

OPERATING MANUAL

ENVIROsense

ETS series

Environmental
transmitters



EN
V1.1



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1 Introduction

ENVIROsense is an environmental temperature, relative humidity and, optionally, barometric pressure transmitter with RS485 Modbus-RTU output.

Two optional additional 0...1 V, 0...5 V or 0...10 V (depending on model) analog outputs for temperature and relative humidity or dew point, with configurable temperature and humidity ranges.

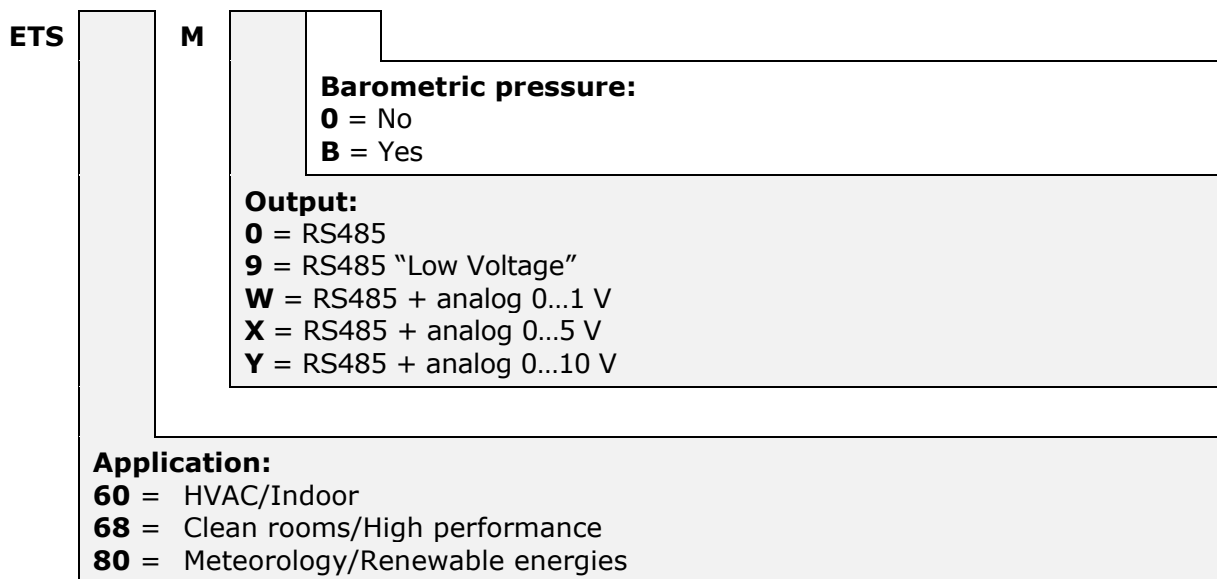
Many calculated humidity quantities available:

- Dew point
- Wet bulb temperature
- Absolute humidity
- Mixing ratio
- Specific enthalpy
- Water vapour partial pressure
- Specific humidity
- Frost point temperature
- Saturation vapour pressure above water
- Saturation vapour pressure above ice

Rugged Ø14 mm compact housing in PBT. Optional protection shield from solar radiations for outdoor applications.

The transmitter is supplied factory-calibrated in multiple points for relative humidity, and it is ready to use. The transmitter can be optionally supplied with an ISO/IEC 17025 calibration certificate.

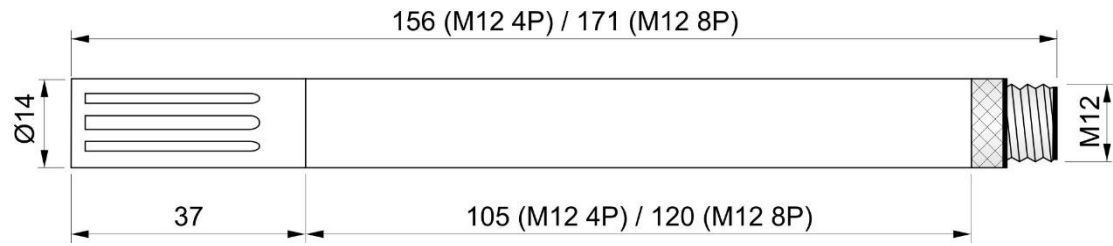
The different models differ in the presence or absence of the optional barometric sensor and analog outputs, in the different power supply voltage range and in the different application field:



2 Technical specifications

| | | |
|----------------------|-------------|---|
| Sensor | RH | Capacitive |
| | Temperature | Pt100 |
| | Pressure | Piezoresistive |
| Measuring range | RH | 0...100% |
| | Temperature | -40...+80 °C |
| | Pressure | 300...1100 hPa |
| Resolution | RH | 0.01% |
| | Temperature | 0.01 °C |
| | Pressure | 0.1 hPa |
| Accuracy | RH | ETS60...: ±1.8% (0...85%) / ±2.5% (85...100%) @ T=15...35 °C (2 + 1.5% of measured value)% @ T= remaining range ETS68...: ±1.2% (0...85%) / ±2% (85...100%) @ T=5...50 °C (1.5 + 1.5% of measured value)% @ T= remaining range ETS80...: ±1.5% (0...90%) / ±2% (90...100%) @ T=15...35 °C (1.5 + 1.5% of measured value)% @ T= remaining range |
| | Temperature | ±0.1 °C ± 0.1% of measured value |
| | Pressure | ±0.5 hPa typical @ T=25 °C ±1 hPa (500...1100 hPa) @ T= full range |
| RH response time | | 10 s (10 → 80 %RH; air speed=2 m/s @ constant temperature) |
| Warm-up time | | 600 ms |
| Long-term drift | RH | ±0.5%RH/year |
| | Temperature | ±0.03 °C/year |
| | Pressure | < ±1 hPa/year |
| Operating conditions | | -40...+80 °C / 0...100 %RH |
| Output | | RS485 Modbus-RTU or ASCII proprietary protocol 2 optional additional 0...1 V, 0...5 V or 0...10 V (depending on model) analog outputs for temperature and humidity |
| Power supply | | 7...30 Vdc (except ETSxxM9...) or 4.5...16 Vdc (only ETSxxM9...) for RS485 output 10...30 Vdc for 0...1 V and 0...5 V analog outputs 15...30 Vdc for 0...10 V output |
| Power consumption | | 1.2 mA @ 24 Vdc (except ETSxxM9...) 3 mA @ 5 Vdc (only ETSxxM9...) |
| Connection | | 4-pole M12 (ETSxxM0... / ETSxxM9...) 8-pole M12 (ETSxxMW... / ETSxxMX... / ETSxxMY...) |
| Weight | | 30 g approx. |
| Material | | PBT |
| Protection degree | | IP 65 |

Dimensions (mm)



3 Installation

For outdoor installation, use the HD9007A-1 or HD9007A-2 bracket with protection against solar radiations, suitable for fixing to a Ø30...50 mm mast. The support requires the HD9007T26.2 adapter from Ø26 to Ø14 mm.

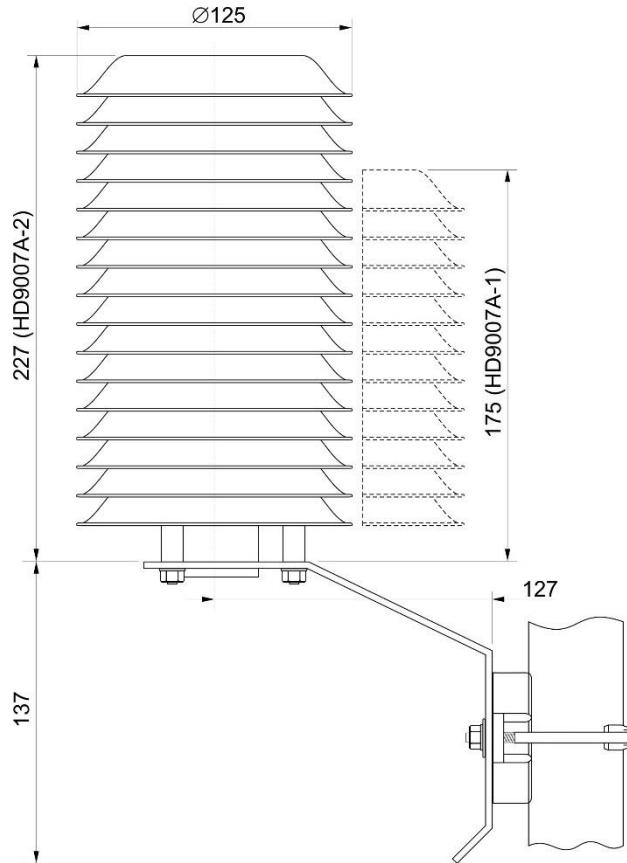


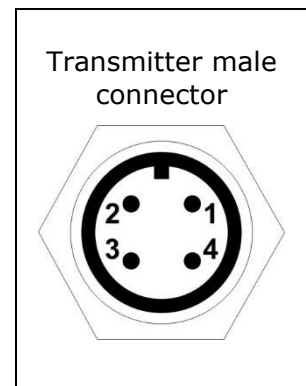
Fig. 3.1: HD9007A-x protection against solar radiations

3.1 Electrical connections

Connector pinout:

ETSxxM0... / ETSxxM9...

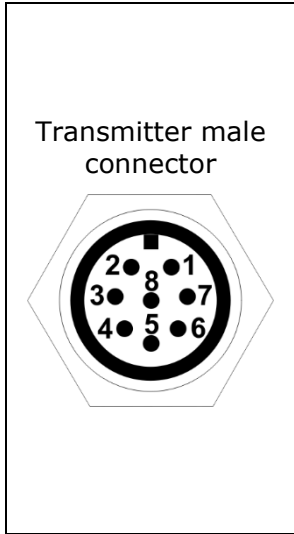
| Pin | Function | CPM12-5... wire color |
|-----|--------------------------------|-----------------------|
| 1 | Power supply positive (+Vdc) | Brown |
| 2 | Power supply negative (GND) | White |
| 3 | RS485 Data + | Blue |
| 4 | RS485 Data - | Black |
| | Not connected | Grey (*) |
| | Connector shell / Cable shield | Yellow/Green |



(*) The CPM12-5... 5-pole cable is compatible with the 4-pole transmitter connector. The grey wire is connected to pin 5 (central) of the cable female connector and it is not used by the transmitter.

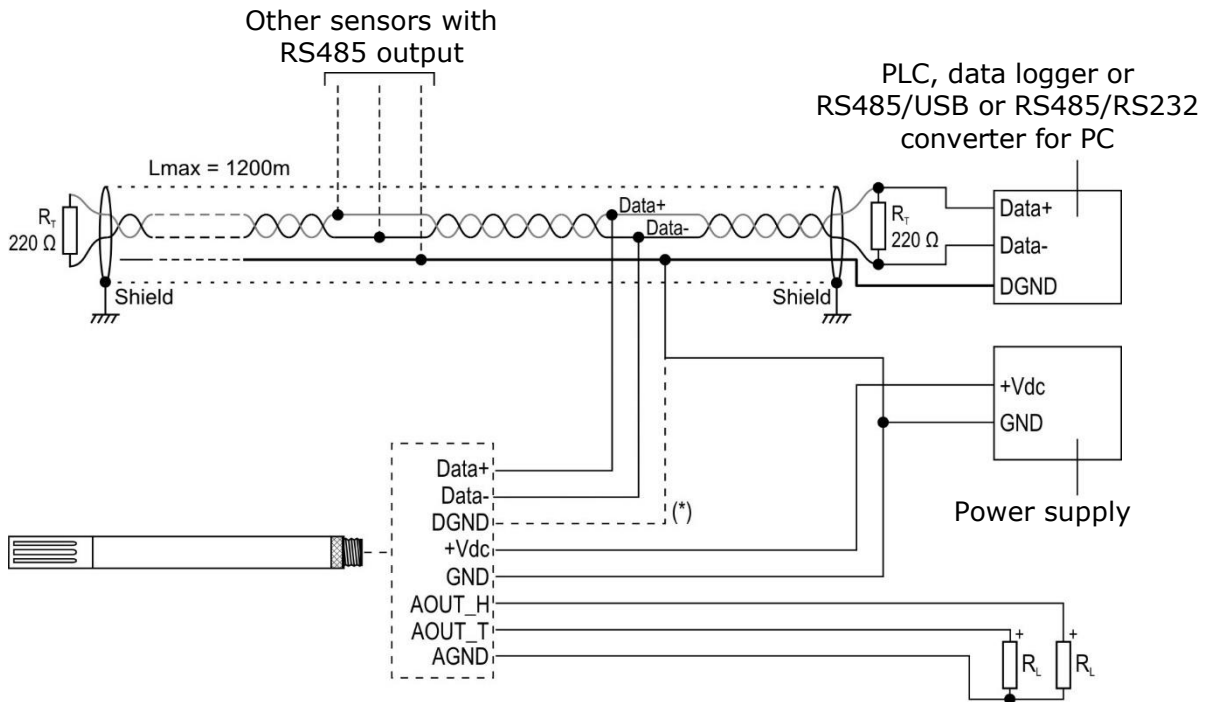
ETSxxMW... / ETSxxMX... / ETSxxMY...

| Pin | Function | CPM12-8... wire color |
|-----|---------------------------------------|-----------------------|
| 1 | Power supply negative (GND) | White |
| 2 | Power supply positive (+Vdc) | Brown |
| 3 | Digital ground (DGND) | Green |
| 4 | RS485 Data - | Yellow |
| 5 | RS485 Data + | Grey |
| 6 | Analog ground (AGND) | Pink |
| 7 | RH analog output positive (AOUT_H) | Blue |
| 8 | Temp. analog output positive (AOUT_T) | Red |
| | Connector shell / Cable shield | Yellow/Green |



The cable shield (yellow/green wire) should be grounded.

Connections:



(*) DGND is present only in models with 8-pin connector; it can be used to connect the RS485 network ground to the transmitter, as an alternative to connecting to GND (DGND and GND are connected internally in the transmitter).

Fig. 3.2: electrical connections

RS485 output:

Before connecting the transmitter to the RS485 network, set the address and the communication parameters, if different from the factory preset (see "Configuration" chapter). The output is not isolated.

Analog outputs:

The load resistance R_L must be $\geq 100 \text{ k}\Omega$. In the event of an anomaly in the measurement (detected measurement outside the measuring range), the output goes to a value 10% higher than the full scale (e.g., 11 V if the output is 0...10 V).

4 Configuration

The configuration of the transmitter can be done:

- By sending serial commands from a PC, via a standard communication program (see the chapter "ASCII proprietary protocol").
- Via the "Holding Registers" in Modbus-RTU mode (see the chapter "Modbus-RTU protocol").

Analog outputs (optional):

By default, the analog outputs correspond to the measuring ranges 0...100% RH and -40...+80 °C.

It is possible:

- to associate the analog outputs with different relative humidity and temperature ranges, within the full measuring range;
- to associate the humidity analog output with dew point, instead of relative humidity.
- to reverse the direction of the output, so that the output decreases as the measurement increases.

Connection to PC:

To connect the transmitter to a PC USB port, to check or change the configuration, the **CP24B-5** (5-pole) or **CP24B-8** (8-pole) optional cables can be used, which also allow the pyranometer to be powered via the USB port.

To use the CP24B-x cables, the related USB drivers must be installed in the PC.

Alternatively, it is possible to use a standard RS485/USB or RS485/RS232 converter, powering the transmitter separately (respecting the minimum supply voltage of the transmitter).

Calibration:

The transmitter is supplied factory calibrated. The user can perform a new relative humidity calibration using CRHx serial commands (see the chapter "ASCII proprietary protocol") or the appropriate Modbus "Holding Registers" (see the chapter "Modbus-RTU protocol").

The transmitter provides information on the last five relative humidity user calibrations performed (only ASCII proprietary protocol).

In case of incorrect calibration, it is always possible to restore the factory calibration.

5 ASCII proprietary protocol

To communicate with the transmitter via the ASCII proprietary protocol:

1. Connect the transmitter to the PC and start a standard serial communication program.
2. In the serial communication program, set the Baud Rate 57600, the parameters 8N2 and the COM port number to which the transmitter is connected.
3. Power the transmitter (or power cycle if already powered) and send the command @ within 10 seconds from the instrument power on (the transmitter replies &| if the command @ is recognized).

Note: if the CP24B-x cable is used, to power cycle the transmitter, disconnect the cable for a few seconds from the PC USB port, then reconnect it.
4. Send the command **CAL USER** (the transmitter replies USER ON|) to enable the configuration change. The command CAL USER is not required only for reading the settings.
5. Send the commands described in the tables below.

After the configuration is complete, the command CAL USER can be disabled by sending the command CAL EXIT.

Note:

If the possibility to access the ASCII proprietary protocol in the first 10 seconds has been disabled (see **WCT** serial command), to access the protocol, it is necessary to re-enable, via Modbus protocol, the wait for the @ command in the first 10 seconds by writing **1** in the holding register with address **82** (after writing the user password in the holding register with address **30002**) and power cycling the transmitter.

Transmitter general information:

| Command | Reply | Description |
|---------|------------------------|-----------------------------------|
| G0 | G0;model | Model |
| G1 | G1;sub-model | Sub-model |
| G2 | G2;nnnnnnnn | Serial number |
| G3 | G3;xx.yy | Firmware revision |
| G4 | G4;yyyy/mm/dd | Firmware revision date |
| G5 | G5;xx.yy | Hardware revision |
| GD | GD;yyyy/mm/dd hh:mm:ss | Factory calibration date and time |

User code:

The user code is an alphanumeric string of up to 8 characters that the user can set to identify the transmitter with a mnemonic name.

| Command | Reply | Description |
|-------------|--------------|---|
| CUCnnnnnnnn | CUC;& | Sets nnnnnnnn as user code. Default= <i>blank</i> |
| RUC | RUC;nnnnnnnn | Reads the user code. |

Enabling/disabling the wait for the @ command at power up:

| Command | Reply | Description |
|---------|--------|---|
| WCTn | WCT;&n | Enable/disable the 10-second wait for the @ command at power up: <ul style="list-style-type: none"> ▪ Disabled if n=0 ▪ Enabled if n=1 <i>Default</i> : Enabled (n=1) |
| RCT | RCT;n | Reads the enabling status of the 10-second wait for the @ command at power up. |

Disabling the first 10 seconds, and thus immediately activating the Modbus-RTU protocol, is useful when the instrument is used in ON/OFF mode with the Modbus-RTU protocol, to limit power consumption (it is powered only for the time necessary to acquire the measurement). With the first 10 seconds disabled, the measurements are available **5 seconds after power up**.

RS485 Modbus-RTU communication parameters:

| Command | Reply | Description |
|---------|--------|--|
| CMA n | CMA;&n | Sets the Modbus-RTU address (1...247) to n. Default=1 |
| RMA | RMA;n | Reads the Modbus-RTU address. |
| CMB n | CMB;&n | Sets the Baud Rate: <ul style="list-style-type: none"> ▪ 9600 if n=0 ▪ 19200 if n=1 (<i>default</i>) ▪ 38400 if n=2 ▪ 57600 if n=3 ▪ 115200 if n=4 |
| RMB | RMB;n | Reads Baud Rate setting. |
| CMP n | CMP;&n | Sets parity and stop bits (data bits = 8 fixed): <ul style="list-style-type: none"> ▪ 8N1 if n=0 ▪ 8N2 se n=1 ▪ 8E1 if n=2 (<i>default</i>) ▪ 8E2 se n=3 ▪ 8O1 if n=4 ▪ 8O2 se n=5 |
| RMP | RMP;n | Reads the setting of parity and stop bits. |
| CMW n | CMW;&n | Sets waiting time after transmission with Modbus-RTU protocol: <ul style="list-style-type: none"> ▪ Immediate reception if n=0 (violates protocol) ▪ Waiting 3.5 characters if n=1 (respects protocol) <i>Default</i> : Waiting 3.5 characters (n=1) |
| RMW | RMW;n | Reads the setting of waiting time after transmission with Modbus-RTU protocol. |

Units of measurement:

Changing the temperature units of measurement affects the Modbus protocol only. The temperature measurement provided by the ASCII proprietary protocol (commands S0/S1) is always in °C.

| Command | Reply | Description |
|---------|--------|---|
| TTn | WUT;&n | Sets the temperature unit of measurement: <ul style="list-style-type: none"> ▪ °C if n=0 (<i>default</i>) ▪ °F if n=1 ▪ K if n=2 |
| RUT | RUT;n | Reads the temperature unit of measurement. |

Measurements reading:

| Command | Reply | Description |
|---------|---------|--|
| S0 | S0;meas | <p>Prints the measurements in the following sequence:</p> <ul style="list-style-type: none"> ▪ Temperature in °C ▪ Relative humidity in % ▪ Specific humidity in g/kg ▪ Absolute humidity in g/m³ ▪ Dew point in °C ▪ Frost point temperature in °C ▪ Wet bulb temperature in °C ▪ Mixing ratio in g/kg ▪ Water vapour partial pressure in hPa ▪ Saturation vapour pressure above water in hPa ▪ Saturation vapour pressure above ice in hPa ▪ Specific enthalpy in kJ/kg ▪ Barometric pressure in hPa <p>If the automatic sending of the measurements is enabled (command S1), sending S0 disables the automatic sending.</p> |
| S1 | S1;meas | Enables the automatic sending of the measurements, once per second. |

Analog outputs (optional):

| Command | Reply | Description |
|-------------------------------|------------|--|
| Humidity analog output | | |
| CRPn | CRP;& | <p>Associates the humidity analog output with:</p> <ul style="list-style-type: none"> ▪ Relative humidity (RH) if n=0 ▪ Dew Point (Td) if n=1 <p><i>Default</i> : Relative humidity (n=0)</p> |
| RRP | RRP;n | Reads the quantity associated with the humidity analog output. |
| CAAIIn...n | CAAI;& | <p>Sets n...n as humidity minimum value for the analog output, in hundredths of %RH, if the output is associated with RH, or hundredths of the set temperature unit of measurement (°C, °F or K), if the output is associated with Td.</p> <p>Min=0 (%RH), -3500 (°C Td), -3100 (°F Td) or 23815 (K Td), default=0 (=0 %RH).</p> |
| RAAI | RAAI;n...n | <p>Reads the humidity minimum value for the analog output, in hundredths of %RH, if the output is associated with RH, or hundredths of the set temperature unit of measurement (°C, °F or K), if the output is associated with Td.</p> |
| CAAFn...n | CAAF;& | <p>Sets n...n as humidity maximum value for the analog output, in hundredths of %RH, if the output is associated with RH, or hundredths of the set temperature unit of measurement (°C, °F or K), if the output is associated with Td.</p> <p>Max=10000 (%RH), 8000 (°C Td), 17600 (°F Td) or 35315 (K Td), default=10000 (=100.00 %RH).</p> |
| RAAF | RAAF;n...n | <p>Reads the humidity maximum value for the analog output, in hundredths of %RH, if the output is associated with RH, or hundredths of the set temperature unit of measurement (°C, °F or K), if the output is associated with Td.</p> |

| Command | Reply | Description |
|----------------------------------|------------|---|
| CAAin | CAAi;& | Sets the direct or reversed correspondence between analog output and humidity: <ul style="list-style-type: none"> ▪ If n=0: Min. output ⇒ Min. RH or Td Max. output ⇒ Max. RH or Td ▪ If n=1: Min. output ⇒ Max. RH or Td Max. output ⇒ Min. RH or Td <i>Default</i> : Direct correspondence (n=0) |
| RAAi | RAAi;n | Reads the type of correspondence (direct or reversed) between analog output and humidity. |
| Temperature analog output | | |
| CABIn...n | CABi;& | Sets n...n as temperature minimum value for the analog output, in hundredths of the set unit of measurement (°C, °F or K). Min=-4000 (°C, °F) or 23315 (K), default=-4000 (= -40.00 °C). |
| RABI | RABI;n...n | Reads the temperature minimum value for the analog output, in hundredths of the set unit of measurement (°C, °F or K). |
| CABFn...n | CABF;& | Sets n...n as temperature maximum value for the analog output, in hundredths of the set unit of measurement (°C, °F or K). Max=8000 (°C), 17600 (°F) or 35315 (K), default=8000 (=80.00 °C). |
| RABF | RABF;n...n | Reads the temperature maximum value for the analog output, in hundredths of the set unit of measurement (°C, °F or K). |
| CABin | CABi;& | Sets the direct or reversed correspondence between analog output and temperature: <ul style="list-style-type: none"> ▪ If n=0: Min. output ⇒ Min. temperature Max. output ⇒ Max. temperature ▪ If n=1: Min. output ⇒ Max. temperature Max. output ⇒ Min. temperature <i>Default</i> : Direct correspondence (n=0) |
| RABi | RABi;n | Reads the type of correspondence (direct or reversed) between analog output and temperature. |

Relative humidity calibration:

| Command | Reply | Description |
|----------|-----------------|--|
| CRHIn | CRHI;& | Sets the type of calibration to be used: <ul style="list-style-type: none"> ▪ Factory calibration if n=0 (<i>default</i>) ▪ User calibration if n=1 |
| RRHI | RRHI;n | Reads the type of calibration in use. |
| CRH0nnnn | CRH0;& | Calibrates the point Nr. 0 to the value nnnn in hundredths of %RH. nnnn =0...2500 (=0...25.00%). |
| CRH1nnnn | CRH1;& | Calibrates the point Nr. 1 to the value nnnn in hundredths of %RH. nnnn =3000...3600 (=30.00...36.00%). |
| CRH2nnnn | CRH2;& | Calibrates the point Nr. 2 to the value nnnn in hundredths of %RH. nnnn =3800...7000 (=38.00...70.00%). |
| CRH3nnnn | CRH3;& | Calibrates the point Nr. 3 to the value nnnn in hundredths of %RH. nnnn =7200...7800 (=72.00...78.00%). |
| CRH4nnnn | CRH4;& | Calibrates the point Nr. 4 to the value nnnn in hundredths of %RH. nnnn =8000...9500 (=80.00...95.00%). |
| WRDdate | WRD;& | Sets the user calibration date. The date should be written in the format yymmddhhmmss (yy=year, mm=month, dd=day, hh=hour, mm=minutes, ss=seconds). |
| WRHDn | WRHD;& | Resets of the user calibration point number n (n=0...4) to the factory value. If n=5, all the points are reset. |
| DRH0 | DRH0;& | Disables the calibration point Nr. 0 |
| DRH1 | DRH1;& | Disables the calibration point Nr. 1 |
| DRH2 | DRH2;& | Disables the calibration point Nr. 2 |
| DRH3 | DRH3;& | Disables the calibration point Nr. 3 |
| DRH4 | DRH4;& | Disables the calibration point Nr. 4 |
| SRH | SRH;cal_hystory | Provides the information of the last 5 user calibrations. 5 data sets are printed, each containing: <ul style="list-style-type: none"> • Calibration number (0...4, 0 is the most recent) • Calibration date (set with the command WRD) • Point Nr. 0 calibration (0=not calibrated, 2=calibrated) • Value measured before calibration (tenths of %RH) • Calibration value (tenths of %RH) • Calibration temperature (tenths of °C) • ... • Point Nr. 4 calibration (0=not calibrated, 2=calibrated) • Value measured before calibration (tenths of %RH) • Calibration value (tenths of %RH) • Calibration temperature (tenths of °C) |

Warning: if a calibration point is disabled with the DRHx command, the point must be recalibrated with the CRHx command to re-enable it.

6 Modbus-RTU protocol

By default, the transmitter has Modbus address **1** and communication parameters 19200, 8E1. The address and the communication parameters can be changed by using the appropriate serial commands of the proprietary protocol or, alternatively, directly with Modbus commands by changing the value of the Holding Registers described later.

By default, the Modbus-RTU protocol is activated after 10 seconds from the transmitter power on. It is possible to disable the first 10 seconds of waiting using the holding register with address 82 or the command WCT of the ASCII proprietary protocol.

To change the Holding Registers values, it is first necessary to enable the writing by entering the appropriate value in the register with address 30002 (see the description of the register in the Holding Registers table).

Below is the list of registers.

Input Registers:

| Address | Description | Format |
|---|--|----------------|
| MEASUREMENTS | | |
| 0 | Temperature in °C, °F or K (x100) | 32-bit Integer |
| 2 | Relative humidity in % (x100) | 32-bit Integer |
| 4 | Dew point in °C, °F or K (x100) | 32-bit Integer |
| 6 | Wet bulb temperature in °C, °F or K (x100) | 32-bit Integer |
| 8 | Absolute humidity in g/m ³ (x100) | 32-bit Integer |
| 10 | Mixing ratio in g/kg (x100) | 32-bit Integer |
| 12 | Specific enthalpy in kJ/kg (x100) | 32-bit Integer |
| 14 | Water vapour partial pressure in hPa (x100) | 32-bit Integer |
| 16 | Specific humidity in g/kg (x100) | 32-bit Integer |
| 18 | Barometric pressure in hPa (x10) | 32-bit Integer |
| 20 | Frost point temperature in °C (x100) | 32-bit Integer |
| 22 | Saturation vapour pressure above water in hPa (x100) | 32-bit Integer |
| 24 | Saturation vapour pressure above ice in hPa (x100) | 32-bit Integer |
| ERROR REGISTERS | | |
| The registers are normally at 0; other values indicate a measurement error: 1=not ready, 2=underflow, 3=overflow. | | |
| 32 | Temperature | 16-bit Integer |
| 33 | Relative humidity | 16-bit Integer |
| 34 | Dew point | 16-bit Integer |
| 35 | Wet bulb temperature | 16-bit Integer |
| 36 | Absolute humidity | 16-bit Integer |
| 37 | Mixing ratio | 16-bit Integer |
| 38 | Specific enthalpy | 16-bit Integer |
| 39 | Water vapour partial pressure | 16-bit Integer |

| Address | Description | Format |
|---------------------------------|--|----------------|
| 40 | Specific humidity | 16-bit Integer |
| 41 | Barometric pressure | 16-bit Integer |
| 42 | Frost point temperature | 16-bit Integer |
| 43 | Saturation vapour pressure above water | 16-bit Integer |
| 44 | Saturation vapour pressure above ice | 16-bit Integer |
| TRANSMITTER GENERAL INFORMATION | | |
| 100...109 | Model (20 characters) | String |
| 110...119 | Sub-model (20 characters) | String |
| 120...123 | Serial number (8 characters) | String |
| 128...131 | Firmware revision (8 characters) | String |
| 132...135 | Hardware revision (8 characters) | String |

Notes on the registers format:

- 1) To read a **32-bit integer** value, two consecutive registers starting from the one indicated must be accessed. The register with lower address contains the most significant bits.
- 2) The alphanumeric **strings** are contained in a series of 16-bit registers. Each register contains 2 characters of the string: the most significant 8 bits contain the ASCII code of the first character, the least significant 8 bits contain the ASCII code of the next character. The start character of the string is in the register of the series with the lowest address.

Example: the transmitter model, for ex. ETS80M00, is available in the registers with address from 100 to 109.

| Register address | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 |
|------------------------|------|------|------|------|------|------|------|------|------|------|
| Register content (Hex) | 4554 | 5338 | 304D | 3030 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 |
| Read value | E | T | S | 8 | 0 | M | 0 | 0 | | |

Holding Registers:

| Indirizzo | Descrizione | Formato |
|-----------|--|----------------|
| 0 | RS485 Modbus-RTU Baud Rate: 0=9600 1=19200 (default) 2=38400 3=57600 4=115200 | 16-bit Integer |
| 1 | RS485 Modbus-RTU parity and stop bits: 0=8N1 1=8N2 2=8E1 (default) 3=8E2 4=8O1 5=8O2 | 16-bit Integer |

| Indirizzo | Descrizione | Formato |
|------------------|--|----------------|
| 2 | Modbus-RTU address (1...247, default=1). | 16-bit Integer |
| 5 | Temperature unit of measurement: 0=°C (default) 1=°F 2=K | 16-bit Integer |
| 31 | Type of calibration to be used: 0=Factory calibration (default) 1=User calibration | 16-bit Integer |
| 51 | Calibrates the RH point Nr. 0 to the value entered in the register, in hundredths of %RH. The value must be in the range 0...2500 (=0...25.00%). | 16-bit Integer |
| 52 | Value, in hundredths of %RH, measured before calibration of point Nr. 0 (<i>read only parameter</i>) | 16-bit Integer |
| 53 | Temperature, in hundredths of °C, measured during calibration of %RH point Nr. 0 (<i>read only parameter</i>) | 16-bit Integer |
| 54 | Enabling status of RH calibration point Nr. 0: 0=Not calibrated, 1=Disabled, 2=Calibrated | 16-bit Integer |
| 55 | Calibrates the RH point Nr. 1 to the value entered in the register, in hundredths of %RH. The value must be in the range 3000...3600 (=30.00...36.00%). | 16-bit Integer |
| 56 | Value, in hundredths of %RH, measured before calibration of point Nr. 1 (<i>read only parameter</i>) | 16-bit Integer |
| 57 | Temperature, in hundredths of °C, measured during calibration of %RH point Nr. 1 (<i>read only parameter</i>) | 16-bit Integer |
| 58 | Enabling status of RH calibration point Nr. 1: 0=Not calibrated, 1=Disabled, 2=Calibrated | 16-bit Integer |
| 59 | Calibrates the RH point Nr. 2 to the value entered in the register, in hundredths of %RH. The value must be in the range 3800...7000 (=38.00...70.00%). | 16-bit Integer |
| 60 | Value, in hundredths of %RH, measured before calibration of point Nr. 2 (<i>read only parameter</i>) | 16-bit Integer |
| 61 | Temperature, in hundredths of °C, measured during calibration of %RH point Nr. 2 (<i>read only parameter</i>) | 16-bit Integer |
| 62 | Enabling status of RH calibration point Nr. 2: 0=Not calibrated, 1=Disabled, 2=Calibrated | 16-bit Integer |
| 63 | Calibrates the RH point Nr. 3 to the value entered in the register, in hundredths of %RH. The value must be in the range 7200...7800 (=72.00...78.00%). | 16-bit Integer |
| 64 | Value, in hundredths of %RH, measured before calibration of point Nr. 3 (<i>read only parameter</i>) | 16-bit Integer |
| 65 | Temperature, in hundredths of °C, measured during calibration of %RH point Nr. 3 (<i>read only parameter</i>) | 16-bit Integer |
| 66 | Enabling status of RH calibration point Nr. 3: 0=Not calibrated, 1=Disabled, 2=Calibrated | 16-bit Integer |

| Indirizzo | Descrizione | Formato |
|-----------|--|----------------|
| 67 | Calibrates the RH point Nr. 4 to the value entered in the register, in hundredths of %RH. The value must be in the range 8000...9500 (=80.00...95.00%). | 16-bit Integer |
| 68 | Value, in hundredths of %RH, measured before calibration of point Nr. 4 (<i>read only parameter</i>) | 16-bit Integer |
| 69 | Temperature, in hundredths of °C, measured during calibration of %RH point Nr. 4 (<i>read only parameter</i>) | 16-bit Integer |
| 70 | Enabling status of RH calibration point Nr. 4: 0=Not calibrated, 1=Disabled, 2=Calibrated | 16-bit Integer |
| 71 | Resets of RH user calibration to factory default: 0=Reset calibration point Nr. 0 1=Reset calibration point Nr. 1 2=Reset calibration point Nr. 2 3=Reset calibration point Nr. 3 4=Reset calibration point Nr. 4 5=Reset all points | 16-bit Integer |
| 72 | Year of RH user calibration | 16-bit Integer |
| 73 | Month of RH user calibration | 16-bit Integer |
| 74 | Day of RH user calibration | 16-bit Integer |
| 82 | Enabling of the 10-second wait for the @ command at power up: 0=Disabled (the transmitter starts directly in Modbus) 1=Enabled (the transmitter waits @ for 10 seconds) If the 10-second wait was disabled and 1 is set 1 in the register, the 10-second wait will occur the next time the transmitter is power cycled. | 16-bit Integer |
| 30002 | Enabling writing in Holding Register: 9876=Enabled 8888=Disabled | 16-bit Integer |

Warning: if a calibration point is disabled, the point must be recalibrated to re-enable it.

Reading of transmitter general information (function 2Bh / 0Eh):

The Modbus function code 2Bh / 0Eh allows reading the basic general information of the transmitter, consisting of:

- Manufacturer
- Transmitter model
- Firmware version

For additional information regarding the protocol, visit the site "www.modbus.org".

7 Maintenance

In order to grant measurements high accuracy, it is necessary to clean the filter periodically.

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

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

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

8 Safety instructions

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

Do not use the instrument in places where there are:

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

User obligations

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

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

9 Accessories ordering codes

The transmitter is supplied with M12 female free connector (only if the optional cable is not ordered).

The cable and the protection shield from solar radiations must be ordered separately.

Installation cables

CPM12-5... Cable with 5-pole M12 connector on one end, open wires on the other end. Length 5 m (CPM12-5.5) or 10 m (CPM12-5.10). **For Versions with only RS485 Modbus-RTU output.**

CPM12-8... Cable with 8-pole M12 connector on one end, open wires on the other end. Length 5 m (CPM12-8.5) or 10 m (CPM12-8.10). **For versions with additional analog output.**

PC connecting cables

CP24B-5 PC connecting cable for the configuration of the transmitter. With built-in RS485/USB converter. 5-pole M12 connector on sensor side and A-type USB connector on PC side. **For Versions with only RS485 Modbus-RTU output.**

CP24B-8 PC connecting cable for the configuration of the transmitter. With built-in RS485/USB converter. 8-pole M12 connector on sensor side and A-type USB connector on PC side. **For versions with additional analog output.**

Solar shields

HD9007A-1 12-ring protection shield from solar radiations. Supplied with mounting bracket.

HD9007A-2 16-ring protection shield from solar radiations. Supplied with mounting bracket.

HD9007T26.2 Adapter from Ø 26 to Ø 14 mm to fit the transmitter into the protection shield from solar radiations HD9007A-1 and HD9007A-2.

Saturated solutions

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

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

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

Spare parts

P8 Filter in PBT with 10 µm stainless steel grid.

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WARRANTY

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

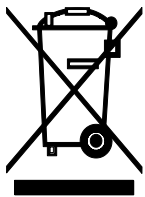
The manufacturer repairs the products that show defects of construction in accordance with the terms and conditions of warranty included in the manual of the product. For any dispute, the competent court is the Court of Padua. The Italian law and the "Convention on Contracts for the International Sales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

TECHNICAL INFORMATION

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

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

DISPOSAL INFORMATION



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

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



senseca.com



Senseca Italy S.r.l.
Via Marconi, 5
35050 Selvazzano Dentro (PD)
ITALY
info@senseca.com

