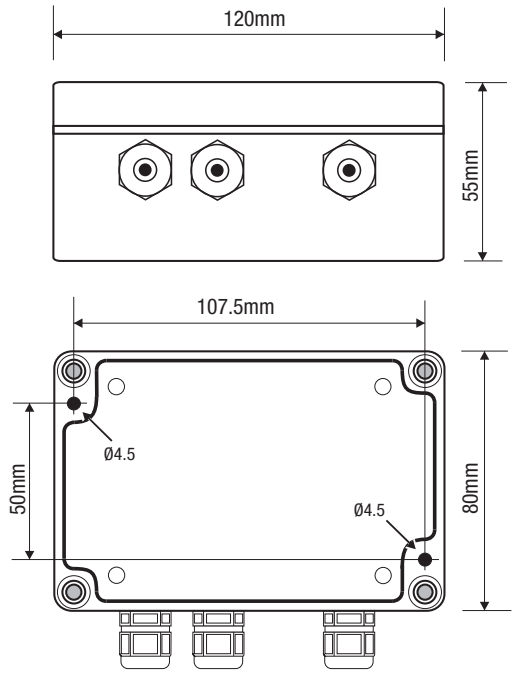
Power
Apply power to the instrument with the correct VAC voltage between the power supply terminals ① and ②.
Connection of the absolute humidity and temperature probe
Connect the probe respecting the colours and the numbers in the following table:

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/m³ and ④=GND for absolute humidity,
⑤=°C and ④=GND for temperature.

DIMENSIONS





HD38 X 17T X X . X

Power
0 = Standard 24VAC power supply
1 = 115VAC power supply
2 = 230VAC power supply

Cable length
2 = Cable 2 meters
5 = Cable 5 meters

Stem length:
1 = Stem length 127 mm
2 = Stem length 227 mm

Analog output
No number = Current analog output 4...20mA
V = Voltage analog output 0...10VDC

ORDER CODES

HD3817T...: Absolute humidity and Pt100 temperature double transmitter. Analog outputs 4...20mA. Measurement range of absolute humidity 0...60g/m³, temperature 0...+200°C (on request, when making the order, other outputs in the ranges 0...130g/m³ 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 127 mm or 227 mm. 3) Probe's cable length 2 m or 5 m.

HD38V17T...: Absolute humidity and Pt100 temperature double transmitter. Analog outputs 0...10Vdc. Measurement range of absolute humidity 0...60g/m³, temperature 0...+200°C (on request, when making the order, other outputs in the ranges 0...130g/m³ 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: 127 mm or 227 mm. 3) Probe's cable length: 2 m or 5 m.

RELATIONS BETWEEN ABSOLUTE HUMIDITY, RELATIVE HUMIDITY AND MIXING RATIO

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

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

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

%RH = % of relative humidity
AH = Absolute humidity in g/m³
MR = Mixing ratio in water vapour kg per air kg
E = Current value of vapour pressure in air in Pascal
E_S = Saturated vapour pressure in air in Pascal
P_0 = Atmospheric pressure in Pascal
T = Temperature in Celsius degrees
The Es value can be obtained from a psychrometric table

HD 2601V.1
HD 2601V.2

HD 2601V.1, HD 2601V.2
4…20mA TRANSMITTER DISPLAYS WITH DIN43650 CONNECTOR

The HD2601V.1 is a 4...20mA passive transmitter display with DIN43650 connector; the HD2601V.2 model is fitted with two independent dual-output transmitter viewers. The display is inserted between transmitter and connector. Power is supplied by the 4...20mA current loop.
The snap-in display can be programmed by the user. Two keys can be used to set scale factors, decimal point position, display update time, maximum, minimum and average values display, time passed after turn-on, open-collector digital output parameters of the single display version.
The programmable parameters are saved into a permanent memory and are not erased when power is disconnected.
All device functions are continuously monitored by an integral diagnostic system. In the single model HD2601V.1, the open-collector digital output can control a digital device or a relay coil.
The instrument display can be rotated at 90° or overturned to fit different installation conditions.

Installation and connections
Fig. 1 shows the typical configuration: the display is inserted between the transmitter (8) and the DIN43650 female connector (1).
The display has two keys: one externally accessible (5) used for data display: current measurement, maximum, minimum and average values, timer; the internal key (9) is accessible only after removing the cover, and is used together with the external key for programming.
In box (3) over the display window, the unit of measurement label can be applied.
The card supporting the display and relevant cover can be rotated at 90° pitches by unscrewing the 4 screws at the corners.

Fig. 2 and 3 illustrate the electrical connections of the single model HD2601V.1 and the dual model HD2601V.2.

Vdc represents the direct current power source.
RL, RL1 e RL2 are the devices inserted in the current loop (PLC, recorder,…).
In the HD2601V.1 model, Rd represents the load connected to the open-collector digital output.
NOTE on Fig. 2: if a relay coil is controlled, insert a diode protecting the device's output.

The numbers 1, 2 and 3 refer to the information on the instrument's connector:

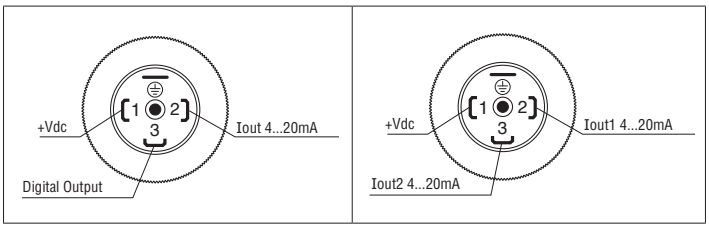


Fig.4 - HD2601V.1 **Fig.5** - HD2601V.2

To proceed with the electrical connections, open the connector by removing the screw (6) as shown in the Fig. 6:

Remove the gasket (1). Unscrew the fairlead (5) and take off the gasket (4). Use a screwdriver to pry and take off the connecting terminal (2). Make the connections as shown in the Fig. 7 and 8: if present, the shielded cable braid must be connected to the earth terminal.
Once the connections are made, close the connector.

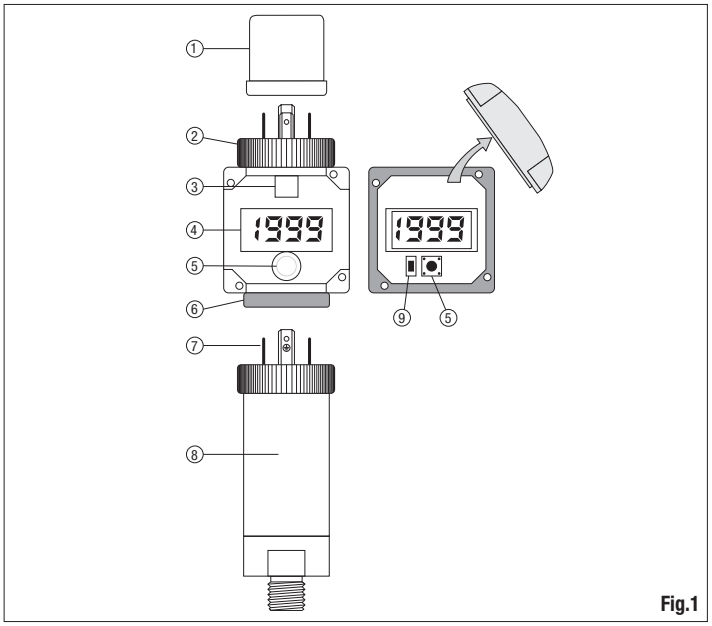


Fig.1

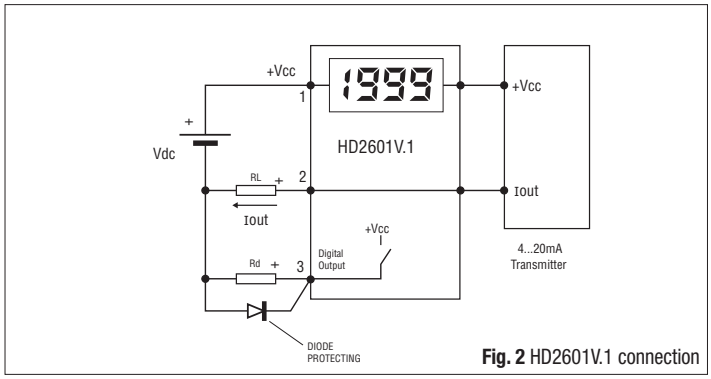


Fig. 2 HD2601V.1 connection

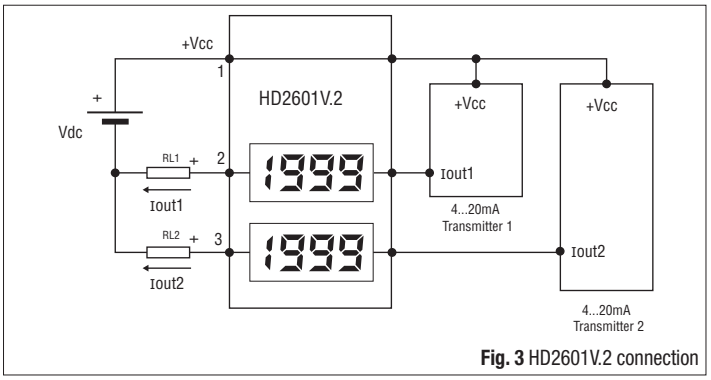


Fig. 3 HD2601V.2 connection

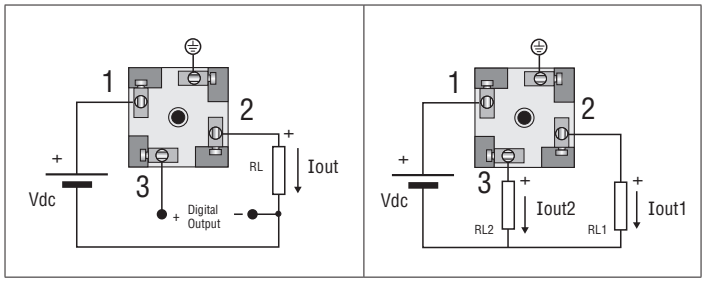


Fig. 7 - HD2601V.1
Electrical connections of the connecting terminal

Fig. 8 - HD2601V.2
Electrical connections of the connecting terminal

The display is now ready for use: proceed with the programming of the scale factors.

Maximum load
The **RL maximum load** applicable to the 4...20mA loop, after insertion of the display, can be calculated as follows (see Fig. 2 and 3):

$$RL\text{max} = \frac{\text{Vdc - (Vtx + 6)}}{0{,}022}$$

Vdc is the direct voltage, **Vtx** is the voltage drop on the transmitter (shown in the relevant technical characteristics).

Display
By pressing the external key (5) (see Fig. 1) it is possible to display, in sequence, the maximum, minimum and average of the captured measurements since the last reset (Record function), and the time passed since the last reset (Timer function).
The controls to reset the Record and Reset functions are independent.
The following table shows, in the same order, the indications provided by the display when repeatedly pressing the external key (5). The sequence starts from measurement mode:

Display indication	Notes
Current measurement	
"HIGH" message	It means "HIGH"
Maximum value	
"Lou" message	It means "LOW"
Minimum value	
"Avg" message	It means "AVERAGE"
Average value	
Y ##	## shows the years
d ##	## shows the days
H ##	## shows the hours
n ##	## shows the minutes
S ##	## shows the seconds
"MEAS"	returns to normal measurement
Current measurement	

To reset the Record (MAX, MIN and AVG) values, keep the external key pressed (5) for about 10 seconds until the display indicates "CLr" (CLEAR).
To reset the timer use the RST (RESET) function in the menu: for the details see the chapter dedicated to programming.

Programming
In order to program the display, the internal key needs to be accessed: unscrew the four screws in the corners of the display face-plate. The internal key (INT) is shown in Fig. 1 by number (9), the external key (EXT) by number (5).
Using the INT key the various menu items are scrolled. Use EXT to access the displayed item. Within the menu item, the two keys are used to increase or decrease the current information. To confirm the entered value press simultaneously the two keys.
To exit the menu, press INT and scroll all the items.

Menu Item	Description
dP	Selection of the decimal point position
ZP 4	Top scale value associated to the 4mA current
EP20	Bottom scale value associated to the 20mA current
filt	Sets the averaging filter on the measurement: this filter calculates the average current of the values captured. The instrument captures 4 measurements per second: one each 0.25s. By setting filt=0.25s no average is performed; with filt=5.00s the moving average is calculated on the last 20 samples. It is possible to set the intermediate values from 0.25s to 5.00s with 0.25s pitches.
HILO	If HILO=YES the display shows "Lo" if the current drops under the minimum threshold 4mA, and "HI" if the current raises over 20mA. If HILO=NO the display continues even outside the limits without showing any alarm.
S Fu (*)	Digital output (only HD2601V.1). By selecting YES the output is enabled, pressing NO the output is disabled.
S Pt (*)	Sets the digital output tripping point (see Fig. 9).
HYSt (*)	Sets the hysteresis width for digital output switching (see Fig. 9).
dir (*)	Sets the digital output tripping direction (see Fig. 9).
rst	Sets the timer to zero.

(*) This function is available only for the HD2601V.1 model.

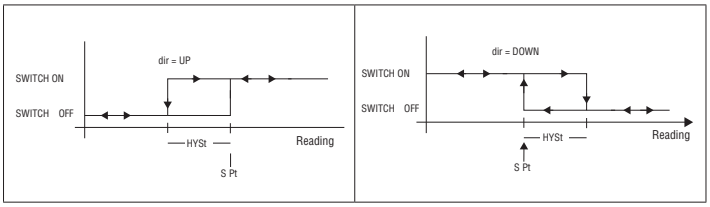


Fig. 9 Description of the Digital Output function

Technical characteristics

Display	4 digit LED, 7.6mm high. The decimal point position can be programmed.
Display range	-1999…+9999
Power	Power supplied by the 4…20mA current loop
Maximum voltage drop	6Vdc
Accuracy	0.2% of span ± 1 digit
Temperature drift	0.01%/°C
RL load resistance	RLmax = [Vdc-(Vtx + 6)] / 0,022
Speed of conversion	4 measurements per second
Electrical connections	DIN43650 connector
Parameter settings memory	Permanent
Programming	Using two keys (5 - 9), one internal
Display filter	Moving average that can be set from 1 (no average) to 20 samples
Error messages	HI = current over 20mA - LO = current under 4mA
Protection degree	IP65
Functioning temperature	-10…+80°C

Technical characteristics of the HD2601V.1 model digital output

Type of output	Open collector, ground output
Maximum current	100mA
Maximum reverse voltage	30Vdc

ORDERING CODES
HD2601V.1: Configurable sandwich LED indicator, plug-on, for transmitters with DIN 43650 connector and 4÷20 mA output, (i.e. HD2004T).
HD2601V.2: Configurable sandwich dual LED indicator, plug-on, for transmitters with DIN 43650 connector and 4÷20 mA outputs, (i.e. HD9008TRR).

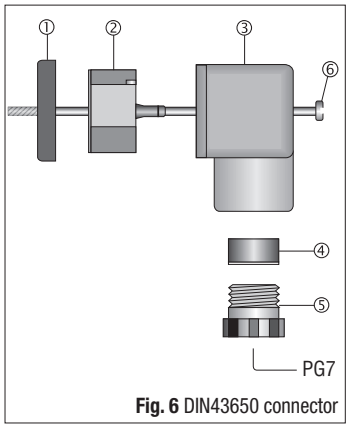


Fig. 6 DIN43650 connector

HD2601V.1

HD2601V.2

HD 9022
CONFIGURABLE MICROPROCESSOR INDICATOR, REGULATOR Pt100 4 WIRE CURRENT OR VOLTAGE INPUT

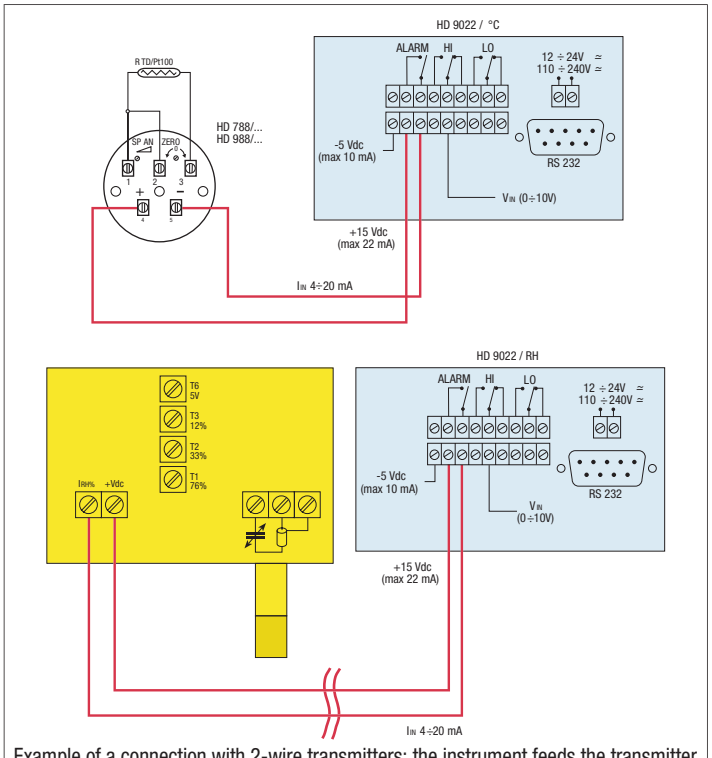
The microprocessor-controlled panel instrument HD 9022 is an indicator with alarm thresholds that may be programmed and configured by the user. At input it accepts signals arriving from 2 or 3 wire transmitters with 0÷1V, 0÷10V voltage or 0÷20 mA, 4÷20 mA current signals, or 4 wires Pt100 sensors. Configuration is always completely present in the instrument, no additional cards are required. The choice for the configuration of the input signals is made by means of the keyboard on the front of the instrument. The dimensions of the instrument are 96x48 mm with depth 145 mm in conformity with DIN 45700. The mode of operation of the HD 9022 is chosen depending on the application, configuring the instrument with the keyboard. The instrument may also be reconfigured with absolute simplicity on the field in order to adapt it to changes in processing requirements.
The configuration involves the input, the scale range, the set point and the auxiliary outputs.

Applications
Typical applications are the display of signals sent by transmitters which may concern temperature, humidity, pressure, speed, capacity, level, force, etc., for the most varied industrial sectors, operating machines and automated systems.

Characteristics
- Set point configurable from -9999 to +19999.
- Indication provided by red leds with seven ½ inch segments.
- Separate clamp for voltage input 0÷1 / 0÷10V, current input 0÷20 / 4÷20 mA and Pt100 input (-200÷+800°C).
- The instrument has an auxiliary power supply: -5 Vdc max 10 mA and +15 Vdc non stabilized max 40 mA for the possible supply of 2-wire transmitters.
- R_{IIN} = 25 Ω, R_{VIN} = 200 kΩ.
- Instrument accuracy: ±0.1% Rdg ± 1 Digit.
- A/D converter resolution: 0.05 mV/Digit, 1µA/Digit.
- Functions: One relay with independent exchange contact for output HI (SP1, SP2).
  One relay with independent exchange contact for output LO (SP3, SP4).
  One relay with maximum or minimum alarm closing contact (L max, L min.) ALARM.
  Resistive relay contacts 3A/220V 50Hz.
- Instrument working temperature: (electronic componentry) 5°C÷50°C.
- Power supply: **12÷24Vac/Vdc (110÷240Vac/Vdc on request).**
- Instrument absorption: 5VA.
- Minimum power of the supply transformer: 20VA.

Function of the keys on the front panel, the display and the leds
❶ Digital display. During programming the following wording appears: F0, F1, F2, F3, F4, F5, F6, F7, F8, SP1, SP2, SP3, SP4, S10.
❷ State indicator of HI relay.
❸ State indicator of LO relay.
❹ State indicator of ALARM relay.
❺ Decimal point.

SEQUENTIAL PROGRAMMING OF WORKING PARAMETERS
❻ **PROG** Every time this key is pressed the program moves one step forward (F0, F1, F2, F3, F4, F5, F6, F7, F8, SP1, SP2, SP3, SP4, S10).
❼ **ENTER** When this key is pressed during programming, the value of the selected variable, which can be modified by the ▼▲ keys, is displayed; pressing once again **ENTER** confirms the stored value.
❽ ▲ Pressing this key during programming increases the value indicated on the display; in F2, it moves the decimal point towards the right. In normal operation it flashes to indicate the value in Volts, mA or Pt100 corresponding to the input; with a second impulse it returns to normal operation.
❾ ▼ Pressing this key during programming decreases the value indicated on the display; in F2, it moves the decimal point towards the left. In normal operation it flashes to indicate the value in Volts, mA or temperature corresponding to the input; with a second impulse it returns to normal operation.



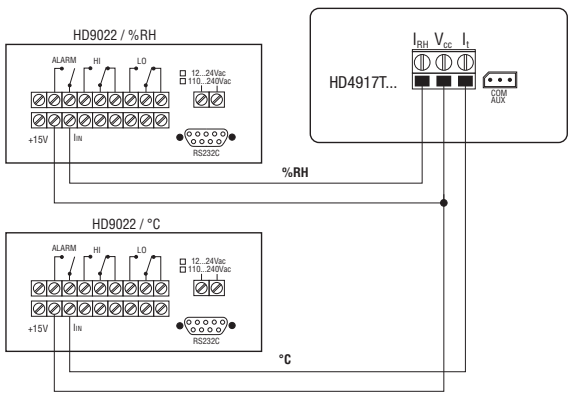
Example of a connection with 2-wire transmitters; the instrument feeds the transmitter.

Configuration of the HD 9022 panel indicator

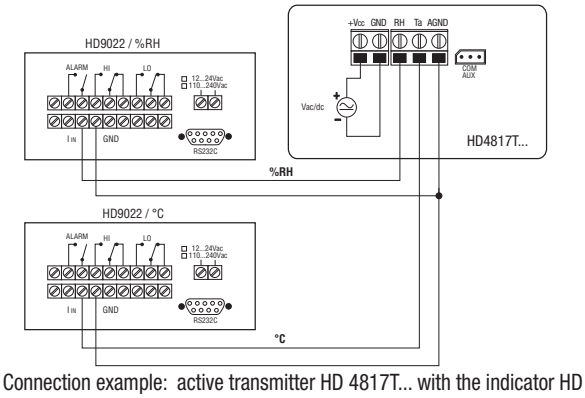
1) Supply power to the instrument.
2) The instrument performs an internal check, the wording C.E.I. appears for a few seconds followed by a number at random.
3) Press **PROG** and the message **F0** appears.
4) Press **PROG** and the message **F1** appears.
5) Press **ENTER** and the symbol *U*, *A* or **Pt** appears. Using the ▲▼buttons, choose the input for voltage: *U*, current: *A* or Pt100: **Pt** signals. Press **ENTER** to confirm.
6) Press **PROG** and the message **F2** appears; press **ENTER**; with the ▲▼ keys, set the decimal point in the desired position.

Press **ENTER** to confirm.

7) Press **PROG** and the message **F3** appears; press **ENTER**, with the ▲▼ keys, set the voltage, current or Pt100 value (as desired) corresponding to the beginning of the scale S1 for example 0V, 4 mA or 0°C. Press **ENTER** to confirm.
8) Press **PROG** and the message **F4** appears; press **ENTER**, with the ▲▼ keys, set the numerical value corresponding to the beginning of the scale R1 for example 0°C. Press **ENTER** to confirm.
9) Press **PROG** and the message **F5** appears; press **ENTER**, with the ▲▼ keys, set the voltage or current value (as selected in point 5) corresponding to the end of the scale S2 for example 10V, 20 mA or 200.0°C. Press **ENTER** to confirm.
10) Press **PROG** and the message **F6** appears; press **ENTER**, with the ▲▼ keys, set the numerical value corresponding to the end of the scale R2 for example 100°C. Press **ENTER** to confirm.
11) Press **PROG** and the message **F7** appears; press **ENTER**, with the ▲▼ keys, set the maximum alarm threshold value L max for the Alarm relay for example 110°C. Press **ENTER** to confirm.
12) Press **PROG** and the message **F8** appears; press **ENTER**, with the ▲▼ keys, set the minimum alarm threshold value L min for the Alarm relay for example -10°C. Press **ENTER** to confirm.
13) Press **PROG** and the message **SP1** appears; press **ENTER**, with the ▲▼ keys, set the Set value for the first threshold "SET relay HI" for example 40°C. Press **ENTER** to confirm.
14) Press **PROG** and the message **SP2** appears; press **ENTER**, with the ▲▼ keys, set the Reset value for the first threshold "RESET relay HI" for example 45°C. Press **ENTER** to confirm.



Connection examples: passive transmitter HD 4917T... with the indicator HD 9022



Connection example: active transmitter HD 4817T... with the indicator HD 9022

15) Press **PROG** and the message **SP3** appears; press **ENTER**, with the ▲▼ keys, set the Set value for the second threshold "SET relay LO" for example 50°C. Press **ENTER** to confirm.
16) Press **PROG** and the message **SP4** appears; press **ENTER**, with the ▲▼ keys, set the reset value for the second relay "RESET relay LO" for example 48°C. Press **ENTER** to confirm.
17) Press **PROG** and the message **S10** appears. Press **ENTER**, with the ▲▼ keys, set the desired speed of RS232 serial transmission among the following ones: 300, 600, 1200, 2400, 4800, 9600 baud. Press **ENTER** to confirm.
18) Press **PROG** and the message **F0** appears. AT THIS POINT THE CONFIGURATION OF THE INSTRUMENT IS COMPLETE.
19) Connect the input of the instrument, press the **ENTER** key and the display will indicate the value corresponding to the input signal.

Varying the configuration

To vary a stored parameter at any stage of the program it is sufficient to the step of the program to be changed with the **PROG** key (F1, F2, F3, etc.). Press **ENTER** and use the ▲▼ keys to modify the parameter previously set; press **ENTER** to confirm, return to **F0** and press **ENTER**.
This simple procedure modifies the desired step of the program.

Note

If the **ENTER**, ▲ or ▼ key is pressed independently during operation, the instrument input value (V, mA or °C) flashes on the display. To return to normal operation, press the s tor **ENTER** key independently again.

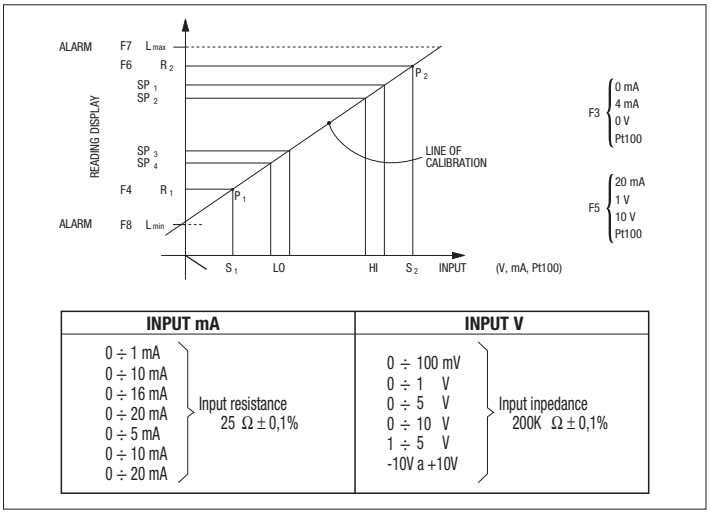
Error signal

The instrument indicates an error signal in the following cases:

OFL: this appears when the set value of **R max** is exceeded.
-OFL: this appears when the set value of **R min** is exceeded.
E1: this appears when the set points P1 and P2 require a resolution of the A/D converter higher than the one available.
E2: this appears when the values of F7 and F8 are inverted.

THE MAXIMUM RESOLUTION OF THE CONVERTER IS: 0.05 mV/Digit, 1µA/Digit.

Summary of programming steps of HD 9022



INPUT mA		INPUT V	
0 ÷ 1 mA 0 ÷ 10 mA 0 ÷ 16 mA 0 ÷ 20 mA 0 ÷ 5 mA 0 ÷ 10 mA 0 ÷ 20 mA	Input resistance 25 Ω ± 0,1%	0 ÷ 100 mV 0 ÷ 1 V 0 ÷ 5 V 0 ÷ 10 V 1 ÷ 5 V -10V a +10V	Input inpedance 200K Ω ± 0,1%

PROG Programming start. Selects the programming step, F0.
PROG Selects the programming step, **F1**.
PROG Selects the programming step, **F2**.
PROG .....
ENTER Exit program mode.
ENTER Allows modification of the variable.
▲ ▼ Modifies the variable on display.
ENTER Confirms the modification.
PROG Moves to next programming step.

STEP	COMMENT	LIMITS
F0	Press **ENTER** to exit program mode	
F1	Select type of input: Voltage, current, Pt100	*U* - *A* - Pt
F2	Position of the decimal separator	0 - 0.0 - 0.00 - 0.000
F3	Beginning of scale value of the input (Voltage, Current, °C)	0...10,00V, 0...20,00 mA -200,0...+800,0°C
F4	Beginning of scale value of the display	-9999...19999
F5	Full scale value of the input (Voltage, Current, °C)	0...10,00V, 0...20,00 mA -200,0...+800,0°C
F6	Full scale value of the display	-9999...19999
F7	Maximum alarm threshold set point	-9999...19999
F8	Minimum alarm threshold set point	-9999...19999
SP1	ON Threshold of Set-point HI	-9999...19999
SP2	OFF Threshold of Set-point HI	-9999...19999
SP3	ON Threshold of Set-point LO	-9999...19999
SP4	OFF Threshold of set-point LO	-9999...19999
S10	Baud rate	300, 600, 1200, 2400, 4800, 9600

Serial interface RS-232C

The HD 9022 is equipped with standard serial interface RS-232C which is available on the SUB D male 9-pin connector. The arrangement of the signals on this connector is as follows:

Pin	Signal	Description
2	TD	Datum transmitted by the HD 9022
3	RD	Datum received by the HD 9022
5	GND	Reference logic ground

The transmission parameters with which the instrument is supplied are:
- baud rate 9600 baud
- parity None
- n. bits 8
- stop bit 1

The data transmission speed may be changed by altering the set-up parameter S10 with the keyboard; the possible baud rates are: 9600, 4800, 2400, 1200, 600, 300. The other transmission parameters are fixed.

All the messages reaching and leaving the HD 9022 must be inserted in a "Communication frame" with the following structure:

<Stx><Record><Etx>

Where:
<Stx> Start of text (ASCII 02)
<Record> constitutes the message
<Etx> End of text (ASCII 03)

Host commands

The structure of the command records is as follows:
<Command character><Sub-command><Values>

Where:
<Command character> is characterized by an alphabetic character indicating the set of commands.
<Sub-command> is characterized by a character indicating the type of command.
<Values> is characterized by ASCII characters that depend on the type of command.

The replies provided by the HD 9022 are essentially of two types:
"Information" and "Data"

The former allow information on the status and programming of the HD 9022 to be obtained, as well as the diagnosis of the message received; the latter contain data on the channel at the moment the request is made.
It is also possible to make use of the serial line for the complete programming of the HD 9022, with the exception of the data transmission speed which may be set only with the keyboard.
The diagnostic replies of the HD 9022 are composed of the following control characters, sent individually (not inserted in the communication frame):
-ack- Command executed (ASCII 06)
-nak- Incorrect command (ASCII 15H)

COMMAND A

Sub-command		Values	Replies
A	Type of terminal		HD 9022
C	Company		DELTA OHM
D	Firmware Version		Vxx Rxx
E	Firmware Date		dd/mm/yy
F	Serial Number (rd)		xxxxxx
	(wr)	stxAFxxxxxxetx	ack/nak

COMMAND M

Sub-command	Values	Replies
1	Measure Channel 1	ack/nak

RESET COMMAND

	Values	Replies
(wr)	stxRESETetx	ack/nak

CHANNEL 1

C1F01	**x**	Input in	V/A/Pt	ack/nak
C1F02	**x**	Point	0/1/2/3	ack/nak
C1F03	**xxxx**	Start of scale	-9999...19999	ack/nak
C1F04	**xxxx**	V/I Start of scale	0000...10000 (2000 if I)	ack/nak
C1F05	**xxxx**	End of scale	-9999...19999	ack/nak
C1F06	**xxxx**	V/I End of scale	0000...10000 (2000 if I)	ack/nak
C1F07	**xxxx**	Energ. Relay HI	-9999...19999	ack/nak
C1F08	**xxxx**	De-energ. Relay HI	-9999...19999	ack/nak
C1F09	**xxxx**	Energ. Relay LO	-9999...19999	ack/nak
C1F10	**xxxx**	De-energ. Relay LO	-9999...19999	ack/nak
C1F11	**xxxx**	Min Relay Alarm	-9999...19999	ack/nak
C1F12	**xxxx**	Max Relay Alarm	-9999...19999	ack/nak

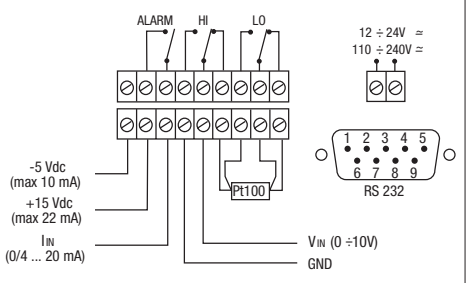
As regards the command just described, a few remarks must be made:
- There is no command character.
- For the other controls of the type C1F01 etc., the present programming status is supplied for the specific command if only the sequence of the sub-command characters is sent.

Ex: StxC1F01Etx Request from Host
StxC1F01:1Etx Reply

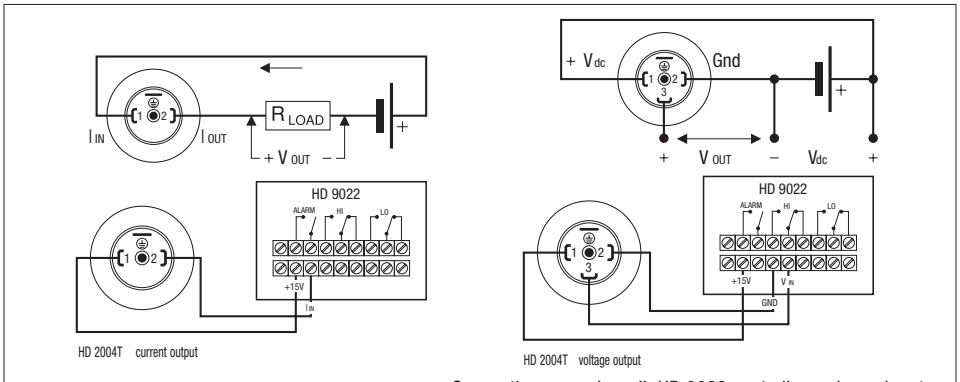
If the sequence of the sub-command characters is followed by a space and then the desired programming value, the programming of the parameter is produced.

Ex: StxC1F01 1Etx Command from Host
ack / nak Reply
StxC1F03 1000Etx Command from Host
ack / nak Reply
StxC1F03-2000Etx Command from Host
ack / nak Reply
StxC1F0512000Etx Command from Host
ack / nak Reply

Note: for programming of the point F03...F12, the value field has fixed length of 5 characters. The first character in the value field may be a space, the minus sign, or the number 1.



Connections

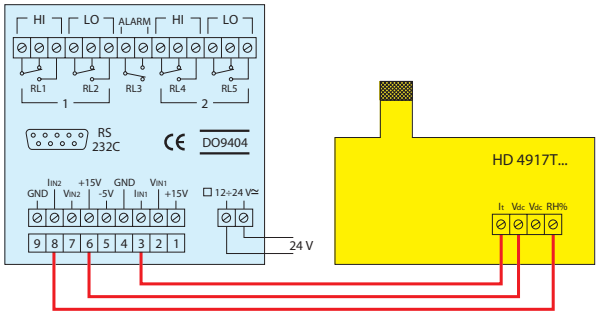


Connection examples wih HD 9022 controller and panel meters

DO 9404
DUAL REGULATING INDICATOR WITH MICROPROCESSOR CONFIGURABLE WITH TWO VOLTAGE OR CURRENT INPUTS

The dual regulating indicator DO 9404 is a microprocessor-controlled panel instrument with LED 96x96, with thresholds and alarms that may be programmed and configured by the user. In the two input channels it accepts signals coming from two distinct transmitters or from a double transmitter. The transmitters may be passive with 2 wires or active with 3 wires, in voltage 0÷1 V, 0÷5 V, 0÷10 V or current 0÷20 mA; 4÷20 mA.

For both input channels the configuration possibility is always present in the instrument, no extra cards are needed.
The choice of configurations for the input signals is made on the keyboard located on the front of the instrument.
The DO 9404 is provided with a serial output RS232C, the baud rate may be configured by means of the keyboard, the control is bi-directional and the output connector is a SUB D female 9-pole connector.



Example of connection of a passive transmitter which sends the DO 9404 two current signals (4÷20 mA)

The instrument dimensions are in accordance with DIN 45700, 96x96 mm, depth 120 mm. The operating mode of the DO 9404 is chosen according to the application, configuring the instrument with the keyboard. It is possible to configure the instrument on the field with maximum simplicity to adapt it to changes in the process requirements.
The configuration possibility concerns the inputs, the extent of the scales, the set points, the alarms and the baud rate.

Applications
A typical application of the DO 9404 is the display and regulation of signals arriving from passive 2-wire or active 3-wire transmitters, of any physical quantity: temperature, humidity, pressure, speed, level, etc. for a wide variety of industrial sectors and automation.

Characteristics
- Set point may be configured from -9999 to +19999
- Indication with 1/2" red LEDS
- Separate terminal for each channel for voltage input 0÷10 V and current input 0÷20 mA, 4÷20 mA
- On the terminal board an auxiliary power supply is available at -5 Vdc max. 10 mA and +15 Vdc non-stabilized max. 44 mA for the possible feeding of passive 2-wire transmitters
- Instrument accuracy ±0.1% Rdg ± 1 digit
- A/D converter resolution: 0.05 mV/digit, 1 µA/digit
- Functions: Two relays with insulated HI LO exchange contact for channel 1: RL1, RL2
  Two relays with insulated HI LO exchange contact for channel 2: RL4, RL5
  One relay for the overall maximum and minimum alarms: RL3
  Resistive 3A/230 Vac relay contacts
- Instrument working temperature: (electronic components) -5°C..50°C
- Power supply: **12÷24 ±10% Vac/Vdc (110÷240Vac/Vdc on request).**

Error signals
The instrument gives error signals in the following cases:
OFL: appears when the SET value is set higher than the high alarm value (maximum).
-OFL: appears when the SET value is set lower than the low alarm value (minimum).
E1: appears when a resolution of the AD converter has been asked for that is higher than what is available: **THE MAXIMUM AD RESOLUTION IS 0.1mV/digit or 2µA/digit.**
E2: appears when there is an analog value at input that is lower or higher than that of the instrument: voltage 0 V..+10 V, current 0-20 mA.
E3: appears when the values of the alarm thresholds are inverted.
E4: reading/writing mistake on the Eeprom.

Configuration of the regulating indicator DO 9404
1) Supply power to the instrument: 11÷30 Vac; 11÷40 Vdc.
2) The dual display indicates OFL on both channels (1 and 2) at the first programming, or values depending on previous programming operations.
3) When the [PROG] key is pressed, the message FO appears alternately on channel 1 or 2.
4) Select which channel (1 or 2) you want to program, for example channel 1.
5) Press the ▲ key, the message F1 appears; confirm with the [ENTER] key and the symbol A (Ampere = current signal 0÷20 mA, 4÷20 mA) or the symbol *U* (voltage V = voltage signal 0÷10 V) appears; with the ▲ and ▼ keys, prepare the input for the desired signal, current A or voltage; for example, set A current input, confirm with the [ENTER] key, then F1 appears. Press the ▲ key and the message F2 appears.
6) Press the key [ENTER] , four figures *8888* appear with the decimal point placed at random; using the ▲ and ▼ keys, set the decimal point in the desired position, the possible configurations are:

8888
8.8
8.88
8.888

Press the [ENTER] key to confirm, then the message F2 appears; press the ▲ key and the message F3 appears.
7) Press [ENTER], then using the ▲ and ▼ keys set the start of scale value for channel 1, for example -30.0°C; confirm with [ENTER] , the message F3 appears, press the ▲ key and the message F4 appears.

8) Press the ENTER, key, then using the ▲and ▼ keys set the analog value corresponding to the start of scale in vol tage or current, depending on the choice made in point 5, for example 4.00 mA; confirm with ENTER, the message F4 appears, press the ▲ key and the message F5 appears.
9) Press ENTER, then using the ▲ and ▼ keys set the full scale value for channel 1, for example 130.0°C; confirm with ENTER , the message F5 appears, press the ▲ key and the message F6 appears.
10) Press the ENTER key, then using the ▲ and ▼ keys set the analog value corresponding to the end of scale in voltage or current, depending on the choice made in point 5, for example 20.00 mA; confirm with ENTER, the message F6 appears, press the ▲ key and the message F7 appears.
11) Press the ENTER key, then using the ▲ and ▼ keys set the SET HI value (closing of contact RL1) for channel 1, for example 0.0°C; confirm with ENTER, the message F7 appears, press the ▲ key and the message F8 appears.
12) Press the ENTER key, then using the ▲ and ▼ keys set the Reset HI value (opening of contact RL1) for channel 1, for example 10.0°C; confirm with ENTER, the message F8 appears, press the ▲ key and the message F9 appears.
13) Press the ENTER key, then using the ▲ and ▼ keys set the SET LO value (closing of contact RL2) for channel 1, for example 20.0°C (control of a refrigerating unit, for example); confirm with ENTER, the message F9 appears, press the ▲ key and the message F10 appears.
14) Press the ENTER key, then using the ▲ and ▼ keys set the Reset LO value (opening of contact RL2) for channel 1, for example 15.0°C (switching off a refrigerating unit, for example); confirm with ENTER, the message F10 appears, press the ▲ key and the message F11 appears.
15) Press the ENTER key, then using the ▲ and ▼ keys set the low ALARM value for the relay RL3, for example -5.0°C; confirm with ENTER, the message F11 appears, press the ▲ key and the message F12 appears.
16) Press the ENTER key, then using the ▲ and ▼ keys set the high ALARM value for the relay RL3, for example 25.0°C; confirm with ENTER, the message F12 appears, press the ▲ key and the message F13 appears.
17) Function F13 is used to select the baud rate for serial transmission; press the ENTER key and a baud rate value appears, then using the ▲ and ▼ keys set the desired rate, choosing one of the following: 300, 600, 1200, 2400, 4800, 9600; the other serial transmission parameters are fixed and cannot be changed; they are:

8 bit
No Parity
1 Stop bit

Note: the baud rate is the same for both channels. Press ENTER to confirm, press the ▼ key until F0 appears indicating the end of programming; press the ENTER key. This operation concludes the programming of channel 1 as described up to this point.

- Programming is the same for both channels, 1 and 2; all that has been described for channel 1 also applies to channel 2.
- The function of the set and reset relays (close contact, open contact), of relays RL1 and RL2 or RL4 and RL5, depends on what the process requires.
- To alter the parameters it is sufficient to enter the program by pressing the PROG key; when F0 appears, choose the channel in which you want to change the parameter, press the ▲ key until the function that you want to change appears, then make the change with the ▲ and ▼keys; press ENTER to confirm, then return to F0 function with the ▼ key, press ENTER thus returning to normal operation.
- In normal operation, pressing one of the ▲ or ▼ keys passes from the measurement of the physical quantity to the voltage or current value corresponding to the measurement in progress; this applies to both channels. When one of the ▲ or ▼ keys is pressed the instrument returns to normal measuring status.
- The serial interface is active only during normal operation.
- The programming parameters remain in the memory even when the instrument is receiving no power.
- The relays are disconnected during programming.

Serial interface RS-232C

The DO 9404 is equipped with standard serial interface RS-232C which is available on the SUB D male 9-pin connector. The arrangement of the signals on this connector is as follows;

Pin	Signal	Description
2	TD	Datum transmitted by the DO 9404
3	RD	Datum received by the DO 9404
5	GND	Reference logic ground

The transmission parameters with which the instrument is supplied are:

-	baud rate	9600 baud
-	parity	None
-	n. bits	8
-	stop bit	1

The data transmission speed may be changed by altering the set-up parameter F13 with the keyboard; the possible baud rates are: 9600, 4800, 1200, 600, 300. The other transmission parameters are fixed.

All the messages reaching and leaving the DO 9404 must be inserted in a “Communication frame” with the following structure:

<Stx><Record><Etx>

where:

<Stx>	Start of text (ASCII 02)
<Record>	constitutes the message
<Etx>	End of text (ASCII 03)

Host commands

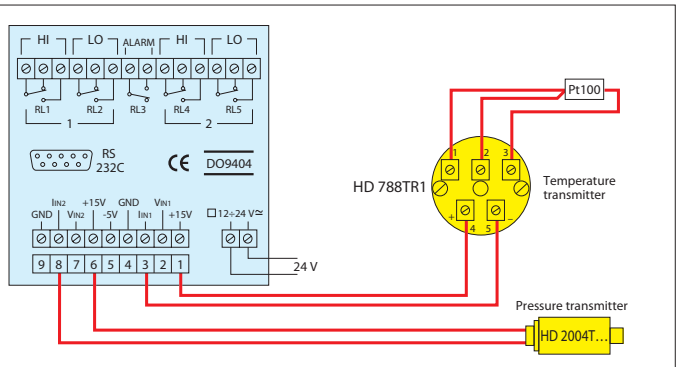
The structure of the command records is as follows:

<Command character><Sub-command><Values>

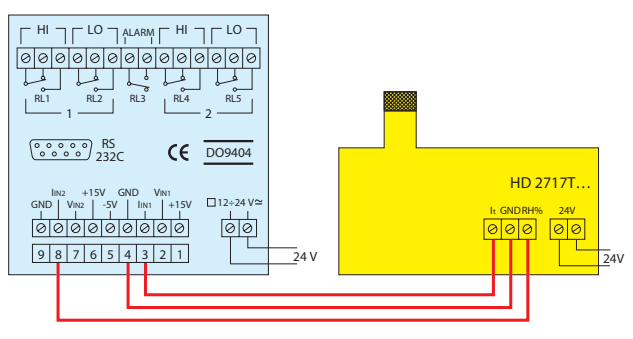
Where:

<Command character>	is characterized by an alphabetic character indicating the set of commands.
<Sub-command>	is characterized by a character indicating the type of command.
<Values>	is characterized by ASCII characters that depend on the type of command.

The replies provided by the DO 9404 are essentially of two types: “Information” and “Data”.
The former allow information on the status and programming of the DO 9404 to be obtained, as well as the diagnosis of the message received; the latter contain data on the two channels at the moment the request is made.
It is also possible to make use of the serial line for the complete programming of the DO 9404, with the exception of the data transmission speed which may be set only with the keyboard.



Example of connection of transmitters which are connected to the DO 9404:
a temperature transmitter which sends a current signal (4÷20 mA)
a pressure transmitter which sends a current signal (4÷20 mA)



Example of connection of a self-powered transmitter which sends the DO 9404 two current signals (4÷20 mA)

The diagnostic replies of the DO 9404 are composed of the following control characters, sent individually (not inserted in the communication frame):

-ack- Command executed (ASCII 06)
-nak- Incorrect command (ASCII 15H)

COMMAND A

Sub-command		Values	Replies
A Type of terminal			DO 9404
C Company			DELTA OHM
D Firmware Version			Vxx Rxx
E Firmware Date			dd/mm/yy
F Serial number	(rd)		AFxxxxxx
	(wr)	xxxxxx	ack/nak

COMMAND M

Sub-command	Values	Replies
1 Measure Channel 1		Measure Channel 1
2 Measure Channel 2		Measure Channel 2

RESET COMMAND		Values	Replies
RESET	(wr)	Stx RESET Etx	ack/nak

COMMAND

Sub-command	Values	Replies
1 Set-up Channel 1		Set-up Channel 1
2 Set-up Channel 2		Set-up Channel 2

CHANNEL 1

C1F01	**x**	Input in	V/A	ack/nak
C1F02	**x**	Point	0/1/2/3	ack/nak
C1F03	**xxxx**	Start of scale	-9999...19999	ack/nak
C1F04	**xxxx**	V/I Start of scale	0000...10000 (2000 if I)	ack/nak
C1F05	**xxxx**	End of scale	-9999...19999	ack/nak
C1F06	**xxxx**	V/I End of scale	0000...10000 (2000 if I)	ack/nak
C1F07	**xxxx**	Energ. Relay 1	-9999...19999	ack/nak
C1F08	**xxxx**	De-energ. Relay 1	-9999...19999	ack/nak
C1F09	**xxxx**	Energ. Relay 2	-9999...19999	ack/nak
C1F10	**xxxx**	De-energ. Relay 2	-9999...19999	ack/nak
C1F11	**xxxx**	Min1 Relay 3	-9999...19999	ack/nak
C1F12	**xxxx**	Max1 Relay 3	-9999...19999	ack/nak

CHANNEL 2

C2F01	**x**	Input in	V/A	ack/nak
C2F02	**x**	Point	0/1/2/3	ack/nak
C2F03	**xxxx**	Start of scale	-9999...19999	ack/nak
C2F04	**xxxx**	V/I Start of scale	0000...10000 (2000 if I)	ack/nak
C2F05	**xxxx**	End of scale	-9999...19999	ack/nak
C2F06	**xxxx**	V/I End of scale	0000...10000 (2000 if I)	ack/nak
C2F07	**xxxx**	Energ. Relay 4	-9999...19999	ack/nak
C2F08	**xxxx**	De-energ. Relay 4	-9999...19999	ack/nak
C2F09	**xxxx**	Energ. Relay 5	-9999...19999	ack/nak
C2F10	**xxxx**	De-energ. Relay 5	-9999...19999	ack/nak
C2F11	**xxxx**	Min2 Relay 3	-9999...19999	ack/nak
C2F12	**xxxx**	Max2 Relay 3	-9999...19999	ack/nak

As regards the command just described, a few remarks must be made:

- There is no command character.
- In the first two cases (Sub-command 1 and 2) the complete set-up of the DO 9404, for Channel 1 and for Channel 2, is made available in the serial line.
- For all the other controls of the type C1F01 etc., the present programming status is supplied for the specific command if only the sequence of the sub-command characters is sent.

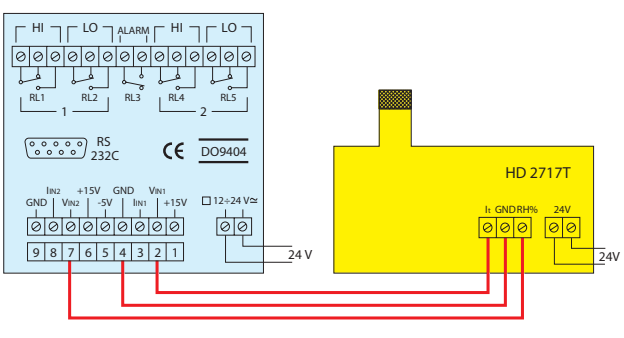
Example: StxC1F01Etx Request from Host
StxC1F01:1Etx Reply

If the sequence of the sub-command characters is followed by a space and then the desired programming value, the programming of the parameter is produced.

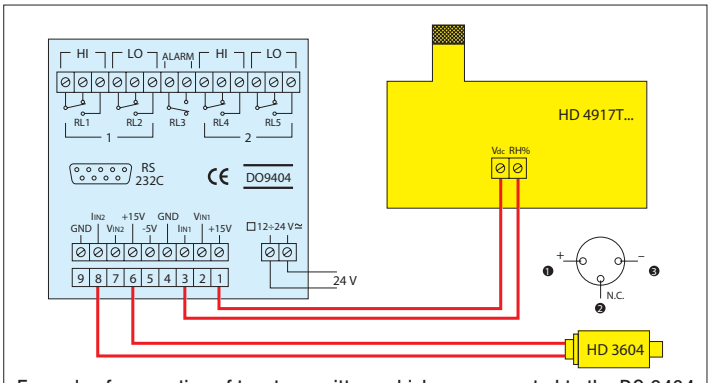
Example: StxC1F01 1Etx Command from Host
ack / nak Reply

Note: for programming of the point F03...F12, the value field has fixed length of 5 characters. The first character in the value field may be a space, the minus sign, or the number one.

StxC1F03 1000Etx Request from Host
ack / nak Reply
StxC1F03-2000Etx Request from Host
ack / nak Reply
StxC1F0512000Etx Request from Host
ack / nak Reply



Example of connection of a self-powered transmitter which sends the DO 9404 two voltage signals (0÷10 V)



Example of connection of two transmitters which are connected to the DO 9404:
a R.H.% transmitter which sends a current signal (4÷20 mA)
a pressure transmitter which sends a current signal (4÷20 mA)

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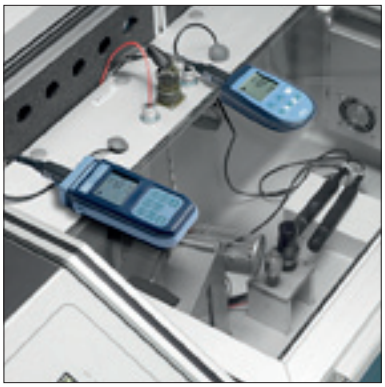

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Permanent Laboratory

ACCREDITATION TABLE

Quantity	Instruments to be calibrated	Measuring range	Uncertainty (*)	Note
Relative humidity	Electrical and mechanical hygrometers and thermohygrometers	from 10%RH to 92%RH (with air temperature from 0°C to 60°C)	from 0,5 to 1,8 % R.H.	1
	Electrical psycrometers	from 10 to 92 % R.H (with air temperature from 0°C to 60°C.	from 0,5 to 1,8 % R.H.	1
Relative humidity	Soluzioni saline sature	from 10 to 90 % R.H. (with air temperature from 20°C to 25°C)	1,4 % R.H.	
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%.
(1) Total extended uncertainty caused by propagation of the uncertainties of the reference quantities (t_{dew} e t_{air}).