REV. 1.2
10/01/2014

HD35...

Wireless
Data Logging System

ENGLISH

The quality level of our instruments is the result of the constant development of the product. This may produce some differences between the information written in this manual and the instrument you have purchased. We cannot completely exclude the possibility of errors in the manual, for which we apologize.

The data, images and descriptions included in this manual cannot be legally asserted. We reserve the right to make changes and corrections with no prior notice.

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1 INTRODUCTION

The Delta OHM wireless data logging system allows several physical quantities to be monitored in a large variety of application fields. Data loggers are available for the monitoring of:

- Temperature
- Relative humidity
- Atmospheric pressure or differential pressure
- Luminance (lux) and UV irradiance
- Carbon monoxide (CO)
- Carbon dioxide (CO_2)
- Acceleration

The models that measure relative humidity and temperature calculate humidity derived quantities. Calculated quantities depend on the model and can be: dew point temperature, wet bulb temperature, absolute humidity, mixing ratio, partial vapor pressure.

Data loggers provided with built-in sensors and data loggers with external probes are available. They can be connected through M12 connectors or terminals according to the model. The data logger with terminal header input can be connected to:

- Transmitters with 0÷20 or 4÷20 mA current output and 0÷1 V or 0÷50 mV voltage output
- Pt100 / Pt1000 temperature sensors and K, J, T, N, E thermocouples
- Voltage-free contact output (commutations counting) or potentiometric sensors

This allows the monitoring capability of the system to be extended to many other quantities in addition to the ones mentioned above.

For each detected quantity, the user can set two alarm thresholds (high threshold and low threshold). The overrun of the thresholds can be indicated by an audible signal of the data logger through an internal buzzer; the alarm signal is immediately transmitted to the base unit and displayed on the PC. A wireless remote alarm module with relay output is available allowing other signaling devices (sirens, flashing lights…) or actuators to be activated. If the system is equipped with a GMS module, the alarm is signaled also by e-mails or SMS messages.

Systems with the following transmission frequencies are available: **868 MHz** (in compliance with EN 300 220 European Directive), **902-928 MHz** (in compliance with U.S. FCC part 15 section 247 and I.C. RSS-210 Directives) and **915,9-929,7 MHz** (in compliance with ARIB STD-T108 standard).

Thanks to wireless transmission, the installation of the system is a very simple and quick operation. In addition, the user will not have to remove the data logger from its position or reach the place where the data logger is installed to download the data measured with the PC.

The correctness of the transmitted data is ensured by the **bidirectional** communication between the base unit and the remote data loggers.

HD35AP-S basic PC software supplied with the product allows configuration of all system devices, display of connection status, level of the RF signal and battery charge level, data automatic download at regular intervals or manual download on request of the user. The data transferred to the PC are entered into a database. If the PC is connected to a local network, installing the advanced version of **HD35AP-PLUS** software (**optional**) allows also other computers connected to the same local network to access the data stored into the database.

Data loggers comply with **EN 12830** standard. The PC application software **HD35AP-S** is designed in compliance with **FDA 21 CFR part 11** recommendations: the operations are protected by access codes and, in the advanced version, a record of the performed operations is kept.

2 SYSTEM COMPONENTS

The system consists of the following components:

- **HD35AP...** base unit
- **HD35RE** repeater
- **HD35ED...** series of data loggers
- **HD35ED-ALM** remote alarm device

HD35AP... BASE UNIT

This device acts as an interface between the network data loggers that are positioned in the measurement sites, and the PC. It communicates wireless with the remote data loggers.

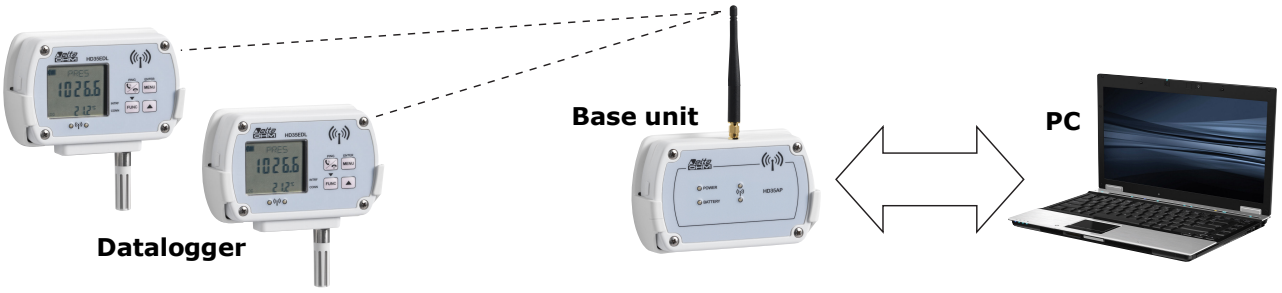


Fig. 2.1: base unit placed between data loggers and PC

HD35RE REPEATER

This device is able to act as a bridge between the base unit HD35AP… and the remote data loggers HD35ED…, allowing the communication distance between data loggers and base unit to be increased. Several repeaters in cascade can be used.

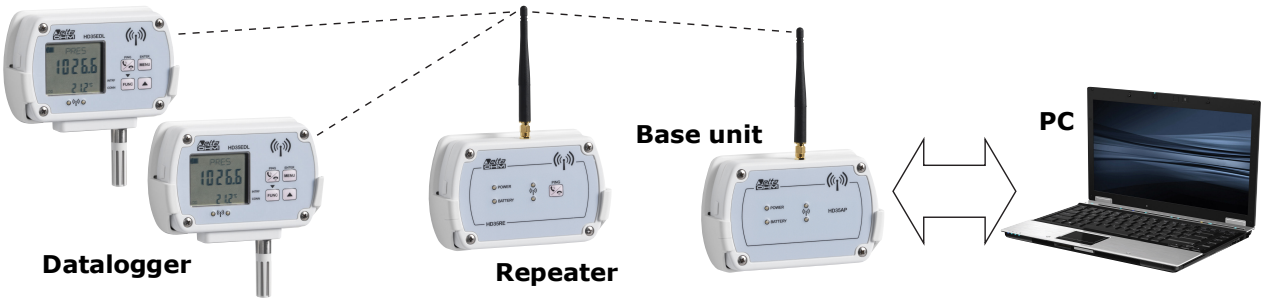


Fig. 2.2: repeater placed between data loggers and base unit

The typical transmitting range between two devices in direct communication is **300 m** in open field. **The range can be reduced in the presence of obstacles or adverse atmospheric conditions**.

HD35ED... DATA LOGGERS

Remote devices with measurement probes. They are installed in the locations to be monitored. They acquire measurements, store them in the internal memory and send them automatically to the base unit at regular intervals or on request of the user. Versions with or without LCD display are available.

HD35ED-ALM REMOTE ALARM DEVICE

Device equipped with relay outputs that allows to activate, in case of an alarm, signaling devices (sirens, flashing lights…) or actuators.

3 INSTALLING THE SYSTEM

Before placing the devices in the final working environment, it is recommended to perform the system function test on the bench. The bench test allows also the wireless network to be configured more easily, in case the supplied system is not factory-configured.

To check and make the system operational, proceed as follows:

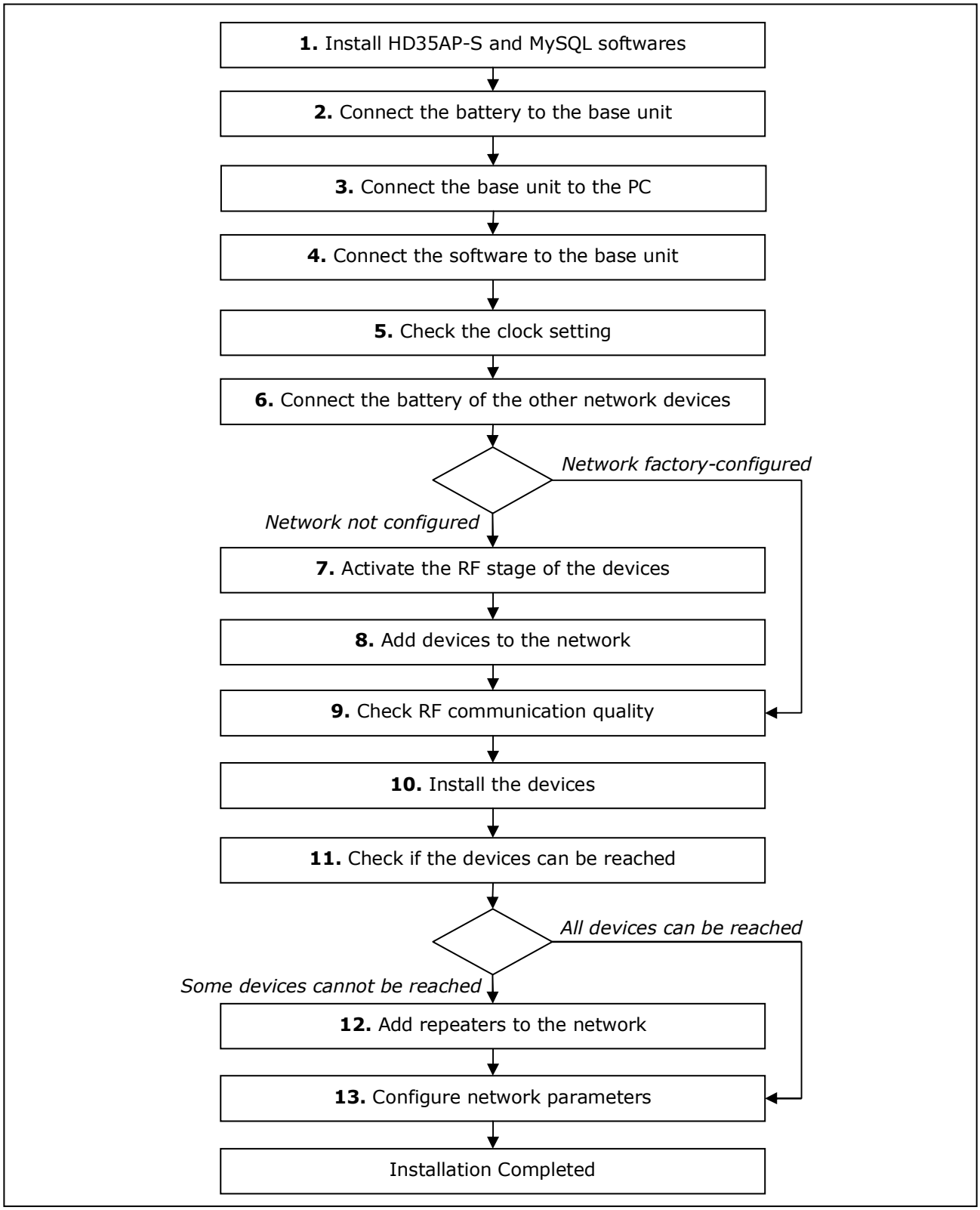


Fig. 3.1: system installation procedure

1. INSTALLING HD35AP-S SOFTWARE

The base unit is supplied with a CD-ROM containing the HD35AP-S software and MySQL Data Base Management System. Install both HD35AP-S and MySQL in your PC. Concerning the installation of MySQL, **thoroughly** follow the installation guide contained in the CD-ROM.

2. CONNECTING THE BASE UNIT BATTERY

For shipments by aircraft, the battery of the devices must be disconnected.

1. Unscrew the 4 front screws of the housing and remove the back cover.
2. Attach the battery connector to the electronic board, paying attention to the correct polarity. The connector is equipped with a polarization key that prevents the possibility of a wrong insertion of the connector.

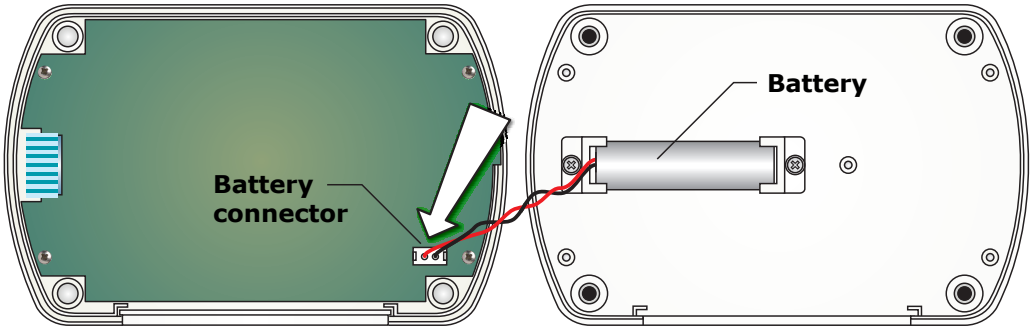


Fig. 3.2: battery in the devices in housing for internal use

3. Close the housing by fixing the 4 front screws.

- **Factory-configured system**: **first connect the battery of the base unit** and check the clock setting. Only after this operation, connect the battery of the data loggers, so that the clock can be synchronized with the updated clock of the base unit at startup.
- **Not configured system**: at startup, data loggers don't synchronize the clock with that of the base unit, consequently it is not important to power the base unit as first.

3. CONNECTING HD35AP... BASE UNIT TO YOUR PC

All the versions of the HD35AP... base unit can be connected to the USB port of a PC through the **CP23** cable. The mini-USB connector of the base unit is located in the bottom part of the housing. In this connection mode, the base unit is powered through the USB port of the PC.

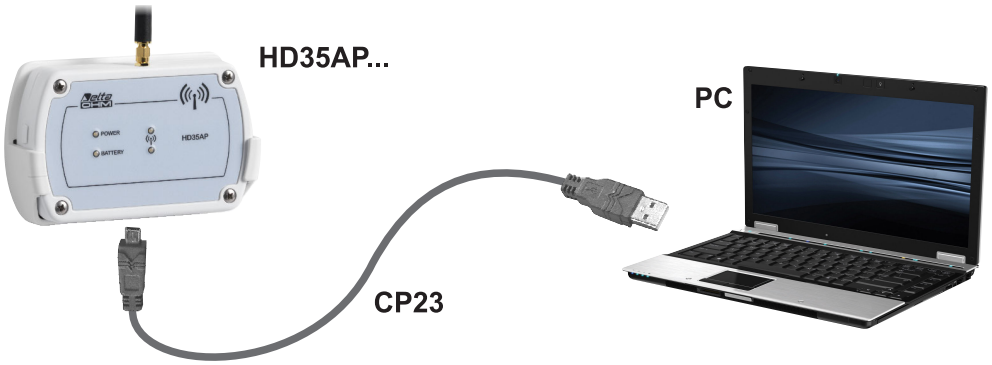


Fig. 3.3: connecting the base unit to your PC

The connection through the CP23 cable doesn't require the installation of USB drivers: when the base unit is connected to the PC, Windows® operating system automatically recognizes the unit as an HID (Human Interface Device) device and uses the drivers already included in the operating system.

The base unit version HD35APW, with Wi-Fi and Ethernet interface, can be connected in alternative to the PC through the local Wi-Fi network or local Ethernet network (see paragraph *ETHERNET or Wi-Fi* on page 15).

4. CONNECT THE SOFTWARE TO THE BASE UNIT

Start the HD35AP-S software in your PC and perform the connection procedure illustrated in the chapter " *Connection to base unit* " of the software online help (software instructions are also available in PDF format in the CD-ROM).

5. CHECK THE CLOCK SETTING

Select the item " *Setting of date and time* " of HD35AP-S software and make sure that the clock of the base unit is updated. If the clock is not updated, set it as explained in the chapter " *Clock setting* " of the software online help.

6. CONNECT THE BATTERY OF THE OTHER NETWORK DEVICES

Connect the battery of the other devices following the procedure indicated at step 2 of the previous page. In the devices with waterproof housing, the position of the battery and the connector is shown in the following figure.

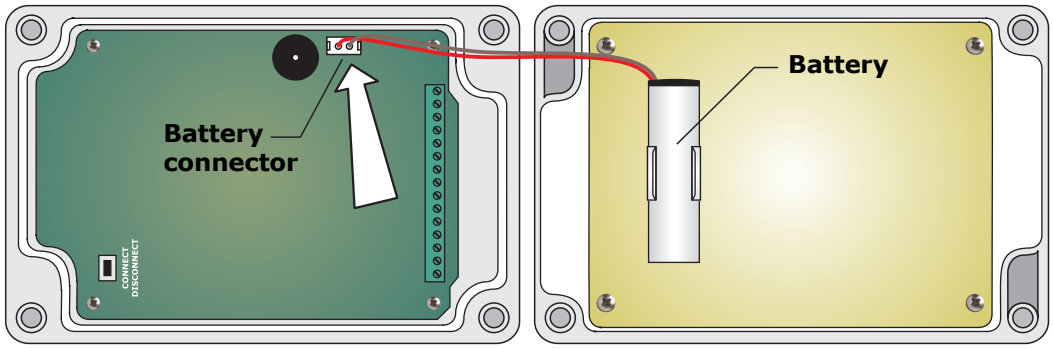


Fig. 3.4: battery in devices with waterproof housing

- **Factory-configured system**: at startup, data loggers synchronize the clock with that of the base unit. If the base unit is not yet connected to the power supply, the synchronization fails and data loggers with LCD option display the clock setting window. Clock synchronization will anyway take place automatically after connecting the base unit to the power supply. Meanwhile, data loggers start storing measurements with their date and time, not synchronized with respect to the system measurements. If you wish to set the clock manually, see paragraph *The menu in LCD data loggers* on page 30.
- **Not configured system**: at startup, data loggers don't synchronize the clock with that of the base unit. In the data loggers with LCD, the window for the clock setting is displayed. Clock synchronization will take place automatically after network configuration (step 8), in the meantime data loggers start storing measurements with their date and time. If you wish to set the clock manually, see paragraph *The menu in LCD data loggers* on page 30.

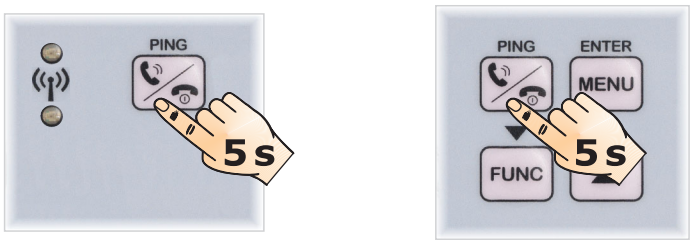
7. ACTIVATING THE RF STAGE IN THE DEVICES (DATA LOGGERS, REPEATERS AND ALARM MODULES)

In the devices belonging to a factory-configured system, the RF stage is activated automatically. In this case, proceed to step 9.

If the system is not factory-configured, the RF stage of the devices will have to be activated manually by pressing the connection button for 5 seconds.

In the models in indoor-use housing, the connection button is on the front panel.

Models without LCD



Models with LCD

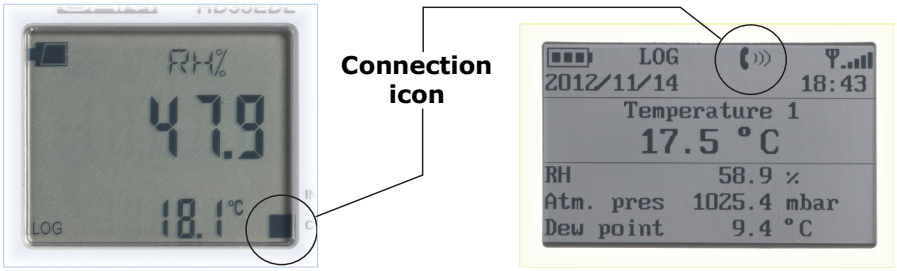
Fig. 3.5: connection button in models in indoor-use housing

In models with waterproof housing, the connection button is inside the instrument (see fig. 9.3.1 on page 53).

The activation of the RF stage is signaled by the lightning-up of the green RF LED for one second and by a beep of the buzzer. Successively, the red RF LED will start blinking until the device is added to a wireless network following the procedure indicated at step 8.

In data loggers with LCD display, the activation of the RF stage is signaled also by the connection icon. The icon will go on blinking until the device is added to a wireless network.

Custom LCD



Connection icon

Graphic LCD

Fig. 3.6: connection icon in the display

In case of doubt of the RF stage status in the devices without LCD (for example, because LEDs seldom blink due to a long logging interval), press the connection button for 5 seconds. If the green RF LED lights up, the RF stage was not active and will be activated. If the red RF LED lights up, the RF stage was already active and will be deactivated; in that case, press again the connection button for 5 seconds to reactivate it.

8. ADDING THE DEVICES TO THE NETWORK

If the network structure is not configured, it is necessary to add data loggers and any repeaters and alarm modules to the base unit. The adding procedure, described in detail in the chapter " *Adding devices to the network* " in the software online help, is briefly outlined hereunder:

1. Select the command " *Network* " of HD35AP-S software.
2. In the section " *Add Devices* " of the window " *Network* ", select the button " *Execute search* ".
3. At the end of the search, the software will list the devices available to be added to the network; select the devices, identified by the RF address, and enter the serial number of each device (RF address and serial number are written on the label on the rear of the instrument).
4. Select the button " *Add to network* ".

Note: the procedure for adding the devices to the network allows a limited number of devices to be added at a time. If the software doesn't list all the devices to be added, complete in any case the procedure with the listed devices and repeat the procedure to add the missing devices. By repeating the procedure, the software will list only the devices that have not been added yet.

The maximum number of devices that can be added to a base unit depends on the data transmission interval, as indicated in the following table.

TAB. 3.1: Number of devices manageable by the base unit

Data transmission interval	Number of devices manageable by the base unit	Data transmission interval	Number of devices manageable by the base unit
1 s	12	**10 s**	120
2 s	24	**15 s**	180
5 s	60	**> 30 s**	254

The table refers to the condition of direct transmission between base unit and data loggers (1 "Hop"). In the presence of repeaters, the data transmission requires more time, and the number of devices manageable by the base unit could be lower than the one indicated.

9. CHECKING THE QUALITY OF RF COMMUNICATION

The correct RF communication between base unit and the other devices connected to the network can be checked in the following ways:

- In the main window of the HD35AP-S software, by checking that the RF signal level remains high, that the strength of the received signal RSSI (Received Signal Strength Indication) exceeds -85 dBm and that the percentage of transmission errors PER (Packet Error Rate) is close to zero.

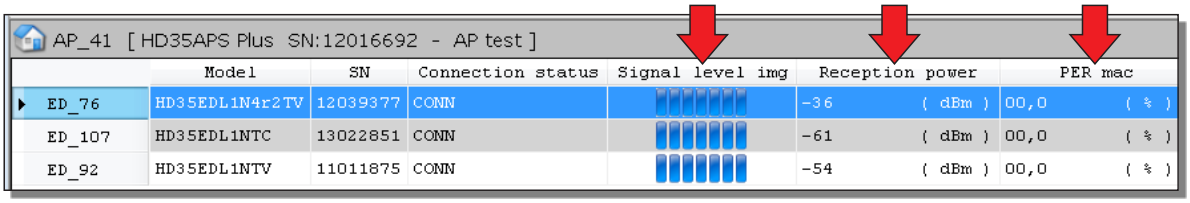


Fig. 3.7: verification of RF communication with HD35AP-S software

- In data loggers with display, by checking that the strength of the received signal RSSI exceeds -85 dBm and that the percentage of transmission errors PER is close to zero. Use the button ▲ to display RF RSSI and PER quantities.
- In the devices without display, by briefly pressing the connection button (PING function) and by making sure that the green RF LED blinks for a few seconds;

10. INSTALLING THE DEVICES

After a bench test of the system, proceed with the individual installation of the devices in the final work location.

If data loggers using external probes with cable are installed, place the probes in the environment to be monitored and connect them to the data loggers (for the connectors layout, see paragraphs *Data logger models in indoor-use housing* on page 26 and *Data logger models in waterproof housing* on page 51).

11. CHECKING WHETHER THE DEVICES ARE REACHABLE

After installing the devices, you need to verify again the correct RF communication between the base unit and the other devices of the network, in order to make sure you didn't place the devices too far from the base unit or in places that make RF transmission difficult (shielded environments or with several obstacles). To check RF communication, proceed as indicated at step 9.

12. ADDING REPEATERS TO THE NETWORK

If a device is not reachable after installation (it fails communication with the base unit), it could be necessary to install one or more repeaters in intermediate points between the device and the base unit.

To add a repeater to the network, connect the internal battery to the repeater and repeat the installation procedure from step ☐ only for the repeater.

13. CONFIGURING NETWORK PARAMETERS

Through the HD35AP-S software, set all the system operation parameters: logging intervals, alarm thresholds, user codes, etc.

For data loggers, specify whether they are installed in a stationary location or mobile location (for ex. in an articulated vehicle).

See software instructions for the setting of the various parameters.

CHANGING THE RF BAND IN THE ...U MODELS

The …U models can operate in the 902-928 (U.S.A. and Canada), 915-928 (Australia) or 921-928 (New Zealand) MHz frequency band. To change the band in the devices with LCD, select the *RF Frequency* item of the *RF Parameters* menu (models with graphic LCD) or the *RF_FREQ_MHZ* item of the *RF_MENU* menu (models with custom LCD). To change the band in the devices without LCD, proceed as follows:

1) If the device is equipped with mini-USB connector on the housing side, connect it to the PC by means of the **CP23** cable.
2) Start the HD35AP-S software and select the *Tools >> HID terminal* command.
3) Select *Setup >> Uart configuration*.
4) Set the Baud Rate to 9600 for the …ED devices. Set the Baud Rate to 115200 for the …RE and …AP devices. Press *Apply*.
5) Select *Connect*.
6) Transmit the command **<000>PW;*nnnn*** with *nnnn*=administrator password.
7) Transmit the command **<000>MC;*n*** with *n*=1 for the 902-928 MHz band, *n*=2 for the 915-928 MHz band and *n*=3 for the 921-928 MHz band.
8) Select *Disconnect*.

Note: after the transmission of a command, check that in the reply of the device appears the confirmation symbol **&**.

4 NETWORK MODIFICATION

One or more devices can be added or removed to/from the network at any time.

ADDING A DEVICE TO AN ALREADY OPERATING NETWORK

To add a device to the network, connect the internal battery to the device and repeat the installation procedure from step ☐ concerning only the device to be added.

REMOVING A DEVICE FROM AN ALREADY OPERATING NETWORK

To remove a device from the network, follow the procedure indicated in detail in the chapter " *Removing devices from the network* " of the software online help, and briefly described hereunder:

1. Select the command " *Network* " of the HD35AP-S software.
2. In the section " *Delete Devices* " of the window " *Network* ", select the device that you wish to remove from the network.
3. Select the button " *Delete Devices* ".

The removal procedure of a device from the network allows to select whether to turn-off the device RF circuit after disconnection or to keep it turned-on so as to allow any connection to another network. If the RF circuit is kept turned-on, it turns-off after 30 minutes if in the meantime the device is not connected to another network.

5 INSTALLING THE HOUSING FOR INDOOR USE

The installation of models in indoor-use housing can be fixed, by means of anodized-aluminum flanges to be attached to the back of the housing, or removable, by means of a practical plastic support to be fixed to the wall. The use of flanges allows preventing the instrument to be taken away, thanks to the possibility of applying a padlock, inserted in a fastening pin to be fixed to the wall.

Removable installation

1. Fix the plastic support to a wall.
2. Insert the device into the support pushing it downwards.

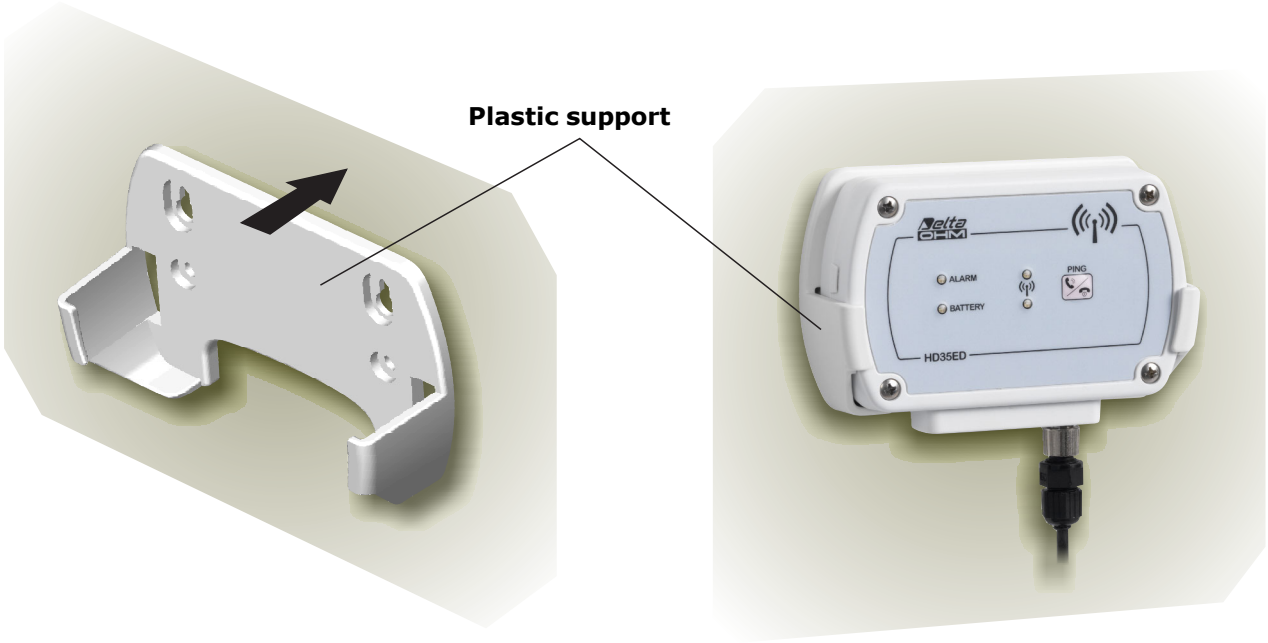


Fig. 5.1: removable installation of the indoor-use housing

Fixed installation

1. Fasten the two flanges to the back of the device housing.
2. Fix the padlock pin and the device with the flanges to the wall.
3. Attach the padlock.

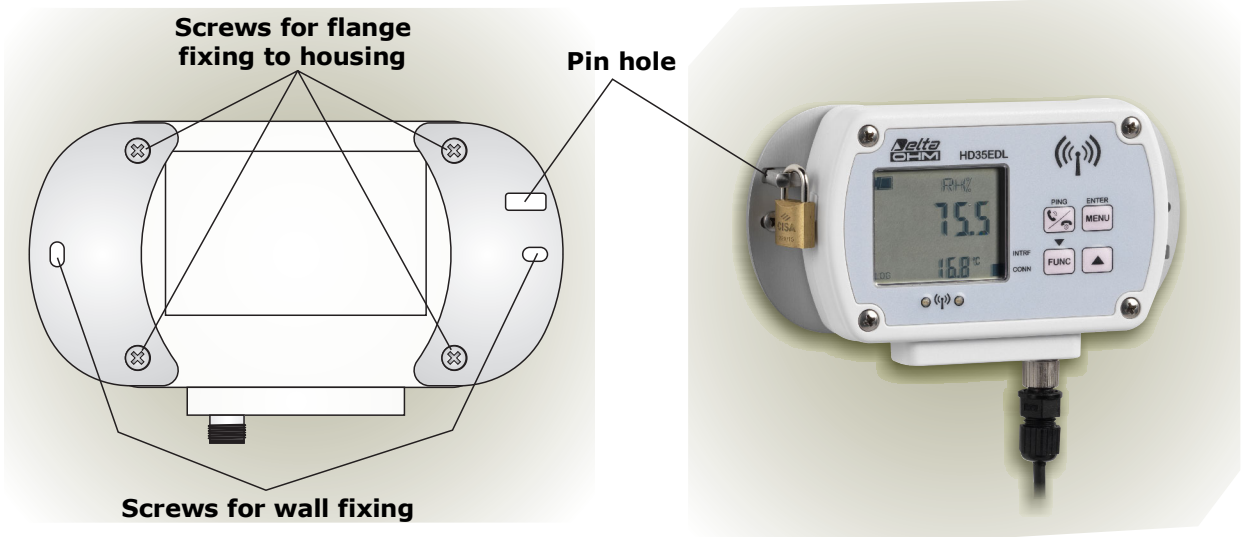


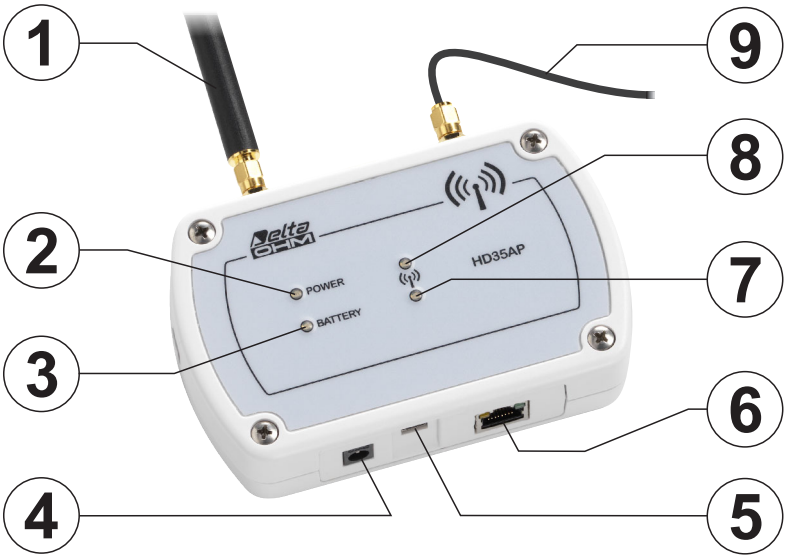
Fig. 5.2: fixed installation of indoor-use housing

6 BASE UNIT HD35AP...

6.1 AVAILABLE VERSIONS

- **HD35AP**: with USB output only;
- **HD35APS**: with USB output and **RS485** output with **MODBUS-RTU** protocol; the base unit operates as a multiplexer for the transmission of MODBUS commands from PC/PLC to network devices;
- **HD35APW**: with USB output, **Wi-Fi** interface for connection to the local wireless network and **ETHERNET** connection for cable connection to the local network; it allows the use of **MODBUS TCP/IP** protocol; integrated Web server;
- **HD35APG**: with USB output and integrated **GSM** module for **e-mail** or **SMS** alarm transmission and stored data transmission via **e-mail** or to an **FTP** address; it allows communication with a PC through the **GPRS TCP/IP** protocol.

6.2 DESCRIPTION



1. RF antenna for transmission in ISM band. In the HD35APG model the antenna is on the left. In the other models the antenna is in the center.
2. POWER LED: in red color, it indicates the presence of an external power supply; it blinks if the battery is recharging.
3. BATTERY LED: in green color, it indicates the internal battery charge level. When the indicator light is steady on, the battery is fully charged; as the battery is running low, the LED blinks with a lower and lower frequency (the blink period increases of 1 second for each 10% decrease of the battery charge).
4. Connector for external 6 Vdc power supply (**SWD06**).
5. Mini-USB connector for PC connection. The PC USB port powers the instrument in the absence of an external power supply.
6. Connector present only in **HD35APW** and **HD35APS** models. In HD35APW models, the connector is a RJ45 type for connection to the ETHERNET network. In HD35APS models, the connector is a 8-pole M12 type for connection to the RS485 network.
7. Green RF LED: it blinks when the unit is in normal operation mode.
8. Red RF LED: it blinks to signal problems in RF transmission.
9. GSM antenna cable (only **HD35APG**). Place the GSM antenna at least 30 cm away from the RF antenna.

6.3 RF LEDs SIGNALS

GREEN LED	RED LED	DESCRIPTION
ON	ON	Initialization phase after a reset or battery connection.
Short blink every 3 s	OFF	Normal operation mode.
Short blink every 3 s	Short blink every 3 s	RF alarm: at least one device exceeded the set PER threshold (Packet Error Rate).
Blinking 1 s ON / 1 s OFF		The unit is changing RF channel.
Blinking 1 s ON / 1 s OFF	Blinking 1 s ON / 1 s OFF	The unit is changing RF channel and signaling an RF alarm (alarm signaling is normal during an RF channel change).
OFF	Blinking 1 s ON / 4 s OFF	Date/time not set. It is necessary to set the clock.
OFF	Blinking 1 s ON / 2 s OFF	There is an error in the user configuration parameters.
OFF	Blinking 1 s ON / 1 s OFF	There is an error in the factory configuration parameters or a hardware component is not working properly.
OFF	OFF	Firmware upload or network file transfer. The RF activity is suspended until upload completion.

6.4 USB CONNECTION

All base unit versions can be connected to a PC through the mini-USB connector and **CP23** cable. In this connection mode, the base unit is powered through the PC USB port.

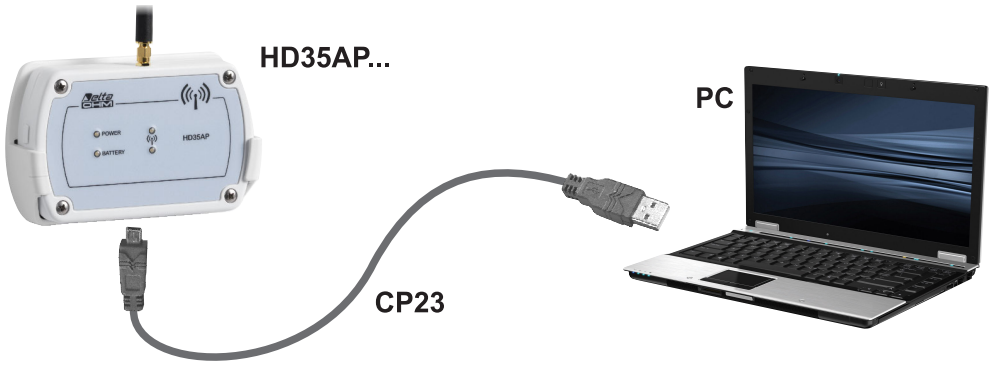


Fig. 6.4.1: USB connection

Connection through CP23 cable doesn't require the installation of USB drivers: when the base unit is connected to a PC, Windows® operating system automatically recognizes the unit as an HID device (Human Interface Device) and uses the drivers already included in the operating system.

Note: if the external power supply is not used but only the USB connection, it is recommended to connect the unit to a minimum 500 mA USB port to allow a sufficient recharging of the internal battery.

6.5 ETHERNET OR WI-FI CONNECTION

The **HD35APW** base unit version can be connected to a PC through an Ethernet or Wi-Fi local network. The choice of the connection mode, Ethernet or Wi-Fi, and of the relevant settings must be performed with the HD35AP-S software.

In the connection mode through local network, the base unit must be powered by means of an external power supply, because the internal battery has a few days life.

For the Ethernet mode, connect the RJ45 connector of the base unit to a local network socket by means of a standard Ethernet cable.

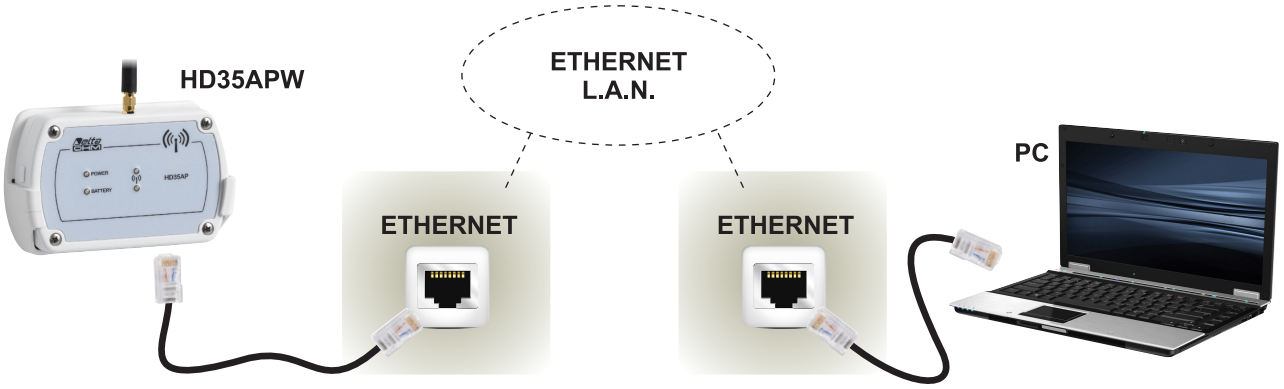


Fig. 6.5.1: ETHERNET connection

In Wi-Fi mode, the base unit can function as a **client**-type device and be connected to the network router (Wi-Fi Access Point), or it can work as a **server**-type device and provide the function of Wi-Fi router, allowing a direct connection to the PC. The choice of client or server mode should be done with the HD35AP-S software.

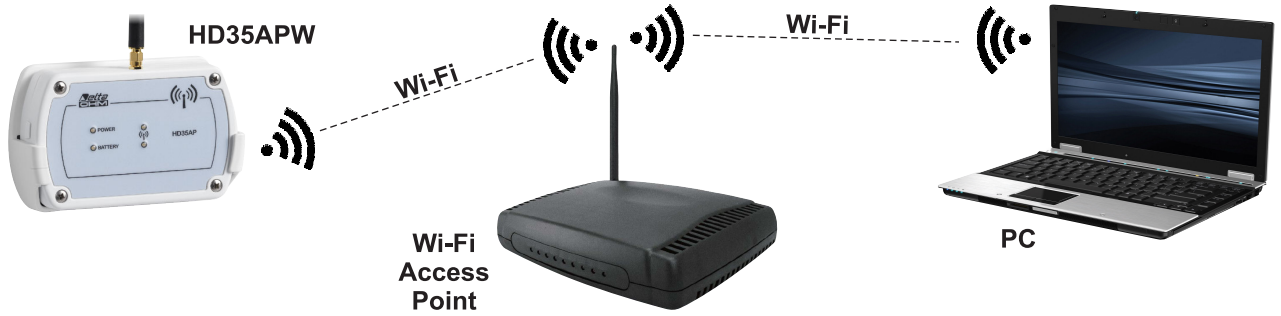


Fig. 6.5.2: base unit in Wi-Fi mode operating as a client

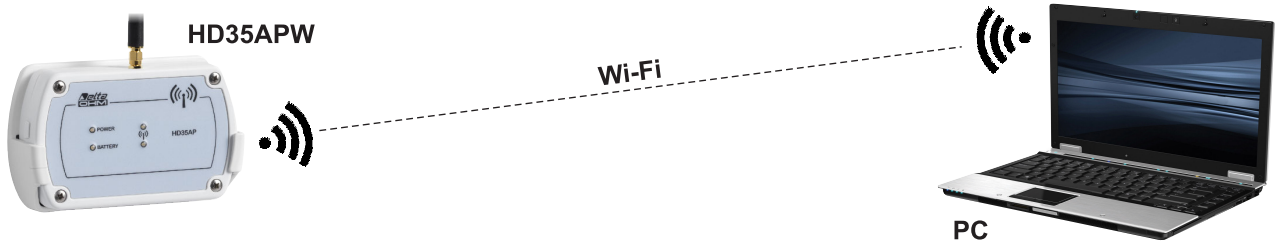


Fig. 6.5.3: base unit in Wi-Fi mode operating as a server

If the base unit operates in Ethernet or Wi-Fi client mode, it is possible to set a fixed IP address or configure the DHCP mode (Dynamic Host Configuration Protocol) so as the unit requests a dynamic IP address to the network server/router.

It is possible to access the base unit from any PC of the local network where the basic HD35AP-S software was installed (see the connection procedure presented in chapter " *Connection to base unit* " of the software online help). To access the data downloaded in the database from a PC other than that where the database was installed **you need instead the advanced version of the software HD35AP-PLUS**.

6.6 RS485 CONNECTION

The **HD35APS** base unit version has a RS485 communication port with **MODBUS-RTU** protocol. For connection to the port, use the CPM12-8P… series cables with 8-pole M12 connector. The figure and the table below show the numbering and the function of the connector contacts:

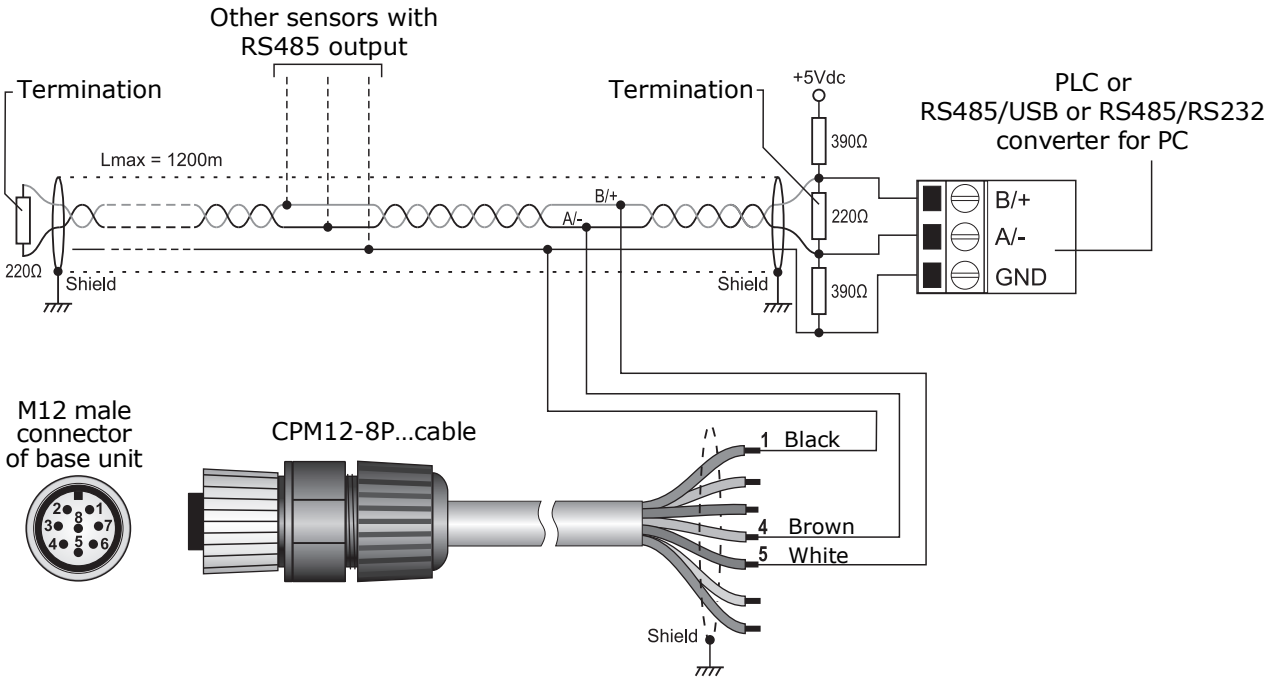


Fig. 6.6.1: RS485 connection

TAB. 6.6.1: CPM12-8P… cable

Connector	Function	Color B
1	GND	Black
2	Not connected	
3	Not connected	
4	RS485 A/-	Brown
5	RS485 B/+	White
6	Not connected	
7	Not connected	
8	Not connected	

Thanks to RS485 connection, several instruments can be connected in a multi-point network. The instruments are connected in sequence by means of a shielded cable with twisted pair wires for signals and a third wire for the ground.

Line terminations must be placed at the ends of the network. In order for the line to be polarized during non-transmission periods, resistors are used to connect signal lines and power supply. Polarization resistors are in one point only in the line, in the proximity of the PC or PLC. The cable shield must be connected to both ends of the line.

The maximum number of devices that can be connected to the line (Bus) RS485 depends on the load characteristics of the devices to be connected. The RS485 standard requires that the total load doesn't exceed 32 (Unit Loads). The load of a base unit HD35APS is equal to 1 unit load. If the total load is higher than 32 unit loads, divide the network in segments and add a signal repeater between a segment and the following. A line termination must be placed at both ends of each segment.

The cable maximum length depends on the transmission speed and on the cable characteristics. Typically, the maximum length is 1200 m. The data line must be kept separated from any power lines to avoid interferences to the transmitted signal.

Each instrument in the RS485 network is univocally identified by an address ranging within 1 and 247. **No more than one transmitter with the same address can be present in the same network**.

Before connecting the base unit to the RS485 network, configure address and Baud Rate (see chapter " *HD35AP… base unit configuration* " of the software *online help*). The communication parameters in the PC/PLC must be the same as those set in the base unit.

6.7 GSM CONNECTION

In order to use the GSM functionalities of the base unit **HD35APG**, a **SIM** card enabled for data transmission must be inserted into the unit. The card should be requested to a carrier that has an adequate coverage of the GSM network in the place where the base unit will be installed. To insert the card, proceed as follows.

1. Unscrew the 4 front screws on the housing and remove the back cover.
2. Disconnect the battery.
3. Press the release button of the SIM housing and, keeping the button depressed, extract the card by making it slide upward.

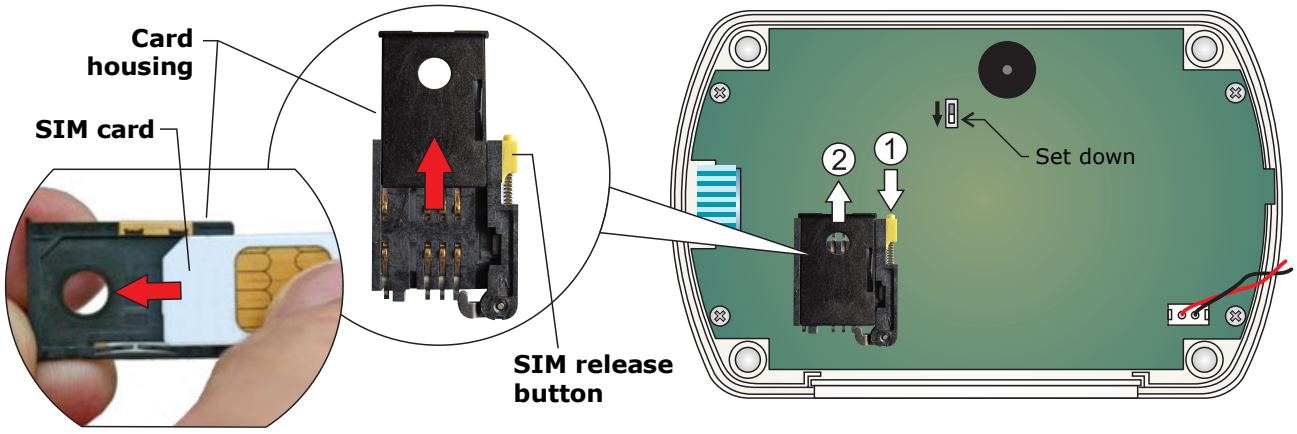


Fig. 6.7.1: inserting the SIM card

4. Insert the SIM card into its housing so as the SIM card contacts face the outside of the housing. The housing is provided with an insertion key that prevents the possibility of inserting the SIM card improperly.
5. Put the SIM housing back in place, making sure that the SIM card contacts face the instrument board.
6. Reconnect the battery.
7. Close again the housing by fixing the 4 front screws.

Through the HD35AP-S software, set the necessary information for GSM operation: SIM PIN, name of the APN access point, e-mail account and addresses, FTP address, telephone numbers, data transmission mode, etc. (see chapter " *GSM Options*" of the software online help).

6.7.1 SENDING COMMANDS TO THE BASE UNIT FROM A MOBILE PHONE

SMS messages containing commands can be sent by a mobile phone to the HD35APG base unit, to change some GSM settings of the unit. This feature is useful in case a connection to a PC with the base unit is not available.

The SMS must be sent to the number of the SIM card inserted into the base unit.

The following table lists the available commands:

TAB. 6.7.1: SMS commands

Command	Description
RESET	Reset of the base unit
EMAIL-ON	Activates periodic download of measurement data via e-mail
EMAIL-OFF	Deactivates periodic download of measurement data via e-mail
EMAIL-PERIOD= *period index*	Set the transmission interval via e-mail, where *period index*: 0->15 min, 1->30 min, 2->1 hour, 3->2 hours, 4->4 hours, 5->8 hours, 6->12 hours, 7->24 hours, 8->2 days, 9->4 days, 10->1 week
EMAIL-DL-START	Activates immediate data download by e-mail starting from the last measurement transmitted
EMAIL-DL-FROM=*YYYY/MM/DD HH:MM:SS*	Downloads data by e-mail starting from the specified date, where YYYY: year, MM: month, DD: day, HH: hour, MM: minutes, SS: seconds
EMAIL-DL-INTERVAL=*YYYY/MM/DD HH:MM:SS - YYYY/MM/DD HH:MM:SS*	Downloads by e-mail all data between the specified dates, where YYYY: year, MM: month, DD: day, HH: hour, MM: minutes, SS: seconds
EMAIL-ALARM-REPORT	Transmits by e-mail a report containing the current measurements of the selected devices for SMS/e-mail alarms
EMAIL-REPORT	Transmits by e-mail a report containing the current measurements of all the network devices
EMAIL-HELP	Transmits an e-mail containing a list of all SMS commands
FTP-ON	Activates the periodic download of measurement data via FTP
FTP-OFF	Deactivates the periodic download of measurement data via FTP
FTP-PERIOD= *period index*	Set the transmission interval via FTP, where *period index*: 0->15 min, 1->30 min, 2->1 hour, 3->2 hours, 4->4 hours, 5->8 hours, 6->12 hours, 7->24 hours, 8->2 days, 9->4 days, 10->1 week
FTP-DL-START	Activates immediate data download by FTP starting from the last measurement transmitted
FTP-DL-FROM=*YYYY/MM/DD HH:MM:SS*	Downloads data via FTP starting from the specified date, where YYYY: year, MM: month, DD: day, HH: hour, MM: minutes, SS: seconds
FTP-DL-INTERVAL=*YYYY/MM/DD HH:MM:SS - YYYY/MM/DD HH:MM:SS*	Downloads by FTP all data between the specified dates, where YYYY: year, MM: month, DD: day, HH: hour, MM: minutes, SS: seconds
FTP-ALARM-REPORT	Transmits by FTP a report containing the current measurements of the selected devices for SMS/e-mail alarms
FTP-REPORT	Transmits by FTP a report containing the current measurements of all the network devices
FTP-HELP	Transmits by FTP a file containing a list of all SMS commands
SMS-ALARM-ON	Activates the transmission of alarm SMS for the overrun of the measurement thresholds for the selected devices
SMS-ALARM-OFF	Deactivates the transmission of alarm SMS for the overrun of the measurement thresholds for the selected devices
SMS-RF-ALARM-ON	Activates the transmission of alarm SMS for RF problems in the selected devices
SMS-RF-ALARM-OFF	Deactivates the transmission of alarm SMS for RF problems
EMAIL-ALARM-ON	Activates the transmission of e-mail alarms when the selected devices have measurements in alarm
EMAIL-ALARM-OFF	Deactivates the transmission of e-mail alarms for measurement alarms
EMAIL-RF-ALARM-ON	Activates the transmission of e-mail alarms when the selected devices have RF problems
EMAIL-RF-ALARM-OFF	Deactivates the transmission of e-mail alarms for RF problems
SMS-ALARM-REPORT	Transmits by SMS the list of the devices in alarm condition. Only the selected devices are taken into consideration for SMS alarms
SMS-DEVICE-ALARM-REPORT=*RF address*	Transmits via SMS a report of the measurements selected for SMS alarms, of the device with specified RF address

Command	Description
SMS-DEVICE-REPORT= *RF address*	Transmits via SMS a report of the measurements of the device with specified RF address
SMS-HELP	Transmits an SMS containing the list of all SMS commands
TCP-SERVER-ON	Activates a TCP connection with AP acting as a TCP server
TCP-SERVER-OFF	Deactivates the TCP connection with AP acting as a TCP server
TCP-CLIENT-ON	Activates a TCP connection with AP acting as a TCP client
TCP-CLIENT-OFF	Deactivate the TCP connection with AP acting as a TCP client
TCP-SERVER=*server address*	Specifies the server address for TCP connection when AP acts as TCP client. The server-address string can be a domain or a IP address
TCP-SERVER-PORT=*port number*	Specifies the number of the TCP port used by the remote server to accept connections with AP when AP acts as TCP client
TCP-LISTEN-PORT=*port number*	Specifies the number of the TCP listening port used by AP when AP acts as TCP server
ADD-PHONE=*phone number*	Adds a phone number to the list of numbers considered for SMS alarms
CANC-PHONE	Delete my phone number and don't consider it any more for SMS alarms. The primary phone number cannot be deleted
ERASE-PHONE=*phone number index*	Deletes the phone number with specified index. This command is accepted only by the primary phone number

Up to 16 commands can be written in the same text message, separated by spaces or commas.

For safety, commands are executed only if they are coming from the cell numbers set in the HD35AP-S software and if the SMS text starts with a user-defined key word. The key word is set through the HD35AP-S software, going to the menu " *GSM options* " at the item " *SMS recipients* " and setting the field " *SMS keyword* " (see chapter " *GSM settings* " of the software online help).

Example: supposing you entered the string **W72A** in the *SMS keyword* field and you wish to activate periodic download via e-mail of the measured data with an interval of 1 hour, you will have to send the following text message:

W72A EMAIL-ON EMAIL-PERIOD=2

With the commands EMAIL-HELP, FTP-HELP and SMS-HELP you can ask the base unit to send respectively by e-mail, to an FTP address and through SMS the complete list of the available SMS commands. This function is useful especially if you don't have the manual at hand, or to obtain the updated command list following the base unit firmware updates.

6.7.2 GPRS TCP/IP CONNECTION

Through GPRS TCP/IP protocol, it is possible to interact with the HD35APG base unit from a remote PC with an Internet connection.

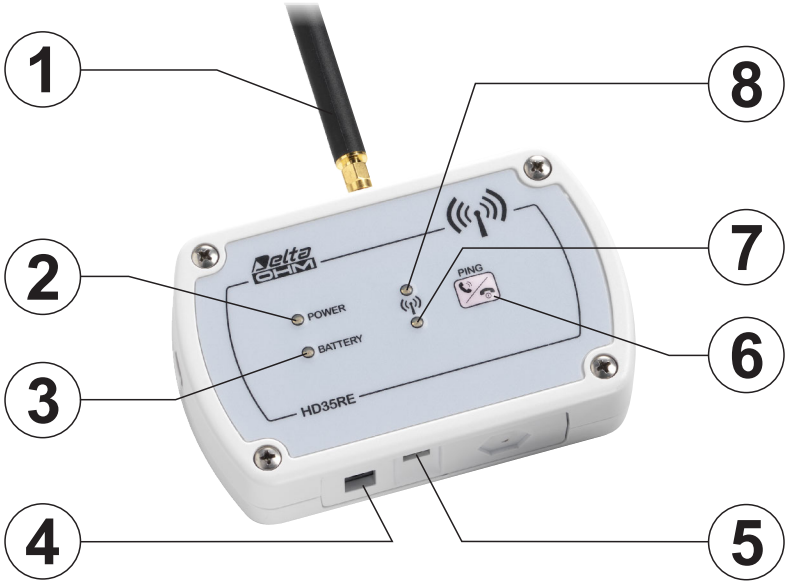
To activate this type of connection you have to send the SMS commands TCP-CLIENT-ON or TCP-SERVER-ON to the base unit.

6.8 TECHNICAL FEATURES OF THE BASE UNIT

Power supply	Internal lithium-ion 3.7 V **rechargeable** battery, 2250 mA/h capacity, JST 3-pole connector **Optional** external 6 Vdc power supply (**SWD06**) Directly powered by a PC USB port
Current consumption	30 mA
Transmission frequency	868 MHz, 902-928 MHz or 915.9-929.7 MHz according to the model
Antenna	External whip antenna
Transmission range	300 m in open field **The range can be reduced in the presence of obstacles or adverse atmospheric conditions**
Serial outputs	USB with Mini-USB connector (**CP23** cable) RS485 with **MODBUS-RTU** protocol (HD35APS only)
Ethernet connection	HD35APW model only. Allows **MODBUS TCP/IP** protocol. With integrated Web server.
Wi-Fi connection	HD35APW model only. Allows **MODBUS TCP/IP** protocol. With integrated Web server.
GSM connection	HD35APG model only. For the transmission of alarm **SMS** and data by **e-mail** or **FTP**. Allows **GPRS TCP/IP** protocol.
Internal memory	The number of storable samples depends on the type of data loggers connected. The capacity is of 226.700 samples if all data loggers record 7 quantities.
LED indicators	Presence of external power supply, battery charge level, RF communication status.
Battery life	**Typically 3 days**
Operating temperature and humidity	-10…+60 °C / 0…85 %RH non condensing
Dimensions	See dimensional drawings
Weight	About 200 g. (battery included)
Housing	ABS
Protection degree	IP 64
Installation	Wall support (**supplied**) for removable installation or flanges (**option**) for fixed installation

7 HD35RE REPEATER

7.1 DESCRIPTION



1. RF Antenna.
2. POWER LED: red color, it indicates the presence of the external power supply; it blinks if the battery is charging.
3. BATTERY LED: green color, it indicates the internal battery charge level. When the indicator light is steady on, the battery is fully charged; as the battery is running low, the LED blinks with a lower and lower frequency (the blink period increases of 1 second for each 10% decrease of the battery charge).
4. Connector for external 6 Vdc power supply (**SWD06**).
5. Mini-USB connector for PC connection. Use reserved for technical assistance.
6. Connection button.
7. Green RF LED: it blinks if the data transmission was successful.
8. Red RF LED: it blinks to signal that data transmission has failed.

The green and red RF LEDs blink simultaneously if the device is in error condition.

Power supply: since the repeater is normally not always connected to a computer, it is advisable to use an external power supply, since the internal battery life is of a few days.

7.2 CONNECTION TO THE WIRELESS NETWORK

The device can be connected and disconnected to/from the wireless network by **pressing for 5 seconds** the connection button on the front panel (see step 6 of paragraph 7.1).

If the device is disconnected, by pressing the connection button for 5 seconds the buzzer emits a beep and the green LED activates for one second to indicate the start of the connection procedure. If the device belongs to a wireless network and the base unit is reachable, once connected, the buzzer emits a second beep and the green RF LED will blink during data transmission. If the device doesn't belong to a wireless network or the base unit cannot be reached, the second beep of the buzzer is not emitted and the red RF LED will blink.

If the device is connected, by pressing the connection button for 5 seconds the buzzer emits a beep, the red RF LED activates for one second and the device is disconnected.

PING function:

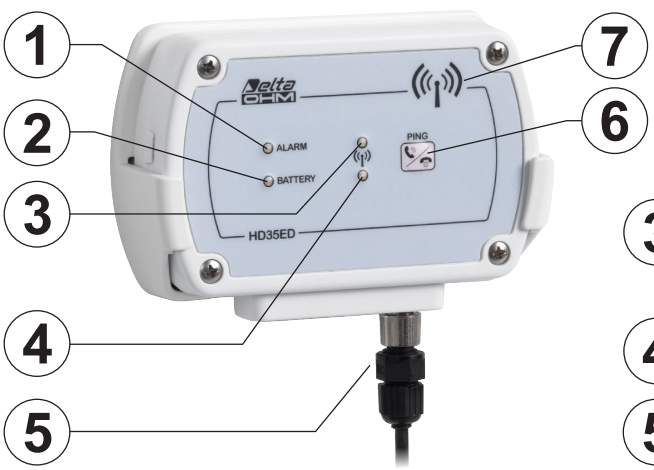
In the devices connected to a wireless network it is possible to check if the base unit can be reached by briefly pressing the connection button: if the green RF LED is blinking, it means that the base unit is reachable, otherwise it will be the red RF LED to blink.

7.3 TECHNICAL FEATURES OF THE REPEATER

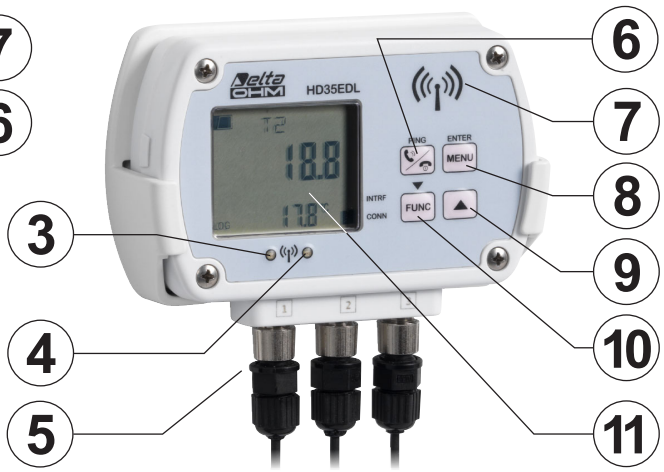
Power supply	Internal lithium-ion 3.7 V **rechargeable** battery, 2250 mA/h capacity, JST 3-pole connector **Optional** external 6 Vdc power supply (**SWD06**) Directly powered by a PC USB port
Current consumption	30 mA
Transmission frequency	868 MHz, 902-928 MHz or 915.9-929.7 MHz according to the model
Antenna	External whip antenna
Transmission range	300 m in open field **The range can be reduced in the presence of obstacles or adverse atmospheric conditions**
Serial outputs	USB with Mini-USB connector (**CP23** cable) **For configuration only, not for data download**
LED indicators	Presence of external power supply, battery charge level, RF communication status.
Keyboard	Connection button
Battery life	Typically 3 days
Operating temperature and humidity	-10…+60 °C / 0…85 %RH non condensing
Dimensions	See dimensional drawing
Weight	About 200 g (battery included)
Housing	ABS
Protection degree	IP 64
Installation	Wall support (**supplied**) for removable installation or flanges (**option**) for fixed installation

8 HD35ED... DATA LOGGERS FOR INDOOR USE

8.1 DESCRIPTION



Models without LCD display



Models with LCD display

1. ALARM LED: red color; it blinks when a measurement is in alarm condition.

2. BATTERY LED: green color, it indicates the internal battery charge level. As the battery is running low, the LED blinks with a lower frequency (the blinking period increases of 1 second for each 10% decrease of the battery charge).

3. Red RF LED: it blinks to signal that data transmission has failed.

4. Green RF LED: it blinks when the data transmission has been successful.

5. Probes and/or integrated sensors. The aspect of the lower part of the data logger depends on the model (see the following page).

6. Connection button.

7. Internal RF antenna.

8. MENU/ENTER key: allows access to the configuration menu; confirm the selected option or the set value in the menu.

9. ▲ key: in normal operation, it scrolls the quantities measured by the data logger; it scrolls upwards the available options or decreases the set value in the menu.

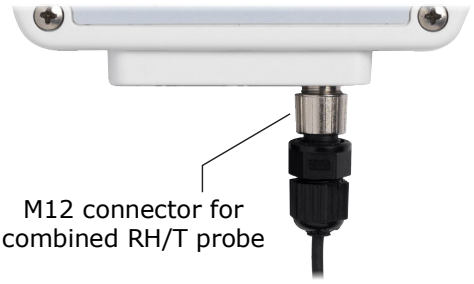
10. FUNC/▼key: in normal operation, it displays the maximum (MAX), the minimum (MIN) and the average (AVG) of the measurements; it scrolls downwards the available options or decreases the set value in the menu.

11. LCD Display. The type of display, custom or graphic, depends on the model.

The green and red RF LEDs blink simultaneously if the device is in error condition.

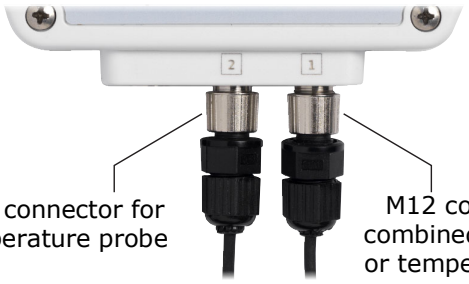
Note: some models of data loggers may be equipped with mini-USB connector, on the housing side, whose use is reserved to the technical assistance.

A



M12 connector for combined RH/T probe

B



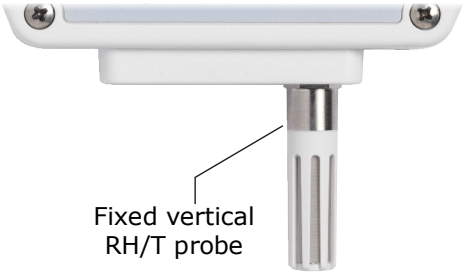
M12 connector for temperature probe

M12 connector for combined RH/T probe or temperature probe

C

M12 connectors for temperature probes

D



Fixed vertical RH/T probe

E

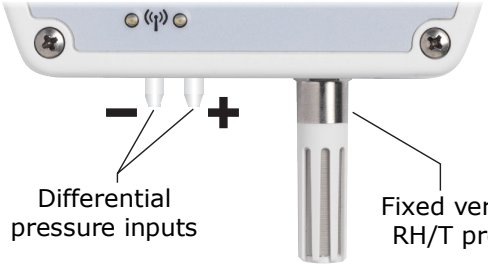
Input terminals protected by a cover (see par.8.5 for terminals scheme)

F

Integrated sensors protected by a grid

Power supply connector

G



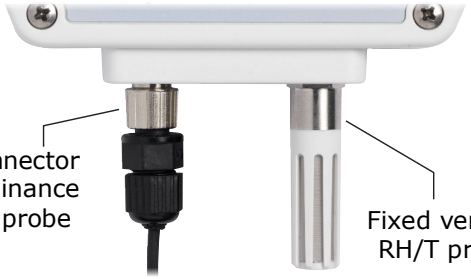
Differential pressure inputs

Fixed vertical RH/T probe

H

Differential pressure inputs

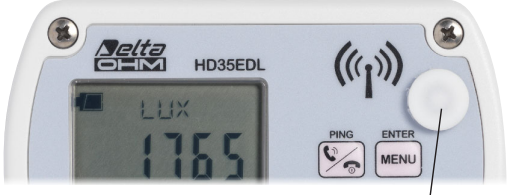
I



M12 connector for illuminance or UVA probe

Fixed vertical RH/T probe

L



Illuminance or UVA integrated sensor

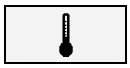
Data logger models in indoor-use housing

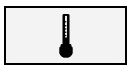
In order to highlight the physical quantities measured by data loggers, order codes include some identification characters for the various quantities, according to the following convention:

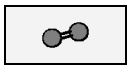

1 = Humidity

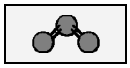

4b = Atmospheric pressure (barometer)


4 = Differential pressure (**4r1** = range 1, **4r2** = range 2, etc.)


N = Temperature with NTC10K sensor (**N/2** = two channels, **N/3** = three channels)


7P = Temperature with Pt100/Pt1000 sensor (**7P/3** = three channels)


A = Carbon monoxide (CO)


B = Carbon dioxide (CO_2)


I = Illuminance (lux)

U = UVA irradiance

TC = Probe with cable

TV = Fixed vertical temperature and/or R.H. probe without cable, with high accuracy R.H. sensor

TVI = Fixed vertical temperature and R.H. probe without cable

TCV = Illuminance/irradiance probe with cable and fixed vertical temperature and R.H. probe without cable, with high accuracy R.H. sensor.

Models measuring temperature and humidity with a combined probe with cable (**...TC** models) use the probes of the **HP3517...** series with **high accuracy humidity sensor** and NTC 10KΩ @ 25 °C or Pt100 temperature sensor according to the model. **Replacement of the HP3517... probe requires recalibration of the instrument in line with the new probe**.

Models with M12 connectors provided with inputs for the measurement of temperature only, use temperature probes of the **TP35...** series with NTC 10KΩ @ 25 °C or Pt100/Pt1000 sensor.

In models with 2 or 3 M12 connectors, the input number is indicated above the connector.

In models for the measurement of the atmospheric pressure, the sensor is inside the instrument.

In models for the measurement of the differential pressure, please pay attention to the polarity indicated next to connections.

TAB. 8.1.1: differential pressure measuring ranges

Model	Measuring range
HD35ED...4r1 TV	-2.5…+2.5 hPa (mbar)
HD35ED...4r2 TV	-10…+10 hPa (mbar)
HD35ED...4r3 TV	-100…+100 hPa (mbar)
HD35ED...4r4 TV	-2000…+2000 hPa (= 2 bar)

For the probes connection mode and the position of the integrated sensors in the various models, refer to the figures indicated in the last column of the following table.

TAB. 8.1.2: data logger models in indoor-use housing

Model	MEASUREMENTS									OPTIONAL LCD		INPUTS		Fig.
	NTC 10K	Pt100 Pt1000	RH	Patm	ΔP	Lux	UVA	CO	CO_2	L Custom	G Graphic	Conn. M12	Built-in sensors	
HD35ED 7P/3 TC		●									●	3		**C**
HD35ED N/3 TC	●									●		3		**C**
HD35ED N TV	●									●			●	**D**
HD35ED 1 TV			●							●			●	**D**
HD35ED 1 TVI			●							●			●	**D**
HD35ED 1N TC	●		●							●		1		**A**
HD35ED 1N/2 TC	●		●							●		2		**B**
HD35ED 17P TC		●	●							●		1		**A**
HD35ED 1N TV	●		●							●			●	**D**
HD35ED 1N TVI	Sensor integrated in RH module		●							●			●	**D**
HD35ED 14bN TC	●		●	●						●		1	Patm	**A**
HD35ED 14bN TV	●		●	●						●			●	**D**
HD35ED 14bN TVI	Sensor integrated in RH module		●	●							●		●	**D**
HD35ED 4r...TV (*)					●					●			●	**H**
HD35ED 1N4r...TV (*)	●		●		●					●			●	**G**
HD35ED 1NI TCV	●		●			●				●		1	T / RH	**I**
HD35ED 1NI TV	●		●			●				●			●	**D**, **L**
HD35ED 1NIU TCV	●		●			●	●			●		1	T / RH	**I**
HD35ED 1NIU TV	●		●			●	●			●			●	**D**, **L**
HD35ED 14bNI TCV	●		●	●		●				●		1	T / RH Patm	**I**
HD35ED 14bNI TV	●		●	●		●				●			●	**D**, **L**
HD35ED 14bNIU TCV	●		●	●		●	●			●		1	T / RH Patm	**I**
HD35ED 14bNIU TV	●		●	●		●	●			●			●	**D**, **L**
HD35ED 1NAB	Sensor integrated in RH module		●					●	●		●		●	**F**
HD35ED 14bNAB			●	●				●	●		●		●	**F**
HD35ED H	Transmitters with 0÷20 mA, 4÷20 mA, 0÷1 V or 0÷50 mV output Pt100 / Pt1000 Sensors, K, J, T, N, E thermocouples Sensors with voltage-free contact or potentiometric output										●	3 terminal inputs		**E**

(*) Please refer to table 8.1.1 for the available ranges.

8.2 CONNECTION TO WIRELESS NETWORK

The device can be connected and disconnected from the wireless network by **pressing for 5 seconds** the connection button on the front panel (see step 6 of paragraph 8.1).

If the device is disconnected, by pressing the connection button for 5 seconds the buzzer emits a beep and the green RF LED blinks for one second to indicate the start of the connection procedure. If the device belongs to a wireless network and the base unit is reachable, once connected, the buzzer emits a second beep and the green RF LED will blink during data transmission. If the device doesn't belong to a wireless network or the base unit cannot be reached, the second beep of the buzzer is not emitted and the red RF LED will blink.

If the device is connected, by pressing the connection button for 5 seconds the buzzer emits a beep, the red RF LED activates for one second and the device is disconnected.

In data loggers with LCD display, the connection status is signaled also by the connection icon on the display (see figure 3.6 at page 9):

- the icon is steady on if the data logger is connected;
- the icon blinks if the data logger is trying to connect (the icon will be steady on once connected or will go on blinking if the base unit is not reachable o the data logger doesn't belong to a wireless network);
- if the data logger is not connected, the icon has the aspect of a hang up phone in data loggers with graphic LCD, and it is off in data loggers wit custom LCD.

PING function:

In the devices connected to a wireless network it is possible to check if the base unit can be reached by briefly pressing the connection button: if the green RF LED is blinking, it means that the base unit is reachable, otherwise it will be the red RF LED to blink.

8.3 DATA LOGGERS WITH LCD OPTION

According to the data logger model, the LCD display is custom (**L** option) or graphic (**G** option) type. The display shows all quantities measured and calculated by the data logger along with the following RF quantities:

- **RSSI** (*Received Signal Strength Indication*): received signal power;
- **PER** (*Packet Error Rate*): percentage of transmission errors;
- **RF Hops**: 1=direct transmission between data logger and base unit, 2= a repeater added between data logger and base unit, 3=two repeaters added, etc.

The indications of connection status, logging (in progress/deactivated), and battery charge level are displayed.

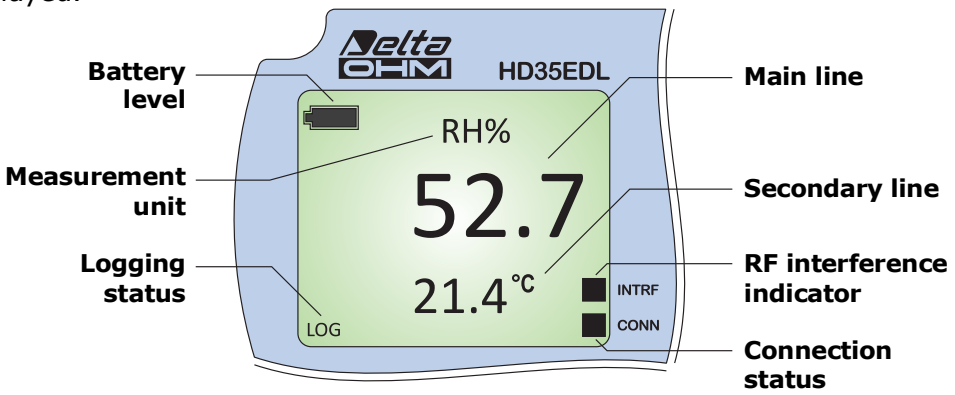


Fig. 8.3.1: custom LCD

In models with custom LCD that measure several quantities, the temperature is displayed in the secondary line, except when a RF quantity appears in the main line; in that case the secondary line shows the number of RF hops.

Models with graphic LCD allow the simultaneous display of 3 measurements in the secondary lines. The graphic display shows in addition the RF signal level and date & time.

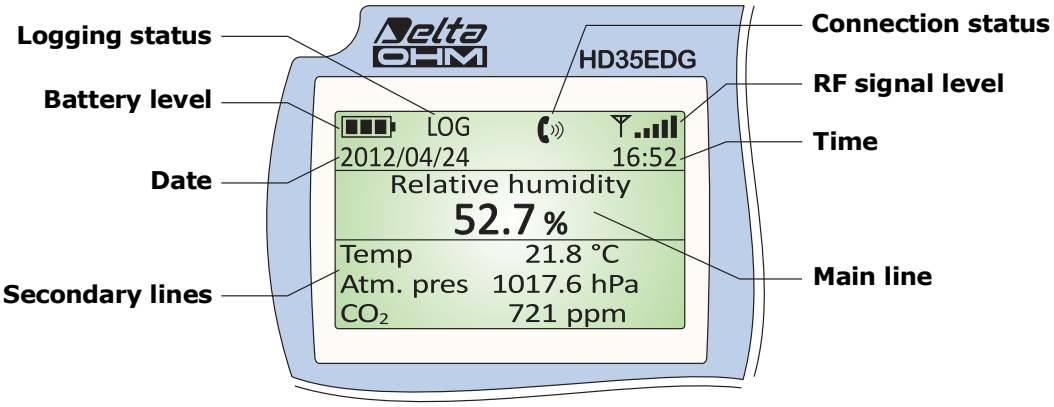


Fig. 8.3.2: graphic LCD

Use the ▲ key to scroll the measured or calculated quantities on the display.

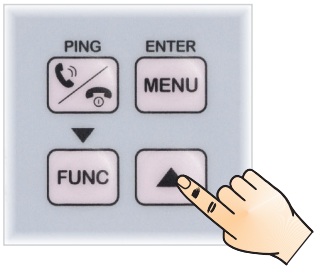


Fig. 8.3.3: selecting the quantities to be displayed

Below please find the indications corresponding to the various quantities in the two types of LCD.

TAB. 8.3.1: indication of quantities on display

Quantity	Custom LCD	Graphic LCD	
		Main line	Secondary line
Temperature (*)	°C or °F stable	Temperature	Temp
Relative humidity	% RH	Relative humidity	RH
Dew point	Td alternated to °C or °F	Dew point	Dew point
Partial vapour pressure	PVP alternated to m.u. (**)	Partial vapor pressure	PVP
Mixing ratio	G/kG	Mixing ratio	Mix ratio
Absolute humidity	G/m^3	Absolute humidity	Abs hum.
Wet bulb temperature	Tw alternated to °C or °F	Wet point	Wet point
Atmospheric pressure	PRES alternated to m.u. (**)	Atmospheric pressure	Atm. Pres
Differential pressure	PRES alternated to m.u. (**)	--	--
Carbon monoxide	--	Carbon monoxide	CO
Carbon dioxide	--	Carbon dioxide	CO_2
Illuminance	LUX	--	--
UVA irradiance	mW/m^2	--	--
Proportion of UV present	µW/lm	--	--
RF signal power	RSSI alternated to dBm	Received signal strength	RSSI
Percentage of RF errors	PER %	Packet error rate	PER
RF hops	HOP	Number RF hops	RF Hops

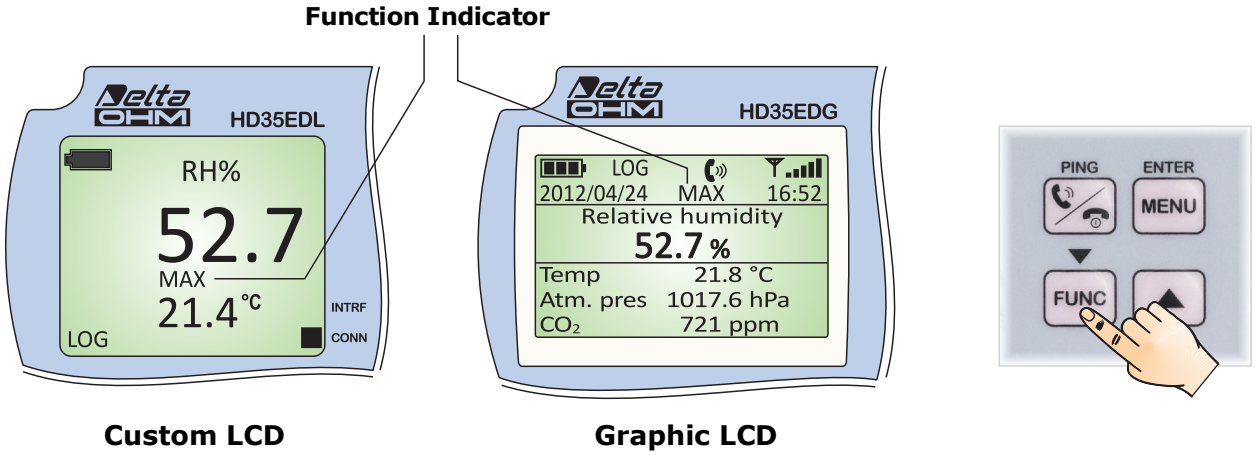
(*) In models with more than one temperature channels, the display shows also the number of channel the shown value refers to.

(**) m.u. = unit of measurement

Different measurement units can be set for certain quantities. The setting can be done through the HD35AP-S software (see the software instructions) or by accessing the configuration menu with the front keyboard (see paragraph *The menu in LCD data loggers* on page 30).

8.3.1 Maximum, minimum and average of the measurements

To display the maximum value (**MAX**), the minimum value (**MIN**) and the average (**AVG**) of the acquired values, press the **FUNC** key until the desired function is shown on the display.



Custom LCD **Graphic LCD**

Fig. 8.3.1: selecting a function

To reinitialize the function value and start a new measuring session, press the **FUNC** key until you read *FUNC CLR* (custom LCD) or *Function clear* (graphic LCD), use the arrow keys to select *yes* and confirm with **ENTER**.

8.4 THE MENU IN LCD DATA LOGGERS

The menu allows displaying the data logger information and changing operation parameters. The menu is structured in levels, with main categories and submenus.

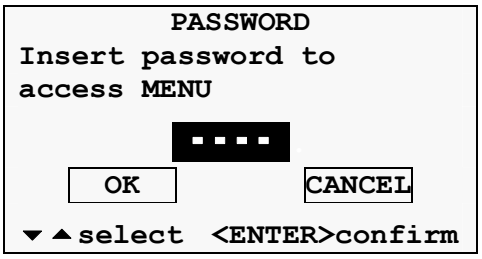
To access the menu you need to enter the user or administrator password. Entering the user password makes some settings not changeable.

The instrument exits automatically the menu if no key is pressed for 3 minutes. After exiting the menu, the password remains active for a few minutes, during which you may enter the menu again without re-entering the password. It is possible to exit the menu by disabling immediately the password by performing a password level reset in the *Password* menu.

8.4.1 The menu in data loggers with graphic LCD

To access a menu parameter proceed as follows:

1. Press **MENU**.
2. Press ▼ to select the password field.



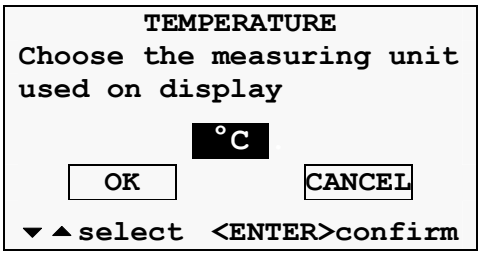
3. Press **ENTER**, the first digit of the password will blink.
4. Use ▼/▲ keys to set the first digit and confirm with **ENTER**, the second digit of the password will blink. Set all the password digits in the same way.
5. Press ▼ to select the option OK and confirm with **ENTER**.
6. Use ▼/▲ keys to select a main category of the menu and confirm with **ENTER**.
7. If the selected main category has a submenu, select the desired item using ▼/▲ and confirm with **ENTER**.

To exit the main menu or a submenu, select the item EXIT (last menu item).

Changing a parameter

After selecting the desired parameter, it can be changed, if allowed, in the following way:

1. Use ▼/▲ keys to highlight the current setting of the parameter.



2. Press **ENTER**, the field will start blinking.

3. Use ▼/▲ keys to select the desired setting and confirm with **ENTER**. If you are setting a numeric value, you can move faster by keeping ▼ or ▲ keys depressed.

4. Press ▼ to select the option OK and confirm with **ENTER**. The instrument closes the parameter window and returns to the previous menu level.

To exit a parameter window without changes, select CANCEL and confirm with **ENTER**.

If only the option CANCEL is available in the parameter window, it means that it is not allowed to change the parameter setting.

Menu structure

The complete structure of the main window with the relevant submenus is shown below. According to the data logger model, some items could not be available if not significant for that particular model.

1) Information

It lists the general information of the instrument: model, serial number, RF address, user code, firmware version, calibration date, etc.

2) Display configuration

1) ***Measures ordering***: changes the order for the display of the measurement quantities on the screen. To move a quantity, select it in the displayed list, press ENTER, move the quantity to the desired position and confirm with ENTER.
2) ***Reset measures order***: choice of the default or user-defined viewing sequence.
3) ***Exit***: returns to main menu.

3) RF Parameters

1) ***Network Address***: network address (not RF) of the data logger. It is used to address the data logger in a Modbus network. Read-only parameter if the instrument is connected to a base unit.
2) ***RF Channel***: used channel of the RF transmission band. Read-only parameter if the instrument is connected to a base unit.
3) ***RF Frequency***: used RF transmission band. Only in the **...U** models, by entering the menu with administrator password it is possible to choose the initial frequency of the RF band among 902, 915 and 921 MHz (the final frequency is always 928 MHz).
4) ***Max number RF Hops***: maximum number of RF hops from the data logger to the base unit (equal to the number of interposed repeaters plus 1). Read-only parameter if the instrument is connected to the base unit.
5) ***RF offline***: enables or disables the RF stage of the data logger. Activation or deactivation of the RF stage can be performed also through the connection button.

6) ***Exit***: returns to the main menu.

4) Ch x settings (x=1, 2, 3) – *Only available in the models with configurable inputs*

1) ***Ch x info***: lists all the general information of the input channel Ch x of the instrument: name of measurement, probe type, resolution. The correspondence between the input signal value and the physical quantity value is also indicated for mA, mV, V, Potentiometer and Counter inputs associated with a physical quantity.
2) ***Ch x configuration***: sets the type of input among the available inputs (see paragraph 8.5.1 on page 37 for setting modes). The input type can be set only with the administrator password.
3) ***Ch x zero setting***: sets the current measurement value as zero value. Only available for mA, mV, V and Potentiometer inputs associated with a physical quantity.
4) ***Ch x down threshold***: lower alarm threshold of channel x.
5) ***Ch x up threshold***: higher alarm threshold of channel x.
6) ***Ch x reset counter***: zeroes the number of counts. The item is available only if the channel is configured as counter.
7) ***Exit***: returns to the main menu.

5) Alarm thresholds or **Alarm configuration**

1) ***Quantity 1 down threshold***: lower alarm threshold of quantity 1. The type of quantity depends on the data logger model.
2) ***Quantity 1 up threshold***: higher alarm threshold of quantity 1. The type of quantity depends on the data logger model.
3) ***…***
4) ***Quantity n down threshold***: lower alarm threshold of quantity n. The type of quantity depends on the data logger model.
5) ***Quantity n up threshold***: higher alarm threshold of quantity n. The type of quantity depends on the data logger model.
6) ***Thres. buzzer alarm***: activates or deactivates the buzzer when measurement thresholds are exceeded.
7) ***Exit***: returns to the main menu.

Note: in the models with configurable inputs, the items down threshold and up threshold of quantities are not available in this submenu, but are included in the menus for the setting of channels Ch 1, Ch 2 and Ch 3.

6) Unit measures

1) ***Quantity 1***: measurement unit of quantity 1. The type of quantity depends on the data logger model.
2) …
3) ***Quantity n***: measurement unit of quantity n. The type of quantity depends on the data logger model.
4) ***Exit***: returns to the main menu.

Note: in the HD35EDH model, only the temperature measurement unit is available. Measurement units for the other quantities are configurable in the menus for the setting of channels Ch 1, Ch 2 e Ch 3.

Note: the unit of measurement is changed only on the LCD; the data are always sent in the unit of measurement set in the base unit.

7) Logging

1) ***Start/stop log***: enables or disables logging.
2) ***Logging mode***: choice between cyclical management (the new data overwrite the old ones when the memory is full) or non-cyclical management (logging stops when the memory is full) of the data logger memory.

3) ***Log/RF Tx interval***: choice of logging and RF transmission interval (the two intervals coincide). If it is higher than the measuring interval, the average of the measurements acquired during the interval will be stored.
4) ***Measure interval***: choice of the measurements acquisition interval. It is forced to the value *RF log/Tx interval* if a higher value is set.
5) ***Log erase***: deletes all stored measurements from the data logger memory.
6) ***Exit***: returns to the main menu.

8) Clock

1) ***Clock Configuration***: date/time of data logger. Read-only parameter if the instrument is connected to a base unit.
2) ***Exit***: returns to the main menu.

9) Password

1) ***Reset password level***: exits menu disabling immediately the password (the password will not remain active for some minutes like it usually happens when exiting a menu: you will have to re-enter the password even if you access the menu at once).
2) ***User password config.***: sets the user level password.
3) ***Exit***: returns to the main menu.

10) CO_2 auto calibration – *Only available in models with integrated CO_2 sensor*

1) ***Start/stop auto-calib.***: enables or disables CO_2 auto-calibration.
2) ***Auto-calib. period***: time interval between two consecutive auto-calibrations.
3) ***Auto-cal. 1st period***: time interval after which the first auto-calibration will be performed after activation.
4) ***Background CO_2 value***: CO_2 reference value for auto-calibration.
5) ***Auto-cal. max change***: maximum offset that can be applied to the measurement by the auto-calibration procedure.
6) ***Exit***: returns to the main menu.

11) Calibration – *Only available with administrator password*

1) ***CO 0 ppm calibration***
2) ***CO sensitivity calib.***: sets the sensitivity of the CO sensor, when the sensor is replaced.
3) ***CO_2 calibration***
4) ***Calibration Type***: choice between user calibration and factory calibration.
5) ***Exit***: returns to the main menu.

Note: relative humidity calibration is only available in models with high-accuracy R.H. sensor: HD35ED…TC and HD35ED…TV models. This sensor is not used in models with graphic display; consequently the R.H. calibration is not displayed in the menu.

12) Language

1) ***Language config.***: choice of the language to be used for the display.
2) ***Exit***: returns to the main menu.

13) Exit

Returns to the measurement mode.

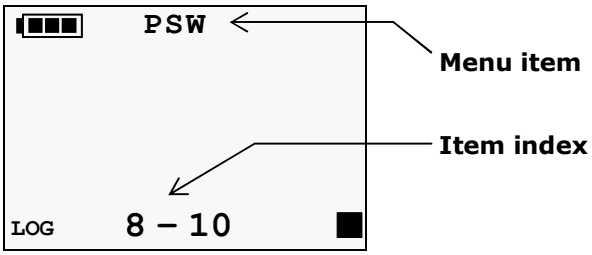
8.4.2 The menu in data loggers with custom LCD

To access a menu parameter proceed as follows:

1. Press **MENU**, the first digit of the password will blink.

2. Using ▼/▲ keys, set the first digit and confirm with **ENTER**, the second digit of the password will blink. Set all the password digits in the same way.

3. Using ▼/▲ keys, select a main category in the menu and confirm with **ENTER**. Menu items appear one at a time in the upper part of the display; the lower part of the display shows the position of the item in the menu and the total number of items in the menu (for ex. "8 – 10" means the eighth item in a menu of 10 items).



4. If the selected main category has a submenu, select the desired item using ▼/▲ keys and confirm with **ENTER**. Scrolling the submenus displays also the parameter current setting.

5. To change the selected parameter, if allowed, use ▼/▲ keys to select the desired setting and confirm with **ENTER**. If you are setting a numeric value, you can fast forward by keeping ▼ or ▲ keys depressed.

To exit the main menu or a sub menu, select EXIT item (last menu item).

If it is not allowed to change a parameter, the notice N/A (Not Available) will appear when pressing ENTER to select it.

Menu structure

The complete structure of the main menu with the relevant submenus is shown below. According to the data logger model, some items could be not available if not significant for that particular model.

1) DEV_INFO (information)

It lists the general information of the instrument: model, serial number, RF address, user code, firmware version, calibration date, etc. Information is shown in the upper part of the display.

2) DISP_MENU (display configuration)

1) ***DISP_LOOP_FOR_MEAS***: enables or disables the cyclical display of the measured quantities. Select *YES* to activate the cyclical display. The derived humidity quantities are not cyclically displayed. The menu item is available only if the data logger measures two or more quantities, in addition to temperature.
2) ***EXIT***: returns to the main menu.

3) RF_MENU (RF parameters)

1) ***NET_ADDR***: network address (not RF) of the data logger. It is used to address the data logger in a Modbus network. Read-only parameter if the instrument is connected to a base unit.
2) ***RF_CHAN***: used channel of RF transmission band. Read-only parameter if the instrument is connected to a base unit.
3) ***RF_FREQ_MHZ***: used RF transmission band. Only in the **...U** models, by entering the menu with administrator password it is possible to choose the initial frequency of the RF band among 902, 915 and 921 MHz (the final frequency is always 928 MHz).
4) ***MAX_NUM_RF_HOPS***: RF hops maximum number from data logger to base unit

(equal to the number of interposed repeaters plus 1). Read-only parameter if the instrument is connected to a base unit.

5) ***RF_OFF_LINE***: enables or disables the RF stage of the data logger. Select *NO* to activate the RF stage. Activation or deactivation of the RF stage can be done also through the connection button.
6) ***EXIT***: returns to the main menu.

4) THLD_MENU (alarm thresholds)

1) ***Quantity 1_DOWN_THLD***: lower alarm threshold of quantity 1. The type of quantity depends on the data logger model.
2) ***Quantity 1_UP_THLD***: higher alarm threshold of quantity 1. The type of quantity depends on the data logger model.
3) …
4) ***Quantity n_DOWN_THLD***: lower alarm threshold of quantity n. The type of quantity depends on the data logger model.
5) ***Quantity n_UP_THLD***: higher alarm threshold of quantity n. The type of quantity depends on the data logger model.
6) ***THLD_ALRM***: enables or disables the buzzer when measurement thresholds are exceeded.
7) ***EXIT***: returns to the main menu.

5) MEAS_UNIT_MENU (measurement unit)

1) ***Quantity 1_UNIT_MEAS***: measurement unit of quantity 1. The type of quantity depends on the data logger model.
2) …
3) ***Quantity n_UNIT_MEAS***: measurement unit of quantity n. The type of quantity depends on the data logger model.
4) ***EXIT***: returns to the main menu.

Note: the unit of measurement is changed only on the LCD; the data are always sent in the unit of measurement set in the base unit.

6) LOG_MENU (logging)

1) ***LOG_STAT***: enables or disables the logging.
2) ***LOG_CYCL***: choice between cyclical management (the new data overwrite the old ones when the memory is full) or non-cyclical management (logging stops when the memory is full) of the data logger memory. Select *YES* for the cyclical management.
3) ***LOG/RF_TIME***: choice of logging and RF transmission interval (the two intervals coincide). If it is higher than the measuring interval, the average of the measurements acquired during the interval will be stored.
4) ***MEAS_TIME***: choice of the measurements acquisition interval. It is forced to the value *Log/RF_TIME* if a higher value is set.
5) ***LOG_DEL***: deletes all stored measurements from the data logger memory. Select *YES* to delete the memory.
6) ***EXIT***: returns to the main menu.

7) CLK_MENU (clock)

1) ***YEAR***: year. Read-only parameter if the instrument is connected to a base unit.
2) ***MON***: month. Read-only parameter if the instrument is connected to a base unit.
3) ***DAY***: day. Read-only parameter if the instrument is connected to a base unit.
4) ***HOUR***: hour. Read-only parameter if the instrument is connected to a base unit.
5) ***MIN***: minutes. Read-only parameter if the instrument is connected to a base unit.
6) ***EXIT***: returns to the main menu.

8) PSW_MENU (password)

1) ***RST_PSW_LVL***: exits the menu and deactivates immediately the password (the password will not remain active for some minutes as it normally happens when exiting the menu: you will need to re-enter the password even if you re-access immediately the menu).
2) ***SET_NEW_PSW***: sets user-level password.
3) ***EXIT***: returns to the main menu.

9) CAL_MENU (calibration) – *Only available with administrator password*

1) ***RH_75%_CAL***: relative humidity sensor calibration at 75%RH.
2) ***RH_33%_CAL***: relative humidity sensor calibration at 33%RH.
3) ***DIFF_PRES_0 Pa_CAL***: calibration of differential pressure to zero.
4) ***LGHT_SENS_PA_LUX***: illuminance sensor sensitivity in pA/lux.
5) ***UVA_SENS_nA_W/m²***: UVA irradiance sensor sensitivity in nA/Wm^{-2}.
6) ***CAL_TYPE***: choice between user calibration (*USER*) or factory calibration (*FACT*).
7) ***EXIT***: returns to the main menu.

Notes:
- relative humidity calibration is available only with high accuracy R.H. sensor models: HD35ED…TC and HD35ED…TV models.
- differential pressure zero calibration is available only in HD35ED…4r…TV models.
- the illuminance sensor sensitivity is available only in HD35ED…I…TCV models.
- the UVA irradiance sensor sensitivity is available only in HD35ED…IU…TCV models.

10) EXIT

Returns to measurement mode.

8.5 CONNECTING THE MODEL WITH TERMINAL HEADER INPUTS

HD35ED[G]H model has three terminal header inputs. Each input can be configured as a Pt100/Pt1000, thermocouple, 0/4…20 mA (shunt resistance inside), 0…1 V, 0…50 mV or potentiometric input. Only input 3 can be also configured as pulse counter (count of voltage-free contact switchings).

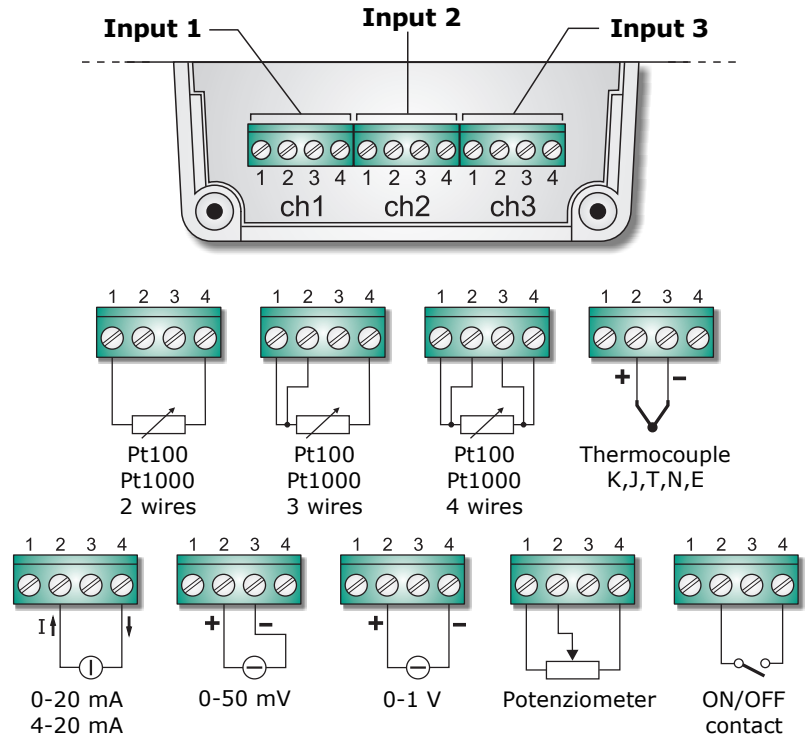


Fig. 8.5.1: sensor connection in HD35EDH model

If a channel is configured as current input, insert the 50 Ω shunt resistance closing the jumper placed on the terminals of the relevant channel. In all the other configurations, leave the jumper open.

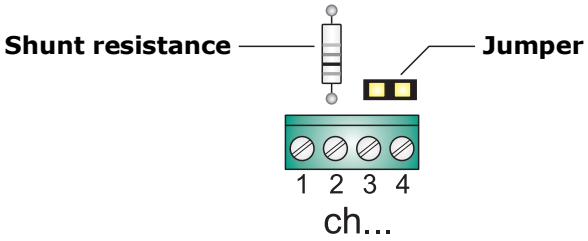


Fig. 8.5.2: shunt resistance for current input

The current input accepts any value in the range 0 to 20 mA.

8.5.1 INPUTS CONFIGURATION

Configuration of inputs can be implemented through the HD35AP-S software (see software instructions) or, if the data logger is equipped with a display, through the front keyboard.

To configure the input channel ch x (x=1,2,3 is the number of the input) through the keyboard, access the menu and select the item *Ch x settings* ⇒ *ch x configuration*. Set the type of input among those available:

- Pt100 2-wire, Pt100 3-wire, Pt100 4-wire, Pt1000 2-wire, Pt1000 3-wire, Pt1000 4-wire,
- TC-K, TC-J, TC-T, TC-N, TC-E,
- 0-1V, 0-50mV, 4-20mA, Potentiometer, Counter, Frequency,
- 0-1V Mapped, 0-50mV Mapped, 4-20mA Mapped, Mapped Potent., Mapped Count., Mapped Freq.

The input types *4-20mA* and *4-20mA Mapped* also work with 0-20 mA signals. The input types *Counter* and *Frequency* are only in channel Ch 3.

Set *NO MEASURE* if the channel is not used.

The indication *Mapped* means that a linear correspondence between input values (in mA, mV, V, Ω or counts) and the values of a physical quantity will be associated to the channel. For example, if *4-20mA* is selected, the data logger stores the input value in mA; if *4-20mA Mapped* is selected, the data logger doesn't store the input value in mA but the corresponding value of the physical quantity associated to the input.

By selecting a Mapped-type configuration, the guided procedure for the association between the input values (in mA, mV, V, Ω or counts) and the values of the corresponding physical quantity is started. The procedure is illustrated below:

1. After confirming the selection of a Mapped input, the procedure start message is displayed, press **ENTER** to continue.

2. Select the measurement unit of the physical quantity among those proposed by the instrument. If the desired measurement unit is not in the list, select *NOT DEF* (not defined). Select the option OK and confirm with **ENTER** to continue.

3. Select the measurement resolution of the physical quantity among those proposed by the instrument. Select the option OK and confirm with **ENTER** to continue.

4. A message will be displayed reminding that the two coordinates of the linear relation between input and physical quantity will be now required:

x1=input value (in mA, mV, V, Ω or counts) in the first point,
y1=value of the physical quantity corresponding to the input value x1,
x2=input value (in mA, mV, V, Ω or counts) in the second point,
y2=value of the physical quantity corresponding to the input value x2,

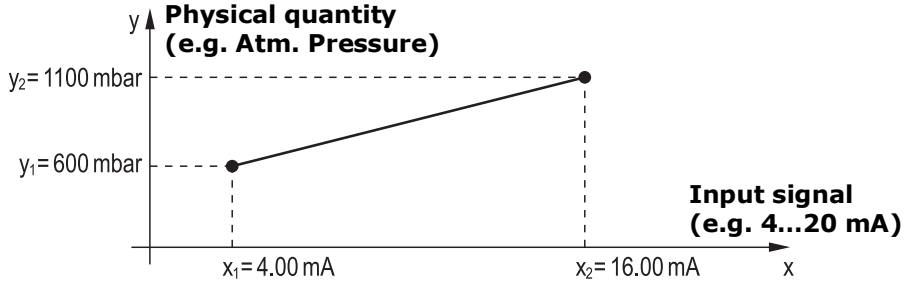


Fig. 8.5.3: association of a physical quantity to the input signal

press **ENTER** to continue.

5. Select the input value x1 for the first point (e.g. 4.00 mA). Select the option OK and confirm with **ENTER** to continue.

6. Select the physical quantity value y1 for the first point (e.g. 600 mbar). Select the option OK and confirm with **ENTER** to continue.

7. Select the input value x2 for the second point (e.g. 20.00 mA). Select the option OK and confirm with **ENTER** to continue.

8. Select the physical quantity value y2 for the second point (e.g. 1100 mbar). Select the option OK and confirm with **ENTER** to continue.

9. The message requesting confirmation of the configuration storage is displayed, press **YES** to save the settings and terminate the procedure.

The procedure can be stopped at any moment by selecting the option CANCEL and confirming with **ENTER**.

A user name can be associated to each measurement channel to remind the type of physical quantity detected. The user name can be set only through the HD35AP-S software.

8.6 CALIBRATION

Instruments and sensors are all factory-calibrated and do not normally require further interventions of the user. Anyway, a new sensor calibration can be performed for:

- CO at zero ppm,
- CO_2 at any reference value within the measurement range,
- High accuracy R.H. (HD35ED…TC and HD35ED…TV models) at 75% and 33%,
- Differential pressure at zero.

R.H. calibration is not available for HD35ED…TVI models and for models with internal sensors (HD35ED[G]14bNAB and HD35ED[G]1NAB).

No calibration is scheduled for temperature sensors.

For a correct calibration of the probes, it is crucial to know and respect the physical phenomena which underlie measurements: for this reason, it is recommended to thoroughly follow the following instructions and to perform new calibrations only if in possession of adequate technical knowledge and instruments.

To access calibration, the data logger must have the user-calibration option set:

- In models with graphic LCD, select the menu item *Calibration* ⇒ *Calibration Type* and set the *User* option.
- In models with custom LCD, select the menu item *CAL_MENU* ⇒ *CAL_TYPE* and set the *User* option.

The calibration procedure deletes the data of the previous user calibration. In case of failed procedure, you can always return the instrument to factory calibration by selecting:

- in models with graphic LCD, the menu item *Calibration* ⇒ *Calibration Type* and setting the *Factory* option;
- in models with custom LCD, the menu item *CAL_MENU* ⇒ *CAL_TYPE* and setting the *FACT* (factory) option.

Calibration can be performed with HD35AP-S software (see software instructions) or, if the data logger has a display, through the front keyboard.

8.6.1 CO SENSOR CALIBRATION

This calibration is available in HD35ED[G]14bNAB and HD35ED[G]1NAB models.

The **zero** of the CO sensor can be calibrated in clean air (in outdoor environment CO concentration is less than 0.1ppm) or with the aid of nitrogen bottles (cod. MINICAN.12A).

To use the nitrogen bottle, unbolt the two screws fixing the sensor protection grid, remove the grid and connect the tube with the rubber sleeve coming from the bottle to the CO sensor head. Supply the gas by adjusting the bottle flow meter so as to obtain a constant flow ranging within 0.1 and 0.2 l/min.

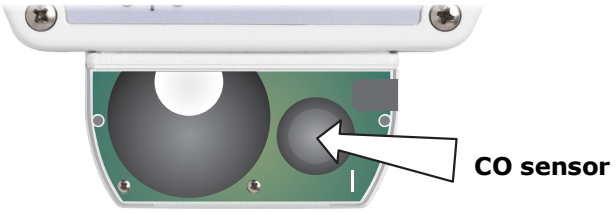
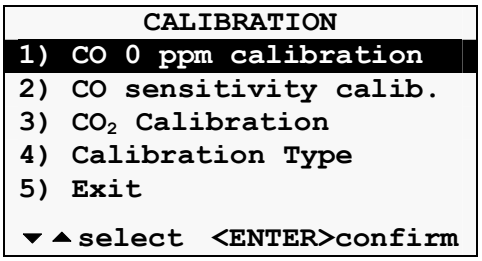


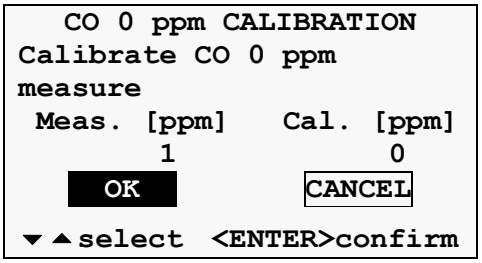
Fig. 8.6.1: CO sensor position

Calibration procedure:

1. Place the instrument in clean air or connect the nitrogen bottle as indicated above.
2. Wait for at least 15 minutes for the measurement to stabilize, with the instrument on.
3. Access the menu with the administrator password and select the item *Calibration ⇒ CO 0 ppm calibration*. Press **ENTER** to confirm.



4. Select the option OK and confirm with **ENTER**: the instrument stores the calibration and returns to the calibration submenu.



5. If the nitrogen bottle was used, close the bottle tap, remove the CO sensor sleeve and place again the protection grid by fixing it with the two screws.

8.6.2 REPLACING THE CO SENSOR

The CO sensor has an expected average life of over 5 years of use in normal conditions. Where it becomes necessary to replace the CO sensor, order a new sensor (code **ECO-SURE-2E CO**).

Replacement procedure:

1. Unscrew the two front screws on the housing, remove the back cover and disconnect the battery.
2. Unscrew the two screws fixing the protection grid of the sensors, remove the grid and extract the exhaust CO sensor (see fig. 8.6.1 for sensor position).
3. Take the new CO sensor and note the number marked on the edge of the new sensor indicating its sensitivity in nA/ppm.

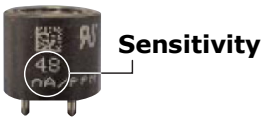
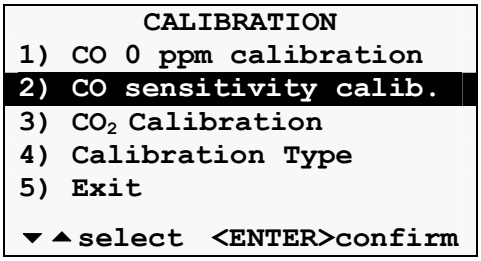
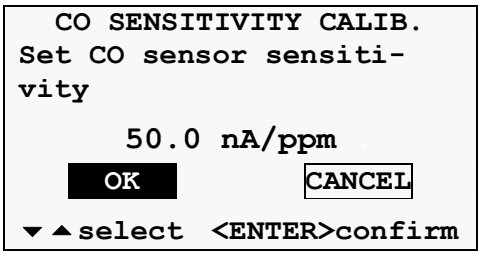


Fig. 8.6.2: CO sensor sensitivity

4. Insert the new sensor electrodes in the contacts.
5. Apply again the protection grid by fixing it with the two screws.
6. Reconnect the battery and close again the housing by fixing the 4 front screws.
7. Access the menu with the administrator password and select the *Calibration ⇒ CO sensitivity calib.* item. Press **ENTER** to confirm.



8. Enter the sensitivity value, select the option OK and confirm with **ENTER**: the instrument stores the value and returns to the calibration submenu.



9. Wait for at least 5 minutes after starting the instrument before detecting the measurement, so as to let the measurement become stable. If necessary, perform zero calibration of the new CO sensor.

8.6.3 CO_2 SENSOR CALIBRATION

This calibration is available in HD35ED[G]14bNAB and HD35ED[G]1NAB models.

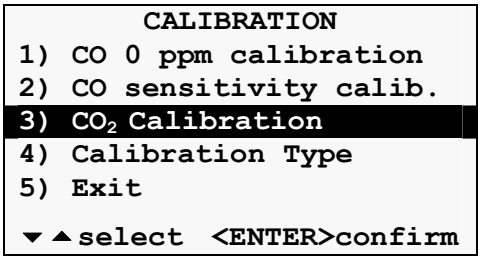
The CO_2 sensor can be calibrated to any reference value within the measurement range.

Calibration procedure:

1. Place the instrument in an environment with known CO_2 concentration (for ex. in clean air).

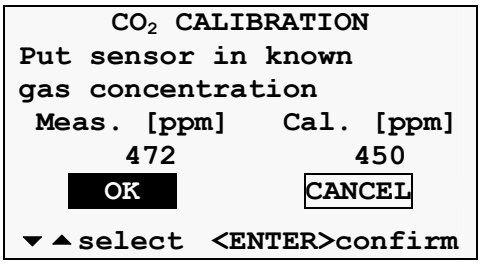
2. Wait for at least 15 minutes for the measurement to become stable, with the instrument on.

3. Access the menu with the administrator password and select the item *Calibration* ⇒ *CO_2 calibration*. Press **ENTER** to confirm.

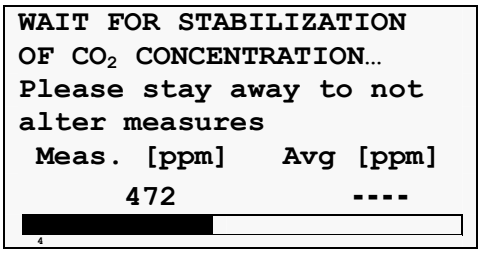


4. The value measured by the instrument appears on the left, and the calibration point on the right. The instrument initially proposes the same measurement value as calibration point.

5. Enter the calibration value, select the option OK and confirm with **ENTER**.



6. The instrument tests the measurement stability. Wait for a few minutes for measurement completion. In the meantime, don't stay too close to the instrument to avoid altering the measurement.



7. At the end, a message is shown indicating the calibration success or failure. Press any key to return to the calibration submenu.

If a message appears declaring that calibration has failed, it means that the value measured by the instrument during the procedure differs too much from the set reference value. In that case repeat calibration checking the CO_2 reference value in the environment and making sure to operate in a stable environment.

8.6.4 CO_2 SENSOR AUTOCALIBRATION

In HD35ED[G]14bNAB and HD35ED[G]1NAB models, the instrument can be set so as CO_2 calibration is automatically performed at predetermined intervals.

In order for auto calibration to be effective, the CO_2 concentration in the environment where the instrument is installed must assume a known value (referred to as environment **background value**). For example, we can have that an instrument installed inside a public place performs a weekly auto calibration when people are not present and CO_2 concentration is close to the outdoor air value (if there is an adequate air change).

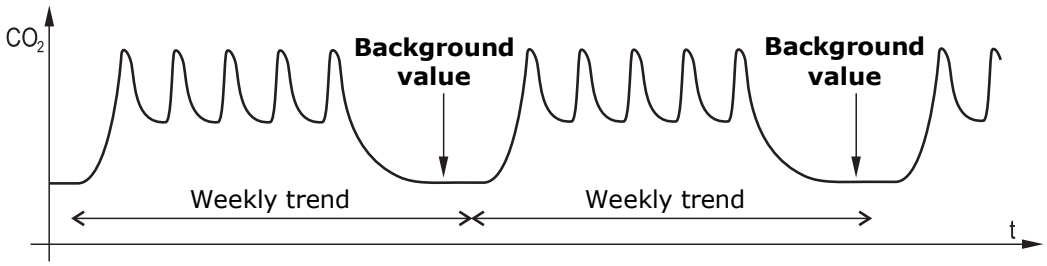


Fig. 8.6.3: example of background value for CO_2 auto calibration

The offset applied to the measurement by the auto calibration procedure can be limited to a maximum value, so as to avoid erroneous calibrations when the measured value differs too much from the estimated background value. The auto calibration procedure acts therefore in the following way:

- If the difference between the measured value and the background value is lower than the maximum offset, an offset is applied to the measurement so that the measured value coincides with the background value.
- If the difference between the measured value and the background value is higher than the maximum offset, only the maximum offset is added or subtracted so as to approach the background value.

To set the auto calibration interval and the maximum offset and to activate auto calibration see the menu item *CO_2 autocalibration* on page 33.

8.6.5 CALIBRATING THE RELATIVE HUMIDITY SENSOR

In HD35ED…TC and HD35ED…TV models with high accuracy R.H. sensor, the sensor can be calibrated in the two points 75% RH and 33%RH.

Before starting the calibration procedure, it's better to **check** if a new calibration is necessary, with the aid of 75.4%RH and 33%RH saturated solutions: a calibration will be performed only if an error of a few humidity points in one of the two calibration points is detected.

The sensor can be calibrated in both points or in one point only.

Preliminary operations before calibration:

Check that the chamber with the saturated saline solutions contains at the same time:

- solid state salt,
- liquid solution or wet salt, in particular for the 75%RH solution.

The instrument and the saturated solutions to be used for this operation must be placed in a stable temperature environment for the whole calibration period. Wait for at least a couple of hours with a stable temperature so that the instrument and the saturated solutions reach a thermal balance with the environment before starting the calibration procedure. In order to obtain a good calibration, it is crucial that the probe and the solution have the same temperature. Bear in mind that plastic material is a bad heat conductor.

Calibration should be performed at a temperature ranging within 15 and 30°C.

Calibration procedure:

1. Unscrew the probe protection grid and screw the M12×1 threaded ring.

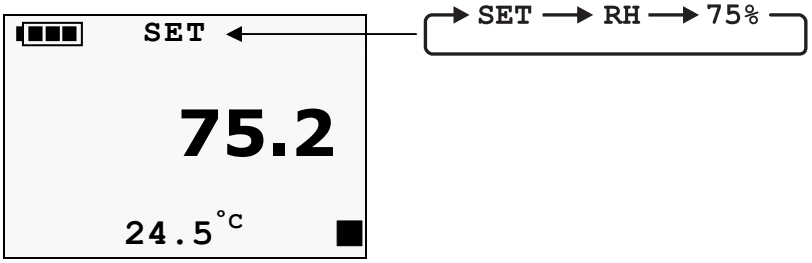
Avoid any contact of the sensitive element with your hands or other objects or liquids. **If some liquid has formed inside the measuring chamber, dry it with a clean absorbent paper towel**.

2. Unscrew the cap of the saturated solution. Screw the threaded ring with the probe on the saturated solution container and wait for at least 30 minutes.

3. Access the menu with the administrator password and select the item *CAL_MENU*. Press **ENTER** to confirm.

4. Select the item *RH_75%_CAL* to calibrate the point 75%RH or *RH_33%_CAL* to calibrate the point 33%RH. Press **ENTER** to confirm.

5. The blinking value of the saturated solution at the temperature measured by the probe is displayed.



Note: the suggested calibration value is not updated if the measured temperature changes after starting calibration. If necessary, set manually the calibration value to the value of the saturated solution at the measured temperature using ▼/▲ keys (see table 8.6.1 below).

6. Press **ENTER** to confirm the value, the instrument stores the calibration and returns to the calibration submenu.

7. Remove the threaded ring with the probe from the container of the saturated solution and close the container with the solution.

8. To calibrate the second point, repeat the procedure from step 2 to step 7 with the second saturated solution.

9. Unscrew the M12X1 threaded ring from the probe and place again the sensor protection grid.

TAB. 8.6.1: saturated solutions

Temperature (°C)	33%RH Solution	75%RH Solution
15	33.3	75.6
20	33.0	75.4
25	32.7	75.2
30	32.4	75.0

8.6.6 DIFFERENTIAL PRESSURE CALIBRATION

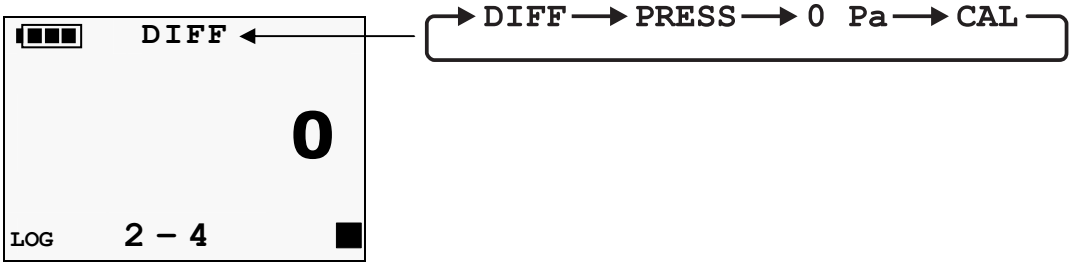
Differential pressure sensors may show a slight difference between the two inputs, consequently the instrument, with an equal pressure applied to the two inputs, doesn't show a zero value. Proceed as follows for the zeroing of the differential value.

Calibration procedure:

1. Leave the instrument pressure input open.

2. Access menu with the administrator password and select the item *CAL_MENU ⇒ DIFF_PRES_0 Pa_CAL*. Press **ENTER** to confirm.

3. The zero value blinks on the display.



4. Press **ENTER**, the instrument stores the calibration and returns to the calibration submenu.

8.6.7 SENSITIVITY OF THE ILLUMINANCE AND/OR UVA IRRADIANCE PROBE

If the illuminance and/or UVA irradiance probe is replaced, you need to set in the data logger the sensitivity of the new probe. Proceed as follows.

1. Access menu with the administrator password and select the item *CAL_MENU ⇒ LGHT_SENS_PA_LUX* to set the sensitivity of the illuminance sensor (in pA/lux) or *CAL_MENU ⇒ UVA_SENS_nA_W/m²* to set the sensitivity of the UVA irradiance sensor (in nA/Wm^{-2}).

2. Press **ENTER**, the current sensitivity value blinks on the display.

3. Set the new value by using the ▼/▲ keys.

4. Press **ENTER**, the instrument returns to the calibration submenu.

8.7 TECHNICAL CHARACTERISTICS OF DATA LOGGERS IN INDOOR USE HOUSING

Power supply	**Non rechargeable** lithium thyonil chloride (Li-$SOCl_2$) internal battery, 3.6 V, AA format, 2-pole Molex 5264 connector. A connector for external power supply (**SWD06**) is available in models in housing with grid.
Transmission frequency	868 MHz, 902-928 MHz or 915.9-929.7 MHz according to the model
Antenna	Internal
Transmission range	300 m in open field **The range can be reduced in the presence of obstacles or adverse atmospheric conditions**
Display	Optional. Custom or graphic LCD according to the model (see table 8.1.2).
Keyboard	Connection button. Models with LCD have buttons for the configuration and scrolling of measured values.
LED Indicators	RF communication status. Models without LCD have alarm and battery level LEDs.
Measuring interval (*)	1, 2, 5, 10, 15, 30 s / 1, 2, 5, 10, 15, 30, 60 min
Logging and transmission interval (*)	1, 2, 5, 10, 15, 30 s / 1, 2, 5, 10, 15, 30, 60 min
Internal memory	Circular management or stop logging if memory is full. The number of storable samples depends on the number of detected quantities (see table 8.7.1).
Alarm	Acoustic by means of the internal buzzer
Battery life	Typ. 2 years (without repeaters, measurement interval 5 s and log interval 30 s)
Operating temperature and humidity	-20…+70 °C (-10…+70 °C for models with grid) 0…85 %RH non condensing
Dimensions	See dimensional drawings
Connectors for external probes with cable	According to the model, M12 connectors or 3.5 mm pitch input terminals.
Weight	200 g approx. (version with LCD, battery included)
Housing	ABS
Protection Degree	IP 64 (versions with M12 connectors)
Installation	Wall support (**supplied**) for removable installation or flanges (**option**) for fixed installation.

(*) Some models that measure several quantities may have a minimum interval exceeding 1 second. Each system data logger can be set with its own measuring and logging interval. The stored value is the average of the measurements acquired during the logging interval.

TAB. 8.7.1: memory capacity of data loggers in indoor use housing

Models	Number of storable samples	Notes
HD35EDNTV, HD35ED1TV, HD35ED1TVI, HD35ED4r…TV, HD35EDH with only one input used (not as counter)	74,000	
HD35EDH with only one input used as counter	56,000	
HD35EDH with two inputs used (not as counter)	56,000	
HD35EDH with two inputs used, one as counter	44,000	
HD35EDH with three inputs used (not as counter)	44,000	
HD35EDH with three inputs used, one as counter	36,000	
HD35EDN/3TC, HD35ED7P/3TC	44,000	
HD35ED1NAB, HD35ED14bNITV, HD35ED14bNITCV	36,000	(1)
HD35ED14bNAB, HD35ED1NIUTV, HD35ED1NIUTCV	32,000	(1),(2)
HD35ED14bNIUTV, HD35ED14bNIUTCV	28,000	(1),(2)
HD35ED1NTC, HD35ED17PTC, HD35ED1NTV, HD35ED1NTVI	22,000	(1)
HD35ED1N/2TC, HD35ED1NITV, HD35ED1NITCV, HD35ED14bNTC, HD35ED14bNTVI, HD35ED14bNTV, HD35ED1N4r…TV	20,000	(1)

Note 1: They store also 5 calculated humidity quantities: dew point temperature, wet bulb temperature, absolute humidity, mixing ratio, partial vapor pressure.

Note 2: Models measuring illuminance and UVA irradiance store also the **proportion of UV present (µW/lumen)**.

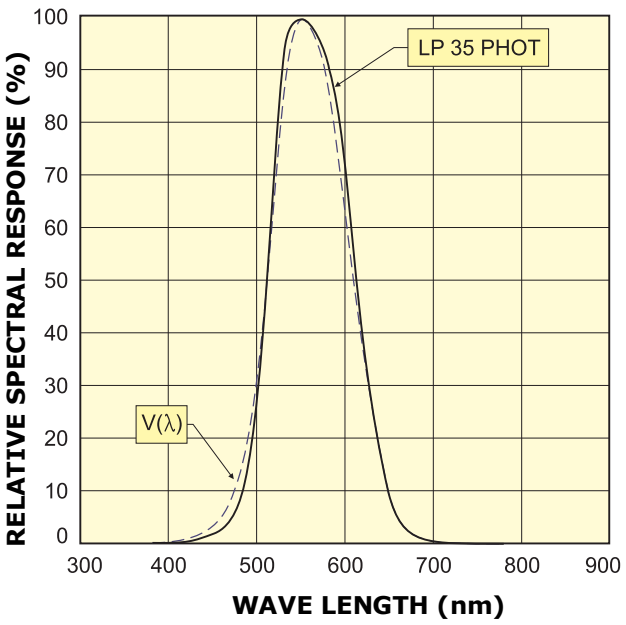
A sample consists of all the quantities measured and calculated by the data logger at the same acquisition time. For example, HD35ED1NAB model detects four quantities and calculates five (derived humidity quantities) and a sample includes a temperature measurement, a CO measurement, a CO_2 measurement and six humidity measurements (the relative humidity measurement plus the five derived quantities).

TAB. 8.7.2: measurement characteristics (instrument in line with sensor)
For all data logger models except versions with terminal header inputs

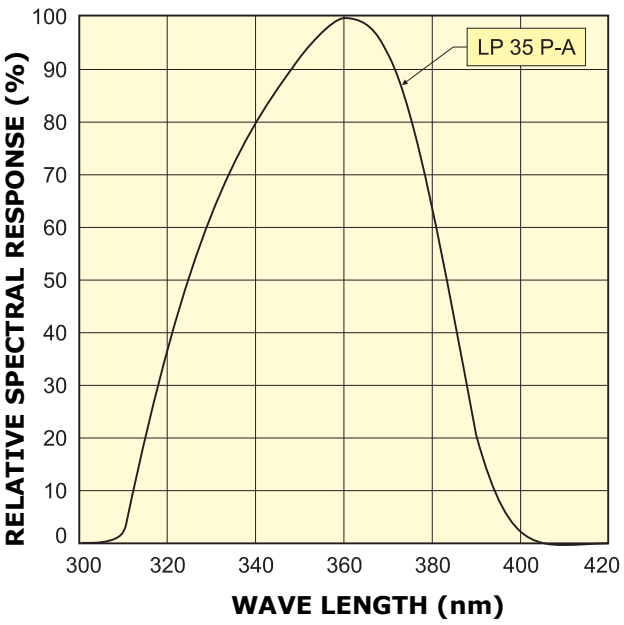
Temperature - NTC10K Sensor For …N…TC and …TV versions	
Sensor	NTC 10 kΩ @ 25 °C
Measuring range	-40…+105 °C
Resolution (instrument)	0.1 °C
Accuracy	± 0.3 °C in the range 0…+70 °C / ± 0.4 °C outside
Stability	0.1 °C/year
Temperature – Sensor integrated in RH module For …TVI versions and HD35ED1NAB, HD35EDG1NAB, HD35ED14bNAB, HD35EDG14bNAB models	
Sensor	Sensor integrated in humidity module
Measuring range	-40…+105 °C
Resolution (instrument)	0.1 °C
Accuracy	± 0.2 °C in the range 0…+60 °C ± (0.2 – 0.05 * T) °C in the range T=-40…0 °C ± [0.2 + 0.032 * (T-60)] °C in the range T=+60…+105 °C
Stability	0.05 °C/year

Temperature - Pt100/Pt1000 Sensor For …7P…TC versions				
Sensor	Pt100 / Pt1000 1/3 DIN thin film			
Measuring range	-100…+350 °C max. for probes measuring only temperature (the measuring range can be limited by the operating temperature of the used probe) -40…+150 °C for T/RH combined probes HD3517ETC…			
Resolution (instrument)	0.1 °C			
Accuracy	1/3 DIN			
Stability	0.1 °C/year			
Relative Humidity – High accuracy sensor For …TC and …TV versions				
Sensor	Capacitive			
Measuring range	0…100 %RH			
Resolution (instrument)	0.1 %			
Accuracy	± 1.5 % RH (0..90 % RH) / ± 2 % RH (remaining range)			
Sensor operating temperature	-20…+80 °C standard -40…+150 °C with HP3517**E**…			
Response time	T_{90} < 20 s (air speed = 2 m/s without filter)			
Temperature drift	±2% over the whole operating temperature range			
Stability	1%/year			
Calculated quantities	According to the model: dew point, wet bulb temperature, absolute humidity, mixing ratio, partial vapor pressure			
Relative humidity For…TVI versions and HD35ED1NAB, HD35EDG1NAB, HD35ED14bNAB, HD35EDG14bNAB models				
Sensor	Capacitive			
Measuring range	0…100 %RH			
Resolution (instrument)	0.1 %			
Accuracy	± 1.8 %RH (0..80 % RH) ± [1.8 + 0.11 * (RH -80)]% RH (remaining range)			
Sensor operating temperature	-40…+105 °C (R.H. max=[100-2*(T-80)] @ T=80…105 °C)			
Response time	T_{63} < 4 s (air speed = 2 m/s,without filter)			
Temperature drift	±2% over the whole operating temperature range			
Stability	< 0.5%/year			
Calculated quantities	According to the model: dew point, wet bulb temperature, absolute humidity, mixing ratio, partial vapor pressure			
Atmospheric Pressure				
Sensor	Piezo-resistive			
Measuring range	600…1100 hPa			
Resolution (instrument)	0.1 hPa			
Accuracy	± 0.5 hPa @ 20°C			
Stability	2 hPa/year			
Temperature drift	±3 hPa tra -20…+60 °C			
Differential Pressure				
Sensor	Piezo-resistive			
Measuring range	According to the model:			
	range 1	**range 2**	**range 3**	**range 4**
	±2.5 hPa	±10 hPa	±100 hPa	±2000 hPa
Resolution (instrument)	0.001 hPa	0.005 hPa	0.05 hPa	1 hPa
Accuracy	± 1% f.s. over the whole compensated temperature range (0…50 °C)			
Connection	Tube Ø 5 mm			

Carbon Monoxide (CO)	
Sensor	Electrochemical cell
Measuring range	0 … 500 ppm
Resolution (instrument)	1 ppm
Accuracy	±3 ppm+3% of measurement
Operating temperature	-5…50 °C
Response time	T_{90} < 50 s
Stability	5% of measurement /year
Sensor life	> 5 years in normal environmental conditions
Carbon Dioxide (CO_2)	
Sensor	Non-dispersive infrared rays (NDIR)
Measuring range	0…5000 ppm
Resolution (instrument)	1 ppm
Accuracy	±(50 ppm+3% of measurement) @ 20 °C and 1013 hPa
Operating temperature	-5…50 °C
Response time	T_{90} < 120 s (air speed= 2 m/s)
Stability	5% of measurement/5 years
Temperature drift	0.1% f.s. / °C
Illuminance	
Sensor	Photodiode
Measuring range	0…10.000 lux
Resolution (instrument)	1 lux (0…2000 lux), 5 lux (2000…10,000 lux)
Spectral range	In accordance with standard photopic curve V(λ)
Spectral response	See graph 1
α (temperature coefficient) $f_6(T)$	<0.05% K
Calibration uncertainty	<4%
f'_1 (accordance with photopic response V(λ))	<6%
f_2 (response as cosine law)	<3%
f_3 (linearity)	<1%
f_4 (instrument reading error)	<0.5%
f_5 (fatigue)	<0.5%
Class	B
One year drift	<1%
Operating temperature	0…50 °C
Reference standard	CIE n°69 – UNI 11142
UVA Irradiance	
Sensor	Photodiode
Measuring range	0…2000 mW/m^2
Resolution (instrument)	1 mW/m^2
Spectral range	UVA, peak ≅ 360 nm
Spectral response	See graph 2
Calibration uncertainty	<5%
f_2 (response as cosine law)	<6%
f_3 (linearity)	<1%
f_4 (instrument reading error)	±1 digit
f_5 (fatigue)	<0.5%
One year drift	<2%
Operating temperature	0…50 °C



Graph 1 – Relative spectral response of illuminance sensor



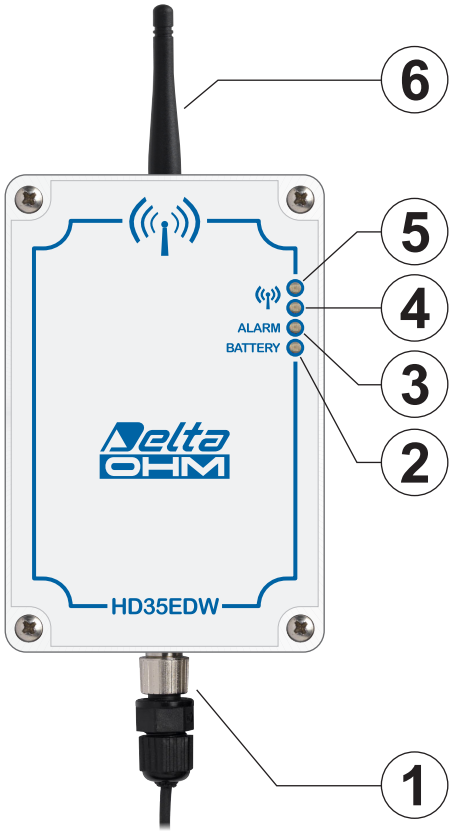
Graph 2 – Relative spectral response of UVA irradiance sensor

TAB. 8.8.3: Characteristics of terminal header inputs of HD35EDH instrument:

Pt100 / Pt1000	
Measuring range	-200…+650 °C
Resolution	0.1 °C
Accuracy	± 0.1 °C (excluding probe error)
Sensor coefficient	α=0.00385 °C^{-1}
Connection	2, 3 or 4 wires
Thermocouple	
Thermocouple type	K, J, T, N, E **Use thermocouples with isolated hot junction**
Measuring range	type K: -200…+1370 °C type J: -100…+750 °C type E: -200…+750 °C type T: -200…+400 °C type N: -200…+1300 °C
Resolution	0.1 °C
Accuracy (excluding probe error)	type K: ± 0.1 °C (< 600 °C) type E: ± 0.1 °C (< 300 °C) ± 0.2 °C (> 600 °C) ± 0.2 °C (> 300 °C) type N: ± 0.1 °C (< 600 °C) type J: ± 0.1 °C ± 0.2 °C (> 600 °C) type T: ± 0.1 °C
Input 0/4…20 mA	
Shunt resistance	Internal (50 Ω)
Resolution	16 bit
Accuracy	± 2 µA
Inputs 0…1 V o 0…50 mV	
Input Resistance	100 MΩ
Resolution	16 bit
Accuracy	± 0.01% f.s.
Inputs for counting the switchings of a voltage-free contact	
Switching frequency	50 Hz max.
Hold Time	10 ms min.
Potentiometer input	
Potentiometer	Typically 10 kΩ
Resolution	16 bit
Accuracy	± 0.01% f.s.

9 HD35EDW... WATERPROOF DATA LOGGERS

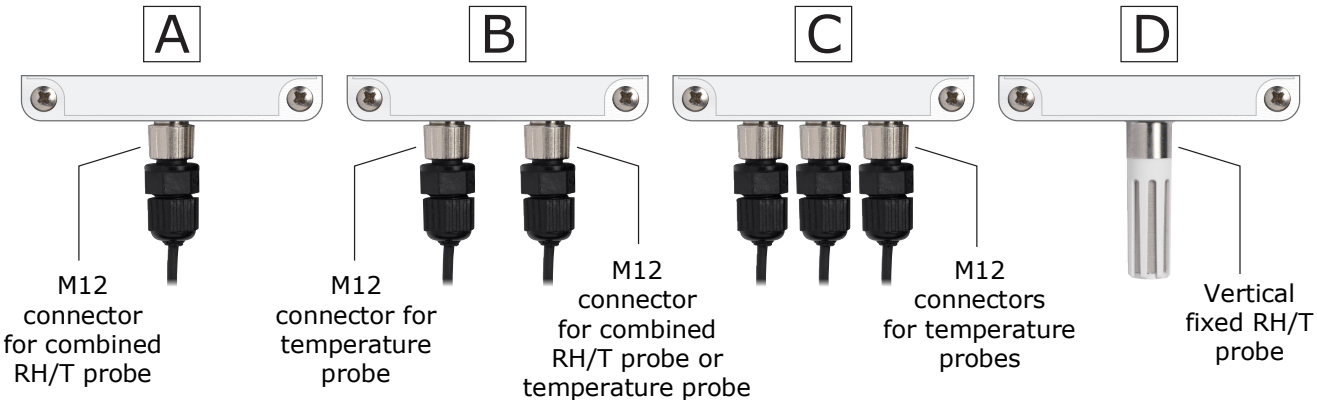
9.1 DESCRIPTION



Models without LCD display

Models with LCD display

1. Probes and/or integrated sensors. The aspect of the lower part of the data logger depends on the model (see next paragraph).
2. BATTERY LED: green color, indicates the charge level of the internal battery. As the battery runs low, the LED blinks with a lower and lower frequency (the blink period increases of 1 second for each 10% decrease of the battery charge).
3. ALARM LED: red color, it blinks when the measurement is in alarm condition.
4. Green RF LED: blinks if data transmission was successful.
5. Red RF LED: blinks to indicate that data transmission has failed.
6. RF Antenna. The antenna is external for outdoor installation with protection shield against solar radiations; the antenna is internal for indoor installation.
7. Custom LCD display.



Data logger models in waterproof housing

In order to highlight the physical quantities measured by data loggers, order codes include some identification characters for the various quantities, according to the following convention:

1 = Humidity

4b = Atmospheric Pressure (barometer)

N = Temperature with NTC10K sensor (**N/2** =two channels, **N/3** = three channels)

7P = Temperature with Pt100/Pt1000 sensor (**7P/3** = three channels)

V = Acceleration

TC = Probe with cable

TV = Fixed vertical temperature and/or R.H. probe without cable, with high accuracy R.H. sensor

TVI = Fixed vertical temperature and R.H. probe without cable

Models measuring temperature and humidity with combined probe with cable (**...TC** models) use the probes of the **HP3517...** series with **high accuracy relative humidity sensor** and NTC 10KΩ @ 25 °C or Pt100 temperature sensor according to the model. **The replacement of the HP3517... probe requires instrument recalibration in line with the new probe**.

Models with M12 connectors equipped with inputs for the measurement of temperature only use **TP35...** series temperature probes with NTC 10KΩ @ 25 °C or Pt100/Pt1000 sensor.

In models with 2 or 3 M12 connectors, the input number is shown on the connector side.

In models measuring the atmospheric pressure, the sensor is inside the instrument.

Refer to the figures indicated in the last column of the table below for probes connection modes and the position of the integrated sensors in the various models.

TAB. 9.1.1: models of data loggers in waterproof housing

Model	MEASUREMENTS					OPTIONAL LCD		INPUTS		Fig.
	NTC 10K	Pt100 Pt1000	RH	Patm	*a*	L Custom	G Graphic	Number of M12 connectors	Built-in sensors	
HD35EDW 7P/3 TC		•				•		3		**C**
HD35EDW N/3 TC	•					•		3		**C**
HD35EDW N TV	•					•			•	**D**
HD35EDW 1 TV			•			•			•	**D**
HD35EDW 1 TVI			•			•			•	**D**
HD35EDW 1N TC	•		•			•		1		**A**
HD35EDW 1N/2 TC	•		•			•		2		**B**
HD35EDW 17P TC		•	•			•		1		**A**
HD35EDW 1N TV	•		•			•			•	**D**
HD35EDW 1N TVI	Sensor integrated in RH module		•			•			•	**D**
HD35EDW 14bN TC	•		•	•		•		1	Patm	**A**
HD35EDW 14b7P TC		•	•	•		•		1	Patm	**A**
HD35EDW 1NV	Sensor integrated in RH module		•		•	•			•	**D**

9.2 INSTALLATION OF WATERPROOF HOUSING

The housing for waterproof models can be fixed to a wall or, for outdoor installations, to a 40 mm diameter mast by means of HD2003.77/40 clamping. For outdoor installations, use the optional protection shield against solar radiations (**HD9217TF1**).

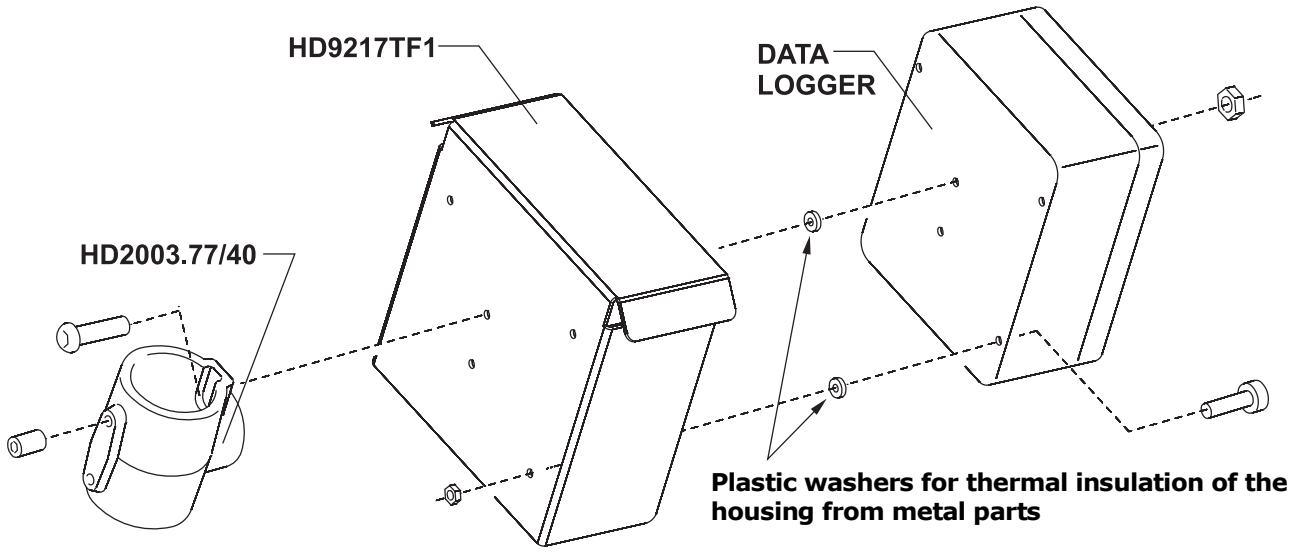


Fig. 9.2.1: installation of waterproof housing

Data loggers supplied with clamping already mounted on the back of the housing are equipped with protection devices against over-voltages connected to the clamping. For a correct operation of the protecting devices, the yellow/green wire with fast-on connector connected to the clamping should be connected to ground.

The outdoor installation of the combined temperature and relative humidity probe requires HD9007A-1 or HD9007A-2 protection against solar radiations.

9.3 CONNECTION TO THE WIRELESS NETWORK

The device can be connected and disconnected to/from the wireless network **by pressing for 5 seconds** the internal connection button.

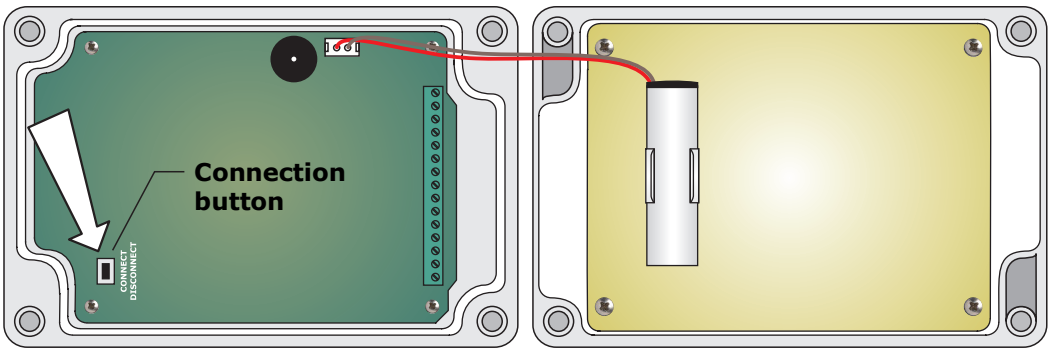


Fig. 9.3.1: internal connection button

If the device is disconnected, by pressing for 5 seconds the connection button the buzzer emits a beep and the green RF LED blinks for 1 second to indicate the start of the connection procedure. If the device belongs to a wireless network and the base unit is reachable, after connection the buzzer emits a second beep and the green RF LED blinks during data transmission. If the device doesn't belong to a wireless network and the base unit is not reachable, the second beep of the buzzer is not emitted and the red RF LED will blink.

If the device is connected, by pressing for 5 seconds the connection button the buzzer emits a beep, the red RF LED blinks for 1 second and the device is disconnected.

In data loggers with LCD display, the connection status is signaled also by the connection icon on the display (see figure 3.6 on page 9):

- The icon is steady on if the data logger is connected;
- The icon blinks if the data logger is trying to connect (the icon will be steady on after connection or will go on blinking if the base unit cannot be reached or the data logger doesn't belong to a wireless network);
- The icon is off if the data logger is not connected.

PING function:

In the devices connected to a wireless network it is possible to check if the base unit can be reached by briefly pressing the connection button: if the green RF LED is blinking, it means that the base unit is reachable, otherwise it will be the red RF LED RF to blink.

9.4 DATA LOGGER WITH LCD OPTION

Through HD35AP-S software, you can select the measurement to be displayed on the main line of the display or set the automatic alternation of measured quantities. Information on the connection status, logging (in progress/disabled), and battery charge level are shown. The secondary line displays temperature (if measured by the model).

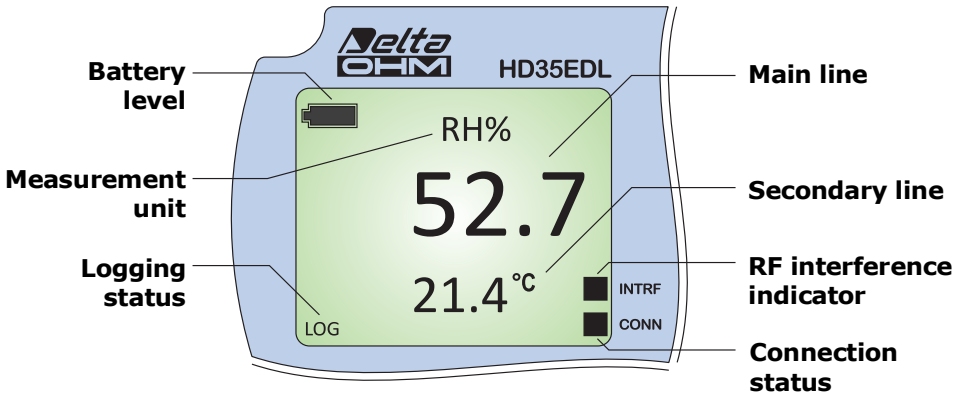


Fig. 9.4.1: custom LCD

9.5 TECHNICAL CHARACTERISTICS OF DATA LOGGERS IN WATERPROOF HOUSING

Transmission frequency	868 MHz, 902-928 MHz or 915.9-929.7 MHz according to the model
Antenna	External for outdoor installation with protection shield against solar radiations. Internal for indoor installation.
Transmission range	300 m in open field (**the range can be reduced in the presence of obstacles or adverse weather conditions**)
Measuring interval (*)	1, 2, 5, 10, 15, 30 s / 1, 2, 5, 10, 15, 30, 60 min
Logging and transmission interval (*)	1, 2, 5, 10, 15, 30 s / 1, 2, 5, 10, 15, 30, 60 min
Internal memory	Circular management or stop logging if memory is full. The number of storable samples depends on the number of detected quantities (see table 9.5.1).
Alarm	Acoustic through internal buzzer
Power supply	**Non rechargeable** lithium thyonil chloride (Li-$SOCl_2$) internal battery, 3.6 V, AA format, 2-pole Molex 5264 connector. Optional 24 Vac/dc power supply.
Display	Optional custom LCD
Buttons	Connection button inside the instrument
LED indicators	RF communication status (2-color LED)
Battery life	Typ. 2 years (without repeaters, measurement interval 5 s and log interval 30 s)
Operating temperature and humidity	-20…+70 °C / 0…100 %RH
Dimensions	See dimensional drawing
Connectors for external probes with cable	M12 connectors
Weight	250 g approx.(battery included)
Housing	ABS
Protection Degree	IP 67
Installation	Wall mount or fixing to a 40mm diameter mast through the clamping HD2003.77/40 (**optional**). Protection shield against solar radiations HD9217TF1 (**optional**) for outdoor installation.

(*) Some models that measure many quantities may have a minimum interval higher than 1 second.

TAB. 9.5.1: memory capacity of data loggers in waterproof housing

Models	Number of storable samples	Notes
HD35EDWNTV, HD35EDW1TV, HD35EDW1TVI	74,000	
HD35EDWN/3TC, HD35EDW7P/3TC	44,000	
HD35EDW1NTC, HD35EDW17PTC, HD35EDW1NTV, HD35EDW1NTVI	22,000	(1)
HD35EDW1N/2TC, HD35EDW14bNTC, HD35EDW14b7PTC	20,000	(1)

Note 1: they store also 5 calculated humidity quantities: dew point, wet bulb temperature, absolute humidity, mixing ratio, partial vapor pressure.

A sample consists of all the quantities measured and calculated by the data logger at the same acquisition time. For example, HD35EDW1NTC model detects two quantities and calculates five (the derived humidity quantities) and a sample consists of a temperature measurement and six humidity measurements (the relative humidity measurement plus five derived quantities).

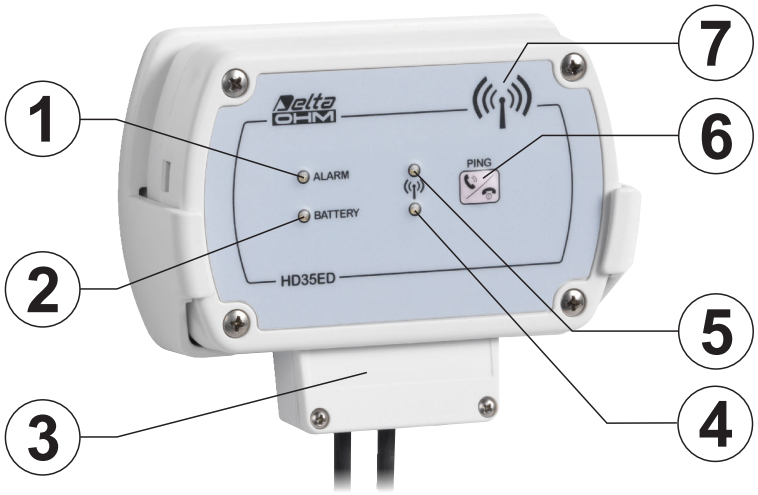
TAB. 9.5.2: Measurement characteristics (instrument in line with sensor)

Temperature - NTC10K Sensor For versions …N…TC and …TV	
Sensor	NTC 10 kΩ @ 25 °C
Measurement range	-40…+105 °C
Resolution (of instrument)	0.1 °C
Accuracy	± 0.3 °C in the range 0…+70 °C / ± 0.4 °C outside
Stability	0.1 °C/year
Temperature – Sensor integrated in RH module For versions …TVI and the model HD35EDW1NV	
Sensor	Sensor integrated in humidity module
Measurement range	-40…+105 °C
Resolution (of instrument)	0.1 °C
Accuracy	± 0.2 °C in the range 0…+60 °C ± (0.2 – 0.05 * T) °C in the range T=-40…0 °C ± [0.2 + 0.032 * (T-60)] °C in the range T=+60…+105 °C
Stability	0.05 °C/year
Temperature - Pt100/Pt1000 Sensor For versions …7P…TC	
Sensor	Pt100 / Pt1000 1/3 DIN thin film
Measurement range	-100…+350 °C max. for probes measuring only temperature (the measurement range can be limited by the operating temperature of the used probe) -40…+150 °C for T/RH combined probes HP3517ETC…
Resolution (of instrument)	0.1 °C
Accuracy	1/3 DIN
Stability	0.1 °C/year

Relative Humidity – High accuracy sensor For versions …TC and …TV	
Sensor	Capacitive
Measurement range	0…100 %RH
Resolution (of instrument)	0.1 %
Accuracy	± 1.5 %RH (0..90 % RH) / ± 2 % RH (remaining range)
Sensor operating temperature	-20…+80 °C standard -40…+150 °C with HP3517**E**…probe
Response time	T_{90} < 20 s (air speed = 2 m/s, without filter)
Temperature drift	±2% over the whole operation temperature range
Stability	1%/year
Calculated quantities	According to the model: dew point, wet bulb temperature, absolute humidity, mixing ratio, partial vapor pressure
Relative Humidity For versions …TVI and the model HD35EDW1NV	
Sensor	Capacitivo
Measurement range	0…100 % RH
Resolution (of instrument)	0.1 %
Accuracy	± 1.8 % RH (0..80 %UR) ±[1.8 + 0.11 * (UR-80)]% RH (remaining range)
Sensor operating temperature	-40…+105 °C (R.H. max=[100-2*(T-80)] @ T=80…105 °C)
Response time	T_{63} < 4 s (air speed = 2 m/s, without filter)
Temperature drift	±2% over the whole operating temperature range
Stability	< 0.5%/year
Calculated quantities	According to the model: dew point, wet bulb temperature, absolute humidity, mixing ratio, partial vapor pressure
Atmospheric pressure	
Sensor	Piezoresistive
Measurement range	600…1100 hPa
Resolution (of instrument)	0.1 hPa
Accuracy	± 0.5 hPa @ 20°C
Stability	2 hPa/year
Temperature drift	±3 hPa tra -20…+60 °C
Acceleration	
Sensor	Triaxial Accelerometer
Measurement range	0…16 g
Resolution (of instrument)	< 0.05 g (function of measured value)
Accuracy	< 0.1 g (function of measured value)

10 HD35ED-ALM REMOTE ALARM DEVICE

10.1 DESCRIPTION



1. ALARM LED: red color, it blinks to signal alarm conditions.
2. BATTERY LED: green color, it indicates the internal battery charge level. As the battery runs low, the LED blinks with a lower and lower frequency (the blink period increases of 1 second for each 10% decrease of the battery charge).
3. Relay outputs. The connection terminals are protected by a cover.
4. Green RF LED: it blinks if RF transmission was successful.
5. Red RF LED: it blinks to indicate that RF transmission has failed
6. Connection button.
7. Internal RF antenna.

10.2 CONNECTION

Two bistable relays with potential-free contact are available. In order for relays to be activated in case of an alarm, alarm conditions should be associated to relays activation through the HD35AP-S software (see section ***Alarm settings*** in the software instructions). Contacts arrangement is shown in the following figure.

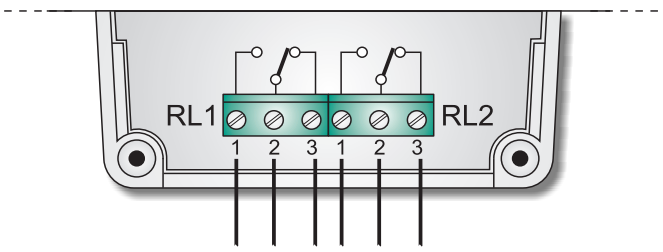


Fig. 10.2.1: relays in HD35ED-ALM alarm device

10.3 CONNECTION TO THE WIRELESS NETWORK

The device can be connected and disconnected to/from the wireless network by **pressing for 5 seconds** the connection button on the front panel (see step 6 of paragraph 7.1).

If the device is disconnected, by pressing the connection button for 5 seconds the buzzer emits a beep and the green LED activates for one second to indicate the start of the connection procedure. If the device belongs to a wireless network and the base unit is reachable, once connected, the buzzer emits a second beep and the green RF LED will blink during data transmission. If the device doesn't belong to a wireless network or the base unit cannot be reached, the second beep of the buzzer is not emitted and the red RF LED will blink.

If the device is connected, by pressing the connection button for 5 seconds the buzzer emits a beep, the red RF LED activates for one second and the device is disconnected.

PING function:

In the devices connected to a wireless network it is possible to check if the base unit can be reached by briefly pressing the connection button: if the green RF LED is blinking, it means that the base unit is reachable, otherwise it will be the red RF LED to blink.

10.4 TECHNICAL CHARACTERISTICS OF THE ALARM DEVICE

Power supply	**Non rechargeable** lithium thyonil chloride (Li-$SOCl_2$) internal battery, 3.6 V, AA format, 2-pole Molex 5264 connector.
Transmission Frequency	868 MHz, 902-928 MHz or 915.9-929.7 MHz according to the model
Antenna	Internal
Transmission range	300 m in open field **The range can be reduced in the presence of obstacles or adverse atmospheric conditions**
Keyboard	Connection button
LED indicators	Alarm condition, battery charge level, RF communication status.
Relays	2 bistable relays with potential-free contact Contact: max 1A @ 30Vdc resistive charge
Buzzer	Sounds cyclically when an alarm condition occurs: 1 single beep indicates that relay 1 is active 2 beeps in rapid succession indicate that relay 2 is active 3 beeps in rapid succession indicate that both relays are active
Battery life	1 year in typical operating conditions **The effective life depends on how often the alarm condition is generated**
Operating temperature and humidity	-10…+60 °C / 0…85 %RH non condensing
Dimensions	See dimensional drawing
Weight	200 g approx. (battery included)
Housing	ABS
Installation	Wall mount (**supplied**) for removable installation or flanges (**optional**) for fixed installation

11 MODBUS-RTU

In RS485 MODBUS-RTU communication the base unit works as a multiplexer (i.e., as an interface) to address MODBUS commands from PC/PLC to wireless network devices. That means that the address of a wireless device (for ex. a data logger) which is not physically connected to the RS485 network can be added to the MODBUS command: the base unit, physically connected to the RS485 network, will intercept the command and will send it to the interested wireless device. The wireless device will execute the command and reply to the base unit; this will send back the reply to the PC/PLC. In order for a wireless device to be addressed successfully, devices with the same MODBUS address as that of wireless devices should not be present in RS485 network.

The device general information can be read through the function code **0x2B/0x0E.** It consists of:

- Manufacturer (Delta OHM)
- Model
- Firmware version

The complete list of MODBUS registers is shown below. According to the device model, some of the listed registers could not be present if not significant for that particular model (for ex., CO_2 measurement will not be available if it is not measured by the data logger). If you try to read a register that is not present, the instrument returns the fixed value 32767. In case of doubt on the registers actually available in a particular model, use the function " *Download the list of MODBUS registers of the device* " included in the *Settings* sections of HD35AP-S software (see software instructions).

The following conventions have been used in the tables:

- **AP** = base unit, **ED** = data logger, **RE** = repeater, **AL** = alarm module
  AP, ED, RE, AL columns indicate the device where the parameter is available.
- Type: **b** = bit, **B** = 8 bits (Byte), **W** = 16 bits without sign (Word), **SW** = 16 bits with sign
- **(x10)** = decimal value expressed as an integer (e.g., if the content of the register is 184, the value is to be intended as 18,4).
- **(x100)** = centesimal value expressed as an integer (e.g., if the content of the register is 500, the value is to be intended as 5,00).

The commands for requesting units of measurement return an index according to the correspondence indicated in the table below:

TAB. 11.1: indexes of the units of measurement

Index	Unit of meas.	Index	Unit of meas.	Index	Unit of meas.	Index	Unit of meas.	Index	Unit of meas.
0	°C	10	atm	20	mph	30	mA	40	Counts
1	°F	11	mmHg	21	knot	31	ppm	41	mm/h
2	%RH	12	mmH_2O	22	W/m^2	32	Hz	42	inch/h
3	g/m^3	13	inchHg	23	$\mu W/cm^2$	33	%	43	counts/h
4	g/kg	14	$inchH_2O$	24	Wh/m^2	34	degrees	44	mW/m^2
5	mbar	15	kgf/cm_2	25	kWh/m^2	35	lux	255	Not defined
6	bar	16	PSI	26	J/m^2	36	m^2/s		
7	Pa	17	m/s	27	$\mu J/cm^2$	37	g (*)		
8	hPa	18	km/h	28	V	38	mm		
9	kPa	19	ft/s	29	mV	39	inch		

(*) Gravity acceleration

TAB. 11.2: Discrete Inputs – Read-only parameters

Address	Type	Discrete Input description	AP	ED	RE	AL
0	b	If 1, the device is subjected to RF interference due to the transmission of more covering repeaters.		✓	✓	✓
1	b	If 1, the last transmitted measurement packet has been lost		✓		
2	b	Flag PENDING_CONF. If 1, there is a pending configuration change request.	✓	✓	✓	✓
3	b	If 1, there are more devices with the same Modbus address in the network. The conflict must be solved.	✓			
4	b	If 1, there is a RF scheduling problem. The set transmission interval is too short.		✓		✓
5	b	If 1, a network migration to another RF channel is in progress.	✓	✓	✓	✓
6	b	If 1, the device supports a rechargeable battery.	✓		✓	

TAB. 11.3: Coils – Read/Write parameters

Address	Type	Coil description	AP	ED	RE	AL
0	b	Waiting time after Modbus transmission: 0= immediate reception, 1=waiting time for 3.5 characters	✓			
1	b	Logging status: 0=active, 1=inactive		✓		
2	b	Logging mode: 0=non cyclic, 1=cyclic		✓		
3	b	Set 1 to delete the device logging memory. Bit zeroing is automatic.	✓	✓		
4	b	Buzzer activation (for AP and ED) or relays activation (for AL) in case of measurement alarm: 0=no, 1=yes	✓	✓		✓
5	b	If 1, there are unsaved device parameters in the flash memory. Set 0 to force storage.	✓			
6	b	If 1, there is a pending RF rescheduling (RF transmission sequence of devices). Set 0 to force rescheduling.	✓			
7	b	Flag CMD_FAILURE. If 1, at least a command sent to the device has failed. Set 0 to reinitialize the flag.	✓	✓	✓	✓
8	b	Buzzer activation in case of RF alarm: 0=no, 1=Yes	✓			
9	b	Protection of configuration with password: 0=no, 1=yes Changing the parameter requires the Administrator password (see Holding Register 10036).	✓			
13	b	Set 1 to reinitialize the counter in HD35EDH model with counter input. Bit zeroing is automatic.		✓		
14	b	If 1, some device parameters in the base unit could be not updated. Set 0 to force the update.		✓	✓	✓
15	b	CO_2 sensor autocalibration: 0=OFF, 1=ON		✓		
16	b	Relay #1 activation in case of measurement alarm: 0=no, 1=yes				✓
17	b	Relay #1 activation in case of RF alarm : 0=no, 1=yes				✓
18	b	If 1, relay #1 is always active as long as the alarm persists				✓
19	b	Relay #2 activation in case of measurement alarm: 0=no, 1=yes				✓
20	b	Relay #2 activation in case of RF alarm : 0=no, 1=yes				✓
21	b	If 1, relay #2 is always active as long as the alarm persists				✓

TAB. 11.4: Input Registers – Read-only parameters

Address	Type	Input Register description	AP	ED	RE	AL
Measured values and status of measurement alarms						
0	SW	**TEMPERATURE** with **NTC10K** sensor of channel **1** in the set measurement unit (x10).		✓		
1	B	Alarm for temperature with NTC10K sensor of channel 1: 0=OFF, 1= lower threshold alarm, 2= higher threshold alarm		✓		

Address	Type	Input Register description	AP	ED	RE	AL
2	SW	**RELATIVE HUMIDITY** in % (x10). Only for models with high accuracy sensor (models …TC and …TV).		✓		
3	B	Relative humidity alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm. Only for models …TC and …TV with high accuracy sensor.		✓		
4	SW	**DEW POINT** in the set measurement unit (x10).		✓		
5	B	Dew Point alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
6	SW	**PARTIAL VAPOR PRESSURE** in hPa (x100).		✓		
7	B	Partial vapor pressure alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
8	SW	**MIXING RATIO** in g/Kg (x10).		✓		
9	B	Mixing ratio alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
10	SW	**ABSOLUTE HUMIDITY** in g/m^3 (x10).		✓		
11	B	Absolute humidity alarm : 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
12	SW	**WET BULB TEMPERATURE** in the set measurement unit (x10).		✓		
13	B	Wet bulb temperature alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
16	SW	**TEMPERATURE** with **NTC10K** sensor of channel **2** in the set measurement unit (x10).		✓		
17	B	Alarm for temperature with NTC10K sensor of channel 2: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
20	SW	**ILLUMINANCE** in lux.		✓		
21	B	Illuminance alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
22	SW	**CO** in ppm.		✓		
23	B	CO alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
24	SW	**ATMOSPHERIC PRESSURE** in the set measurement unit (the multiplier depends on the set unit).		✓		
25	B	Atmospheric pressure alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
32	SW	**CO_2** in ppm.		✓		
33	B	CO_2 alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
46	SW	**TEMPERATURE** with sensor integrated in RH module in the set measurement unit (x10). Only for **models …TVI and …AB**.		✓		
47	B	Alarm for temperature with sensor integrated in RH module: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm. Only for **models** …TVI and …AB.		✓		
48	SW	**RELATIVE HUMIDITY** in % (x10). Only for **models …TVI and …AB**.		✓		
49	B	Relative humidity alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm. Only for models…TVI and …AB.		✓		
50	SW	**TEMPERATURE** with **NTC10K** sensor of channel **3** in the set measurement unit (x10).		✓		
51	B	Alarm for temperature with NTC10K sensor of channel 3: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
56	SW	**DIFFERENTIAL PRESSURE** for the range **r3** in the set measurement unit (the multiplier depends on the set unit).		✓		
57	B	Differential pressure alarm for the range r3: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		

Address	Type	Input Register description	AP	ED	RE	AL
60	SW	**DIFFERENTIAL PRESSURE** for ranges **r1** and **r2** in the set measurement unit (the multiplier depends on the set unit).		✓		
61	B	Differential pressure alarm for ranges r1 and r2: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
62	SW	**DIFFERENTIAL PRESSURE** for the range **r4** in the set measurement unit (the multiplier depends on the set unit).		✓		
63	B	Differential pressure alarm for the range r4: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
64	SW	**TEMPERATURE** with **Pt100 sensor** of HP3517E… probe in the set measurement unit (x10).		✓		
65	B	Alarm for temperature with Pt100 sensor of HP3517E… probe: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
68	SW	**UVA IRRADIANCE** in mW/m^2.		✓		
69	B	UVA irradiance alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
70	SW	**PROPORTION OF UV PRESENT** in µW/lumen.		✓		
71	B	Proportion of UV present alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
Measured values and status of measurement alarms for configurable inputs						
1000 + 200 x (**N**-1)	SW	**TEMPERATURE** with 2-wire **Pt100 sensor** of channel **N** in the set measurement unit (x10).		✓		
1001 + 200 x (**N**-1)	B	Alarm for temperature with 2-wire Pt100 sensor of channel **N**: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
1002 + 200 x (**N**-1)	SW	**TEMPERATURE** with 3-wire **Pt100 sensor** of channel **N** in the set measurement unit (x10).		✓		
1003 + 200 x (**N**-1)	B	Alarm for temperature with 3-wire Pt100 sensor of channel **N**: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
1004 + 200 x (**N**-1)	SW	**TEMPERATURE** with 4-wire **Pt100 sensor** of channel **N** in the set measurement unit (x10).		✓		
1005 + 200 x (**N**-1)	B	Alarm for temperature with 4-wire Pt100 sensor of channel **N**: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
1006 + 200 x (**N**-1)	SW	**TEMPERATURE** with 2-wire **Pt1000 sensor** of channel **N** in the set measurement unit (x10).		✓		
1007 + 200 x (**N**-1)	B	Alarm for temperature with 2-wire Pt1000 sensor of channel **N**: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
1008 + 200 x (**N**-1)	SW	**TEMPERATURE** with 3-wire **Pt1000 sensor** of channel **N** in the set measurement unit (x10).		✓		
1009 + 200 x (**N**-1)	B	Alarm for temperature with 3-wire Pt1000 sensor of channel **N**: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
1010 + 200 x (**N**-1)	SW	**TEMPERATURE** with 4-wire **Pt1000 sensor** of channel **N** in the set measurement unit (x10).		✓		
1011 + 200 x (**N**-1)	B	Alarm for temperature with 4-wire Pt1000 sensor of channel **N**: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
1012 + 200 x (**N**-1)	SW	**TEMPERATURE** with **TC_K** sensor of channel **N** in the set measurement unit (x10).		✓		
1013 + 200 x (**N**-1)	B	Alarm for temperature with TC_K sensor of channel **N**: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
1014 + 200 x (**N**-1)	SW	**TEMPERATURE** with **TC_J** sensor of channel **N** in the set measurement unit (x10).		✓		
1015 + 200 x (**N**-1)	B	Alarm for temperature with TC_J sensor of channel **N**: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
1016 + 200 x (**N**-1)	SW	**TEMPERATURE** WITH **TC_T** sensor of channel **N** in the set measurement unit (x10).		✓		
1017 + 200 x (**N**-1)	B	Alarm for temperature with TC_T sensor of channel **N**: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		

Address	Type	Input Register description	AP	ED	RE	AL
1018 + 200 x (**N**-1)	SW	**TEMPERATURE** with **TC_N** sensor of channel **N** in the set measurement unit (x10).		✓		
1019 + 200 x (**N**-1)	B	Alarm for temperature with TC_N sensor of channel **N**: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
1026 + 200 x (**N**-1)	SW	**TEMPERATURE** with **TC_E** sensor of channel **N** in the set measurement unit (x10).		✓		
1027 + 200 x (**N**-1)	B	Alarm for temperature with TC_E sensor of channel **N**: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
1028 + 200 x (**N**-1)	SW	Input value in **mV** of channel **N** (x10). Only if channel **N** is configured as **0...1 V** input (HD35EDH).		✓		
1029 + 200 x (**N**-1)	B	Alarm for channel **N** if the channel is configured as 0…1 V input (HD35EDH): 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
1030 + 200 x (**N**-1)	SW	Input value in **mV** of channel **N** (x100). Only if channel **N** is configured as **0...50 mV** input (HD35EDH).		✓		
1031 + 200 x (**N**-1)	B	Alarm for channel **N** if the channel is configured as 0…50 mV input (HD35EDH): 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
1032 + 200 x (**N**-1)	SW	Input value in **mA** of channel **N** (x100). Only if channel **N** is configured as 4…20 mA input (HD35EDH).		✓		
1033 + 200 x (**N**-1)	B	Alarm for channel **N** if the channel is configured as 4…20 mA input (HD35EDH): 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
1034 + 200 x (**N**-1)	SW	Position of **potentiometer** in % of channel **N**. Only if channel **N** is configured as potentiometric input (HD35EDH).		✓		
1035 + 200 x (**N**-1)	B	Alarm for channel **N** if the channel is configured as potentiometric input (HD35EDH): 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
1036 + 200 x (**N**-1)	SW	Value of quantity associated to channel **N** if the channel is configured as 0…1 V input (HD35EDH).		✓		
1037 + 200 x (**N**-1)	B	Alarm for quantity associated to channel **N** if the channel is configured as 0…1 V input (HD35EDH): 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
1038 + 200 x (**N**-1)	SW	Value of quantity associated to channel **N** if the channel is configured as 0…50 mV input (HD35EDH).		✓		
1039 + 200 x (**N**-1)	B	Alarm for quantity associated to channel **N** if the channel is configured as 0…50 mV input (HD35EDH): 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
1040 + 200 x (**N**-1)	SW	Value of quantity associated to channel **N** if the channel is configured as 4…20 mA input (HD35EDH).		✓		
1041 + 200 x (**N**-1)	B	Alarm for quantity associated to channel **N** if the channel is configured as 4…20 mA input (HD35EDH): 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
1042 + 200 x (**N**-1)	SW	Value of quantity associated to channel **N** if the channel is configured as potentiometric input (HD35EDH).		✓		
1043 + 200 x (**N**-1)	B	Alarm for quantity associated to channel **N** if the channel is configured as potentiometric input (HD35EDH): 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
4000 to 4001	SW	**Number of counts**. Only if the channel is configured as counter (HD35EDH).		✓		
4002 to 4003	B	Alarm for number of counts if the channel is configured as counter (HD35EDH): 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		
da 4004 a 4005	SW	Value of quantity associated to the channel if the channel is configured as counter (HD35EDH).		✓		
4006 to 4007	B	Alarm for quantity associated to the channel if the channel is configured as counter (HD35EDH): 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.		✓		

Address	Type	Input Register description	AP	ED	RE	AL
Measurement units and resolution						
5000	W	Unit of measurement for **TEMPERATURE** with **NTC10K** sensor of channel **1**: 0=°C, 1=°F.		✓		
5004	W	**DEW POINT** measurement unit: 0=°C, 1=°F.		✓		
5012	W	**WET BULB TEMPERATURE** measurement unit: 0=°C, 1=°F.		✓		
5016	W	Unit of measurement for **TEMPERATURE** with **NTC10K** sensor of channel **2**: 0=°C, 1=°F.		✓		
5024	W	**ATMOSPHERIC PRESSURE** measurement unit: see TAB 10.1		✓		
5025	SW	**ATMOSPHERIC PRESSURE** resolution: …, -2=100, -1=10, 0=1, 1=0.1, 2=0.01, …		✓		
5046	W	Unit of measurement for **TEMPERATURE** with sensor integrated in RH module: 0=°C, 1=°F. Only for **models …TVI** and **…AB**.		✓		
5050	W	Unit of measurement for **TEMPERATURE** with **NTC10K** sensor of channel **3**: 0=°C, 1=°F.		✓		
5056	W	**DIFFERENTIAL PRESSURE** measurement unit for range **r3**: see TAB 10.1		✓		
5057	SW	**DIFFERENTIAL PRESSURE** resolution for range **r3**: …, -2=100, -1=10, 0=1, 1=0.1, 2=0.01, …		✓		
5060	W	**DIFFERENTIAL PRESSURE** measurement unit for ranges **r1** and **r2**: see TAB 10.1		✓		
5061	SW	**DIFFERENTIAL PRESSURE** resolution for ranges **r1** and **r2**: …, -2=100, -1=10, 0=1, 1=0.1, 2=0.01, …		✓		
5062	W	**DIFFERENTIAL PRESSURE** measurement unit for range **r4**: see TAB 10.1		✓		
5063	SW	**DIFFERENTIAL PRESSURE** resolution for range **r4**: …, -2=100, -1=10, 0=1, 1=0,1, 2=0,01, …		✓		
5064	W	Unit of measurement for **TEMPERATURE** with **Pt100** sensor of HP3517E… probe: 0=°C, 1=°F.		✓		
6000 + 200 x (**N**-1)	W	Unit of measurement for **TEMPERATURE** with **2-wire Pt100** sensor of channel **N**: 0=°C, 1=°F.		✓		
6002 + 200 x (**N**-1)	W	Unit of measurement for **TEMPERATURE** with **3-wire Pt100** sensor of channel **N**: 0=°C, 1=°F.		✓		
6004 + 200 x (**N**-1)	W	Unit of measurement for **TEMPERATURE** with **4-wire Pt100** sensor of channel **N**: 0=°C, 1=°F.		✓		
6006 + 200 x (**N**-1)	W	Unit of measurement for **TEMPERATURE** with **2-wire Pt1000** sensor of channel **N**: 0=°C, 1=°F.		✓		
6008 + 200 x (**N**-1)	W	Unit of measurement for **TEMPERATURE** with **3-wire Pt1000** sensor of channel **N**: 0=°C, 1=°F.		✓		
6010 + 200 x (**N**-1)	W	Unit of measurement for **TEMPERATURE** with **4-wire Pt1000** sensor of channel **N**: 0=°C, 1=°F.		✓		
6012 + 200 x (**N**-1)	W	Unit of measurement for **TEMPERATURE** with **TC_K** sensor of channel **N**: 0=°C, 1=°F.		✓		
6014 + 200 x (**N**-1)	W	Unit of measurement for **TEMPERATURE** with **TC_J** sensor of channel **N**: 0=°C, 1=°F.		✓		
6016 + 200 x (**N**-1)	W	Unit of measurement for **TEMPERATURE** with **TC_T** sensor of channel **N**: 0=°C, 1=°F.		✓		
6018 + 200 x (**N**-1)	W	Unit of measurement for **TEMPERATURE** with **TC_N** sensor of channel **N**: 0=°C, 1=°F.		✓		
6026 + 200 x (**N**-1)	W	Unit of measurement for **TEMPERATURE** with **TC_E** sensor of channel **N**: 0=°C, 1=°F.		✓		
6036 + 200 x (**N**-1)	W	Measurement unit of the quantity associated to channel **N** if the channel is configured as 0…1 V input (HD35EDH). See TAB 10.1		✓		
6037 + 200 x (**N**-1)	SW	Resolution of the quantity associated to channel **N** if the channel is configured as 0…1 V input (HD35EDH): …, -2=100, -1=10, 0=1, 1=0.1, 2=0.01, …		✓		

Address	Type	Input Register description	AP	ED	RE	AL
6038 + 200 x (**N**-1)	W	Measurement unit of the quantity associated to channel **N** if the channel is configured as 0…50 mV (HD35EDH). See TAB 10.1		✓		
6039 + 200 x (**N**-1)	SW	Resolution of the quantity associated to channel **N** if the channel is configured as 0…50 mV (HD35EDH): …, -2=100, -1=10, 0=1, 1=0.1, 2=0.01, …		✓		
6040 + 200 x (**N**-1)	W	Measurement unit of the quantity associated to channel **N** if the channel is configured as 4…20 mA input (HD35EDH). See TAB 10.1		✓		
6041 + 200 x (**N**-1)	SW	Resolution of the quantity associated to channel **N** if the channel is configured as 4…20 mA input (HD35EDH): …, -2=100, -1=10, 0=1, 1=0.1, 2=0.01, …		✓		
6042 + 200 x (**N**-1)	W	Measurement unit of the quantity associated to channel **N** if the channel is configured as potentiometric input (HD35EDH). See TAB 10.1		✓		
6043 + 200 x (**N**-1)	SW	Resolution of the quantity associated to channel **N** if the channel is configured as potentiometric input (HD35EDH): …, -2=100, -1=10, 0=1, 1=0.1, 2=0.01, …		✓		
9002	W	Measurement unit of the quantity associated to channel **N** if the channel is configured as counter (HD35EDH). See TAB 10.1		✓		
9003	SW	Resolution of the quantity associated to channel **N** if the channel is configured as counter (HD35EDH): …, -2=100, -1=10, 0=1, 1=0.1, 2=0.01, …		✓		
General information						
10000	W	Year of last measurement.		✓		
10001	W	Month of last measurement.		✓		
10002	W	Day of last measurement.		✓		
10003	W	Hour of last measurement.		✓		
10004	W	Minutes of last measurement.		✓		
10005	W	Seconds of last measurement.		✓		
10006	W	Packet Error Rate in % of the device (x10).		✓	✓	✓
10007	W	Number of RF hops of the last transmitted packet.		✓	✓	✓
10008	SW	RF signal level in dBm (relating to last RF hop).		✓	✓	✓
10009	W	Battery level: 0=empty, 1=half full , 2=full, 3=external power supply	✓	✓	✓	✓
10010	W	Time, in seconds, elapsed since the last transmitted packet.		✓	✓	✓
10011	W	RF signal level expressed as 0 to 7 scale.		✓	✓	✓
10012	W	Modbus address of the AP to which the device is connected.		✓	✓	✓
10013	W	Password level for the current connection: 0=no password, 1=user level, 2= administrator level	✓			
10014	W	Battery remaining capacity in %.	✓		✓	
10015	W	Estimation of battery remaining capacity in hours (x10).	✓		✓	
10016	W	Type of power supply: 0=battery, 1=USB, 2=ext. power supply	✓		✓	
10017	W	Estimation of battery remaining capacity in weeks		✓		✓
10018	W	Alarm relay #1 status: 0=deactivated, 1=intermittent, 2=active, 3=undetermined				✓
10019	W	Alarm relay #2 status: 0=deactivated, 1=intermittent, 2=active, 3=undetermined				✓

TAB. 11.5: Holding Registers – Read/Write parameters

Address	Type	Holding Register description	AP	ED	RE	AL
Measurement alarm thresholds						
0	SW	Lower alarm threshold for **TEMPERATURE** with **NTC10K** sensor of channel **1** in the set measurement unit (x10).		✓		
1	SW	Higher alarm threshold for temperature with NTC10K sensor of channel 1 in the set measurement unit (x10).		✓		
2	SW	**RH** lower alarm threshold in % (x10). Only for models with high accuracy sensor (models …TC and …TV).		✓		
3	SW	RH higher alarm threshold in % (x10). Only for models with high accuracy sensor (models …TC and …TV).		✓		
4	SW	**DEW POINT** lower alarm threshold in the set measurement unit (x10).		✓		
5	SW	Dew point higher alarm threshold in the set measurement unit (x10).		✓		
6	SW	**PARTIAL VAPOR PRESSURE** lower alarm threshold in hPa (x100).		✓		
7	SW	Partial vapor pressure higher alarm threshold in hPa (x100).		✓		
8	SW	**MIXING RATIO** lower alarm threshold in g/Kg (x10).		✓		
9	SW	Mixing ratio higher alarm threshold in g/Kg (x10).		✓		
10	SW	**ABSOLUTE HUMIDITY** lower alarm threshold in g/m^3 (x10).		✓		
11	SW	Absolute humidity higher alarm threshold in g/m^3 (x10).		✓		
12	SW	**WET BULB TEMPERATURE** lower alarm threshold in the set measurement unit (x10).		✓		
13	SW	Wet bulb temperature higher alarm threshold in the set measurement unit (x10).		✓		
16	SW	Lower alarm threshold for **TEMPERATURE** with **NTC10K** sensor of channel **2** in the set measurement unit (x10).		✓		
17	SW	Higher alarm threshold for temperature with NTC10K sensor of channel 2 in the set measurement unit (x10).		✓		
20	SW	**ILLUMINANCE** lower alarm threshold in lux.		✓		
21	SW	Illuminance higher alarm threshold in lux		✓		
22	SW	**CO** lower alarm threshold in ppm.		✓		
23	SW	CO higher alarm threshold in ppm.		✓		
24	SW	**ATMOSPHERIC PRESSURE** lower alarm threshold in the set measurement unit (the multiplier depends on the set unit).		✓		
25	SW	Atmospheric pressure higher alarm threshold in the set measurement unit (the multiplier depends on the set unit).		✓		
32	SW	**CO_2** lower alarm threshold in ppm.		✓		
33	SW	CO_2 higher alarm threshold in ppm.		✓		
46	SW	Lower alarm threshold for **TEMPERATURE** with sensor integrated in RH module in the set measurement unit (x10). Only for **models …TVI** and **…AB**.		✓		
47	SW	Higher alarm threshold for temperature with sensor integrated in RH module in the set measurement unit (x10). Only for models …TVI and …AB.		✓		
48	SW	**RH** lower alarm threshold in % (x10). Only for **models …TVI** and **…AB**.		✓		
49	SW	RH higher alarm threshold in % (x10). Only for models …TVI and …AB.		✓		
50	SW	Lower alarm threshold for **TEMPERATURE** with **NTC10K** sensor of channel **3** in the set measurement unit (x10).		✓		
51	SW	Higher alarm threshold for temperature with NTC10K sensor of channel 3 in the set measurement unit (x10).		✓		

Address	Type	Holding Register description	AP	ED	RE	AL
56	SW	**DIFFERENTIAL PRESSURE** lower alarm threshold for range **r3** in the set measurement unit (the multiplier depends on the set unit).		✓		
57	SW	Differential pressure higher alarm threshold for range r3 in the set measurement unit (multiplier depends on the set unit).		✓		
60	SW	**DIFFERENTIAL PRESSURE** lower alarm threshold for ranges **r1** and **r2** in the set measurement unit (the multiplier depends on the set unit).		✓		
61	SW	Differential pressure higher alarm threshold for ranges r1 and r2 in the set measurement unit (the multiplier depends on the set unit).		✓		
62	SW	**DIFFERENTIAL PRESSURE** lower alarm threshold for range **r4** in the set measurement unit (the multiplier depends on the set unit).		✓		
63	SW	Differential pressure higher alarm threshold for range r4 in the set measurement unit (the multiplier depends on the set unit).		✓		
64	SW	Lower alarm threshold for **TEMPERATURE** with **Pt100** sensor of HP3517E… probe in the set measurement unit (x10).		✓		
65	SW	Higher alarm threshold for temperature with Pt100 sensor of HP3517E… probe in the set measurement unit (x10).		✓		
68	SW	**UVA IRRADIANCE** lower alarm threshold in mW/m^2.		✓		
69	SW	UVA irradiance higher alarm threshold in mW/m^2.		✓		
70	SW	**PROPORTION OF UV PRESENT** lower alarm threshold in µW/lumen.		✓		
71	SW	Proportion of UV present higher alarm threshold in µW/lumen.		✓		
Measurement alarm thresholds for configurable inputs						
1000 + 200 x (**N**-1)	SW	Lower alarm threshold for **TEMPERATURE** with **2-wire Pt100** sensor of channel **N** in the set measurement unit (x10).		✓		
1001 + 200 x (**N**-1)	SW	Higher alarm threshold for temperature with 2-wire Pt100 sensor of channel **N** in the set measurement unit (x10).		✓		
1002 + 200 x (**N**-1)	SW	Lower alarm threshold for **TEMPERATURE** with **3-wire Pt100** sensor of channel **N** in the set measurement unit (x10).		✓		
1003 + 200 x (**N**-1)	SW	Higher alarm threshold for temperature with 3-wire Pt100 sensor of channel **N** in the set measurement unit (x10).		✓		
1004 + 200 x (**N**-1)	SW	Lower alarm threshold for **TEMPERATURE** with **4-wire Pt100** sensor of channel **N** in the set measurement unit (x10).		✓		
1005 + 200 x (**N**-1)	SW	Higher alarm threshold for temperature with 4-wire Pt100 sensor of channel **N** in the set measurement unit (x10).		✓		
1006 + 200 x (**N**-1)	SW	Lower alarm threshold for **TEMPERATURE** with **2-wire Pt1000** sensor of channel **N** in the set measurement unit (x10).		✓		
1007 + 200 x (**N**-1)	SW	Higher alarm threshold for temperature with 2-wire Pt1000 sensor of channel **N** in the set measurement unit (x10).		✓		
1008 + 200 x (**N**-1)	SW	Lower alarm threshold for **TEMPERATURE** with **3-wire Pt1000** sensor of channel **N** in the set measurement unit (x10).		✓		
1009 + 200 x (**N**-1)	SW	Higher alarm threshold for temperature with 3-wire Pt1000 sensor of channel **N** in the set measurement unit (x10).		✓		
1010 + 200 x (**N**-1)	SW	Lower alarm threshold for **TEMPERATURE** with **4-wire Pt1000** sensor of channel **N** in the set measurement unit (x10).		✓		
1011 + 200 x (**N**-1)	SW	Higher alarm threshold for temperature with 4-wire Pt1000 sensor of channel **N** in the set measurement unit (x10).		✓		
1012 + 200 x (**N**-1)	SW	Lower alarm threshold for **TEMPERATURE** with **TC_K** sensor of channel **N** in the set measurement unit (x10).		✓		
1013 + 200 x (**N**-1)	SW	Higher alarm threshold for temperature with TC_K sensor of channel N in the set measurement unit (x10).		✓		
1014 + 200 x (**N**-1)	SW	Lower alarm threshold for **TEMPERATURE** with **TC_J** sensor of channel **N** in the set measurement unit (x10).		✓		

Address	Type	Holding Register description	AP	ED	RE	AL
1015 + 200 x (**N**-1)	SW	Higher alarm threshold for temperature with TC_J sensor of channel N in the set measurement unit (x10).		✓		
1016 + 200 x (**N**-1)	SW	Lower alarm threshold for **TEMPERATURE** with **TC_T** sensor of channel **N** in the set measurement unit (x10).		✓		
1017 + 200 x (**N**-1)	SW	Higher alarm threshold for temperature with TC_T sensor of channel N in the set measurement unit (x10).		✓		
1018 + 200 x (**N**-1)	SW	Lower alarm threshold for **TEMPERATURE** with **TC_N** sensor of channel **N** in the set measurement unit (x10).		✓		
1019 + 200 x (**N**-1)	SW	Higher alarm threshold for temperature with TC_N sensor of channel N in the set measurement unit (x10).		✓		
1026 + 200 x (**N**-1)	SW	Lower alarm threshold for **TEMPERATURE** with **TC_E** sensor of channel **N** in the set measurement unit (x10).		✓		
1027 + 200 x (**N**-1)	SW	Higher alarm threshold for temperature with TC_E sensor of channel N in the set measurement unit (x10).		✓		
1028 + 200 x (**N**-1)	SW	Channel **N** lower alarm threshold in **mV** (x10). Only if channel **N** is configured as **0...1 V** input (HD35EDH).		✓		
1029 + 200 x (**N**-1)	SW	Channel **N** higher alarm threshold in mV (x10). Only if channel **N** is configured as 0…1 V input (HD35EDH).		✓		
1030 + 200 x (**N**-1)	SW	Channel **N** lower alarm threshold in **mV** (x100). Only if channel **N** is configured as **0...50 mV** input (HD35EDH).		✓		
1031 + 200 x (**N**-1)	SW	Channel **N** higher alarm threshold in mV (x100). Only if channel **N** is configured as 0…50 mV input (HD35EDH).		✓		
1032 + 200 x (**N**-1)	SW	Channel **N** lower alarm threshold in **mA** (x100). Only if channel **N** is configured as 4…20 mA input (HD35EDH).		✓		
1033 + 200 x (**N**-1)	SW	Channel **N** higher alarm threshold in mA (x100). Only if channel **N** is configured as 4…20 mA input (HD35EDH).		✓		
1034 + 200 x (**N**-1)	SW	Channel **N** lower alarm threshold in **%**. Only if channel **N** is configured as potentiometric input (HD35EDH).		✓		
1035 + 200 x (**N**-1)	SW	Channel **N** higher alarm threshold in **%**. Only if channel **N** is configured as potentiometric input (HD35EDH).		✓		
1036 + 200 x (**N**-1)	SW	Lower alarm threshold expressed as value of the quantity associated to channel **N** when the channel is configured as 0…1 V input (HD35EDH).		✓		
1037 + 200 x (**N**-1)	SW	Higher alarm threshold expressed as value of the quantity associated to channel **N** when the channel is configured as 0…1 V input (HD35EDH).		✓		
1038 + 200 x (**N**-1)	SW	Lower alarm threshold expressed as value of the quantity associated to channel **N** when the channel is configured as 0…50 mV (HD35EDH).		✓		
1039 + 200 x (**N**-1)	SW	Higher alarm threshold expressed as value of the quantity associated to channel **N** when the channel is configured as 0…50 mV (HD35EDH).		✓		
1040 + 200 x (**N**-1)	SW	Lower alarm threshold expressed as value of the quantity associated to channel **N** when the channel is configured as 4…20 mA (HD35EDH).		✓		
1041 + 200 x (**N**-1)	SW	Higher alarm threshold expressed as value of the quantity associated to channel **N** when the channel is configured as 4…20 mA (HD35EDH).		✓		
1042 + 200 x (**N**-1)	SW	Lower alarm threshold expressed as value of the quantity associated to channel **N** when the channel is configured as potentiometric input (HD35EDH).		✓		
1043 + 200 x (**N**-1)	SW	Higher alarm threshold expressed as value of the quantity associated to channel **N** when the channel is configured as potentiometric input (HD35EDH).		✓		
4000 to 4001	SW	Lower alarm threshold as number of **counts**. Only if the channel is configured as counter (HD35EDH).		✓		
4002 to 4003	SW	Higher alarm threshold as number of **counts**. Only if the channel is configured as counter (HD35EDH).		✓		

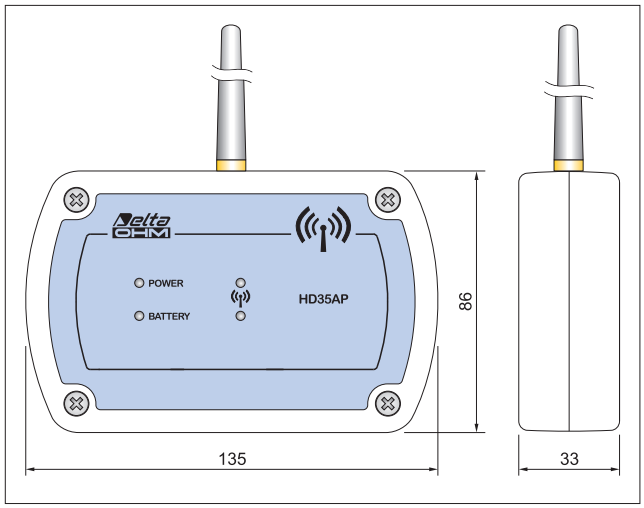
Address	Type	Holding Register description	AP	ED	RE	AL
4004 to 4005	SW	Lower alarm threshold expressed as value of the quantity associated to the channel when the channel is configured as counter (HD35EDH).		✓		
4006 to 4007	SW	Higher alarm threshold expressed as value of the quantity associated to the channel when the channel is configured as counter (HD35EDH).		✓		
General information						
10000 to 10019	B	User code with ASCII codification. Acceptable values are in the set {32,…,126}.	✓	✓	✓	✓
10020	W	Current year	✓			
10021	W	Current month	✓			
10022	W	Current day	✓			
10023	W	Current hour	✓			
10024	W	Current minute	✓			
10025	W	Current second	✓			
10026	W	Measurement interval: 0=1s, 1=2s, 2=5s, 3=10s, 4=15s, 5=30s, 6=1min, 7=2min, 8=5min, 9=10min, 10=15min, 11=30min, 12=1h		✓		
10027	W	Logging/RF interval: 0=1s, 1=2s, 2=5s, 3=10s, 4=15s, 5=30s, 6=1min, 7=2min, 8=5min, 9=10min, 10=15min, 11=30min, 12=1h		✓		✓
10029	W	Network RF channel. By changing this register, all network devices migrate to the new RF channel.	✓			
10030	W	Max number of RF transmissions for each command sent by AP to a remote device.	✓			
10031	W	Packet Error Rate threshold in % (x10) for RF alarms generation (for ex. 500 means 50.0%)	✓			
10032	W	Temperature measurement unit: 0=°C, 1=°F The setting is extended to all EDs except for mapped quantities in HD35EDH	✓			
10033	W	Atmospheric pressure measurement unit: see TAB 10.1. The setting extends to all EDs except for mapped quantities in HD35EDH	✓			
10034	W	Baud rate RS485: 0=9600, 1=19200, 3=38400 bit/s	✓			
10035	W	RS485 communication mode: 0=8N1, 1=8N2, 2=8E1, 3=8E2, 4=8O1, 5=8O2	✓			
10036	W	Password to be supplied to enable configuration change commands. The reading provides the fixed value 32768.	✓			
10037	B	Device group with ASCII codification. Acceptable values are in the set {32,…,126}.	✓	✓	✓	✓
10049	W	Differential pressure measurement unit for ranges r1, r2 and r3: see TAB 10.1. The setting is extended to all EDs except for the mapped quantities in HD35EDH	✓			
10050	W	Differential pressure measurement unit for range r4: see TAB 10.1. The setting is extended to all EDs except for the mapped quantities in HD35EDH	✓			
10052	W	Setting of the quantities to be displayed in the automatic viewing cycle for models HD35EDLW… without keyboard. Set the i-th bit (starting from LSB) to 1 if you wish to include the i-th quantity in the viewing cycle. *Example*: if in the model measuring and calculating: 1=Temp., 2=RH, 3=Td, 4=PVP, 5=Mix.Ratio, 6=AH, 7=Tw, the register is set to 0000 0000 0010 0010, only the relative humidity (RH) and the absolute humidity (AH) will be displayed alternatively.		✓		

Address	Type	Holding Register description	AP	ED	RE	AL
10053	W	Setting of the RF quantities (RSSI, PER%) to be displayed in the automatic viewing cycle for models HD35EDLW… without key-board. Set the i-th bit (starting from LSB) to 1 if you wish to include the i-th quantity in the viewing cycle.		✓		
10054	W	Period, in hours, of CO_2 sensor auto calibration.		✓		
10055	W	Period, in hours, after which the first CO_2 auto calibration after activation will occur.		✓		
10056	W	CO_2 reference value (in ppm) for auto calibration.		✓		
10057	W	CO_2 maximum acceptable variation (in ppm), with respect to the reference value, for auto calibration.		✓		
10058	W	Relay #1 activation duration in seconds (1…54000 s) in case of cyclical activation (*Coils – address 18 = 0*).				✓
10059	W	Relay #1 deactivation duration in seconds (1…54000 s) in case of cyclical activation (*Coils – address 18 = 0*).				✓
10060	W	Number of relay #1 activations in case of cyclical activation (*Coils – address 18 = 0*).				✓
10061	W	Relay #2 activation duration in seconds (1…54000 s) in case of cyclical activation *(Coils – address 21 = 0*).				✓
10062	W	Relay #2 deactivation duration in seconds (1…54000 s) in case of cyclical activation (*Coils – address 21 = 0*).				✓
10063	W	Number of relay #2 activations in case of cyclical activation (*Coils – address 21 = 0*).				✓
20000 to 20011	B	User code with ASCII codification of measurement #1. Available for models with more measurements of the same type.		✓		
20012 to 20023	B	User code with ASCII codification of measurement #2. Available for models with more measurements of the same type.		✓		
20024 to 20035	B	User code with ASCII codification of measurement #3. Available for models with more measurements of the same type.		✓		
20036 to 20047	B	User code with ASCII codification of measurement #4. Available for models with more measurements of the same type.		✓		
20048 to 20059	B	User code with ASCII codification of measurement #5. Available for models with more measurements of the same type.		✓		
20060 to 20071	B	User code with ASCII codification of measurement #6. Available for models with more measurements of the same type.		✓		
20072 to 20083	B	User code with ASCII codification of measurement #7. Available for models with more measurements of the same type.		✓		
20084 to 20095	B	User code with ASCII codification of measurement #8. Available for models with more measurements of the same type.		✓		
20096 to20107	B	User code with ASCII codification of measurement #9. Available for models with more measurements of the same type.		✓		
20108 to 20119	B	User code with ASCII codification of measurement #10. Available for models with more measurements of the same type.		✓		
20120 to 20131	B	User code with ASCII codification of measurement #11. Available for models with more measurements of the same type.		✓		
20132 to 20143	B	User code with ASCII codification of measurement #12. Available for models with more measurements of the same type.		✓		

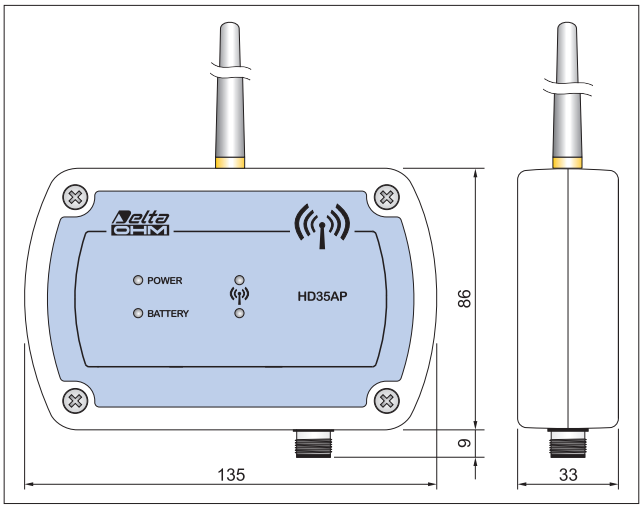
Warning: the execution of MODBUS commands changing the parameters setting of a device can take a certain time, due to the RF transmission between the device and the base unit. The value of the flag PENDING_CONF (Discrete Inputs – address 2) is set to 1 during the execution of a configuration change request. Only when the flag returns to 0 the request is considered as concluded. The flag CMD_FAILURE (Coils – address 7) allows to check whether the request was successful. It is recommended to check the status of the two flags before considering a device configuration changed.

12 DIMENSIONS

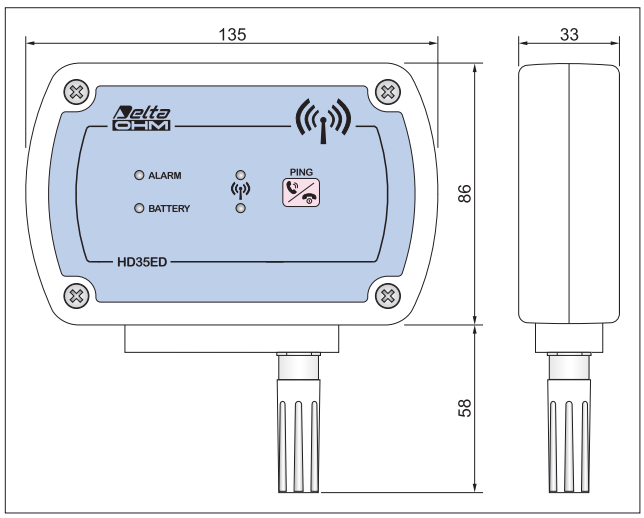
The following figures show the dimensions of the instruments in mm.



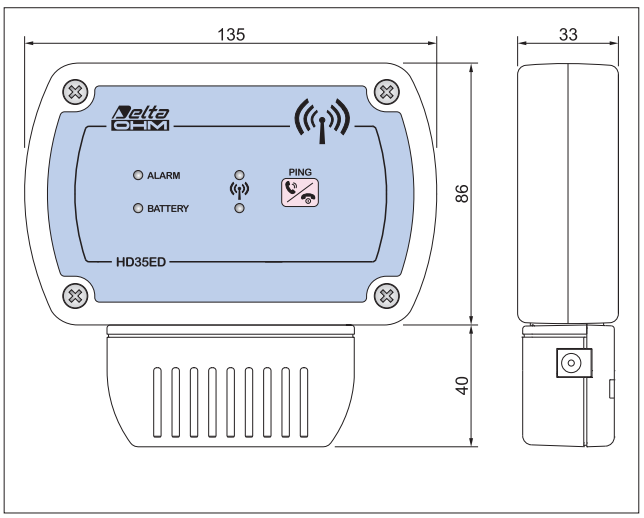
HD35AP - HD35APW - HD35APG - HD35RE



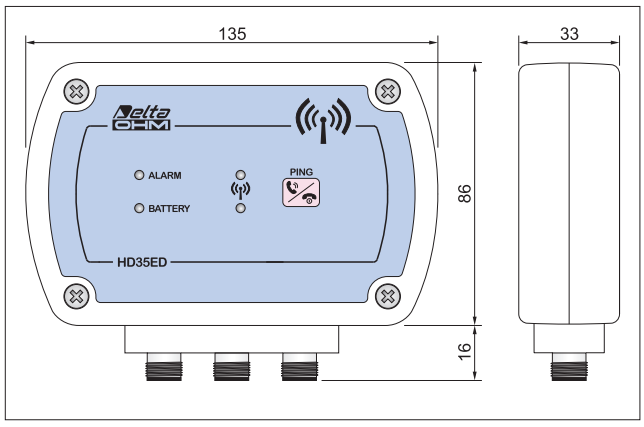
HD35APS



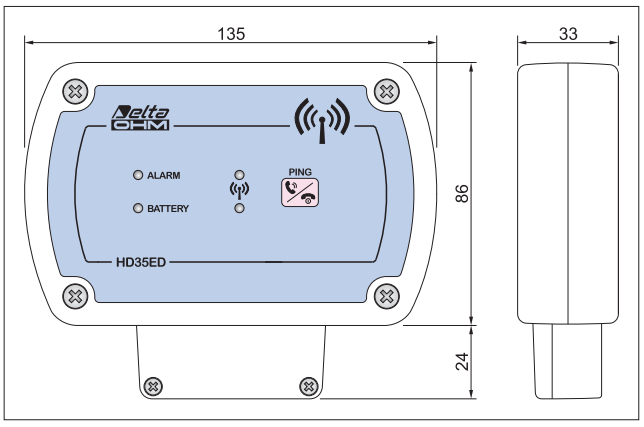
HD35ED... versions with fixed RH/T probe



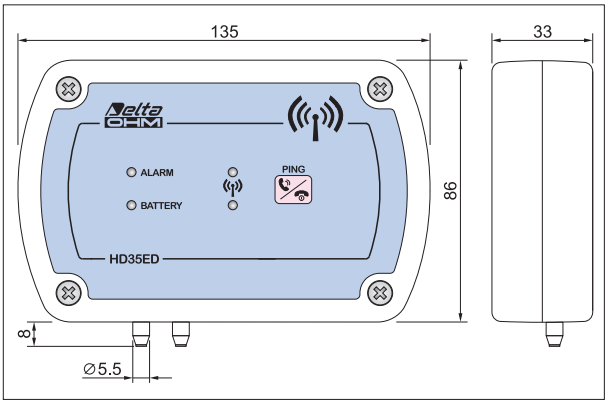
HD35ED... versions with grid



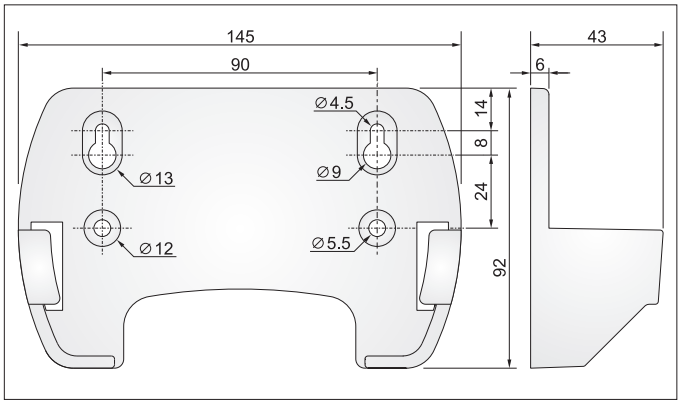
HD35ED... versions with M12 connectors



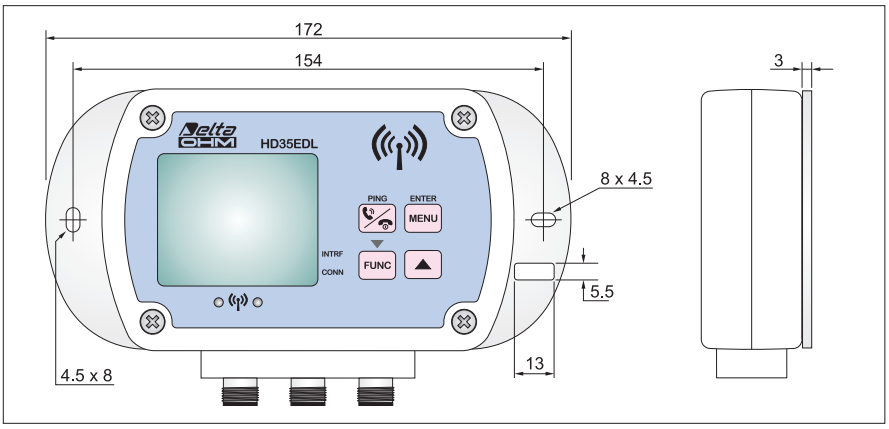
HD35ED... versions with terminals



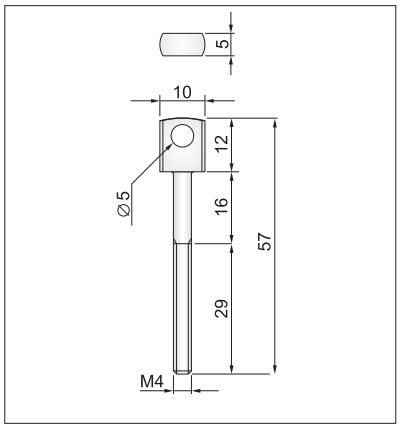
HD35ED... versions with differential pressure inputs



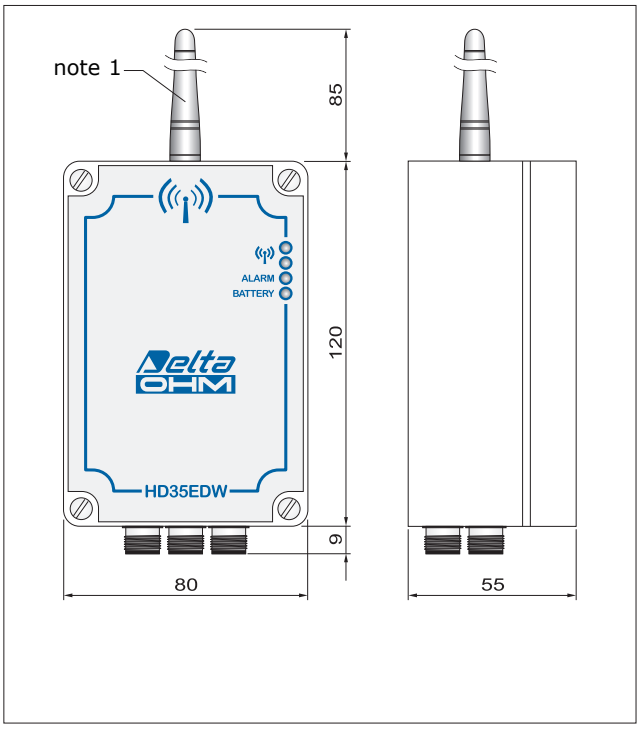
Support for removable installation



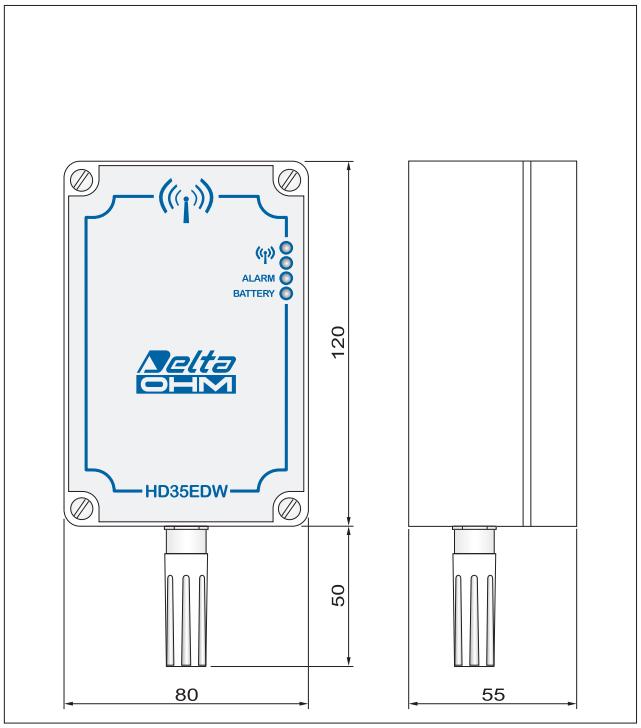
Flanges for fixed installation



Lock pin



HD35EDW... versions with M12 connectors

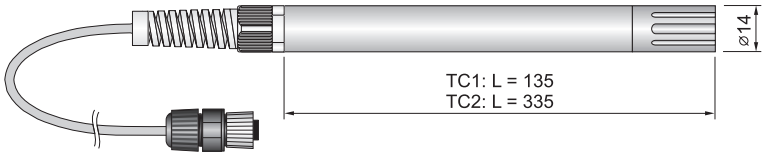


HD35EDW... versions with fixed RH/T probe

Note 1: the antenna is external for outdoor installation with protection shield against solar radiations; the antenna is internal for indoor installation.

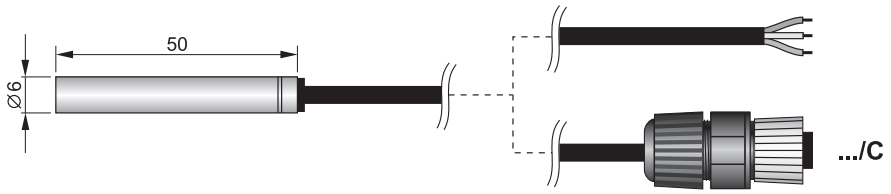
13 RELATIVE HUMIDITY AND TEMPERATURE PROBES

Combined probes for temperature and relative humidity:

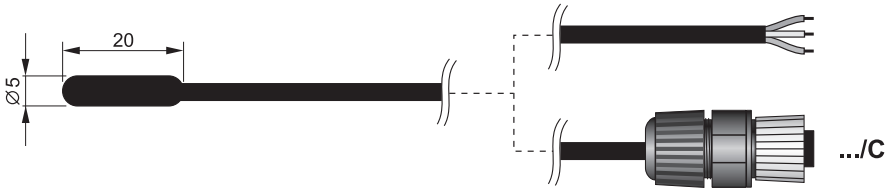
HP3517…


R.H. Sensor	Capacitive
Temperature sensor	NTC 10 kΩ @ 25 °C (HP3517TC…) Pt100 1/3 DIN (HP3517**E**TC…)
R.H. sensor measurement range	0…100 %RH
Temperature sensor measurement range	-40…+105 °C (HP3517TC… with NTC 10 kΩ sensor) -40…+150 °C (HP3517ETC… with Pt100 sensor)
R.H. sensor operating temperature	-20…+80 °C standard -40…+150 °C with option **E**
Accuracy	± 1.5 %RH (0..90 %RH) / ± 2 %RH (remaining range)
Cable length	2, 5 or 10 m standard
Connection	4-pole M12 female connector

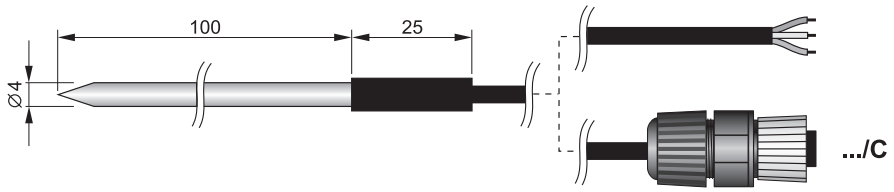
Temperature probes with Pt1000 1/3 DIN thin film sensor:

TP35.1…


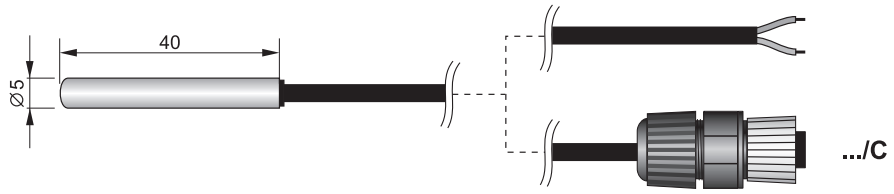
Sensor	3-wire Pt1000
Temperature range	-50…+105 °C
Accuracy	1/3 DIN
Application	Immersion
Cable length	3, 5 or 10 m standard, other lengths on request
Connection	Free wires or 4-pole M12 female connector (option **/C**)
Material	AISI 316 stainless steel tube

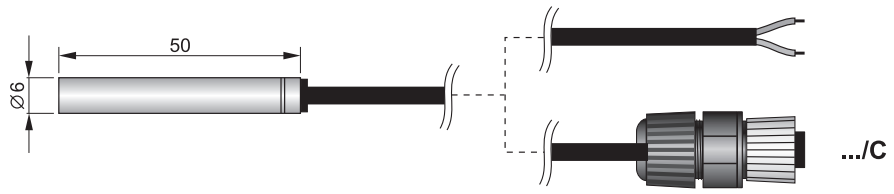
TP35.2…


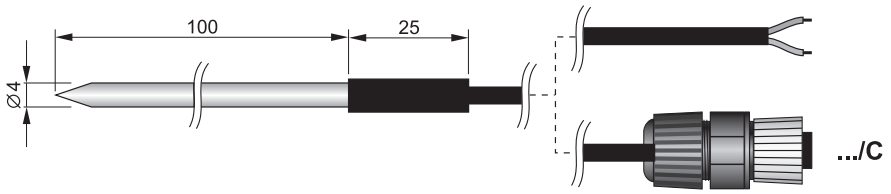
Sensor	3-wire Pt1000
Temperature range	0…+70 °C
Accuracy	1/3 DIN
Application	Immersion
Cable length	3 or 5 m standard, other lengths on request
Connection	Free wires or 4-pole M12 female connector (option **/C**)
Material	Thermo-plastic rubber

TP35.5…	
	
Sensor	3-wire Pt1000
Temperature range	-40…+300 °C
Accuracy	1/3 DIN
Application	Penetration
Cable length	3 or 5 m standard, other lengths on request
Connection	Free wires or 4-pole M12 female connector (option **/C**)
Material	AISI 316 stainless steel tube

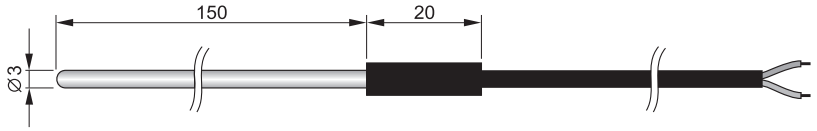
Temperature probes with NTC 10KΩ @ 25 °C sensor:

TP35N1…	
	
Sensor	NTC 10 kΩ @ 25 °C
Temperature range	-20…+85 °C
Accuracy	± 0.3 °C in the range 0…+70 °C / ± 0.4 °C outside
Application	Immersion
Cable length	3, 5 o 10 m standard, other lengths on request
Connection	Free wires or 4-pole M12 female connector (option **/C**)
Material	AISI 316 stainless steel tube

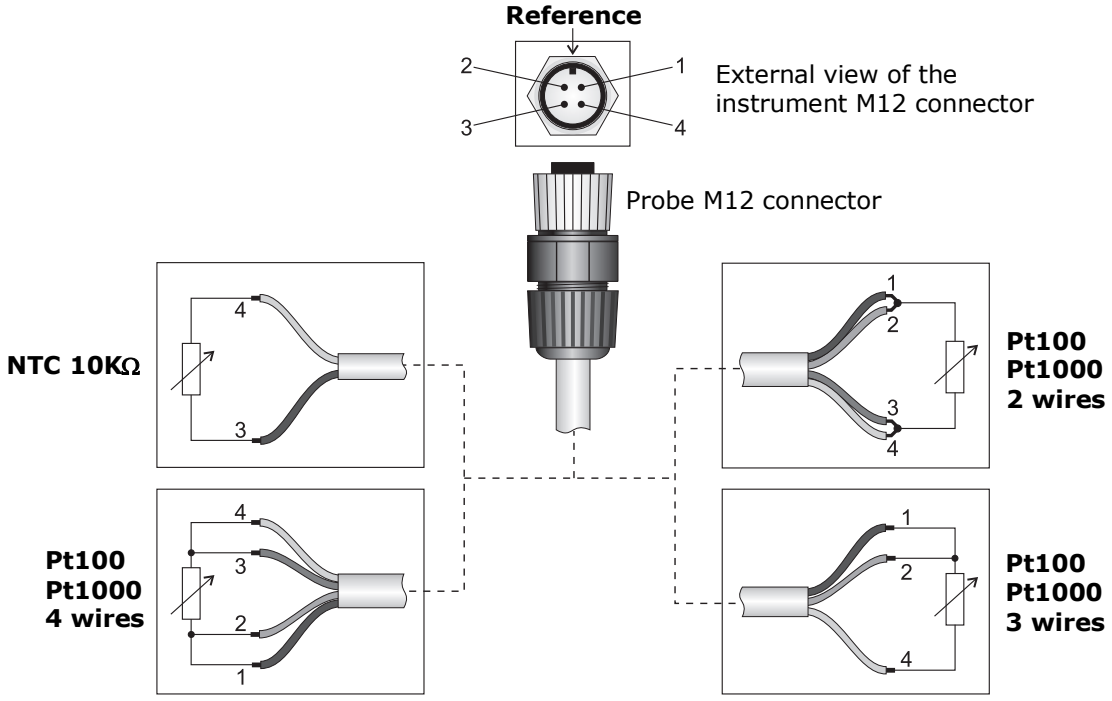
TP35N2…	
	
Sensor	NTC 10 kΩ @ 25 °C
Temperature range	0…+70 °C
Accuracy	± 0.3 °C
Application	Immersion
Cable length	3, 5 o 10 m standard, other lengths on request
Connection	Free wires or 4-pole M12 female connector (option **/C**)
Material	AISI 316 stainless steel tube

TP35N5…	
	
Sensor	NTC 10 kΩ @ 25 °C
Temperature range	-20…+105 °C
Accuracy	± 0.3 °C in the range 0…+70 °C / ± 0.4 °C outside
Application	Penetration
Cable length	3 o 5 m standard, other lengths on request
Connection	Free wires or 4-pole M12 female connector (option **/C**)
Material	AISI 316 stainless steel tube

Temperature probes with K thermocouple sensor:

TP35K6.5	
	
Sensor	K thermocouple with isolated junction
Max temperature	-50…+750 °C
Accuracy	Class 1 according to IEC 60584-2
Application	Immersion
Cable length	5 m standard, other lengths on request
Connection	Free wires
Material	AISI 316 stainless steel tube

Connections of Pt100, Pt1000 and NTC 10KΩ temperature probes with M12 connector:



14 STORAGE OF INSTRUMENTS

Instruments storage conditions:

- Temperature: -40...+70 °C.
- Humidity: less than 90 %RH no condensation.
- In storage, avoid places where:
    - humidity is high;
    - instruments are exposed to direct sun radiation;
    - instruments are exposed to a high temperature source;
    - high vibration levels are present;
    - there are vapor, salt and/or corrosive gas.

15 SAFETY INSTRUCTIONS

General safety instructions

These instruments have been manufactured and tested in accordance with EN61010-1 safety directives for electronic measuring instruments and have left the factory in perfect safety technical conditions.

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

The instruments proper operation and operating safety can be ensured only in the climatic conditions specified in this manual.

Do not use the instruments in places where there are:

- Rapid ambient temperature variations that may cause condensation.
- Corrosive or flammable gases.
- Direct vibrations or shocks to the instrument.
- High-intensity electromagnetic fields, static electricity.

If the instruments are moved from a cold place to a hot one, or vice versa, condensation formation can cause their malfunction. In this case, you will have to wait for the instruments temperature to reach ambient temperature before turning the instruments on.

User obligations

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

- EEC directives on workplace safety
- National low regulations on workplace safety
- Accident prevention regulations

16 ORDERING CODES

BASE UNIT

HD35AP... Base unit for interfacing between PC and system data loggers. USB connection. In addition to USB output, one of the following options is available: RS485 output with MODBUS-RTU protocol (option **S**), Wi-Fi interface and ETHERNET connection with integrated Web server (option **W**), GSM module (option **G**). Power supply through PC USB port or external power supply unit **SWD06** (**option**). The unit is supplied with: internal lithium-ion rechargeable battery **HD35-BAT1**, **basic HD35RAP-S** software, wall support **HD35.03**, instruction manual.
Radio frequency (868, 902-928 or 915.9-929.7 MHz) should be specified upon ordering.
CP23 USB cable and **HD35.11K** kit (pair of flanges, lock pin and padlock) for fixed installation should be ordered separately.

HD35AP ☐ . ☐

RADIO FREQUENCY:
J = radio frequency 915.9-929.7 MHz (Japan)
E = radio frequency 868 MHz (Europe)
U = radio frequency 902-928 MHz (U.S.A. and Canada)

TYPE OF CONNECTION:
No character = only USB output
S = USB and RS485 with MODBUS-RTU protocol outputs
W = USB output, Wi-Fi interface and ETHERNET connection with integrated Web server
G = USB output and GSM module

REPEATER

HD35RE RF signal repeater. Power supply through PC USB port or external power supply unit **SWD06** (**option**). Supplied with: internal lithium-ion rechargeable battery **HD35-BAT1**, wall support **HD35.03**, instruction manual.
Radio frequency (868, 902-928 or 915.9-929.7 MHz) should be specified upon ordering.
CP23 USB cable and **HD35.11K** kit (pair of flanges, lock pin and padlock) for fixed installation should be ordered separately.

HD35RE. ☐

RADIO FREQUENCY:
J = radio frequency 915.9-929.7 MHz (Japan)
E = radio frequency 868 MHz (Europe)
U = radio frequency 902-928 MHz (U.S.A. and Canada)

ALARM MODULE

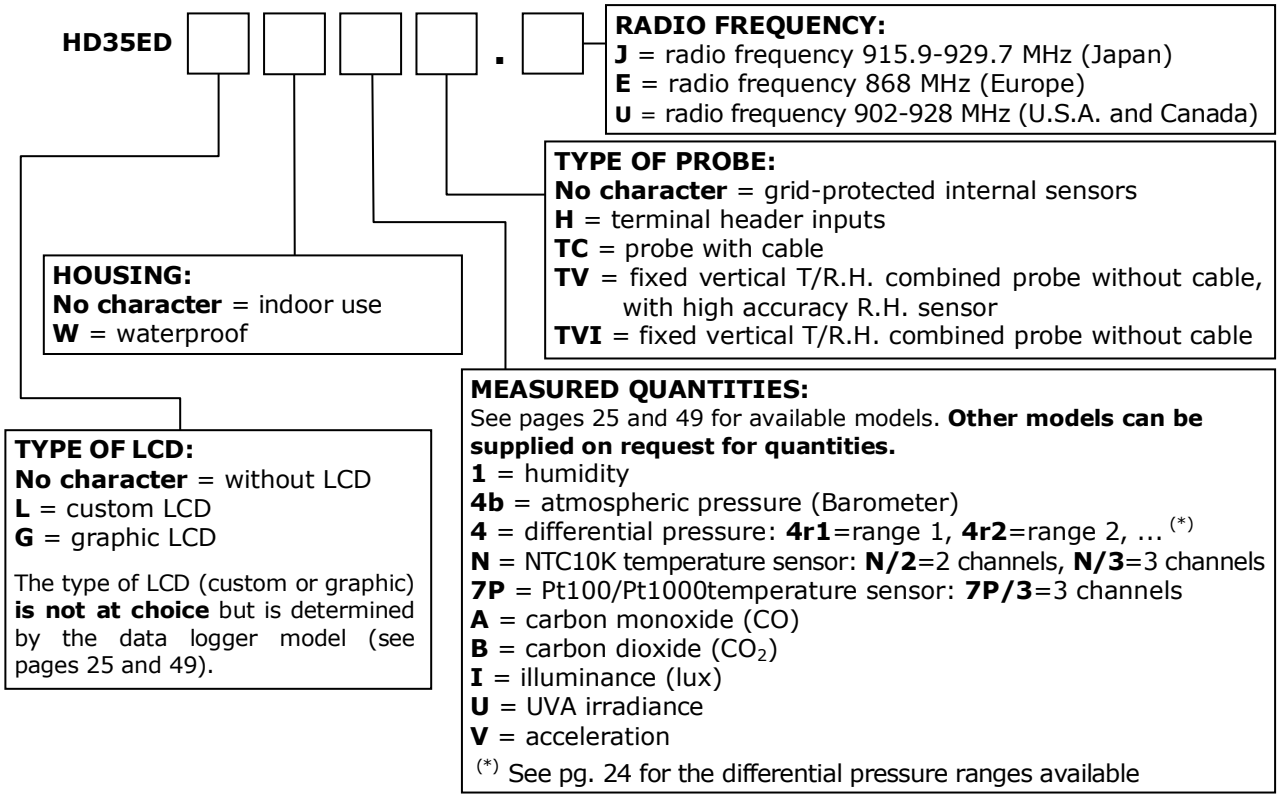
HD35ED-ALM Module with two relay outputs for signaling alarm events. Power supply through non-rechargeable lithium-thionyl-chloride (Li-$SOCl_2$) 3.6V internal battery, battery life: 1 year typical. Supplied with: battery **HD35-BAT2**, wall support **HD35.03**, instruction manual.
Radio frequency (868, 902-928 or 915.9-929.7 MHz) should be specified upon ordering.
HD35.11K kit (pair of flanges, lock pin and padlock) for fixed installation should be ordered separately.

HD35ED-ALM. ☐

RADIO FREQUENCY:
J = radio frequency 915.9-929.7 MHz (Japan)
E = radio frequency 868 MHz (Europe)
U = radio frequency 902-928 MHz (U.S.A. and Canada)

DATA LOGGER

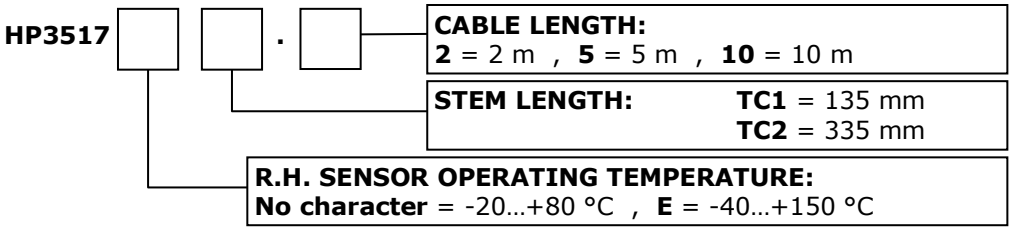
HD35ED... Wireless data logger. Stores measurements in the internal memory. Transmits the acquired data to the base unit automatically at regular intervals or on request. **Optional LCD Display**. Acoustic alarm with internal buzzer. Power supply through non-rechargeable lithium-thionyl-chloride (Li-$SOCl_2$) 3.6V internal battery, typical life with 5s measurement interval and 30s transmission interval: 2 years. Supplied with: battery, wall support **HD35.03** (only for indoor-use models), instruction manual.
Radio frequency (868, 902-928 or 915.9-929.7 MHz) should be specified upon ordering. External probes have to be ordered separately. The kit **HD35.11K** (pair of flanges, lock pin and padlock) for fixed installation of indoor housing has to be ordered separately.
For versions with waterproof housing, **specify upon ordering if the instrument should be installed outside with protection shield against solar radiations, and if the housing should be supplied with HD2003.77/40 clamping already assembled**.



PROBES

TEMPERATURE AND RELATIVE HUMIDITY COMBINED PROBES

HP3517... Temperature and relative humidity combined probe with high accuracy R.H. sensor. R.H. sensor measurement range: 0…100%. Temperature sensor: NTC10KΩ for HP3517TC..., Pt100 for HD3517ETC. NTC10KΩ sensor measurement range: -40…+105 °C. Pt100 sensor measurement range: -40…+150 °C. R.H. sensor operating temperature: -20…+80 °C standard, -40…+150 °C with **option E**. Diameter 14 mm. Cable length 2, 5 or 10 m standard. 4-pole M12 female connector.



HD9007A-1 12-ring protection against solar radiations. Includes support bracket.

HD9007A-2 16-ring protection against solar radiations. Includes support bracket.

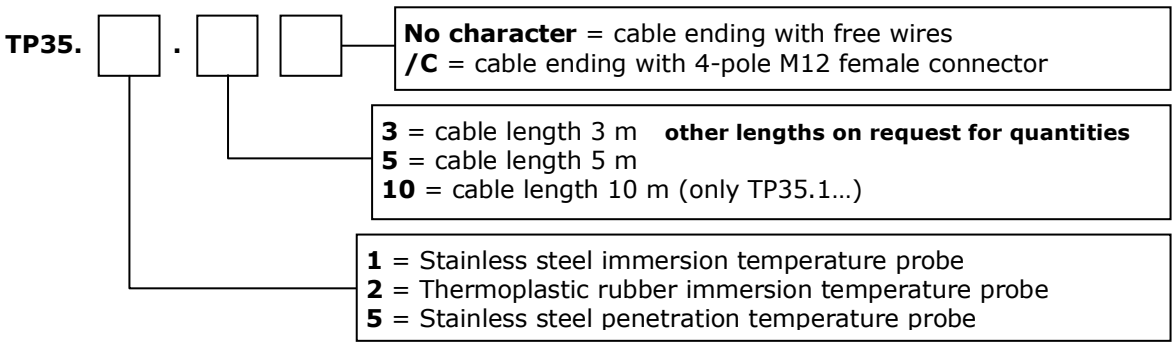
HD9007T26.2 Adapter for Ø 14 mm probes for protections against solar radiations HD9007A-1 and HD9007A-2.

Pt1000 TEMPERATURE PROBES

TP35.1… Stainless steel immersion temperature probe. 3-wire Pt1000 1/3 DIN sensor. Dimensions: Ø 6 x 50 mm. Cable length 3, 5 or 10 m standard. Cable ending with free wires or 4-pole M12 female connector. Operating temperature: -50…+105 °C.

TP35.2… Thermoplastic rubber immersion temperature probe. 3-wire Pt1000 1/3 DIN sensor. Dimensions: Ø 5 x 20 mm. Cable length 3 or 5 m standard. Cable ending with free wires or 4-pole M12 female connector. Operating temperature: 0…+70 °C.

TP35.5… Stainless steel penetration temperature probe. 3-wire Pt1000 1/3 DIN sensor. Dimensions: Ø 4 x 100 mm. Cable length 3 or 5 m standard. Cable ending with free wires or 4-pole M12 female connector. Operating temperature: -40…+300 °C.

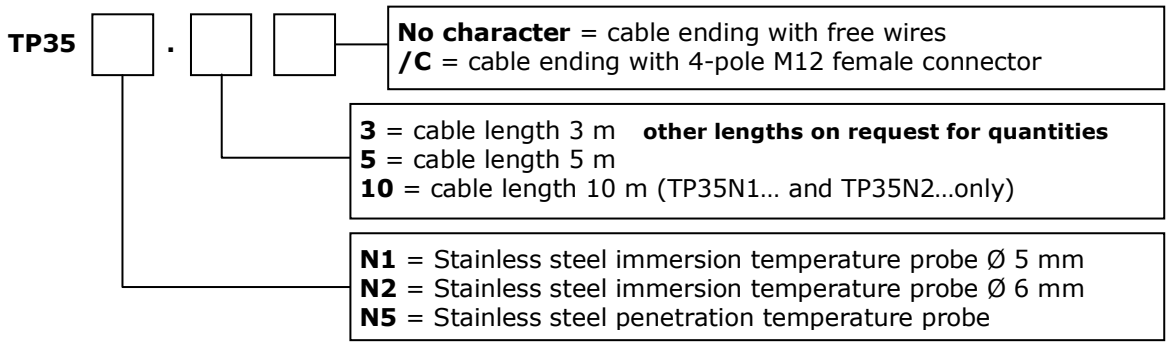


NTC 10KΩ @ 25 °C SENSOR TEMPERATURE PROBES

TP35N1… Stainless steel immersion temperature probe. NTC 10KΩ @ 25 °C sensor. Dimensions: Ø 5 x 40 mm. Cable length 3, 5 or 10 m standard. Cable ending with free wires or 4-pole M12 female connector. Operating temperature: -20…+85 °C.

TP35N2… Stainless steel immersion temperature probe. NTC 10KΩ @ 25 °C sensor. Dimensions: Ø 6 x 50 mm. Cable length 3, 5 or 10 m standard. Cable ending with free wires or 4-pole M12 female connector. Operating temperature: 0…+70 °C.

TP35N5… Stainless steel penetration temperature probe. NTC 10KΩ @ 25 °C sensor. Dimensions: Ø 4 x 100 mm. Cable length 3 or 5 m standard. Cable ending with free wires or 4-pole M12 female connector. Operating temperature: -20…+105 °C.



THERMOCOUPLE TEMPERATURE PROBES

TP35K6.5 Stainless steel immersion temperature probe. K-type thermocouple sensor wih isolated junction. Cable length 5 m. Cable ending with free wires.

PHOTOMETRIC – RADIOMETRIC PROBES

LP 35 PHOT Photometric probe for the measurement of illuminance, CIE photopic filter, spectral response in accordance with standard photopic vision, diffuser for cosine correction. Measurement range: 0…10,000 lux. Cable length 2m.

LP 35 P-A 2-sensor combined probe for the measurement of illuminance, with standard photopic spectral response, and **UVA** irradiance in 315 nm…400 nm spectral range, diffuser for cosine correction. Measurement range: 0…2000 mW/m^2. Cable length 2m.

LP BL Base with level. On request, to be assembled to the probe upon ordering. For photometric and radiometric probes.

LP BL3 Adjustable wall support for Ø 30 mm photometric and radiometric probes.

ACCESSORIES

HD35AP-S Additional copy of HD35AP-S basic software CD-ROM for system configuration, real-time measurement display and data download. Access to data is allowed only from the PC where the database is installed. For Windows® operating systems.

HD35AP-PLUS Advanced version of HD35AP-S software allowing access to database from all the computers network-connected to the server where the database is installed. It works with digital key. For Windows® operating systems.

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

CPM12-8P.2 8-pole cable. Length 2 m. 8-pole M12 connector on one side, free wires on the other. For RS485 connection to HD35APS base unit.

CPM12-8P.5 8-pole cable. Length 5 m. 8-pole M12 connector on one side, free wires on the other. For RS485 connection to HD35APS base unit.

CPM12-8P.10 8-pole cable. Length 10 m. 8-pole M12 connector on one side, free wires on the other. For RS485 connection to HD35APS base unit.

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

HD35.03 Plastic support for removable installation of base units, repeaters and data loggers in indoor-use housing.

HD35.11K Pair of flanges in anodized aluminum alloy for fixed installation of base units, repeaters and data loggers in indoor-use housing. Lock pin and padlock included.

HD35-ANT Spare external RF antenna for HD35AP… base units and HD35RE repeater.

HD35-BAT1 Lithium-ion **rechargeable** 3.7 V battery, capacity 2250 mA/h, JST 3-pole connector. For HD35AP… base units and HD35RE repeater.

HD35-BAT2 Lithium Thionyl Chloride (Li-$SOCl_2$) **non rechargeable** 3.6 V battery, AA format, Molex 5264 2-pole connector. For HD35ED… data loggers and HD35ED-ALM alarm module.

HD2003.77/40 Clamping for fixing the waterproof housing to the 40 mm diameter mast.

HD2003.71K 40 mm diameter mast kit, 2 m high, in two pieces.

HD2003.75 Base for 40 mm diameter mast, with tip to be driven into the ground.

HD2003.78 Base for 40 mm diameter mast, to be fixed to the floor.

HD2003.75K Mast bracing kit, for ground installation, fixing diameter 2m. Stainless steel string.

HD2003.78K Mast bracing kit, for floor installation, fixing diameter 2m. Stainless steel string.

HD2003.2.14 Three sectors flange for ∅ 40 mm tube, 6 inputs ∅ 16 mm.

HD2004.20 40 mm diameter tripod kit. 3 m high. It can be fixed on a surface with screws or on the ground by means of pegs.

HD9217TF1 Protection shield against solar radiations for outdoor installation. For waterproof HD35EDW… data loggers.

Accessories for humidity probes

HD75 Saturated solution to check Relative Humidity probes at 75 % RH, includes ring adapter for 14 mm diameter probes, thread M12×1.

HD33 Saturated solution to check Relative Humidity probes at 33 % RH, includes ring adapter for 14 mm diameter probes, thread M12×1.

Accessories for CO sensor

MINICAN.12A Nitrogen bottle for CO calibration at 0 ppm. Volume 20 liters. **With adjustment valve.**

MINICAN.12A1 Nitrogen bottle for CO calibration at 0 ppm. Volume 20 liters. **Without adjustment valve.**

ECO-SURE-2E CO Spare CO Sensor.

HD37.36 Connection tube kit between instrument and MINICAN.12A for CO calibration.

DELTA OHM metrology laboratories LAT N° 124 are accredited by ACCREDIA for Temperature, Humidity, Pressure, Photometry / Radiometry, Acoustics and Air Velocity. They can supply calibration certificates for the accredited quantities.

FCC and IC Notices and Approvals

Contains Transmitter Module FCC ID: X7J-A10040601
IC ID: 8975A-A10040601

Notice: This device complies with Part 15 -15.247(a2) and 15.247(b) and 15.249 of the FCC Rules and with Industry Canada (IC) licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Avis: *Cet appareil est conforme avec Part 15 -15.247(a2) et 15.247(b) et 15.249 des règlements FCC et Industrie Canada (IC) RSS standard exempts de licence(s). Son fonctionnement est soumis aux deux conditions suivantes: (1) cet appareil ne peut pas provoquer d'interférence et (2) cet appareil doit accepter toute interférence, y compris les interférence qui peuvent causer un mauvais fonctionnement du dispositif.*

Notice: This equipment has been tested and found to comply with the limits for Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and radiates radio frequency energy, and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by tirning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measure:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Notice: To satisfy FCC/IC RF exposure requirements for mobile and base station transmission devices, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during operation. To ensure compliance, operation at closer than this distance is not recommended. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Avis: *Pour répondre aux exigences d'exposition RF FCC/IC pour les dispositifs de transmission mobiles et les stations de base, une distance de séparation de 20 cm ou plus doit être maintenue entre l'antenne de l'appareil et des personnes en cours de fonctionnement. Pour assurer la conformité, l'exploitation de plus près à cette distance n'est pas recommandée. L'antenne(s) utilisé pout cet émetteur ne dois pas être co-localisés ou fonctionner conjointement avec une autre antenne ou transmetteur.*

Notice: Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Avis: *Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.*

CERTIFICATO DI CONFORMITÀ DEL COSTRUTTORE

MANUFACTURER'S CERTIFICATE OF CONFORMITY

rilasciato da

issued by

DELTA OHM SRL STRUMENTI DI MEASUREMENT

DATA 2013/07/02
DATE

Si certifica che gli strumenti sotto riportati hanno superato positivamente tutti i test di produzione e sono conformi alle specifiche, valide alla data del test, riportate nella documentazione tecnica.

We certify that below mentioned instruments have been tested and passed all production tests, confirming compliance with the manufacturer's published specification at the date of the test.

La riferibilità delle misure ai campioni internazionali e nazionali è garantita da una catena di riferibilità che ha origine dalla taratura dei campioni di prima linea dei laboratori accreditati di Delta OHM presso l'Istituto Primario Nazionale di Ricerca Metrologica.

The traceability of measures assigned to international and national reference samples is guaranteed by a reference chain which source is the calibration of Delta OHM accredited laboratories reference samples at the Primary National Metrological Research Institute.

Type Prodotto: **Serie di datalogger wireless**
Product Type: ***Wireless Data Loggers series***

Nome Prodotto: **Serie HD35...**
Product Name: ***HD35... series***

Responsabile Qualità
Head of Quality

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Cod. Fisc./P.Iva IT03363960281 - N.Mecc. PD044279
R.E.A. 306030 - ISC. Reg. Soc. 68037/1998

WARRANTY

TERMS OF WARRANT

All DELTA OHM instruments are subject to accurate testing, and are guaranteed for 24 months from the date of purchase. DELTA OHM will repair or replace free of charge the parts that, within the warranty period, shall be deemed non efficient according to its own judgement. Complete replacement is excluded and no damage claims are accepted. The DELTA OHM guarantee only covers instrument repair. The guarantee is void in case of incidental breakage during transport, negligence, misuse, connection to a different voltage than that required for the appliance by the operator. Finally, a product repaired or tampered by unauthorized third parties is excluded from the guarantee. The instrument shall be returned FREE OF SHIPMENT CHARGES to your dealer. The jurisdiction of Padua applies in any dispute.

The electrical and electronic equipment marked with this symbol cannot be disposed of in public landfills. According to the UE Directive 2002/96/EC, the European users of electrical and electronic equipment can return it to the dealer or manufacturer upon purchase of a new one. The illegal disposal of electrical and electronic equipment is punished with an administrative fine.

This warranty must be sent together with the instrument to our service centre.

IMPORTANT: Warranty is valid only if coupon has been correctly filled in all details.

Instrument code **HD35... series**

Serial Number _____

RENEWALS

Date _____	Date _____
Inspector _____	Inspector _____
Date _____	Date _____
Inspector _____	Inspector _____
Date _____	Date _____
Inspector _____	Inspector _____

CE

RoHS 2002/95/EC

CE CONFORMITY	
The product complies with 2004/108/CE (EMC) and 2006/95/CE (low voltage) directives, and meets the requirements of the following technical standards:	
Safety	EN61010-1
Electrostatic discharge immunity test	EN61000-4-2 Level 3
Radiated, radio-frequency, electromagnetic field immunity	EN61000-4-3 Level 3
Electrical fast transient/burst immunity	EN61000-4-4 Level 3
Immunity to conducted disturbances, induced by RF fields	EN61000-4-6
Voltage dips, short interruptions and voltage variations immunity	EN61000-4-11
Radio disturbance characteristics (conducted and radiated emissions)	EN55022:2007 class B