# 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 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, 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 multi-standard RS232C serial port and USB 2.0. The storing interval, printing, and baud rate can be configured using the menu.
The HD2101.1 and HD2101.2 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 IP67 protection degree.**

**HD2101.2**

**HD2101/USB**

**INSTRUMENT TECHNICAL CHARACTERISTICS**

*Instrument*

| | |
|---|---|
| Dimensions (Length x Width x Height) | 185x90x40mm |
| Weight | 470g (complete with batteries) |
| Materials | ABS, rubber |
| Display | 2x4½ digits plus symbols<br>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 | 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 | Schedule 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 | 1s…3600s (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 |
| Immediate print interval | 1s…3600s (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 and USB | 8-pole MiniDin connector |
| 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 |

*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) ±2,5%RH (in the remaining 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 | -40°C…150°C (180°C) ±(1,5+0,02 times the displayed value) | ±0.3°C |
| **HP475ACR** | Pt100 | 0…100%RH | -40°C…+150°C | | ±0.3°C |
| **HP475AC1R** | Pt100 | 0…100%RH | -40°C…+150°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 |
| Typical capacity @30%RH | 300pF±40pF |
| Sensor operating temperature (depending on model) | -20°C…+80°C<br>-40°C…+150°C |
| Measuring range | 0÷100%RH |
| Uncertainty | ±1,5%RH (10…90%RH) ±2,5%RH in the remaining range) |
| Resolution | 0.1%RH |
| Temperature drift @ 20°C | 0.02%RH/°C |
| Response time %RH at constant temperature | 10sec (10÷80%RH; air speed=2m/s) |

*Temperature with sensor Pt100*

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

*Temperature with thermocouple K - HP572AC*

| | |
|---|---|
| Resolution | 0.1°C |
| Temperature drift @ 20°C | 0.02%/°C |

**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…+350°C) ±0.4°C (+350°C…+500°C) |
| TP472I.0 | Immersion | -50°C…+400°C | ±0.25°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C) |
| TP473P | Penetration | -50°C…+400°C | ±0.25°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C) |
| TP473P.0 | Penetration | -50°C…+400°C | ±0.25°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C) |
| TP474C | Contact | -50°C…+400°C | ±0.3°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C) |
| TP474C.0 | Contact | -50°C…+400°C | ±0.3°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C) |
| TP475A.0 | Air | -50°C…+250°C | ±0.3°C (-50°C…+250°C) |
| TP472I.5 | Immersion | -50°C…+400°C | ±0.3°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C) |
| TP472I.10 | Immersion | -50°C…+400°C | ±0.30°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C) |
| TP49A | Immersion | -70°C…+400°C | ±0.25°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C) |
| TP49AC | Contact | -70°C…+400°C | ±0.25°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C) |
| TP49AP | Penetration | -70°C…+400°C | ±0.25°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C) |
| TP875 | Globethermometer Ø 150mm | -30°C…+120°C | ±0.25°C |
| TP876 | Globethermometer Ø 50mm | -30°C…+120°C | ±0.25°C |
| TP87 | Immersion | -50°C…+200°C | ±0.25°C |
| TP878 TP878.1 | For solar panel | +5°C…+80°C | ±0.25°C |
| TP879 | 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 | Pt100 4 wires | -50…+400°C | Class A |
| TP47.1000 | Pt1000 2 wires | -50…+400°C | Class A |

*Common characteristics*
Temperature drift @ 20°C

| | |
|---|---|
| Pt100 | 0.003%/°C |
| Pt1000 | 0.005%/°C |

**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.**
**HD2101.2K:** 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.
**HD2101/USB:** Connection cable USB 2.0 connector type A - 8-pole MiniDin.
**DeltaLog9:** Software for download and management of the data on PC using Windows 98 to Vista operating systems.
**SWD10:** Stabilized power supply at 230Vac/12Vdc-1000mA mains voltage.
**HD40.1:** On request, portable, serial input, 24 column thermal printer, 58mm paper width.

**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 14x110 mm. 2m connecting cable.
**HP474ACR:** %RH and temperature combined probe. Dimensions: handle Ø 26x130 mm, probe Ø 14x210 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 13.5x75 mm.
**HP475AC1R:** %RH and temperature combined probe. 2 m connection cable. Handle Ø 26x110 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.

**Temperature PROBES complete with SICRAM module**
**TP472I:** Immersion probe, Pt100 sensor. Stem Ø 3 mm, length 300 mm. Cable length 2 metres.
**TP472I.0:** Immersion probe, Pt100 sensor. Stem Ø 3 mm, length 230 mm. Cable length 2 metres.
**TP473P:** Penetration probe, Pt100 sensor. Stem Ø 4mm, length 150 mm. Cable length 2 metres.
**TP473P.0:** Penetration probe, Pt100 sensor. Stem Ø 4mm, length 150 mm. Cable length 2 metres.
**TP474C:** Contact probe, Pt100 sensor. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 metres.
**TP474C.0:** Contact probe, Pt100 sensor. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 metres.
**TP475A.0:** Air probe, Pt100 sensor. Stem Ø 4mm, length 230mm. Cable length 2 metres.
**TP472I.5:** Immersion probe, Pt100 sensor. Stem Ø 6mm, length 500 mm. Cable length 2 metres.
**TP472I.10:** Immersion probe, Pt100 sensor. Stem Ø 6mm, length 1000mm. Cable length 2 metres.
**TP875:** Globe thermometer Ø 150mm with handle, cable length 2 metres.
**TP876:** Globe thermometer Ø 50mm with handle. Cable 2 metres.
**TP87:** Immersion probe, Pt100sensor. Stem Ø 3mm, length 70mm. Cable 2 metres.
**TP878:** Contact probe for solar panels. Cable 2 metres
**TP878.1:** Contact probe for solar panels. Cable 5 metres.

**Temperature probes without SICRAM module**
**TP47.100:** 4 wire direct Pt100 sensor immersion probe,. Probe's stem Ø 3mm, length 230mm. Connection cable 4 wires with connector, length 2 metres.
**TP47.1000:** Pt1000 sensor immersion probe. Probe's stem Ø 3mm, length 230mm. Connection cable 2 wires with connector, length 2 metres.
**TP47:** Only connector for probe connection: direct 4 wires Pt100 and 2 wires Pt1000.

**Accessories**
**HD11:** Saturated solution at 11.3%RH@20°C for calibration of relative humidity probes, fixing adapter M24x1.5, M12x1.
**HD33:** Saturated solution at 33.0%RH@20°C for calibration of relative humidity probes, fixing adapter M24x1.5, M12x1.
**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 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*
**P5:** Stainless steel grid protection for probes Ø 14 mm.
**P6:** 20µm sintered complete protection made of stainless steel for probes Ø 14 mm.
**P7:** 10µm sintered complete protection made of PTFE for probes Ø 14 mm.
**P8:** Stainless steel grid and Pocan protection for probes Ø 14 mm.

## 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 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<br>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) ±2,5%RH (in the remaining 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 | -40°C…150°C (180°C) ±(1,5+0,02 times the displayed value) | ±0.3°C |
| **HP475ACR** | Pt100 | 0…100%RH | -40°C…+150°C | | ±0.3°C |
| **HP475AC1R** | Pt100 | 0…100%RH | -40°C…+150°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 |
| Typical capacity @30%RH | 300pF±40pF |
| Sensor operating temperature (depending on model) | -20°C…+80°C<br>-40°C…+150°C |
| Measuring range | 0÷100%RH |
| Uncertainty | ±1,5%RH (10…90%RH) ±2,5%RH in the remaining range) |
| Resolution | 0.1%RH |
| Temperature drift @ 20°C | 0.02%RH/°C |
| Response time %RH at constant temperature | 10sec (10÷80%RH; air speed=2m/s) |

*Temperature with sensor Pt100*

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

*Temperature with thermocouple K - HP572ACR*

| | |
|---|---|
| Resolution | 0.1°C |
| Temperature drift @ 20°C | 0.02%/°C |

**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…+350°C)<br>±0.4°C (+350°C…+500°C) |
| TP472I.0 | Immersion | -50°C…+400°C | ±0.25°C (-50°C…+350°C)<br>±0.4°C (+350°C…+400°C) |
| TP473P | Penetration | -50°C…+400°C | ±0.25°C (-50°C…+350°C)<br>±0.4°C (+350°C…+400°C) |
| TP473P.0 | Penetration | -50°C…+400°C | ±0.25°C (-50°C…+350°C)<br>±0.4°C (+350°C…+400°C) |
| TP474C | Contact | -50°C…+400°C | ±0.3°C (-50°C…+350°C)<br>±0.4°C (+350°C…+400°C) |
| TP474C.0 | Contact | -50°C…+400°C | ±0.3°C (-50°C…+350°C)<br>±0.4°C (+350°C…+400°C) |
| TP475A.0 | Air | -50°C…+250°C | ±0.3°C (-50°C…+250°C) |
| TP472I.5 | Immersion | -50°C…+400°C | ±0.3°C (-50°C…+350°C)<br>±0.4°C (+350°C…+400°C) |
| TP472I.10 | Immersion | -50°C…+400°C | ±0.30°C (-50°C…+350°C)<br>±0.4°C (+350°C…+400°C) |
| TP49A | Immersion | -70°C…+400°C | ±0.25°C (-50°C…+350°C)<br>±0.4°C (+350°C…+400°C) |
| TP49AC | Contact | -70°C…+400°C | ±0.25°C (-50°C…+350°C)<br>±0.4°C (+350°C…+400°C) |
| TP49AP | Penetration | -70°C…+400°C | ±0.25°C (-50°C…+350°C)<br>±0.4°C (+350°C…+400°C) |
| TP875 | Globethermometer Ø 150mm | -30°C…+120°C | ±0.25°C |
| TP876 | Globethermometer Ø 50mm | -30°C…+120°C | ±0.25°C |
| TP87 | Immersion | -50°C…+200°C | ±0.25°C |
| TP878<br>TP878.1 | For solar panel | +5°C…+80°C | ±0.25°C |
| TP879 | 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 | Pt100 4 wires | -50…+400°C | Class A |
| TP47.1000 | Pt1000 2 wires | -50…+400°C | Class A |

*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 14x110 mm. 2m connecting cable.
**HP474ACR:** %RH and temperature combined probe. Dimensions: handle Ø 26x130 mm, probe Ø 14x210 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 13.5x75 mm.
**HP475AC1R:** %RH and temperature combined probe. 2 m connection cable. Handle Ø 26x110 mm. Stainless steel stern 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.

**Temperature PROBES complete with SICRAM module**
**TP472I:** Immersion probe, Pt100 sensor. Stem Ø 3 mm, length 300 mm. Cable length 2 metres.
**TP472I.0:** Immersion probe, Pt100 sensor. Stem Ø 3 mm, length 230 mm. Cable length 2 metres.
**TP473P:** Penetration probe, Pt100 sensor. Stem Ø 4mm, length 150 mm. Cable length 2 metres.
**TP473P.0:** Penetration probe, Pt100 sensor. Stem Ø 4mm, length 150 mm. Cable length 2 metres.
**TP474C:** Contact probe, Pt100 sensor. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 metres.
**TP474C.0:** Contact probe, Pt100 sensor. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 metres.
**TP475A.0:** Air probe, Pt100 sensor. Stem Ø 4mm, length 230mm. Cable length 2 metres.
**TP472I.5:** Immersion probe, Pt100 sensor. Stem Ø 6mm, length 500 mm. Cable length 2 metres.
**TP472I.10:** Immersion probe, Pt100 sensor. Stem Ø 6mm, length 1000mm. Cable length 2 metres.
**TP875:** Globe thermometer Ø 150mm with handle, cable length 2 metres.
**TP876:** Globe thermometer Ø 50mm with handle. Cable 2 metres.
**TP87:** Immersion probe, Pt100sensor. Stem Ø 3mm, length 70mm. Cable 2 metres.
**TP878:** Contact probe for solar panels. Cable 2 metres
**TP878.1:** Contact probe for solar panels. Cable 5 metres.

**Temperature probes without SICRAM module**
**TP47.100:** 4 wire direct Pt100 sensor immersion probe,. Probe's stem Ø 3mm, length 230mm. Connection cable 4 wires with connector, length 2 metres.
**TP47.1000:** Pt1000 sensor immersion probe. Probe's stem Ø 3mm, length 230mm. Connection cable 2 wires with connector, length 2 metres.
**TP47:** Only connector for probe connection: direct 4 wires Pt100 and 2 wires Pt1000.

**Accessories**
**HD11:** Saturated solution at 11.3%RH@20°C for calibration of relative humidity probes, fixing adapter M24x1.5, M12x1.
**HD33:** Saturated solution at 33.0%RH@20°C for calibration of relative humidity probes, fixing adapter M24x1.5, M12x1.
**HD75:** Saturated solution at 75.4%RH@20°C for calibration of relative humidity probes, fixing adapter M24x1.5, M12x1.

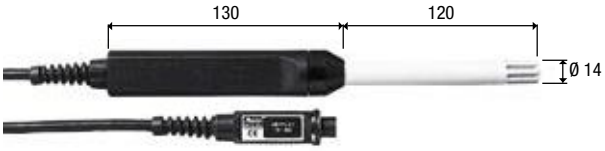
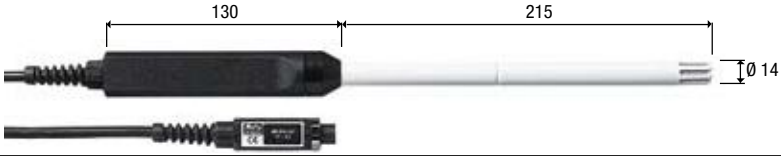
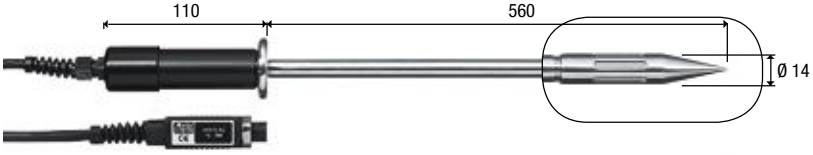
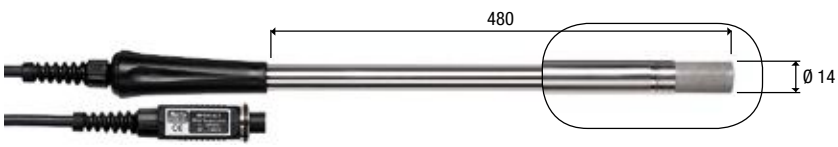
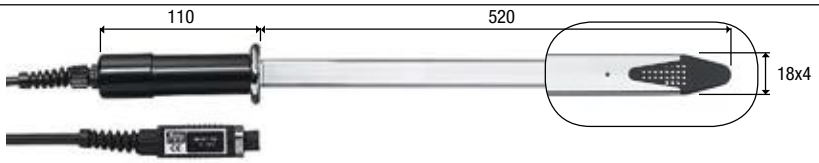
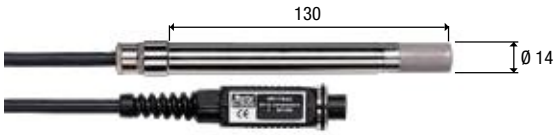
*Protection for humidity probes Ø 26 M24x1,5*
**P1:** Stainless steel grid protection for probes Ø 26 mm.
**P2:** 20µ sintered polyethylene PE protection for probes Ø 26 mm.
**P3:** 20µ sintered bronze protection for probes Ø 26 mm.
**P4:** 20µ sintered PE complete cap for probes Ø 26 mm.

*Protection for humidity probes Ø 14 M12x1*
**P5:** Stainless steel grid protection for probes Ø 14 mm.
**P6:** 20µm sintered complete protection made of stainless steel for probes Ø 14 mm.
**P7:** 10µm sintered complete protection made of PTFE for probes Ø 14 mm.
**P8:** Stainless steel grid and Pocan protection for probes Ø 14 mm.



HD11 / HD33 / HD75


## RELATIVE HUMIDITY AND TEMPERATURE PROBES

| Code | Sensors | Range RH - Temp. | |
|---|---|---|---|
| **HP472ACR** | RH Pt100 | 5 ÷ 98% RH -20°C...+80°C |   |
| **HP572ACR** | RH TC.K | |   |
| **HP473ACR** | RH Pt100 | |   |
| **HP474ACR** | | 5 ÷ 98% RH -40°C...+150°C |   |
| **HP475ACR** | | |   |
| **HP475AC1R** | | |   |
| **HP477DCR** | | |   |
| **HP478ACR** | | |   |

## SATURATED SOLUTIONS AND PROBE PROTECTIONS

| CODE | | | USE |
|---|---|---|---|
| **HD75 HD33 HD11** | **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** |
| **P5 P6 P7 P8** | Ø 14 | M 12x1 |  **P5** **P6** **P7** **P8** |

HD 75
HD 33
HD 11

## HD 75, HD 33, HD 11
## 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.
12. Repeat points 1, 2, 3 and 4 to perform a possible third point with the third saturated solution (if necessary).

**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 and 11%RH solutions 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 possibile. 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.
Screw the probe to the bottom of the bottle thread.

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


HUMISET HD33
MAGNESIUM CHLORIDE
HUMISET HD11
SODIUM CHLORIDE
HUMISET HD75
SODIUM CHLORIDE
HUMISET HD33
MAGNESIUM CHLORIDE
HUMISET HD75
SODIUM CHLORIDE

# HD 37AB17D
# HD 37B17D

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

**HD37AB17D** and **HD37B17D** instrument 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 that allows 8 hours of continuous working in acquisition mode.

**Technical Features**

| | |
|---|---|
| Dimensions | 275 mm x 45 mm x 40 mm |
| Weight | 230 g (batteries included) |
| Materials | ABS |
| Mains power supply **(code SWD06)** | Batteries charger **100-240Vac/6Vdc-1A** |
| 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 |
| Instrument working temperature | 0°C ... 50°C |
| Working relative humidity | 0%RH ... 95%RH no condensation |
| Temperature / Storage humidity | -25°C ... +70°C / 10%RH ... 90%RH no condensation |
| Safety of the stored data | Unlimited |

**Connections**

| | |
|---|---|
| USB interface | USB 2.0 cable B type Baudrate 460800 |
| Charger Batteries power supply (code SWD06) | 2 - poles connector (positive at the centre)<br>Output voltage: **6Vdc**<br>Maximum current: 1600mA (9, 60 VA Max). |
| **Measuring rate** | 1 sample every three seconds |
| **Storage capacity** | 20000 Records<br>Every record includes the following:<br>- date and time<br>- measurement of the carbon dioxide (CO2)<br>- measurement of the carbon monoxide (CO- only HD37AB17D)<br>- measurement of the relative humidity (RH)<br>- measurement of the temperature (T) |

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

**Sensor Features**

| | |
|---|---|
| **Relative Humidity RH** | Capacitive sensor |
| Sensor protection | Net filter made of stainless steel (on request filter P6 in AISI316 sintered 20µm or filter P7 in PTFE sintered 10µm) |
| Measurement range | 0...100 % RH |
| Sensor working range | -40...+80°C |
| Accuracy | ±2% (5÷90%RH) ±2,5% in the remaining range |
| 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 | -40...+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 consisting 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:** instrument to measure $CO_2$ (Carbon dioxide), CO (Carbon monoxide), 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.

**P5:** Stainless steel grid protection for probes diameter 14, thread M12×1.

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

**P7:** 10µ, PTFE protection for probes diameter 14, thread M12×1.

**P8:** Stainless steel and Pocan 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.

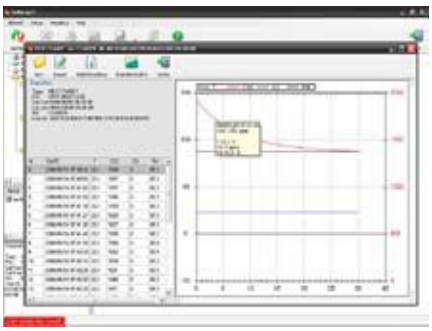
**MINICAN.12A:** Cylinder of nitrogen for the calibration of CO and $CO_2$ at 0ppm. Volume 12 litres. **With adjustment valve**.

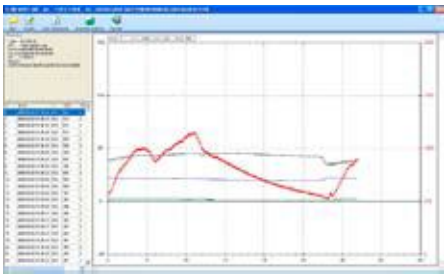
**MINICAN.12A1:** Cylinder of nitrogen for the calibration of CO and $CO_2$ at 0ppm. Volume 12 litres. **Without adjustment valve**.

**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 $CO_2$.



# 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 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. It prints 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, HD2010, HD2110, 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.).

**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 controllers, they 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 the air quality in indoor environments.
Typical applications include checking air quality in all buildings occupied by people (schools, hospitals, auditoria, work places, canteens, etc.).. This analysis allows the managing of conditioning plants (temperature and humidity) and ventilation (recycle air/hour) in order to reach a double purpose: getting a good air quality in accordance with ASHRAE and IMC regulations and energy saving.
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, thanks to a double filter and a particular measurement technique, ensures accurate measurements 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. The instrument can be wall mounted and sensors are all inside.
The instruments are factory calibrated and require no further adjustment by the installer.
Versions are available with analog voltage output 0÷10V 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 measured environmental parameters when the user-settable thresholds are exceeded. The activation of the control is highlighted by the LED indicators (only on models HD46 ... R). The operation of the relay is very versatile, having modes of activation above and below the threshold, and with single or double threshold modes. The thresholds are configurable by the user throughout the whole measurement range.
The LCD display option allows instant viewing of all the measurements taken by the instrument.
The model **HD45 BVR** is distinguished by the ability to indicate an immediate level of air quality, through turning on of the LED indicators associated with graphic symbols.
All the functions of the instrument can be quickly and intuitively configured connecting the instrument to the PC.
The instruments are easy to use, with complete configuration possibilities, which makes them versatile and able to meet many needs in various application fields. The instruments come with a standard configuration that makes them immediately operational. Upon request, the devices can be supplied with custom configurations.
**HD46** Series models can be equipped with keyboard that allows you to easily configure the instrument even without a connection to a PC. The models having a keypad are fitted with backlit display, activated by pushing a button.
Models of the series **HD45** ... provided with relay have a hardware switch that allows quick selection of the threshold between a set of preset values.
All models perform continuous "logging" of the 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 | 5...98 % RH<br>-40…+85°C Dew point Td |
| Working range of the sensor | -40...+80°C |
| Accuracy | ±2% (10..90%RH) @ 20°C, ±2.5% in the remaining range.<br>For Dew point, see table |
| Resolution | 0,1% |
| Temperature dependance | 2% on the whole temperature range |
| Hysteresis and repeatability | 1%RH |
| Response time ($T_{90}$) | <20 sec.<br>(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 | ±0.2°C ±0.15% of the measured value within 0…70°C<br>±0.3°C ±0.15% of the measured value within -30…0°C and 70…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 | -5…50°C |
| Accuracy | ±(50ppm+3% of the measured value) @ 20°C and 1013hPa |
| Resolution | 1ppm |
| Temperature dependance | 0,1%f.s./°C |
| Response time ($T_{90}$) | <120 sec.<br>(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. The values given below refer to accuracy of ± 0.25 ° C, 1013.25mbar, ± 2.5% RH.

| | | Relative humidity(%) | | | | | |
|---|---|---|---|---|---|---|---|
| | | **10** | **30** | **50** | **70** | **90** | **100** |
| Temperature (°C) | **-20** | 2.50 | 1.00 | 0.71 | 0.58 | -- | -- |
| | **0** | 2.84 | 1.11 | 0.78 | 0.64 | 0.56 | 0.50 |
| | **20** | 3.34 | 1.32 | 0.92 | 0.75 | 0.64 | 0.62 |
| | **50** | 4.16 | 1.64 | 1.12 | 0.90 | 0.77 | 0.74 |
| | **100** | 5.28 | 2.07 | 1.42 | 1.13 | 0.97 | 0.91 |

## Characteristics of the instrument

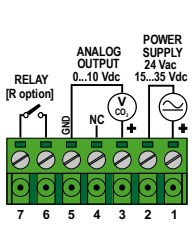
| | |
|---|---|
| **Measuring frequency** | 1 sample every 3 seconds |
| **Storage capacity** | 2304 records |
| **Storage interval** | Selectable within 30s, 1m, and 5m<br>The stored values represent the average values of samples collected every 3 seconds in selected storage interval. |
| **Serial output** | Serial output for USB<br>(mini-USB/USB cable with adapter cod. RS45 or RS45I)<br>RS485 MODBUS-RTU<br>(only HD45…S… and HD46…S…) |
| **Safety of stored data** | Unlimited |
| **Analogue output** | 0…10Vdc ($R_L$ > 10kΩ) (only HD45…V…and HD46…V)<br>11Vdc outside the measuring range |
| **Relay output** | Two-state (only HD45…R and HD46…R)<br>Contact: max 1A @ 30Vdc resistive load |
| **Power supply** | 24Vac ± 10% (50…60Hz) or 15…35Vdc |
| **Power consumption** | 100 mW |
| **Stabilising time** | 15 minutes (to guarantee the declared accuracy) |
| **Working temperature of the instrument** | 0°C ... 50°C |
| **Working humidity of the instrument** | 0%RH ... 95%RH no condensate |
| **Dimensions (LxHxW)** | 80 x 80 x 30 mm *(HD45.17…)*<br>80 x 80 x 34 mm *(HD45.B… and HD45.7B…)*<br>120 x 80 x 30 mm *(HD46.17…)*<br>120 x 80 x 34 mm *(HD46.17B…)* |
| **Housing material** | ABS |

## Installation

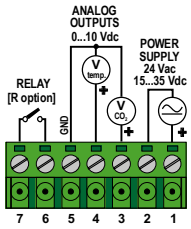
The container is easy and quick to open. Simply press the two tabs of the container to remove the front panel to have immediately access to the terminal block connections and fixing holes.

## Electrical connections

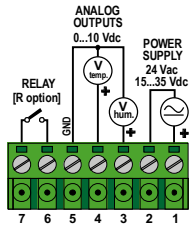
*Series HD45...*



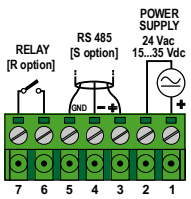

**HD45 B...V**
**HD45 B...VR**




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



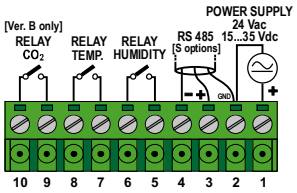

**HD45 17...V**
**HD45 17...VR**



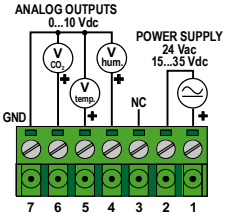

**HD45...R**
**HD45...S**

**HD45...SR**

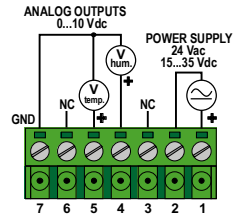
*Series HD46...*



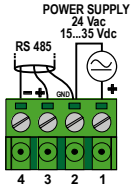

**HD46...R**
**HD46...SR**




**HD46 17B...V**




**HD46 17...V**



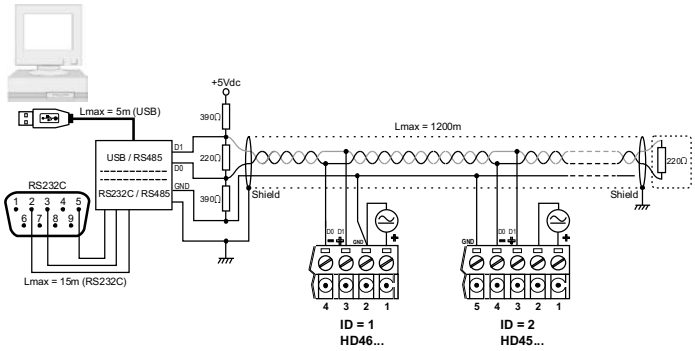

**HD46...S**

## Configuration

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

## RS485 Connection

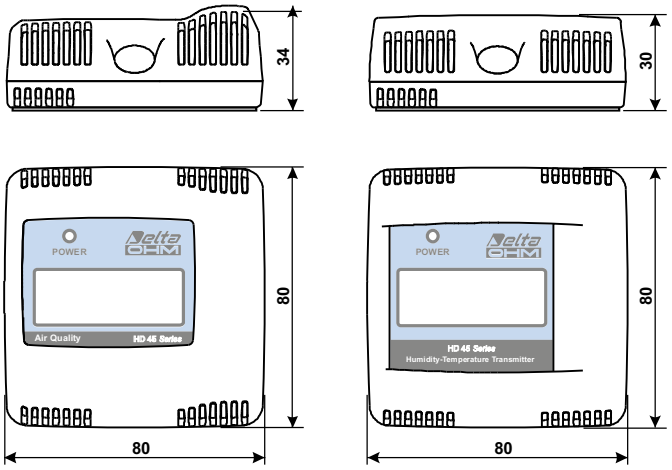
Models with RS485 output use the **MODBUS RTU** protocol.
To connect to the PC, interpose a RS232C/RS485 or USB/RS485 converter.




## Dimensions of the housing

All dimensions are expressed in mm.

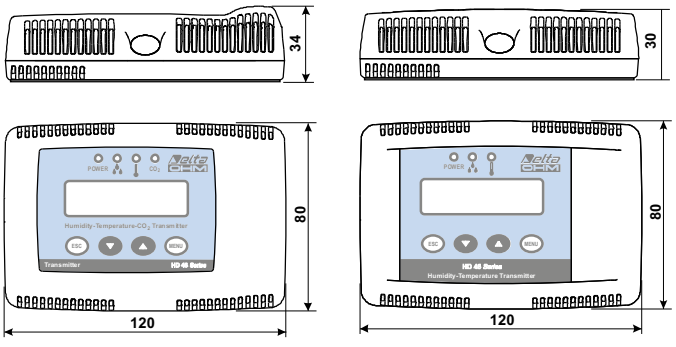
*Series HD45...*




**HD45 B...**
**HD45 7B...**

**HD45 17...**

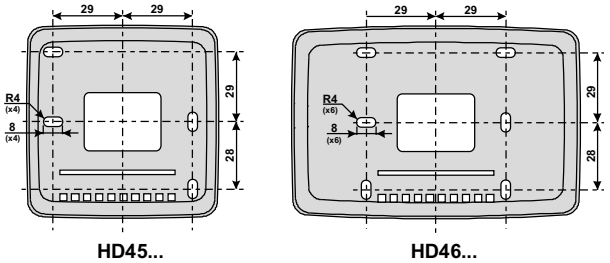
*Series HD46...*




**HD46 17B...**

**HD46 17...**

*Fixing holes*




**HD45...**

**HD46...**

**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

Optionally you can have the analog output 0 ... 10Vdc for each quantity measured by the instrument (option **V**), or RS485 serial output (option **S**). There are no models with both types of output.
There is the option with only relay (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 the outputs ) together with serial output RS485 (option **SR**).
The relay output together with the analog output (option **VR**) is only available on 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 17S | ✓ | ✓ | | | ✓ | | | Power |
| HD45 17R | ✓ | ✓ | | | | ✓ (1 output) | | Power |
| HD45 17SR | ✓ | ✓ | | | ✓ | ✓ (1 output) | | Power |
| HD45 17VR | ✓ | ✓ | | ✓ (2 outputs) | | ✓ (1 output) | | Power |
| HD45 17DV | ✓ | ✓ | | ✓ (2 outputs) | | | ✓ | Power |
| HD45 17DS | ✓ | ✓ | | | ✓ | | ✓ | Power |
| HD45 17DR | ✓ | ✓ | | | | ✓ (1 output) | ✓ | Power |
| HD45 17DSR | ✓ | ✓ | | | ✓ | ✓ (1 output) | ✓ | Power |
| HD45 17DVR | ✓ | ✓ | | ✓ (2 outputs) | | ✓ (1 output) | ✓ | Power |
| HD45 7BV | | ✓ | ✓ | ✓ (2 outputs) | | | | Power |
| HD45 7BS | | ✓ | ✓ | | ✓ | | | Power |
| HD45 7BR | | ✓ | ✓ | | | ✓ (1 output) | | Power |
| HD45 7BSR | | ✓ | ✓ | | ✓ | ✓ (1 output) | | Power |
| HD45 7BVR | | ✓ | ✓ | ✓ (2 outputs) | | ✓ (1 output) | | Power |
| HD45 7BDV | | ✓ | ✓ | ✓ (2 outputs) | | | ✓ | Power |
| HD45 7BDS | | ✓ | ✓ | | ✓ | | ✓ | Power |
| HD45 7BDR | | ✓ | ✓ | | | ✓ (1 output) | ✓ | Power |
| HD45 7BDSR | | ✓ | ✓ | | ✓ | ✓ (1 output) | ✓ | Power |
| HD45 7BDVR | | ✓ | ✓ | ✓ (2 outputs) | | ✓ (1 output) | ✓ | Power |
| HD45 BV | | | ✓ | ✓ (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 BDV | | | ✓ | ✓ (1 output) | | | ✓ | Power |
| HD45 BDS | | | ✓ | | ✓ | | ✓ | Power |
| HD45 BDR | | | ✓ | | | ✓ (1 output) | ✓ | Power |
| HD45 BDSR | | | ✓ | | ✓ | ✓ (1 output) | ✓ | Power |
| HD45 BDVR | | | ✓ | ✓ (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 17S | ✓ | ✓ | | | ✓ | | | Power |
| HD46 17R | ✓ | ✓ | | | | ✓ (2 outputs) | | Power RH + T |
| HD46 17SR | ✓ | ✓ | | | ✓ | ✓ (2 outputs) | | Power RH + T |
| HD46 17DV | ✓ | ✓ | | ✓ (2 outputs) | | | only LCD | Power |
| HD46 17DS | ✓ | ✓ | | | ✓ | | only LCD | Power |
| HD46 17DTR | ✓ | ✓ | | | | ✓ (2 outputs) | ✓ | Power RH + T |
| HD46 17DTSR | ✓ | ✓ | | | ✓ | ✓ (2 outputs | ✓ | Power RH+ T |
| HD46 17BV | ✓ | ✓ | ✓ | ✓ (3 outputs) | | | | Power |
| HD46 17BS | ✓ | ✓ | ✓ | | ✓ | | | Power |
| HD46 17BR | ✓ | ✓ | ✓ | | | ✓ (3 outputs) | | Power RH+T+ $CO_2$ |
| HD46 17BSR | ✓ | ✓ | ✓ | | ✓ | ✓ (3 outputs | | Power RH +T+ $CO_2$ |
| HD46 17BDV | ✓ | ✓ | ✓ | ✓ (3 outputs) | | | only LCD | Power |
| HD46 17BDS | ✓ | ✓ | ✓ | | ✓ | | only LCD | Power |
| HD46 17BDTR | ✓ | ✓ | ✓ | | | ✓ (3 outputs) | ✓ | Power RH +T+ $CO_2$ |
| HD46 17BDTSR | ✓ | ✓ | ✓ | | ✓ | ✓ (3 outputs) | ✓ | Power RH +T+ $CO_2$ |

**ORDERING CODES**

**HD45** □□□

AVAILABLE OPTIONS

**V** = Analog output 0÷10Vdc
**S** = RS485 output
**R** = Relay output
**VR** = Analog output 0÷10Vdc + 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

**V** = Analogue outputs 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 +$CO_2$

**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 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 operating systems from Windows® 98 to Windows Vista®.
**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.

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...

## TEMPERATURE AND RELATIVE HUMIDITY TRANSMITTERS, RELATIVE HUMIDITY, TEMPERATURE AND RELATIVE HUMIDITY, TEMPERATURE AND DEW POINT

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.

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 | ±2% (10..90%RH), ±2.5% outside | |
| 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)<br>±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 | |
| Repeatability | 0.5°C DP | |

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

| | STANDARD RANGE | EXTENDED 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** | | |
| Electronics working temperature | 0...+60°C | |
| Probe working temperature | STANDARD RANGE | EXTENDED RANGE |
| | -20…+100°C | -40…+150°C |
| Storage temperature | -20…+80°C | |
| Electronics protection class | IP66 | |
| Case dimensions | 80x84x44 | |

**TAB.1 - Accuracy of dew point measurement:**

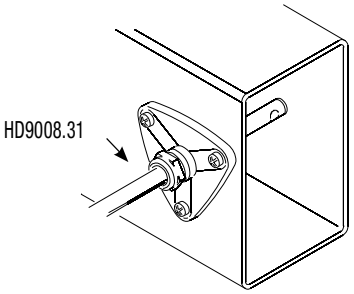
| Temperature °C \ DP °C | -20 | -10 | 0 | 10 | 20 | 30 | 40 | 60 | 80 |
|---|---|---|---|---|---|---|---|---|---|
| -20 | ≤±1 | | | | | | | | |
| -10 | ≤±1 | ≤±1 | | | | | | | |
| 0 | ≤±1 | ≤±1 | ≤±1 | | | | | | |
| 10 | ≤±3 | ≤±1 | ≤±1 | ≤±1 | | | | | |
| 20 | ≤±4 | ≤±2 | ≤±1 | ≤±1 | ≤±1 | | | | |
| 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 |

DP LIMIT

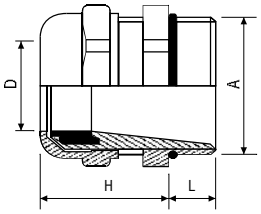
For example at 20°C a Dew Point value of 0°C DP is measured with an accuracy better than 1°C DP.

**Installation notes**

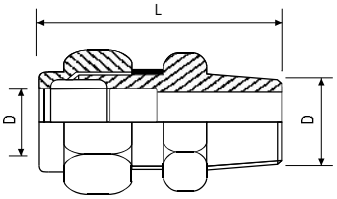
To fix the probe inside a ventilation duct, a pipe , etc., use for example the HD9008.31 flange, a PG16 metal cable gland (Ø10…14mm) or a 3/8" universal biconical connection.




**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"

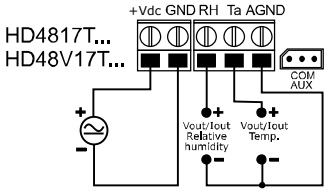
**Electrical connections**

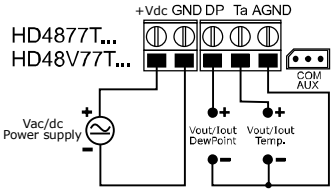
*HD48.. series with analog output*

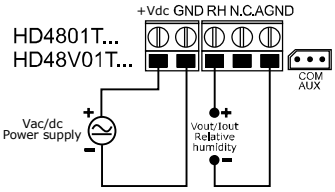
Power the instrument as shown in the below connection schemes, the power supply terminals are marked as +Vcc and GND.

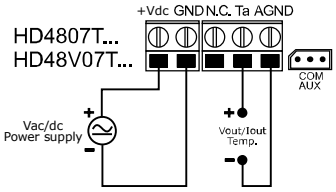
Depending on the model, the output signal is available between:

- 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.



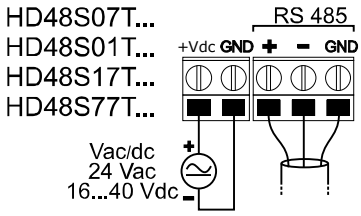



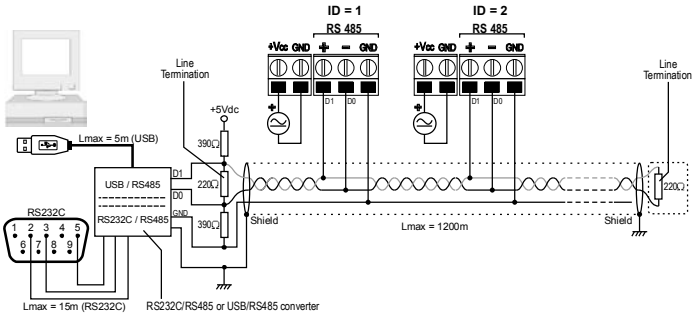




**HD48.. series with RS485 output**

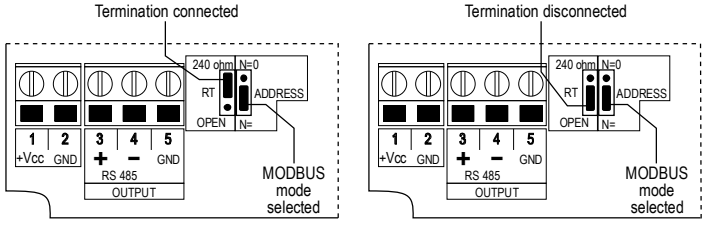
Connect the instrument as shown in the below connection schemes, the power supply terminals are marked as +Vcc and GND.




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 non-transmission periods, resistors are connected between signal and power supply lines. If more than 32 devices have to be connected, place a signal repeater between a group and the next one. The line termination must be connected at both ends of each segment. The instrument has a built-in line termination that can be connected or removed through a short jumper placed next to the terminal block. If the instrument is the last or the first device of a network group, connect the termination placing the short jumper between the "RT" and "240 ohm" indications. If the instrument is not at the end of a network group, remove the termination placing the short jumper between the "RT" and "OPEN" indications.




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

- Characteristic impedance: 120 ohm
- Capacity: less than 50pF/m
- Resistance: less than 100 ohm/km
- gauge: 0,22 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.

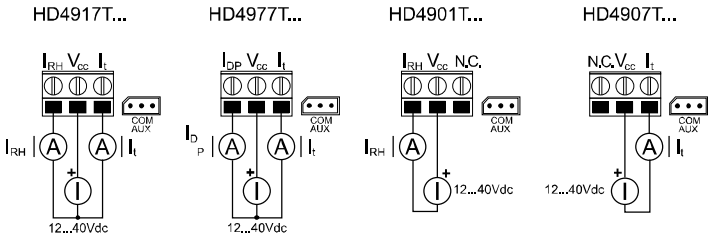
To operate with the MODBUS-RTU protocol be sure that the ADDRESS short jumper is between "ADDRESS" and "N=" indications.

Each transmitter of the network is univocally identified by an address. **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.

**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:

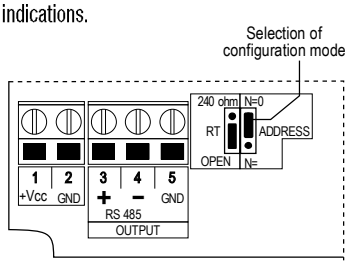
$R_L Max = (Vcc-12)/0.022V$, e.g. if Vcc=24Vdc the max load is $R_L Max$ =545 ohm.



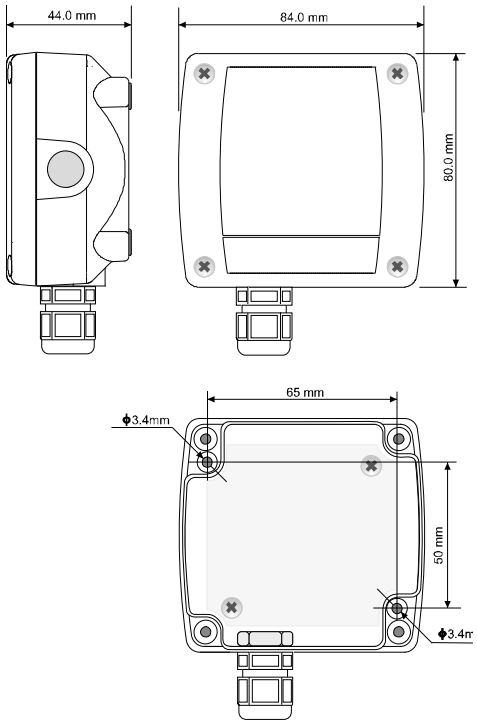

**Relative humidity probe calibration**

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. For the models with analog output, provided with RS232 (COM AUX) serial connector, use the **HD48TCAL** kit. The kit includes the **RS27** cable for the serial connection of the transmitters to the PC and a CD-ROM for Windows® operating systems, that guides the user in the relative humidity probe calibration procedure.

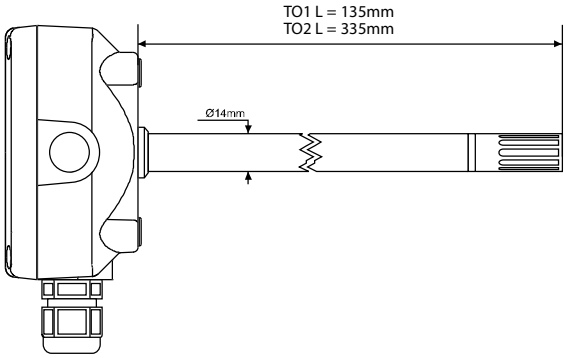
For the models with RS485 output, use the **HD48STCAL** Kit. The kit includes the **RS48** cable with built-in USB/RS485 adapter and a CD-ROM for Windows® operating systems, that guides the user in the relative humidity probe calibration procedure. To calibrate the instrument it is necessary to move 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.



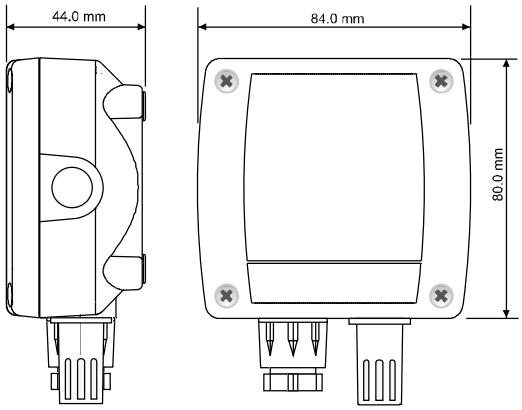

**Case dimensions**




**Probe dimensions:**
**TO series**

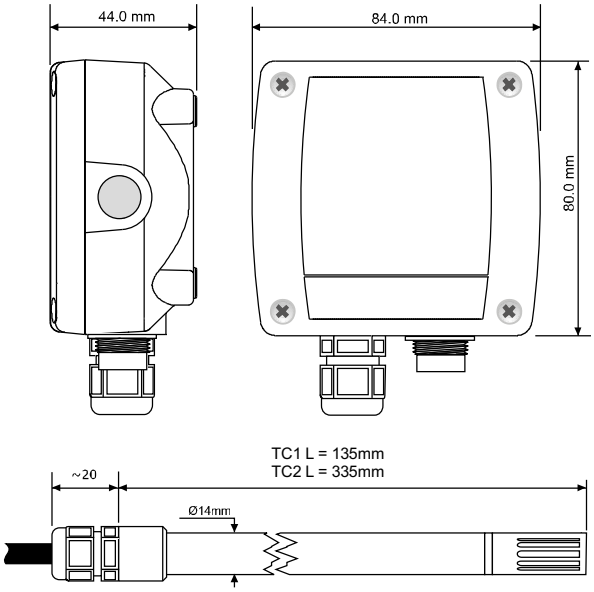



**TV series**





## TC series




## ORDERING CODES

**HD48**
**HD49**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | **T** | | | **L** | **L** = with LCD display |
| | | | **T** | | | | Cable length<br>**2** = 2m<br>**5** = 5m<br>**10** = 10m |
| | | | **T** | | | | Probe type<br>**TO1** = 135mm<br>**TO2** = 335mm<br>**TC1** = 135mm<br>**TC2** = 335mm<br>**TV** = wall mounting |
| | | | | | | | **No sign** = standard range –20…+80°C<br>**E** = extended range –40…+150°C |
| | | | | | | | **07** = temperature output<br>**01** = %RH output<br>**17** = Temperature and %RH outputs<br>**77** = Temperature and dew point outputs |
| | | | | | | | **No sign** = 4...20mA analogue output<br>**V** = 0...10Vdc analog output (only HD48.. models)<br>**S** = solo uscita RS485<br>Note: Versions with analogue output have one analogue output for each measured quantity. |

## 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.

**HD4917TO1:** 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.

**HD4877TO2:** 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.

**HD4977TO2:** 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 **RS27** serial connection cable, RS232 null modem, with 9-pole sub-D female connector for PC and 3-pole connector for transmitter COM port, and CD-ROM for Windows operating systems that guides the user in the relative humidity probe calibration procedure. The kit is for the models with analog output only.

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

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

**HD33:** 33% RH saturated solution for the verification of the relative humidity sensor, complete with thread for probes 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.

**P5:** Stainless steel grid protection for Ø 14mm probes.

**P6:** 20µ sintered stainless steel protection for Ø 14mm probes.

**P7:** 10µ PTFE protection for Ø 14mm probes.

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

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

The instruments of the HD2717T... series are transmitters, indicators, and ON/OFF regulators with data logging functions, they measure temperature and humidity.
The main feature of these instruments is their **interchangeable probe.** The probe can be replaced by the user without process interruption. Thus, the probe can be calibrated or repaired at a later time.
The instrument is available in 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).
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 the interchangeability of the probes.

The instruments measure:
- Temperature in Celsius or Fahrenheit temperature scale
- Relative humidity

and calculate:
- Absolute humidity
- Mixing Ratio
- Dew point

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.<br>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. |

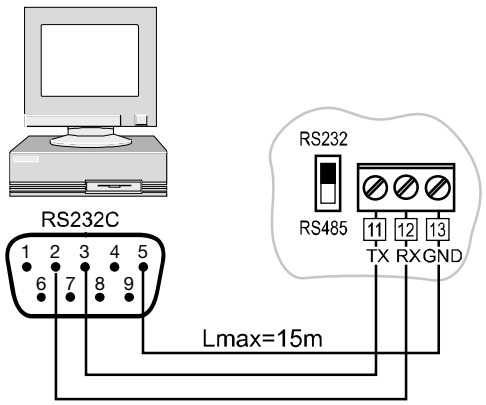
| **Probes complete with SICRAM2 module for instruments HD2717T.xx** | |
|---|---|
| **S.TV** | Vertical probe L=130mm |
| The material of the **S.TC**...probes can be chosen between stainless steel AISI304 or POCAN plastic material. | |
| **S.TC1.2** | Probe L=130mm with cable 2m |
| **S.TC1.2P** | Probe L=130mm with cable 2m (POCAN probe) |
| **S.TC1.5** | Probe L=130mm with cable 5m |
| **S.TC1.5P** | Probe L=130mm with cable 5m (POCAN probe) |
| **S.TC1.10** | Probe L=130mm with cable 10m |
| **S.TC1.10P** | Probe L=130mm with cable 10m (POCAN probe) |
| **S.TC2.2** | Probe L=330mm with cable 2m |
| **S.TC2.2P** | Probe L=330mm with cable 2m ( POCAN probe) |
| **S.TC2.5** | Probe L=330mm with cable 5m |
| **S.TC2.5P** | Probe L=330mm with cable 5m (POCAN probe) |
| **S.TC2.10** | Probe L=330mm with cable 10m |
| **S.TC2.10P** | Probe L=330mm with cable 10m (POCAN probe) |

| **Probes complete with SICRAM2 module for instruments HD2717TO.xx** | |
|---|---|
| **S.TO1** | horizontal probe L= 130mm |
| **S.TO2** | horizontal probe L= 330mm |

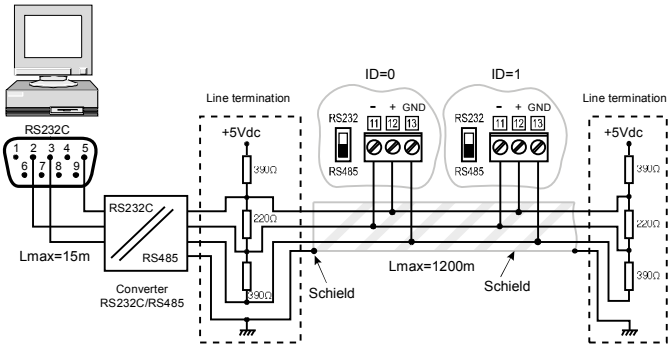
**Version with display HD2717Tx.Dx**

**Version without display HD2717TO.0R**

**Probe TO: HD2717TO.0R**




**PC: instrument connection with serial communication protocol RS232C.**

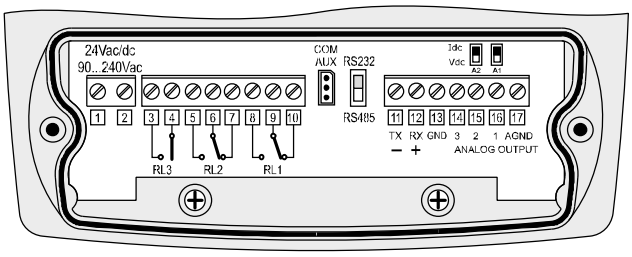



**Connection PC / instrument with the RS485 communication protocol for distances up to 1200 m using the RS232C/RS485 converter.**

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 specifics (@ 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 | 5 ... 98%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 | ±2.5%RH (10...90%RH) ±2.5%RH in the remaining range |
| Accuracy of the calculated physical quantities | See table in the following chapter | |
| Response time | | 3min with grid protection (at 20°C and 0.5m/s) |

| **Outputs** | | |
|---|---|---|
| Communications | Type | RS232C and RS485 Multidrop |
| | Baud Rate | 9600 baud<br>57600 baud non-permanent |
| Physical quantities | Measured | Temperature, relative humidity |
| | Calculated | Dew point, absolute humidity, (mixing ratio). |
| Analog outputs | Output types | 4...20mA; 0...20mA<br>0...10Vdc; 2…10Vdc |
| | Load resistance | Current output: 500Ω max<br>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<br>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, analog outputs 1 and 2, relay status1, 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® 98 to Vista operating systems |
| 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 |

**Accuracy of the calculated physical quantities**

The accuracy of the calculated physical quantities depends on the accuracy of the relative humidity and temperature calibration. The provided values refer to an accuracy of ±2.5%RH, ±0.25°C, 1013.25mbar.

**Accuracy of the Dew Point Td (°C)**

| | | Relative Humidity (%) | | | | | |
|---|---|---|---|---|---|---|---|
| | | **10** | **30** | **50** | **70** | **90** | **100** |
| Temperature (°C) | **-20** | 2.50 | 1.00 | 0.71 | 0.58 | -- | -- |
| | **0** | 2.84 | 1.11 | 0.78 | 0.64 | 0.56 | 0.50 |
| | **20** | 3.34 | 1.32 | 0.92 | 0.75 | 0.64 | 0.62 |
| | **50** | 4.16 | 1.64 | 1.12 | 0.90 | 0.77 | 0.74 |
| | **100** | 5.28 | 2.07 | 1.42 | 1.13 | 0.97 | 0.91 |

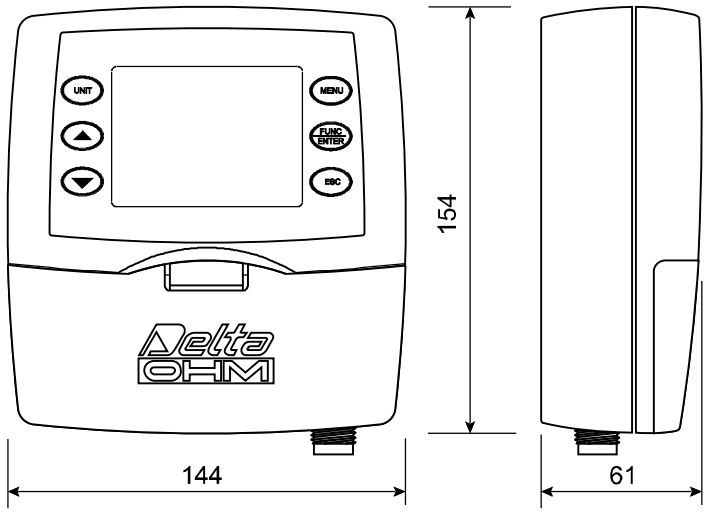
**Accuracy of the absolute humidity (g/m³)**

| | | Relative Humidity (%) | | | | | |
|---|---|---|---|---|---|---|---|
| | | **10** | **30** | **50** | **70** | **90** | **100** |
| Temperature (°C) | **-20** | 0.020 | 0.030 | 0.035 | 0.038 | --- | --- |
| | **0** | 0.12 | 0.15 | 0.16 | 0.18 | 0.20 | 0.21 |
| | **20** | 0.45 | 0.49 | 0.54 | 0.59 | 0.64 | 0.66 |
| | **50** | 2.07 | 2.27 | 2.48 | 2.67 | 2.87 | 2.96 |
| | **100** | 14.81 | 15.78 | 16.75 | 17.72 | 18.57 | 19.06 |

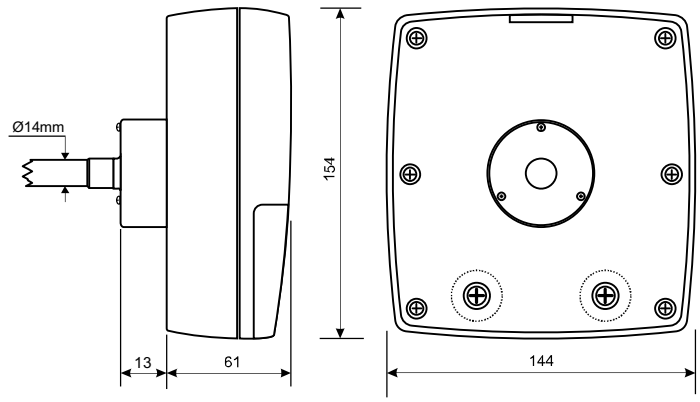
**Accuracy of the mixing ratio (g/kg)**

| | | Relative Humidity (%) | | | | | |
|---|---|---|---|---|---|---|---|
| | | **10** | **30** | **50** | **70** | **90** | **100** |
| Temperature (°C) | **-20** | 0.020 | 0.022 | 0.026 | 0.029 | --- | --- |
| | **0** | 0.09 | 0.11 | 0.12 | 0.13 | 0.15 | 0.15 |
| | **20** | 0.37 | 0.41 | 0.46 | 0.51 | 0.55 | 0.58 |
| | **50** | 2.04 | 2.32 | 2.61 | 2.90 | 3.25 | 3.42 |
| | **100** | 19.06 | 36.00 | 75.9 | 228.9 | --- | --- |

**Dimensions**




**Versions HD2717Tx.xx for vertical probes or with cable**




**Version HD2717TO... for horizontal probes**

**Ordering codes**

**HD2717TO…:** 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 of without display and without relay.
**HD2717T.0R:** Model of without display, with configurable control relays (2) and alarm relay (1).
**HD2717T.D0:** Model of with custom display, without relay.
**HD2717T.DR:** Model of 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 130mm, length of the cable 2m.
**S.TC1.2P:** Probe with cable. Length of stem 130mm, length of the cable 2m. Made of POCAN.
**S.TC1.5:** Probe with cable. Length of stem 130mm, length of the cable 5m.
**S.TC1.5P:** Probe with cable. Length of stem 130mm, length of the cable 5m. Made of POCAN.
**S.TC1.10:** Probe with cable. Length of stem 130mm, length of the cable 10m.
**S.TC1.10P:** Probe with cable. Length of stem 130mm, length of the cable 10m. Made of POCAN.
**S.TC2.2:** Probe with cable. Length of stem 330mm, length of the cable 2m.
**S.TC2.2P:** Probe with cable. Length of stem 330mm, length of the cable 2m. Made of POCAN.
**S.TC2.5:** Probe with cable. Length of stem 330mm, length of the cable 5m.
**S.TC2.5P:** Probe with cable. Length of stem 330mm, length of the cable 5m. Made of POCAN.
**S.TC2.10:** Probe with cable. Length of stem 330mm, length of the cable 10m.
**S.TC2.10P:** Probe with cable. Length of stem 330mm, length of the cable 10m. Made of POCAN.

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

**S.TO1:** Horizontal probe for instrument HD2717TO.xx. Length of stem 130mm.
**S.TO2:** Horizontal probe for instrument HD2717TO.xx. Length of stem 330mm.

**Accessories**

**RS27:** RS232 null-modem serial connection cable with 9 poles sub-D 9 female connector and 3 pole connector for COM AUX port. (Included in the supply of the instruments without display).
**DeltaLog12:** Further unit of software for PC connection, data download, instrument setup, and management of an instrument network. For operative systems Windows® 98 to Vista.
**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.
**P5:** Stainless steel grid protection for probes Ø 14mm.
**P6:** 20µ sintered stainless steel protection for probes Ø 14mm.
**P7:** 10µ PTFE protection for probes Ø 14mm.
**P8:** Stainless steel grid and Pocan protection for probes Ø 14mm.

**HD2717 Tx . x x**

**Relay**
**0** = without relay
**R** = with relay

**Display**
**0** = without display
**D** = with display

**Tipo di sonda**
**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... series are transmitters, indicators, and ON/OFF regulators with data logging functions, they measure temperature and humidity.
They are fitted with a graphic 128x64 backlit display.
The main feature of these instruments is their **interchangeable probe**. The probe can be replaced by the user without process interruption. Thus, the probe can be calibrated or repaired at a later time.
The instrument is available in 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).
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 the interchangeability of the probes. The instruments measure:
- Temperature in Celsius or Fahrenheit temperature scale
- Relative humidity

and calculate:
- Dew point
- Absolute humidity
- Mixing Ratio

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.<br>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**. |

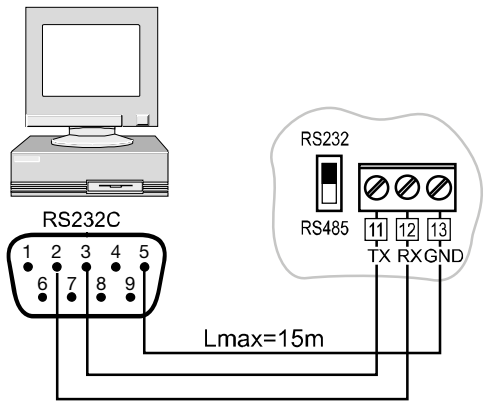
| **Probes complete with SICRAM2 module for instruments HD2817Tx.Dx** | |
|---|---|
| S.TV | Vertical probe L= 130mm |
| The material of the S.TC...probes can be chosen between stainless steel AISI304 or POCAN plastic material. | |
| S.TC1.2 | Probe L=130mm with cable 2m |
| S.TC1.2P | Probe L=130mm with cable 2m (POCAN probe) |
| S.TC1.5 | Probe L=130mm with cable 5m |
| S.TC1.5P | Probe L=130mm with cable 5m (POCAN probe) |
| S.TC1.10 | Probe L=130mm with cable 10m |
| S.TC1.10P | Probe L=130mm with cable 10m (POCAN probe) |
| S.TC2.2 | Probe L=330mm with cable 2m |
| S.TC2.2P | Probe L=330mm with cable 2m ( POCAN probe) |
| S.TC2.5 | Probe L=330mm with cable 5m |
| S.TC2.5P | Probe L=330mm with cable 5m (POCAN probe) |
| S.TC2.10 | Probe L=330mm with cable 10m |
| S.TC2.10P | Probe L=330mm with cable 10m (POCAN probe) |

| **Probes complete with SICRAM2 module for instruments HD2817TO.xx** | |
|---|---|
| S.TO1 | horizontal probe L= 130mm |
| S.TO2 | horizontal probe L= 330mm |

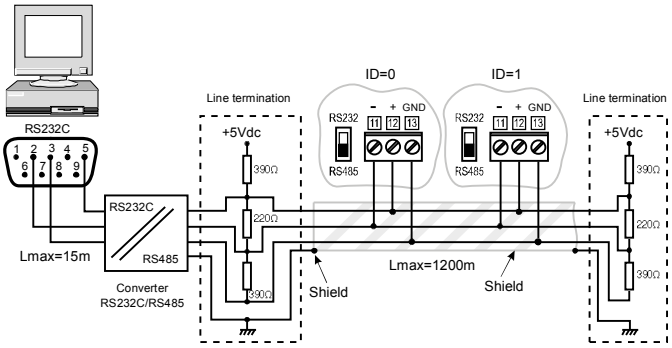
HD2817TC.Dx


HD2817TO.Dx

Sonda TO: HD2817TO1.DR

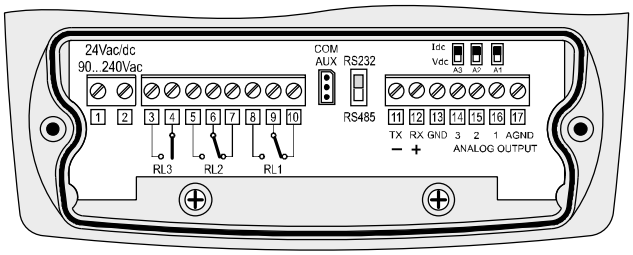



**PC: instrument connection with serial communication protocol RS232C.**




**Connection PC / 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 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 specifics (@ 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 | ±2.5%RH (10...90%RH) ±2.5%RH in the remaining field |
| Accuracy of the calculated physical quantity | See table in the following chapter | |
| Response time | | 3min with grid protection (at 20°C and 0.5m/s) |

| **Outputs** | | |
|---|---|---|
| Communications | Type | RS232C and RS485 Multidrop |
| | Baud Rate | 9600 baud<br>57600 baud non-permanent |
| Physical quantities | Measured | Temperature, relative humidity |
| | Calculated | Dew point, absolute humidity, mixing ratio. |
| Analog outputs | Number | 3 |
| | Output types | 4...20mA; 0...20mA<br>0...10Vdc; 2…10Vdc |
| | Load resistance | Current output: 500Ω max<br>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<br>Vdc = 11V |
| Relay | Control relay | 2 x 3A/250Vac Load resistance,<br>1 change-over contact |
| | Alarm relay | 1 x 3A/250Vac Load resistance,<br>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, 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<br>Lithium buffer battery |
| | Accuracy | ±1min/month |
| Software | | DeltaLog12<br>for Windows® 98 to Vista operating systems |
| Display | Graphic backlit LCD | 128x64 pixel |
| Ambient working conditions of the electronics | Operating temperature | -20…+60°C |
| | Relative humidity | 0…90%RH - No condensate |
| | Static working pressure of the sensors | 12 bar max. |
| | Storage temperature | -30…+80°C |
| Housing | L x H x W | 143x154x61 |
| | Weight | 600g |
| | Material | ABS |
| | Degree of protection | Electronics IP65 |

**Accuracy of the calculated physical quantities**
The accuracy of the calculated physical quantities depends on the accuracy of the relative humidity and temperature calibration. The provided values refer to an accuracy of ±2.5%RH, ±0.25°C, 1013.25mbar.

**Accuracy of the Dew Point Td (°C)**

| | | Relative Humidity (%) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 10 | 30 | 50 | 70 | 90 | 100 |
| Temperature (°C) | -20 | 2.50 | 1.00 | 0.71 | 0.58 | -- | -- |
| | 0 | 2.84 | 1.11 | 0.78 | 0.64 | 0.56 | 0.50 |
| | 20 | 3.34 | 1.32 | 0.92 | 0.75 | 0.64 | 0.62 |
| | 50 | 4.16 | 1.64 | 1.12 | 0.90 | 0.77 | 0.74 |
| | 100 | 5.28 | 2.07 | 1.42 | 1.13 | 0.97 | 0.91 |

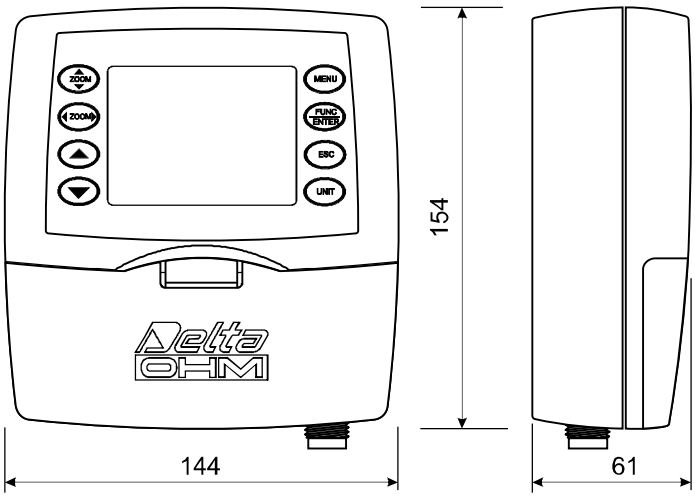
**Accuracy of the absolute humidity (g/m³)**

| | | Relative Humidity (%) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 10 | 30 | 50 | 70 | 90 | 100 |
| Temperature (°C) | -20 | 0.020 | 0.030 | 0.035 | 0.038 | --- | --- |
| | 0 | 0.12 | 0.15 | 0.16 | 0.18 | 0.20 | 0.21 |
| | 20 | 0.45 | 0.49 | 0.54 | 0.59 | 0.64 | 0.66 |
| | 50 | 2.07 | 2.27 | 2.48 | 2.67 | 2.87 | 2.96 |
| | 100 | 14.81 | 15.78 | 16.75 | 17.72 | 18.57 | 19.06 |

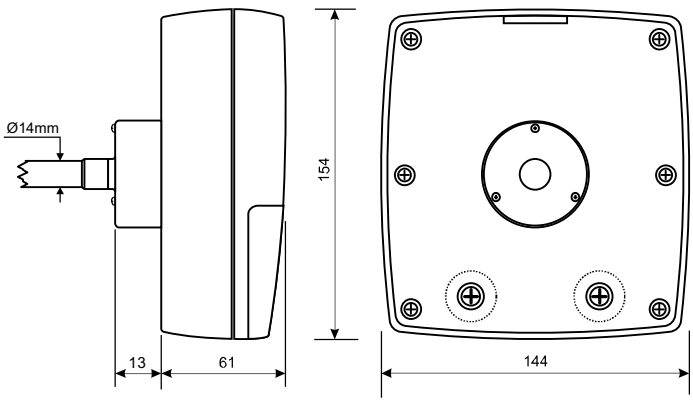
**Accuracy of the mixing ratio (g/kg)**

| | | Relative Humidity (%) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 10 | 30 | 50 | 70 | 90 | 100 |
| Temperature (°C) | -20 | 0.020 | 0.022 | 0.026 | 0.029 | --- | --- |
| | 0 | 0.09 | 0.11 | 0.12 | 0.13 | 0.15 | 0.15 |
| | 20 | 0.37 | 0.41 | 0.46 | 0.51 | 0.55 | 0.58 |
| | 50 | 2.04 | 2.32 | 2.61 | 2.90 | 3.25 | 3.42 |
| | 100 | 19.06 | 36.00 | 75.9 | 228.9 | --- | --- |

**Dimensions**




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




**Version HD2817TOx.Dx for horizontal probes**

**ORDERING CODES**

**HD2817T...:** 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. **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.
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 130mm, length of the cable 2m.
**S.TC1.2P:** Probe with cable. Length of stem 130mm, length of the cable 2m. Made of POCAN.
**S.TC1.5:** Probe with cable. Length of stem 130mm, length of the cable 5m.
**S.TC1.5P:** Probe with cable. Length of stem 130mm, length of the cable 5m. Made of POCAN.
**S.TC1.10:** Probe with cable. Length of stem 130mm, length of the cable 10m.
**S.TC1.10P:** Probe with cable. Length of stem 130mm, length of the cable 10m. Made of POCAN.
**S.TC2.2:** Probe with cable. Length of stem 330mm, length of the cable 2m.
**S.TC2.2P:** Probe with cable. Length of stem 330mm, length of the cable 2m. Made of POCAN.
**S.TC2.5:** Probe with cable. Length of stem 330mm, length of the cable 5m.
**S.TC2.5P:** Probe with cable. Length of stem 330mm, length of the cable 5m. Made of POCAN.
**S.TC2.10:** Probe with cable. Length of stem 330mm, length of the cable 10m.
**S.TC2.10P:** Probe with cable. Length of stem 330mm, length of the cable 10m. Made of POCAN.

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

**S.TO1:** Horizontal probe for instrument HD2817TO.xx. Length of stem 130mm.
**S.TO2:** Horizontal probe for instrument HD2817TO.xx. Length of stem 330mm.

**Accessories**

**RS27:** RS232 null-modem serial connection cable with 9 poles sub-D 9 female connector and 3 pole connector for COM AUX port. (Included in the supply of the instruments without display).
**DeltaLog12:** Further unit of software for PC connection, data download, instrument setup, and management of an instrument network. For operative systems Windows® 98 to Vista.
**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.
**P5:** Stainless steel grid protection for probes Ø 14mm.
**P6:** 20µ sintered stainless steel protection for probes Ø 14mm.
**P7:** 10µ PTFE protection for probes Ø 14mm.
**P8:** Stainless steel 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, for the model HD2001.2, 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 three models.

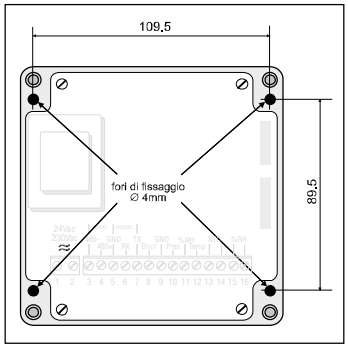


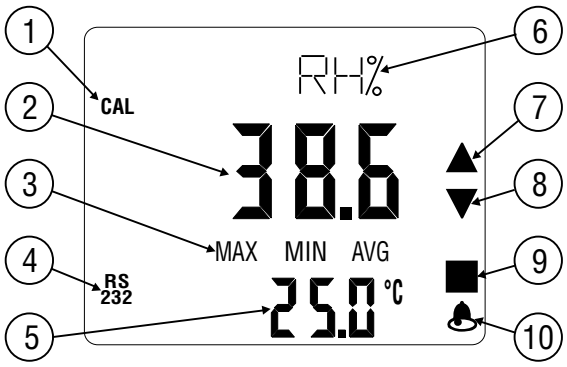

**Fig.1** Position of the fixing holes.

**Fig.2** Hot-wire probe mod. HD2001.2.

**Table 1**

| | Input | | | Output | |
|---|---|---|---|---|---|
| **Model** | 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** | * | --- | --- | * | * |

### Display description



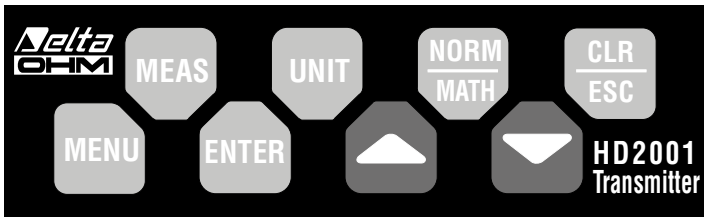

The display constantly shows the measurements of two values. While in the first line ② the value can be selected through the MEAS button, the second line ⑤ below always shows the temperature. During measurement, the first line ⑥ displays the unit of measurement of the main variable; inside the menu it 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 i 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**ument **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 CAL**ibration: 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 figure.

**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**ument **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**

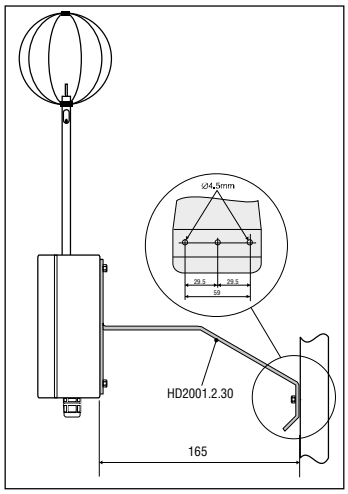



**Fig.3** Support for model HD2001.2

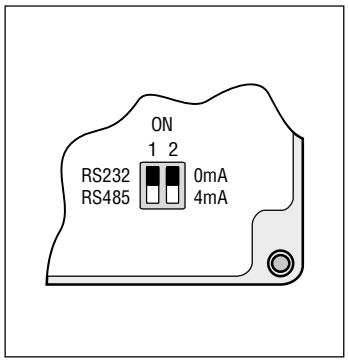



**Fig.4** Selection dip switch for protocol RS232/ RS485 and analogue output.

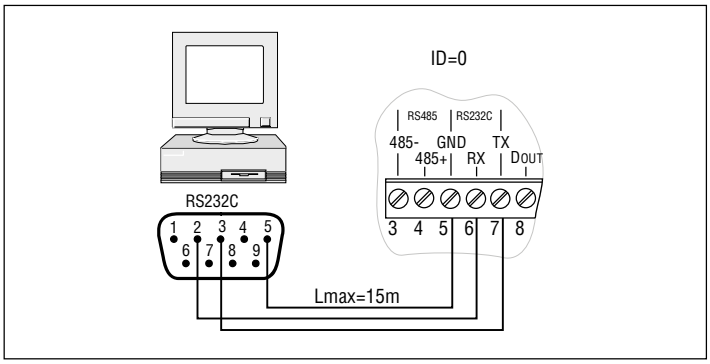



**Fig.5** Connection to PC/ device with RS232C protocol.

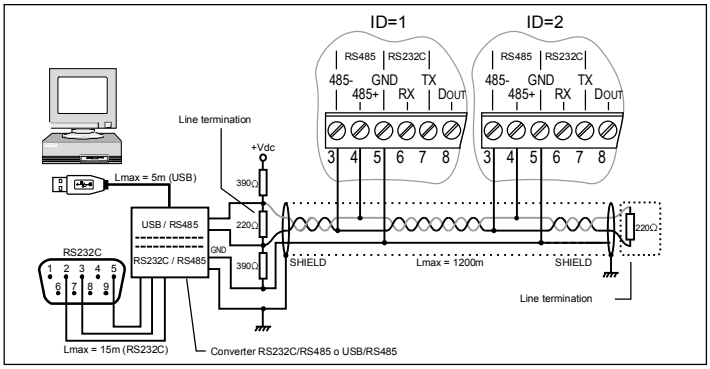



**Fig.6** PC Connection with the RS485 communication protocol for distances up to 1200 m. The instruments are tandem-connected through a shielded twisted pair cable for signals and a third wire for grounding. Both ends of the network need to have resistors for impedance matching (Line terminations). 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.

**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<br>0…100%RH<br>600…1100mbar | 4...20mA<br>0...20mA<br>0...10Vdc<br>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.

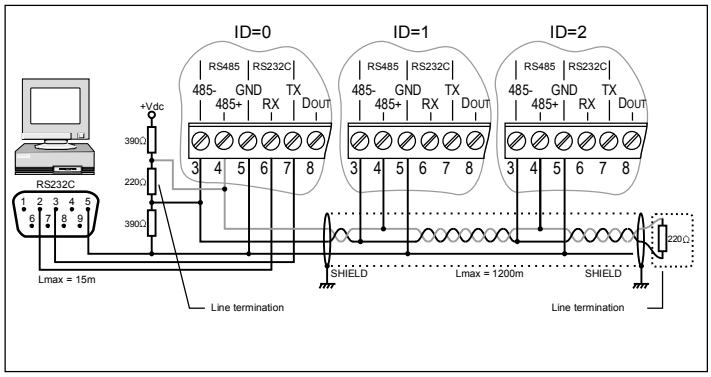



**Fig.7** RS485 network in which the conversion function is performed by first instrument of the network. The instrument that is connected directly to PC is identified by the ID = 0 and must be placed no more than 15m away from the PC. If your PC does not have the RS232 connection, you must insert a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

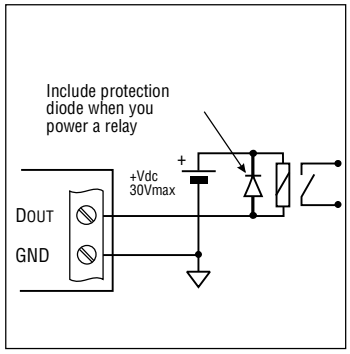



**Fig.8** Typical connection for alarm relay activation

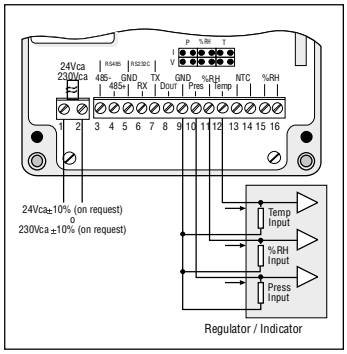



**Fig.9** Connection example of the analogue output to an indicator/regulator.

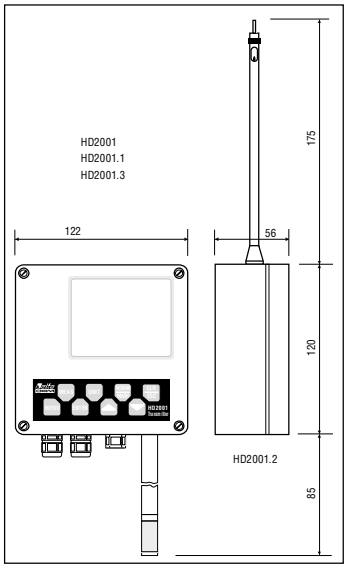



**Fig.10** Dimensions.

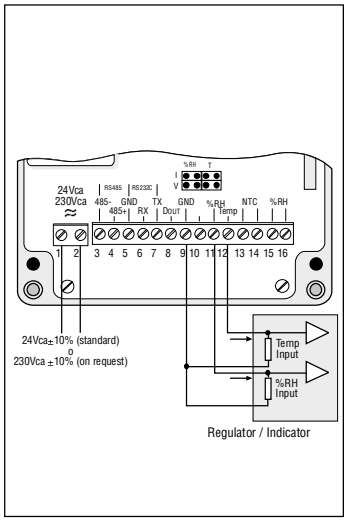



**Fig.11** Connection example to an indicator/ regulator with analogue input HD2001.3.

| **Table 3** | | | | |
|---|---|---|---|---|
| **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 |

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

**Calibration of the humidity sensor offset:**
all that is reported below rigorously.

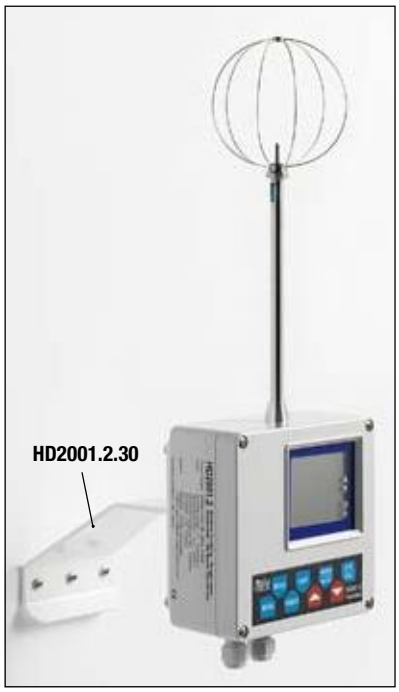
1. Enter the probe in the container with the saturated solution at 75% relative humidity at about 20°C. Wait at least 30 minutes.
2. Using the MENU button select the item "**EN**a**BL**e **CAL**ibration", press the UP arrow until reaching #51: the calibration procedure is started automatically.
3. The 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<br>±0.4°C outside this range | | | |
| Humidity | Sensor capacity | 300pF | | | |
| | %RH working range | 0…100%RH | | | |
| | TD working range | -20 … +80°C | | | |
| | Accuracy | ±2.0% (10…90%RH), ±2.5%RH in the remaining range | | | |
| Pressure | Working range | 600…1100mbar - 600…1100hPa - 60.0…110.0kPa | | | ---- |
| | Accuracy | ±0.5mbar @25°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<br>0...20mA<br>0...10Vdc<br>2 … 10Vdc | --- | 4...20mA<br>0...20mA<br>0...10Vdc<br>2 … 10Vdc |
| | Load resistance | --- | Current output: 500Ω max<br>Voltage output: 100kΩ min | --- | Current output: 500Ω max<br>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 | | | |

**ORDER 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 range, 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 range, 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…30Vdc power supply; the HD9009TRR is a transmitter with a 0…1V standard voltage output (other outputs available on demand) and 10…30Vdc 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 –40…+60°C 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 (HD9009TR).

### 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 2, "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.**

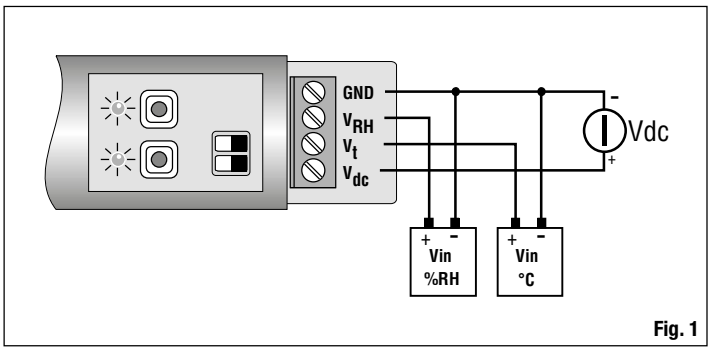


Fig. 1

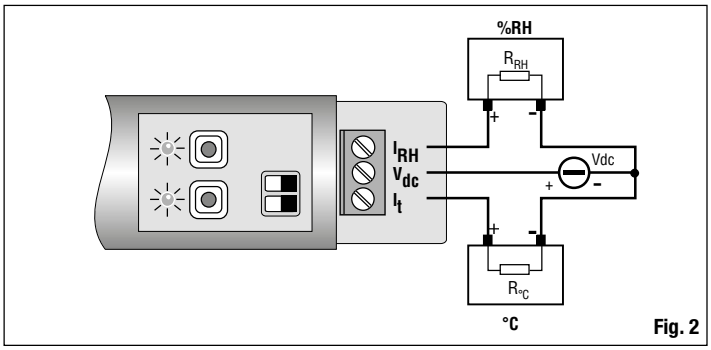


Fig. 2

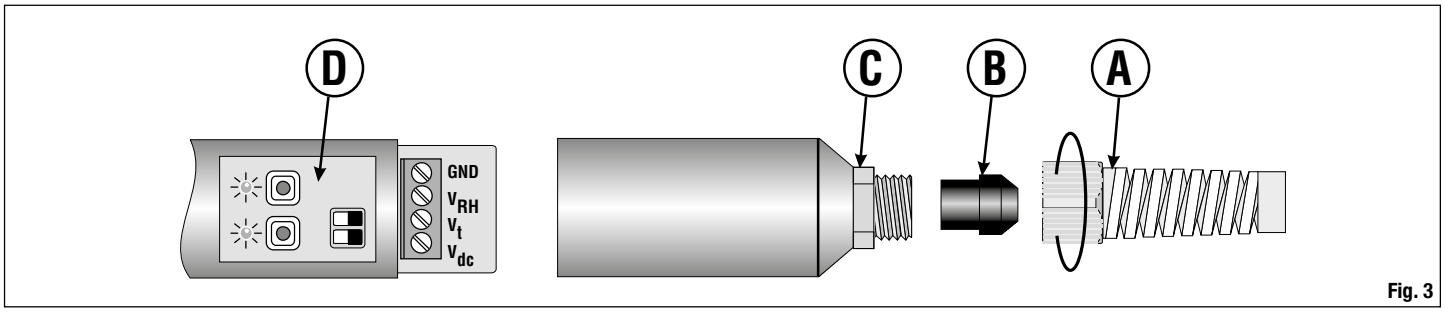


Fig. 3

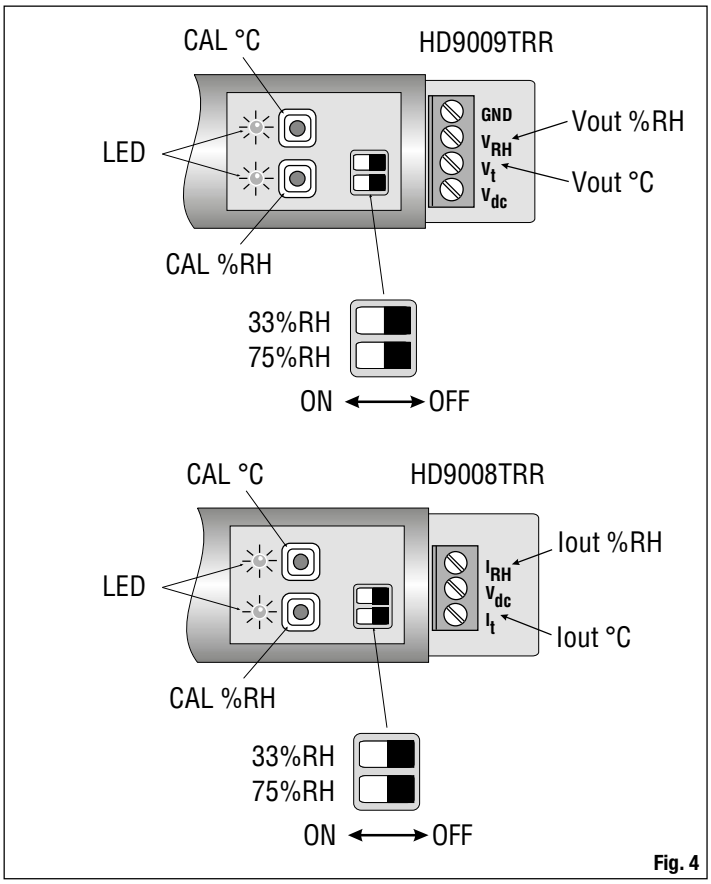



**Fig. 4**

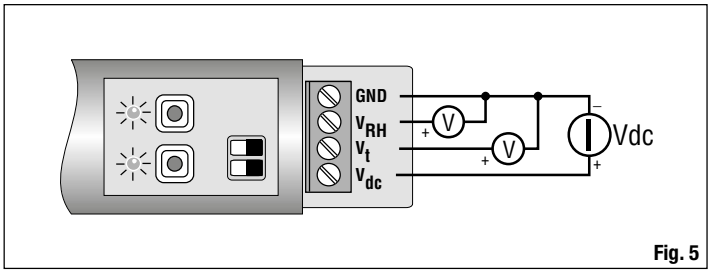



**Fig. 5**

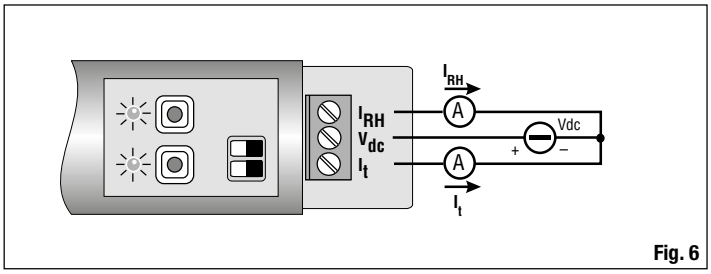



**Fig. 6**

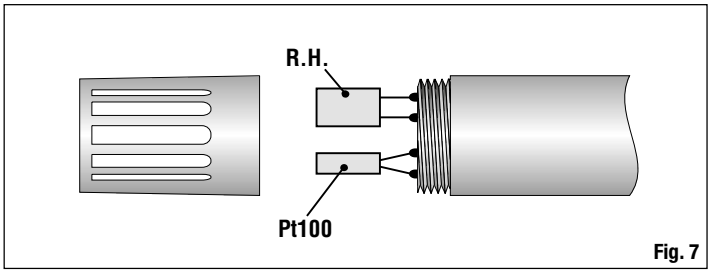



**Fig. 7**

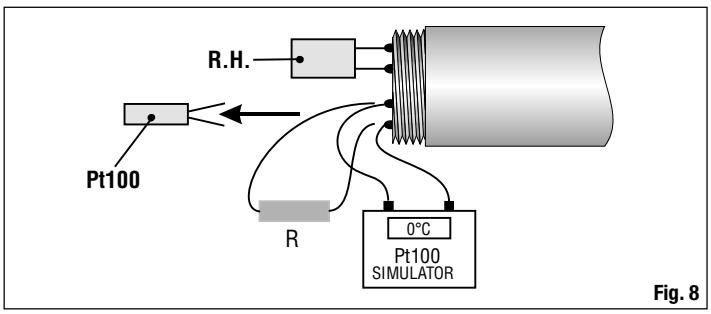



**Fig. 8**

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…Vdc 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…30Vdc continuous voltage power supply, a precision ammeter with a 0…25mA min. range.
HD9009TRR: a 10…30Vdc 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: HD9008TR and Fig.6: HD9009TR).
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…30Vdc continuous voltage power supply, a precision ammeter with 0…25mA minimum range.
For HD9009TRR: a 10…30Vdc 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 | | HD9008TR | HD9009TR |
|---|---|---|---|
| Electronics Working Temperature | | -40…+80°C | |
| Sensor Working Temperature | | -40…+80°C | |
| Transmitter Power Supply | | 10...30Vdc (4…20mA) | 10…30Vdc (2mA) |
| Capacity | | 300 pF typ. | |
| HUMIDITY | Measuring Range | 0…100%RH | |
| | Accuracy at 20°C | ±2%RH (10…90%RH) ±2.5%RH (for the remaining range values) | |
| | Response time at 63% of final variation | 3 min. with filter; 6s 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 | 60s with filter; 5s 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, 1…6Vdc, 0…10Vdc voltage outputs can be provided on ordering.
(**) Out-of-standard measuring ranges have to be requested when ordering and have to be re-programmed with a Pt100 simulator.
(***)Use screened cables.

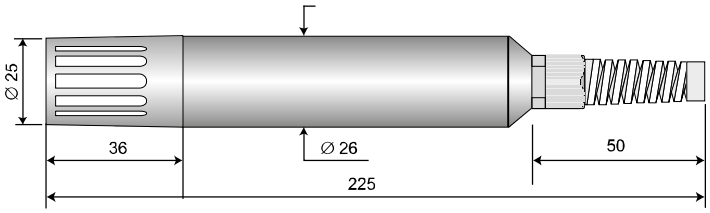

**HD9007**
**MULTIPLATE RADIATION SHIELD**

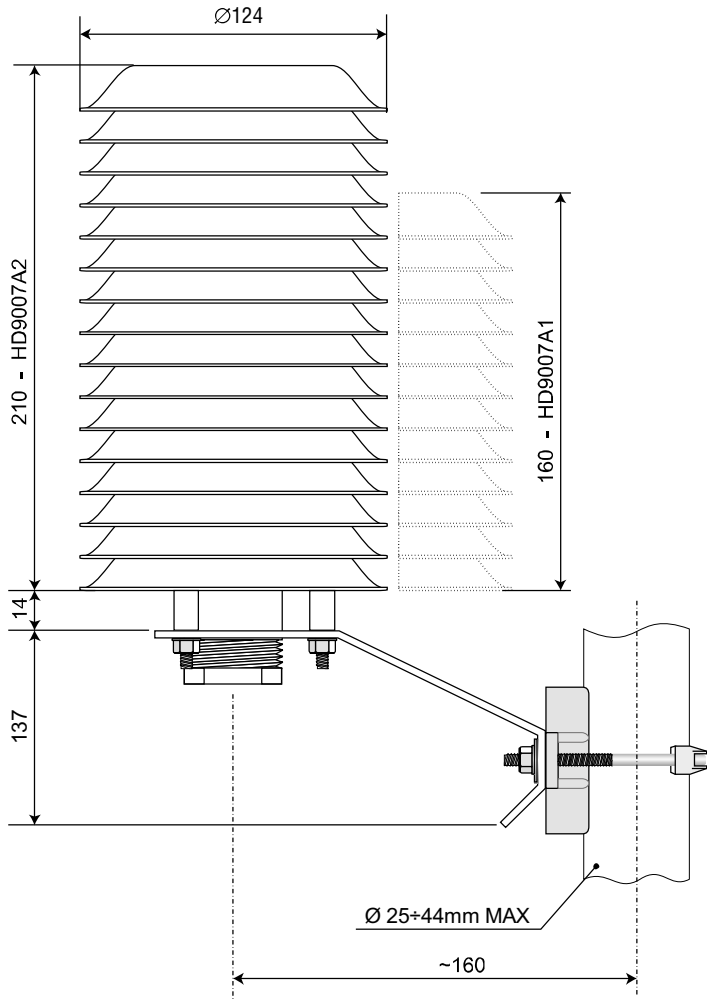
**Characteristics**
Luran S777K (BASF) antistatic UV-resistant thermoplastic material with low thermal conductivity and high reflection.
White power-painted, anticorodal aluminium support bracket. Stainless steel U-bar mounting bracket for shafts from 25 to 44mm.
Dimensions: external Ø : 130 mm.
Height, excluding bracket: HD9007 A1: 190 mm, weight: 640 gr.
HD9007 A2: 240 mm, weight: 760 gr.
Sensor fixing ring nuts: Ø 27 mm, Ø 25 mm on demand when ordering.

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

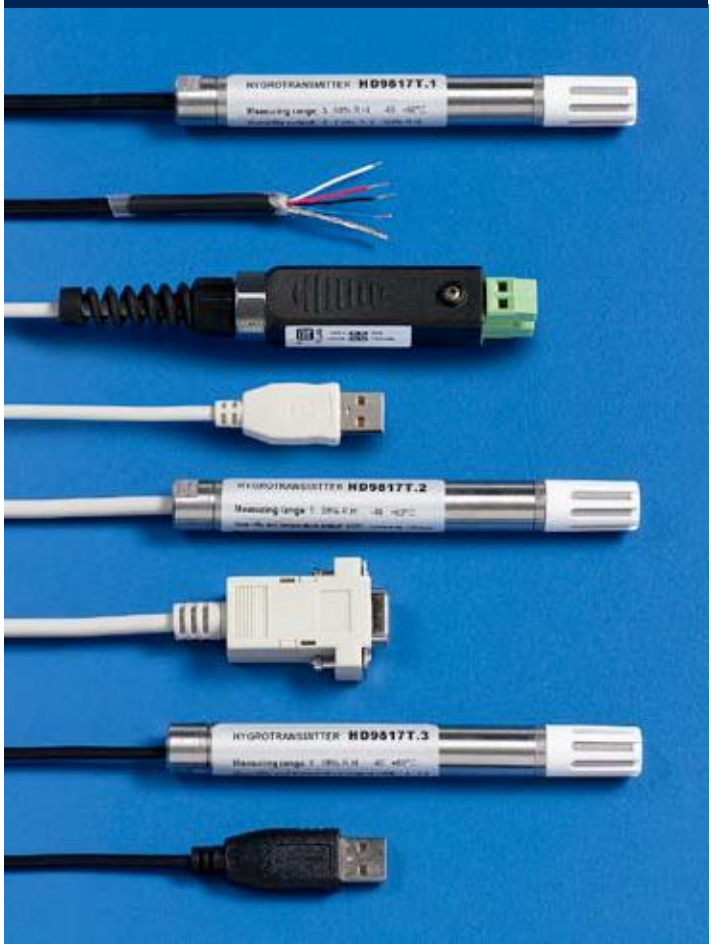
**ORDERING CODES**
**HD9008TRR:** dual passive RH and temperature microprocessor transmitter 4…20mA outputs in 0…100%RH and -40…+80°C ranges.
**HD9009TRR:** dual RH and temperature microprocessor transmitter. 0…1V output in 0…100%RH and -40…+80°C ranges.

**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 9817T1
# HD 9817T2
# HD 9817T3

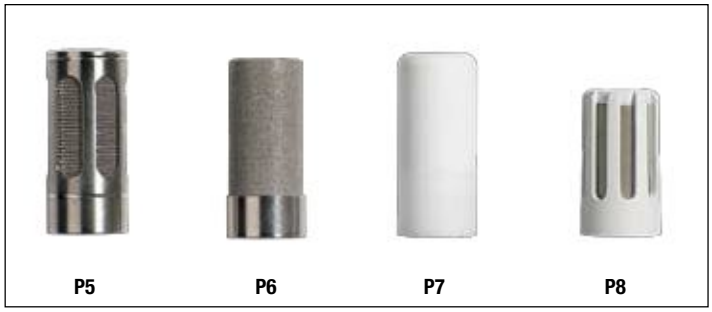


## HD 9817T1, HD 9817T2, HD 9817T3
## RELATIVE HUMIDITY AND TEMPERATURE TRANSMITTERS WITH DIGITAL OR ANALOGUE OUTPUT

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 (∅ 14 x 133 mm) and wide range of outputs (analogue 0...1V or digital RS232C, 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.

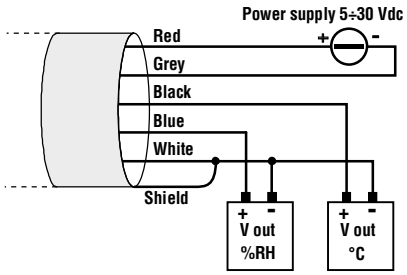
**Versions, outputs and connections**

| | HD9817T1 | HD9817T1.1 | HD9817T2 | HD9817T3 |
|---|---|---|---|---|
| Output | 0...1V = 0...100%RH<br>0...1V = –40...+60°C<br>(-20...+80°C on request) | | RS232C non insulated, 2400 baud rate | USB 1.1-2.0 non insulated |
| Temperature sensor | Pt100 | NTC 10kΩ | Pt100 | Pt100 |
| Load resistance | $R_L$ > 10kΩ | | | |
| Cable Connection | L=1,5m (7 wires + shield) | | L= 2m DB9 female connector | L= 2m USB connector type A |




***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**

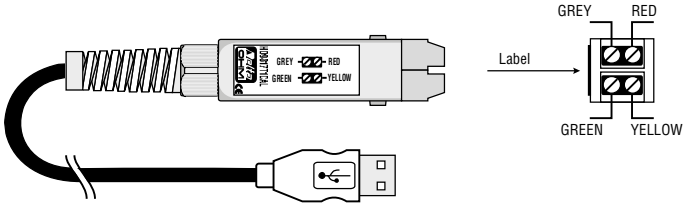
This model requires that you install USB drivers first in order to ensure a correct PC connection: **don't connect the instrument to your PC before installing the drivers**. For further details, see the guide in the CDRom which is supplied with the instrument.

**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.

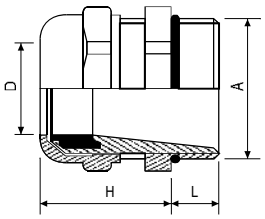
The terminal board is seen from above: in order to direct the clamps correctly, make sure that the label on the side of the module is placed as shown in the figure below.



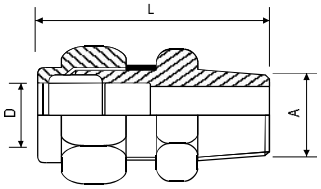
***Installation notes***

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**



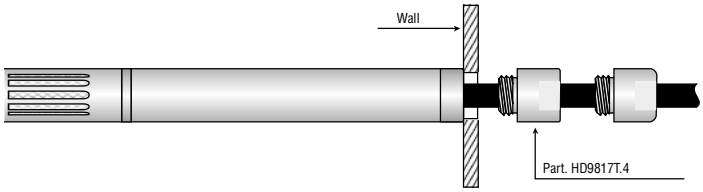

**PG16.12 Metal cable gland**
D = 10…14mm
L = 6.5mm
H = 23mm
A = PG16




**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...30Vdc) between the wires:
**Red** = (+) power supply positive
**Grey** = (-) power supply negative.

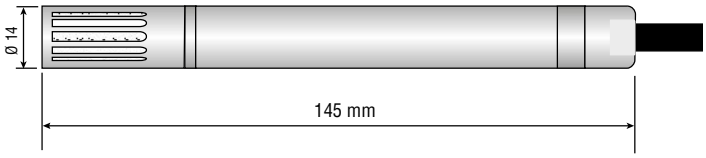
*Analogue output*

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.**

***HD9817T… Dimensions***




| Technical data | | |
|---|---|---|
| **HD9817T1R - HD9817T1.1R- HD9817T2R - HD9817T3R** | | |
| 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 | ±2% (10…90%RH), ±2,5% in the remaining range |
| | Temperature dependence | 2% on the whole temperature range |
| | Hysteresis and repeatability | 1%RH |
| | Long term stability | 1%/year |
| Temperature | Sensor type | Pt100 1/3 DIN (on request, NTC 10kΩ: code HD9817T1.1 |
| | 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…30Vdc |
| | Consumption | Typically 2mA |
| | Max. operating temperature | -40…+80°C (for short periods) |
| | Operating humidity | 0…100%RH |
| Housing | Dimensions | Ø14x138mm |
| | 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...30Vdc. AISI 304 housing. Probe protection class IP65. Dimensions ∅14x133mm. Output with cable L=1,5m (7 wires + shield). Max. working temperature -40°+80°C. **Supplied with HD9817TC software.**

**HD9817T1.1R:** 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...30Vdc. AISI 304 housing. Probe protection class IP65. Dimensions ∅14x133mm. 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 ∅14x133mm. 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 ∅14x133mm. Output with cable L= 2m with USB type A connector. Max. working temperature -40°+80°C. **Supplied with HD9817TC software.**

**HD9817T.4:** Wall-mounting adapter. Only for HD9817T1 and HD9817T1.1 on request.

**HD9817T1CAL:** USB interface module for connecting HD9817T1 and HD9817T1.1 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. Adapter is required HD9008.26.14

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

**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 sensorsTC and TO series.

**P5:** 20µ stainless steel grid protection for probes Ø 14mm, thread M 12x1.

**P6:** 20µ sintered stainless steel protection for probes Ø 14mm, thread M 12x1.

**P7:** 10µ PTFE protection for probes Ø 14mm, thread M 12x1.

**P8:** 20µ 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 -50...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 making the order**, different ranges both for absolute humidity and temperature, but within the set limits.

The standard power supply is 24VAC. On request, we can supply the 115VAC or 230VAC versions.

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

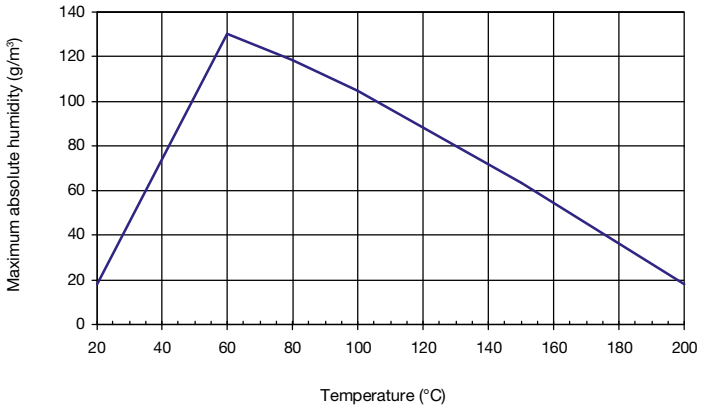
**Technical Information**

| | | |
|---|---|---|
| ABSOLUTE HUMIDITY | Type of sensor | Heat conductivity with double combined NTC. |
| | Sensor protection | 20µm sintered bronze filter AISI304 |
| | Measurement range | 0...130 g/m³ (0...100% RH @60°C and 1013hPa) (*) |
| | Sensor working range | 0 … +200°C |
| | Accuracy | ±3g/m³ to 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...) | $R_L < 500\Omega$ |
| | 0…10Vdc (HD38V17T...) | $R_L > 10k\Omega$ |
| GENERAL | Power supply voltage | 24Vac ±10% 50...60Hz<br>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 |

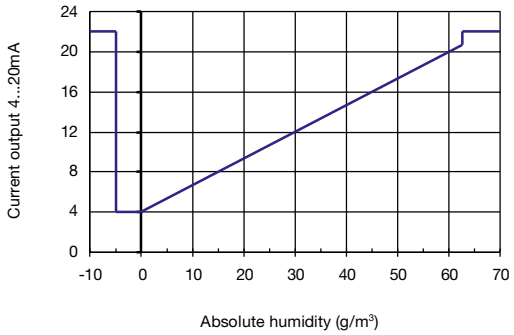
(*) **Note**: The 0...130g/m³ range is referred to a 60°C temperature. The absolute humidity maximum value varies with environment temperature according to the following diagram.

**Diagram of the absolute humidity and temperature outputs**

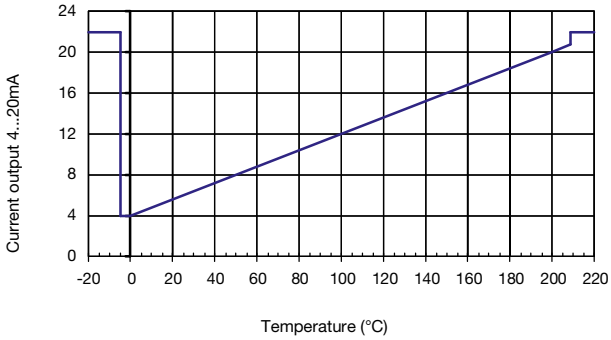
The graphs of the absolute humidity and temperature outputs are reported below.



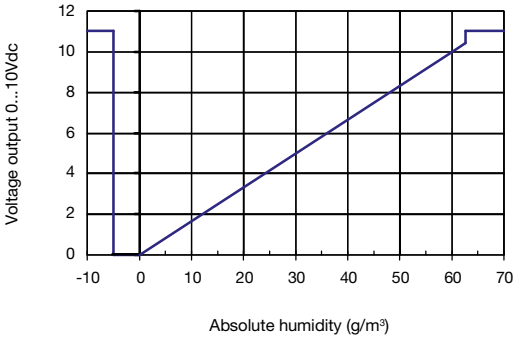

**Absolute humidity (g/m³)**
4...20mA current output according to 0...60g/m³ standard range



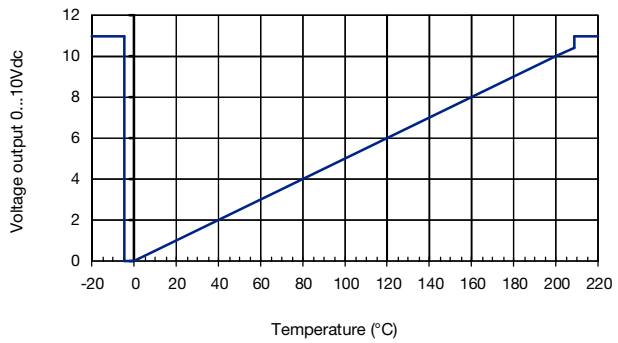

**Temperature (°C)**
4...20mA current output according to 0...200°C standard range




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

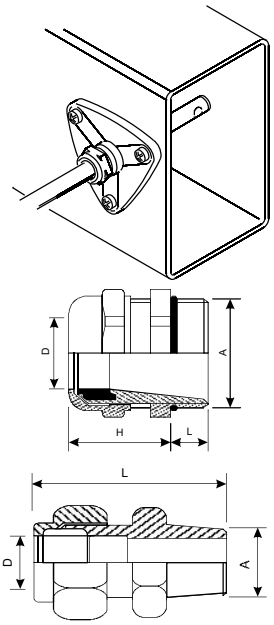



**Temperature (°C)**
0...10Vdc voltage output according to 0...200°C standard range




**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 (∅10…14mm) metallic fairlead or a 3/8" biconical universal fitting.

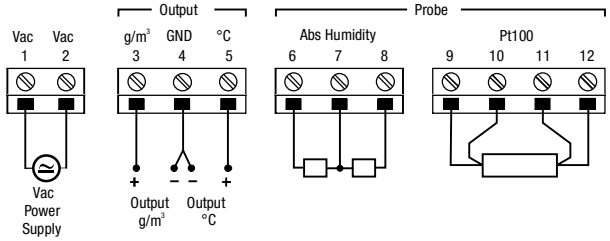



**HD9008.31.12 flange**

**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**

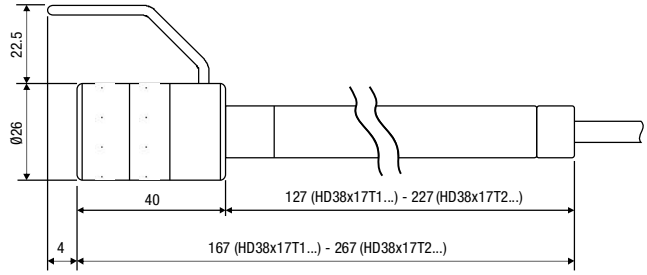


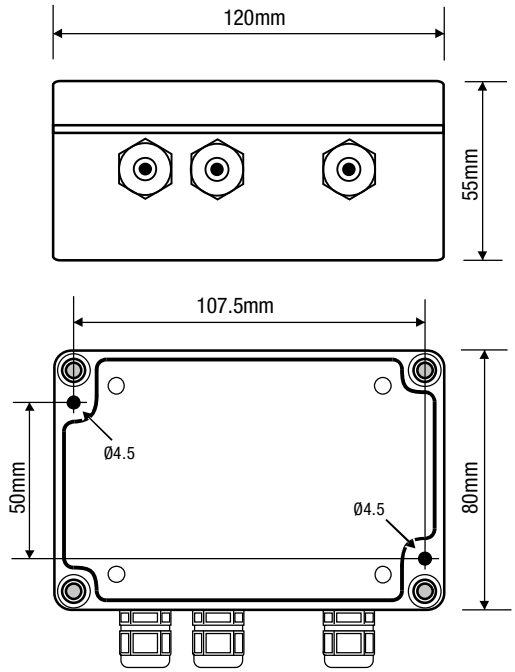

Power
Apply power to the instrument with the correct VAC voltage between the power supply terminals ① and ②.
Connection of the absolute humidity and temperature probe
Connect the probe respecting the colours and the numbers in the following table:

| 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 CX . X**

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

**Cable length**
**C2** = Cable 2 meters
**C5** = 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 0C°...+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 0C°...+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 = 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:

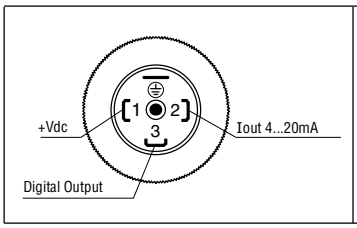



**Fig.4** - HD2601V.1

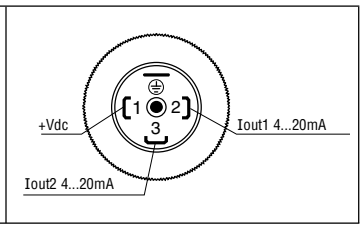



**Fig.5** - HD2601V.2

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.

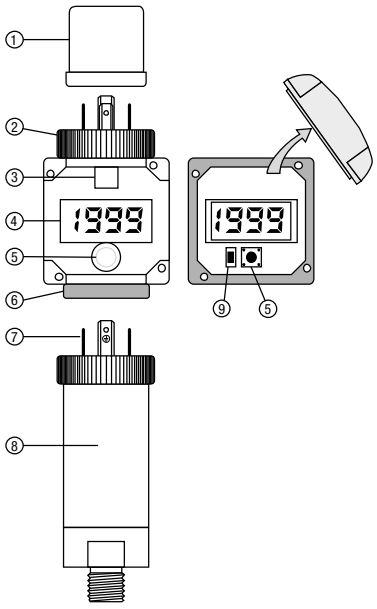


**Fig.1**

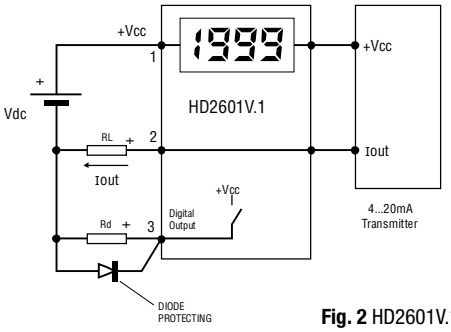



**Fig. 2** HD2601V.1 connection

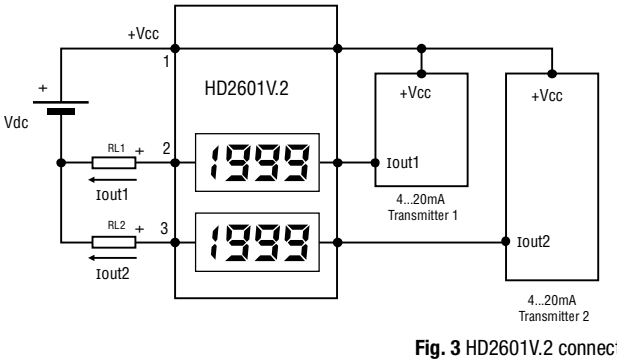



**Fig. 3** HD2601V.2 connection

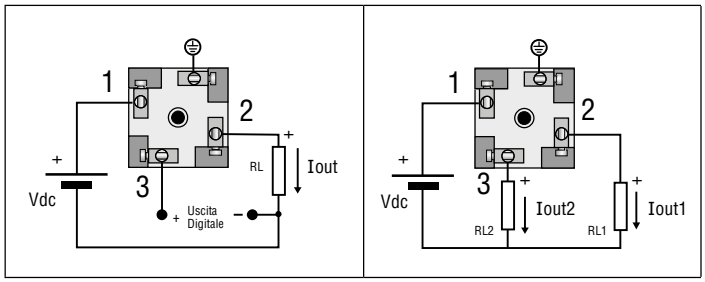



**Fig. 7** - HD2601V.1
Electrical connections of the connecting terminal




**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 | |
| “Aug” 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.

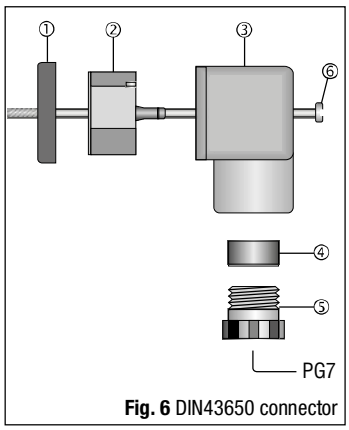



**Fig. 6** DIN43650 connector

| 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.

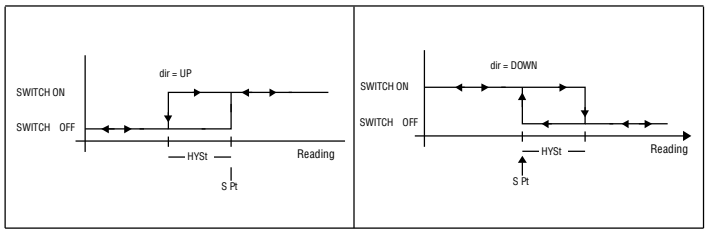



**Fig. 9** Description of the Digital Output function

**Technical characteristics**

| | |
|---|---|
| Display | 4 digit LED, 7.6mm high.<br>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. HD9008TR.K).

**HD2601V.1**

**HD2601V.2**

# HD 4049
# HD 5002
# HD 404


HD 404

HD 4049


HD 5002

## HD 4049, HD 5002, HD 404
## 78X48 OR 96X96 PANEL REGULATORS FOR CONNECTION TO TEMPERATURE AND RELATIVE HUMIDITY TRANSMITTERS

**MODELS: HD 404, HD 4049**

**CHARACTERISTICS SHARED BY THE VARIOUS MODELS:**
- Resolution: 0.1°C, 0.1% R.H.
- Display: red LEDS, height 12.7 mm
- Precision: instrument only ±0.1
- Power supply: 12÷24 V≂
- Relay contacts for the regulators: Clean exchange contact 3A/220 Vac resistive
- Electronics working temperature: -5...50°C

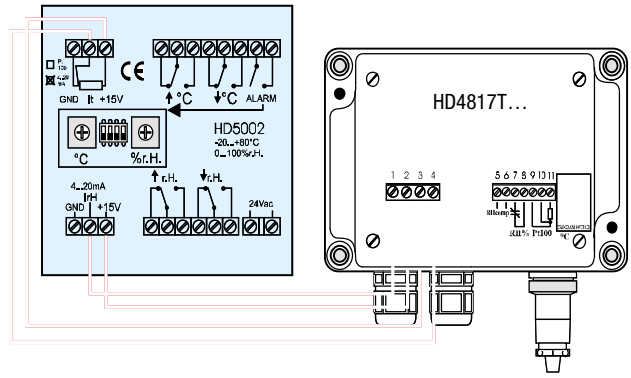
**HD 404 ON/OFF temperature regulator**
This regulator may be connected to the transmitters of the series:
**HD 2008T, HD 2012T...** as long as the temperature configuration of the transmitter is the same as the regulator
Regulating range: 4 mA ≙ -20°C, 20 mA ≙ +80°C Hysteresis: 0.6÷6°C.
Bridge for selecting the function: ☼ / ❄

**HD 4049 ON/OFF relative humidity regulator**
This regulator may be connected to the transmitters of the series:
**HD4817T... OR HD4917T...**
Regulating range: 4 mA ≙ 0% R.H., 20 mA ≙ 100% R.H.
Hysteresis: 1÷6 points of relative humidity
Bridge for selecting the function: humidify/dehumidify.

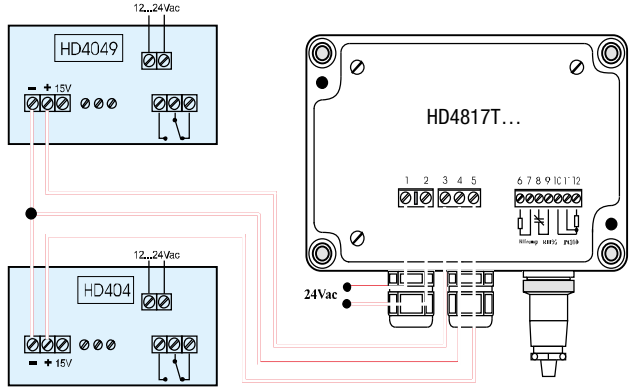
**HD 5002, HD 5002/5**
The HD 5002 or the HD 5002/5 in combination with temperature and relative humidity transmitters forms a complete temperature and humidity measuring and regulating system. Depending on the series, the HD 5002 feeds the transmitter and measures the absorbed current which is proportional to the relative humidity (terminal IR.H.) and the temperature (terminal It). Voltage drops along the connection wires do not influence the measurement precision, since the signal is a current and not a voltage. Regulation is of the three-point type (heat - OFF - cool for temperature, humidify - OFF - dehumidify for relative humidity). **Also, an alarm contact is made if the temperature differs by more than 8°C from the set value (or if humidity differs by more than 15% from the set R.H.).** A dip switch on the rear of the instrument selects the alarm conditions, high or low for temperature, high or low for humidity.

**TECHNICAL DATA**
**Using range:** humidity 0%...100% R.H.
**Temperature:** -20...+80°C (HD 5002), -30...+130°C (HD 5002/5) depending on the transmitter used
**Resolution:** 0.1°C, 0.1% R.H.
**Accuracy:** transmitter included, relative humidity: ±2,5% up to 90% R.H., ±3% beyond 90% R.H. Temperature: ±0.3°C
**Hysteresis:** 0.6°C÷6°C, 1÷10 points of relative humidity
**Display:** red LEDS; 3 ½ figures, height 12.7 mm
**Outputs:** 4 exchange contacts (↑°C,↓°C,↑%R.H.,↓%R.H.) plus alarm contact when made, capacity 3 A/220 Vac resistive
**Power supply: 24 Vac**
**Instrument working temperature:** -5...+50°C
**Dimensions:** front panel: 96x96 mm.
instrument body: 88x90x123 mm.

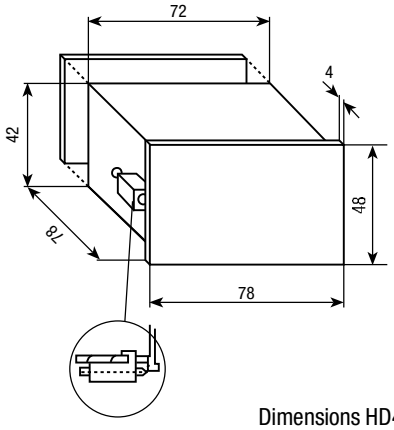
**ATTENTION: For compatibility with DELTA OHM 4÷20 mA regulators place the jumper in the position 4÷20 mA .**
With the multidrop technique, more than one regulator, indicator or recorder may be connected in series.




The temperature configuration of the transmitter HD4817T... connected to HD5002 has to be: 4mA = -20°C ... 20mA = +80°C.




The temperature configuration of the transmitter HD4817T, connected to HD404 has to be: 4mA = -20°C ... 20mA = +80°C.




Dimensions HD404 and HD4049

# HD 9022


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

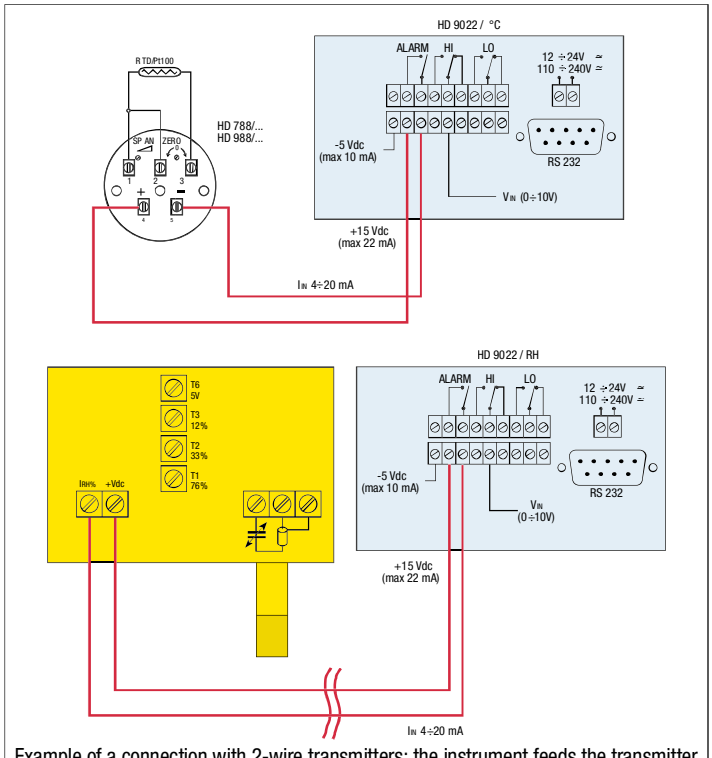
The microprocessor-controlled panel instrument HD 9022 is an indicator with alarm thresholds that may be programmed and configured by the user. At input it accepts signals arriving from transmitters with 2 or 3 wires, in voltage 0÷1V, 0÷10V or in current 0÷20 mA, 4÷20 mA, or Pt100 with 4 wires. Configuration 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: there is a terminal board for input **12÷24Vac/Vdc** or **110÷240Vac/Vdc (the one or the other; not both kinds of power supply).**
- 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.
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 ▲ ▼or **ENTER** key independently again.

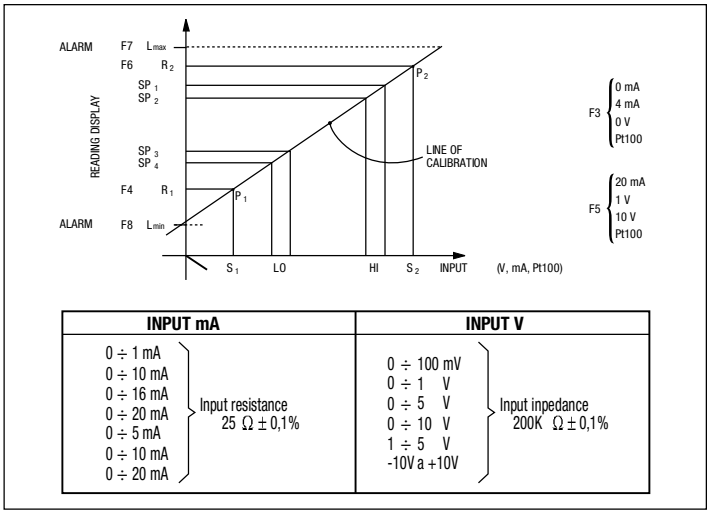
**Error signal**

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.

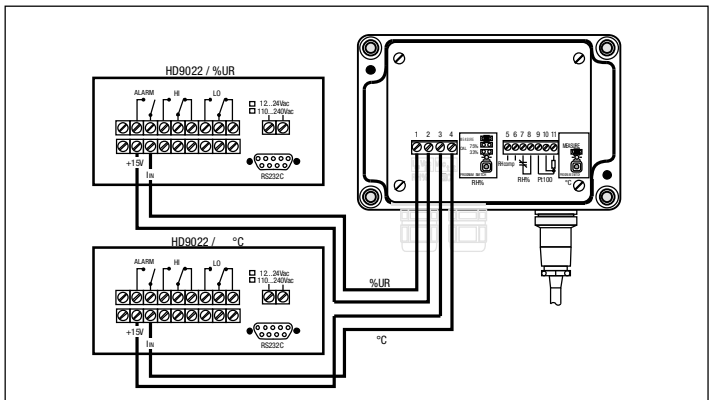
THE MAXIMUM RESOLUTION OF THE CONVERTER IS: 0.05 mV/Digit, 1µA/Digit.

**Summary of programming steps of HD 9022**

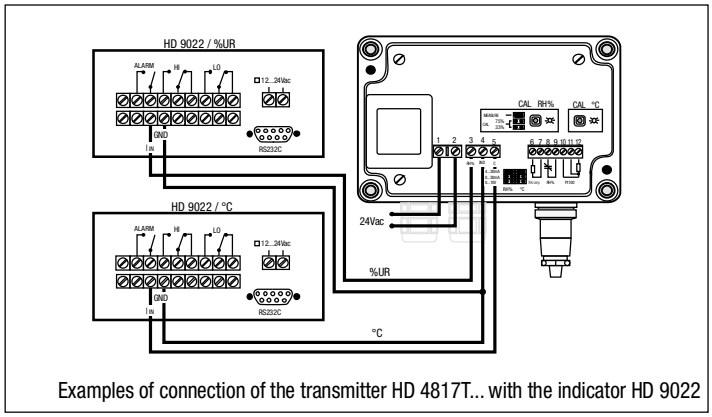



| INPUT mA | INPUT V |
|---|---|
| 0 ÷ 1 mA<br>0 ÷ 10 mA<br>0 ÷ 16 mA<br>0 ÷ 20 mA<br>0 ÷ 5 mA<br>0 ÷ 10 mA<br>0 ÷ 20 mA<br>Input resistance 25 Ω ± 0,1% | 0 ÷ 100 mV<br>0 ÷ 1 V<br>0 ÷ 5 V<br>0 ÷ 10 V<br>1 ÷ 5 V<br>-10V a +10V<br>Input inpedance 200K Ω ± 0,1% |

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.




Connection examples: HD 4917T... transmitters with HD 9022 panel meter




Examples of connection of the transmitter HD 4817T... with the indicator HD 9022

| 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 | -9999...19999 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 mass |

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 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 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 | ack/nak |
| **C** | Company | | DELTA OHM | ack/nak |
| **D** | Firmware Version | | Vxx Rxx | ack/nak |
| **E** | Firmware Date | | dd/mm/yy | ack/nak |
| **F** | Serial Number | (rd) | xxxxxx | ack/nak |
| | | (wr) | stxAFxxxxxxetx | ack/nak |

**COMMAND M**

| Sub-command | Values | Replies |
|---|---|---|
| **1** | Measure Channel 1 | ack/nak |
| **2** | Measure Channel 2 | 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 |

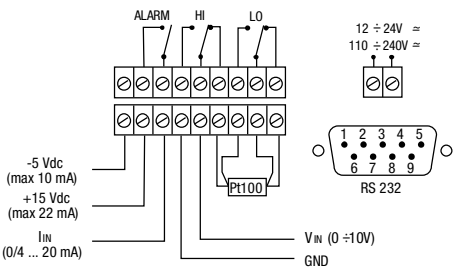
As regards the command just described, a few remarks must be made:
- There is no command character.
- For the other controls of the type C1F01 etc., the present programming status is supplied for the specific command if only the sequence of the sub-command characters is sent.

Ex: StxC1F01Etx Request from Host
StxC1F01:1Etx Reply

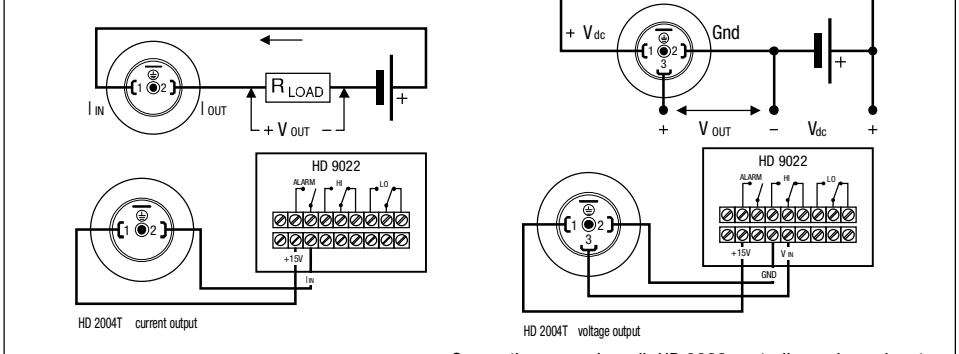
If the sequence of the sub-command characters is followed by a space and then the desired programming value, the programming of the parameter is produced.

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

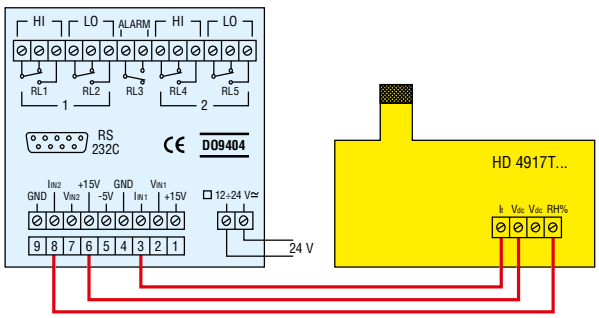


Connection examples wih HD 9022 controller and panel meters

# DO 9404


## HD 9404
## DUAL REGULATING INDICATOR WITH MICROPROCESSOR CONFIGURATION AND TWO INPUTS, FOR VOLTAGE OR CURRENT

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.

### 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 ENTER key, 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 voltage 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 LO 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 HI 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 FO 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 LO contact, open HI 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 ENTER key; when FO 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 FO 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 female 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 mass |

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>

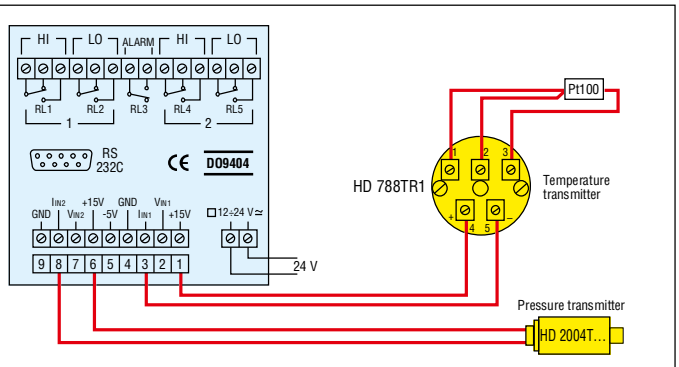
Where:

| | |
|---|---|
| <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. |

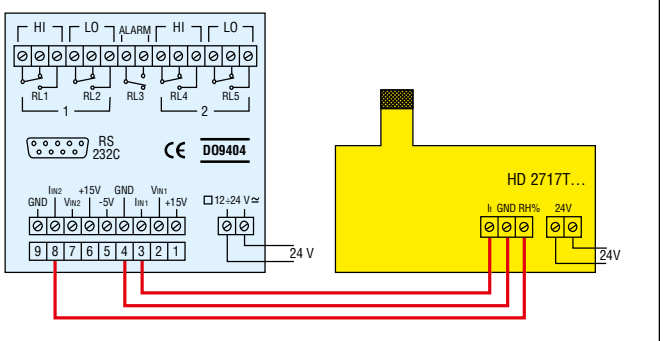
The replies provided by the DO 9404 are essentially of two types: "Information" and "Data".

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.
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) |




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)

**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** | | Vales | Replies |
|---|---|---|---|
| **RESET** | (wr) | | |

**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** | Min1 Relay 3 | -9999...19999 | ack/nak |
| **C1F12** | **xxxx** | Max1 Relay 3 | 0000-9999 | 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.

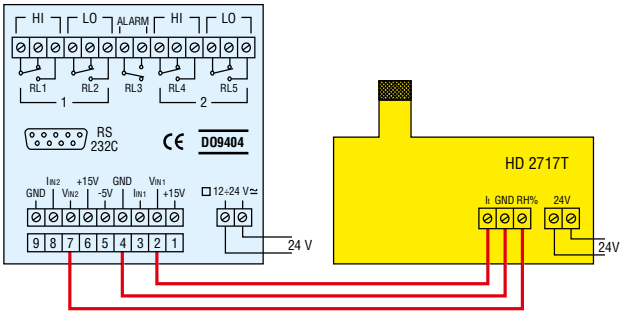
| | | |
|---|---|---|
| Example: | StxC1F01Etx | Request from Host |
| | StxC1F01:1Etx | Reply |

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.

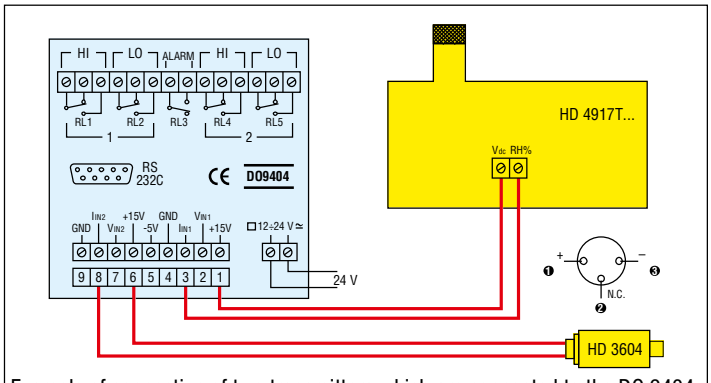
| | | |
|---|---|---|
| Example: | StxC1F01 1Etx | Command from Host |
| | ack / nak | Reply |

**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)

SIT N° 124 laboratory - Humidity measurements

## Calibration Service in Italy

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**Permanent Laboratory** **SIT ACCREDITATION TABLE**

| Quantity | Instruments to be calibrated | Measuring range | Uncertainty (*) | Note |
|---|---|---|---|---|
| Relative humidity | Electrical and mechanical hygrometers and thermo- hygrometers | from 10 to 92 % RH (with air temperature within 0°C…60°C) | from 0,5 to 1,8 %RH | ⇦ |
| | Electrical Psycrometers | from 10 to 92 % RH (with air temperature within 0°C…60°C) | from 0,5 to 1,8 %RH | ⇦ |
| | Saturated salt solutions | from 10 to 90 % RH (with air temperature within 20°C .. 25°C) | 1,4 %RH | |
| Dew point | Mirror Hygrometers | from -20°C to 60°C | 0,16°C | |

(*) The measurement uncertainty is expressed at a confidence level of 95%.
⇦ Extended composed uncertainty resulting from the propagation of uncertainties of reference magnitudes (Td and Tair)