# HD 35AP...
# HD 35RE
# HD 35ED...

[ GB ] Wireless data recording systems

## [ GB ] Introduction to the wireless data recording systems

A data recording system is a set of instruments which allows **measuring** and **storing** the values of certain physical quantities, such as temperature, humidity, pressure, solar radiation, etc.

A data recording system is generally made of:

- **Sensors**: they are placed at the measuring points and convert the values of the physical quantities into electrical analog or digital signals.
- **Acquisition system**: it reads and logs the electrical signals outgoing from the sensors. If the acquisition system is digital, the acquired values are kept in the system's internal memory until the memory is full.
- **PC**: the transfer of data from a digital acquisition system to a PC allows storing the measured values even after the internal memory of the acquisition system is full. The PC also allows processing and analyzing the acquired values.


**Data recording system**

### Connecting the components of the system

The components of the recording system can be connected in two different ways:

- **Wired connection**
- **Wireless connection by radio frequency transmission**

The type of connection depends on various factors, such as:

- the distance among the various components of the system;
- ease of installation;
- cost of installation;
- possibility to easily modify the system;
- electromagnetic interferences in the environment of installation.

### Advantages of the wireless connection

- **Quick and easy installation**: as it is not necessary the laying of cables and conduits, a wireless system is installed much more easily and quickly than a wired system, especially when the components are at a great distance from one another.
- **Reduction of installation costs**: the absence of cables allows a considerable saving in cost of material and labor.
- **Flexibility of the system**: the absence of fixed links between the various parts allows moving the system components at any time without problems.
- **Low maintenance**: the cables are subject to deterioration over time, the absence of cables reduces the maintenance costs of the system.

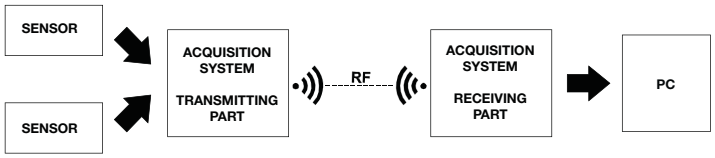
### Contraindications of the wireless connection

The operation of a wireless system can be difficult in environments with excessive electromagnetic interferences (in which case a wired shielded connection may be preferable) or in areas particularly shielded that hinder the radio transmission between the parts of the system.

### Radio frequency transmission in wireless systems

In the case of wireless connections, the acquisition system is made of a radiofrequency transmitting part and a radiofrequency receiving part:

- **Transmitting part**: positioned near the sensor, it transmits the measured values to the receiving part. The transmitter part is normally integrated in the measuring instrument to which the sensor is connected.
- **Receiving part**: positioned close to the PC, it receives the measured values and transmits them to the PC. The receiving part is usually indicated by the terms **Base Unit** or **Access Point**.




**Wireless data recording system**

The transmitter part of the acquisition system can be unique for all the sensors or can be made of multiple transmitters, each of which sends the measurements of some of the sensors. The receiving part of the system is the same for all sensors.

### Delta OHM wireless system

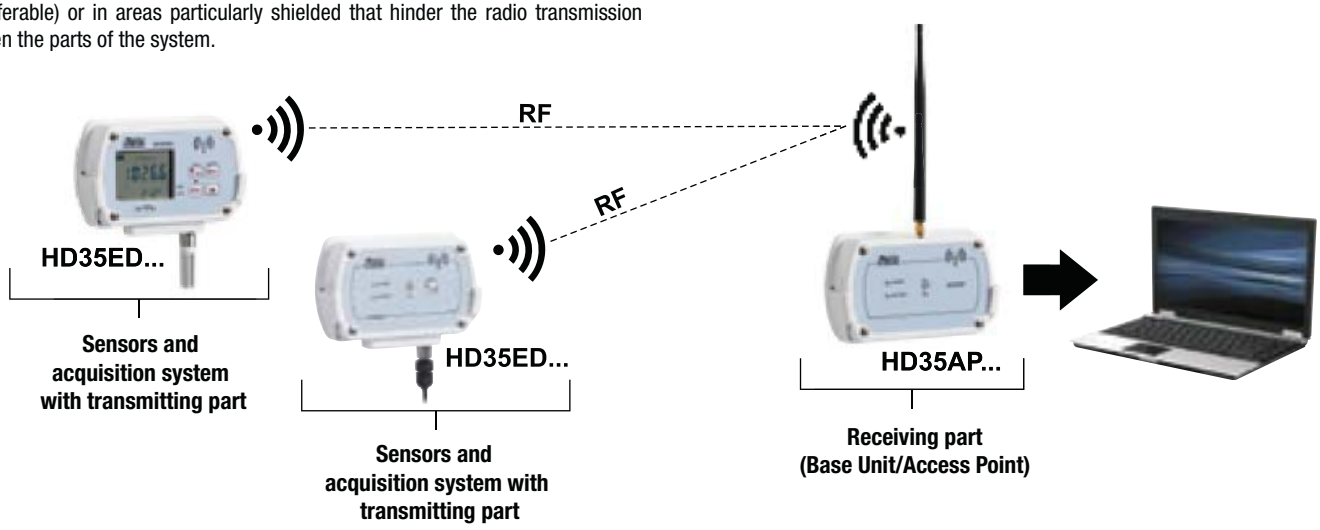
The basic Delta OHM HD35… series wireless system is made of:

- **One or more devices of the series HD35ED…**: the devices HD35ED... acquire the values measured by integrated or external sensors connected via cable. The data are both stored in the internal memory of the device and transmitted via radio to the receiving unit (base unit / Access Point). The devices HD35ED… work with a battery and do not require power connections.
- **Base Unit (Access Point) HD35AP…**: it receives the measured values from all devices HD35ED... and sends them to the PC. The base unit HD35AP… has an internal battery with limited autonomy, therefore it has to be powered externally by connecting it to a power supply (optional) or to the USB port of the PC.
- **HD35AP-S Software**: once installed in a PC, it allows downloading and viewing the data, entering the data into a database and configuring the system. The basic version of the software, which allows downloading the data in the local database of the PC where the software is installed and display them only from the same PC, is supplied free of charge with the base unit.

### System configuration

The Delta OHM HD35… series wireless system can be fully configured through the basic software HD35AP-S. The RF communication between the devices HD35ED... and the base unit HD35AP... is bi-directional, that is to say that it allows the base unit HD35AP... to transmit to the devices HD35ED... all the changes in operating parameters generated by using the software HD35AP-S:

- The devices HD35ED… transmit the measured values to the base unit HD35AP…
- The base unit HD35AP… transmits the changes in the operating parameters to the devices HD35ED…




**Delta OHM wireless data recording system**

## Choosing the base unit HD35AP…

The base unit HD35AP... is available in various versions. The choice of the base unit is independent of the type of measure to be accomplished, but it must be carried out according to how we want to connect the unit to a PC or PLC:

- **USB** connection, available in all the **HD35AP…** versions. The base unit should be installed near the PC and requires an external power by connection to a power supply (optional) or to the USB port of the PC.
- **RS485 with MODBUS-RTU protocol** connection, available in **HD35APS**. This version is particularly suitable for connection to a PLC via a multi-point RS485 network. It requires external power by connection to a power supply (optional).
- **ETHERNET** connection, available in **HD35APW**. This version is suitable if there is a wired local network. It is not necessary to install the unit near the PC, but it is sufficient to set it up near an access point in the local network. It requires external power by connection to a power supply (optional).
- **Wi-Fi** connection, available in **HD35APW**. This version is suitable if there is a wireless local network. It requires external power by connection to a power supply (optional).
- **GSM** connection, available in **HD35APG**. This version is designed to operate even in the absence of a connection to the PC, being able to transmit the data via e-mail or FTP via the GSM network. It is therefore suitable for monitoring the data in unattended installations and mobile installations (for example, during freight). It requires an external power by connection to a power supply (optional).

*Note*: even if the unit **HD35APW** is connected to the local network, with the basic HD35AP-S software the data are available for download only in the local database of the PC where the software is installed and viewable only from the same PC. In order to download and display the data in remote databases, the advanced system features (**PLUS option**) should be purchased.

## Choice of the HD35ED… devices

The devices HD35ED... that acquire measures are available in many versions which differ one to the other in the type of measures that can be realized. The choice must be therefore made according to the following criteria:

- the type of variables that are meant to be measured;
- the need to have sensors connected by cable to the instrument or sensors integrated in the instrument;
- the need of having or not the LCD display in the instrument to see the measures directly on the instrument display or configure the device via the front keypad;
- the fact that the measurement zone is in an indoor or outdoor environment (for example, for the detection of meteorological data in an external environment, it is convenient to choose a model in waterproof housing with screen protection from solar radiation).

## How many HD35ED… devices can be used

In the data recording system, it is possible to use many HD35ED… devices simultaneously, all of them communicating with the same base unit HD35AP…

The number of devices to be used depends on:

- the number and type of quantities to be measured;
- the dislocation of the areas where the measures have to be carried out;

**Examples:**

- If it is requested to detect the temperature in two refrigerated cells placed side by side, it can be used a single device that can simultaneously measure two temperatures by using external probes (for example, HD35EDN/2TC).
- If it is requested to measure the temperature in two separate rooms or in two areas of a freight depot away a few dozen meters from each other, it is necessary to use two separate devices (for example, two HD35EDNTV with integrated sensor).

It is possible to easily add to the system or remove from the system one or more devices HD35ED… at any time.

## How to increase wireless area coverage

In order to increase the distance between the HD35ED... devices and the HD35AP... base unit, install one or more RF signal repeaters **HD35RE…** between the devices and the base unit.

The repeaters are also useful to increase the distance in the **presence of obstacles**, for example when the HD35ED... devices and the base unit are installed in interior spaces separated by walls of reinforced concrete, or in **adverse weather conditions**, if the devices are installed in outdoor environments.

## Which transmission frequency should be used

The transmission frequency of the wireless system must be one of those of free usage in the country where the system is installed. It is important to purchase the system with the correct frequency as **the transmission band cannot be changed by the end user**. Delta OHM offers the following alternatives:

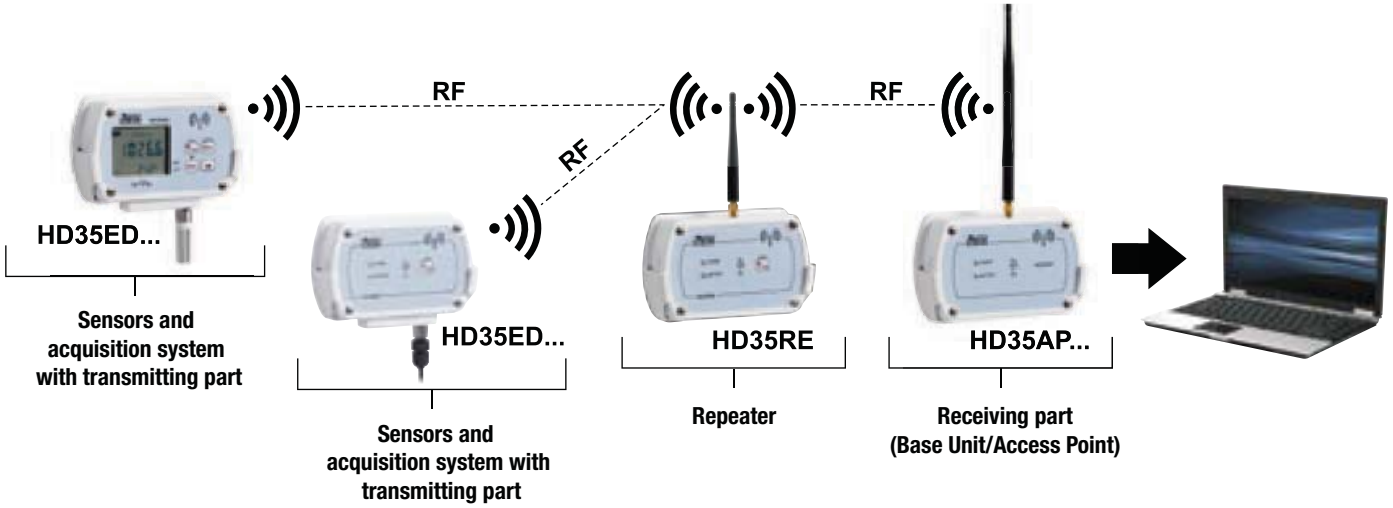
- **868 MHz** (in compliance with the European Standard EN 300 220)
- **902-928 MHz** (in compliance with FCC U.S. part 15 section 247 and Industry Canada RSS-210 standards)
- **915,9-929,7 MHz** (in compliance with Japanese standard ARIB STD-T108)

## Immediate alarms

The Delta OHM HD35… series wireless system **immediately** signals the exceeding of the threshold values of the measures in the following ways:

- By an acoustic signal generated by the buzzer inside the devices.
- By highlighting the measures with errors on the PC monitor by means of the HD35AP-S software.
- By sending an SMS to the set phone numbers (only with the base unit HD35APG).
- By sending an alarm e-mail to the set addresses (only with the base units HD35APG and HD35APW).
- By activating additional signaling or actuators via the optional remote alarm module **HD35ED-ALM** with relay outputs.

The system allows setting two alarm thresholds for each measured variable (lower threshold and upper threshold). The alarm is signaled if the measured value falls below the lower threshold or rises above the upper threshold.




**Wireless data recording system with repeater**

## HD35AP… – HD35RE – HD35ED…
## The Delta OHM wireless data logging system

The Delta OHM wireless data logging system allows the monitoring of many physical quantities in various application fields. The data loggers are available for the monitoring of:

- Temperature
- Humidity
- Atmospheric pressure and differential pressure
- Illuminance (lux)
- UVA, UVB and UVC irradiance
- Carbon monoxide (CO)
- Carbon dioxide ($CO_2$)
- Solar radiation
- Rainfall quantity
- Wind speed and direction
- Leaf wetness
- WBGT index
- Acceleration

The models that measure relative humidity and temperature calculate derived humidity quantities. The calculated quantities depend on the model and can be: Dew Point, wet bulb temperature, absolute humidity, mixing ratio, partial vapour pressure.

Depending on the model, the external measuring probes are connected to the data logger via M12 connector or screw terminal header. Some of the models are equipped with built-in sensors.

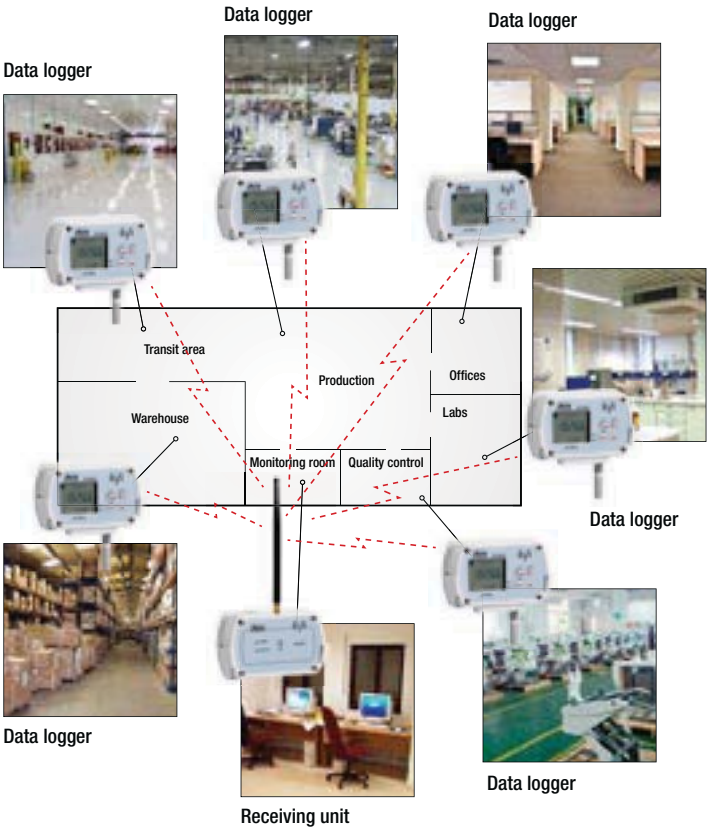
**Data loggers with terminal header inputs are available for the connection of:**

- Transmitters with 0÷20 or 4÷20 mA current output and 0÷50 mV, 0÷1 V or 0÷10 V voltage output
- Pt100 / Pt1000 and K, J, T, N, E type thermocouple temperature sensors
- Sensors with voltage free contact output (counting of switchings) or potentiometric output

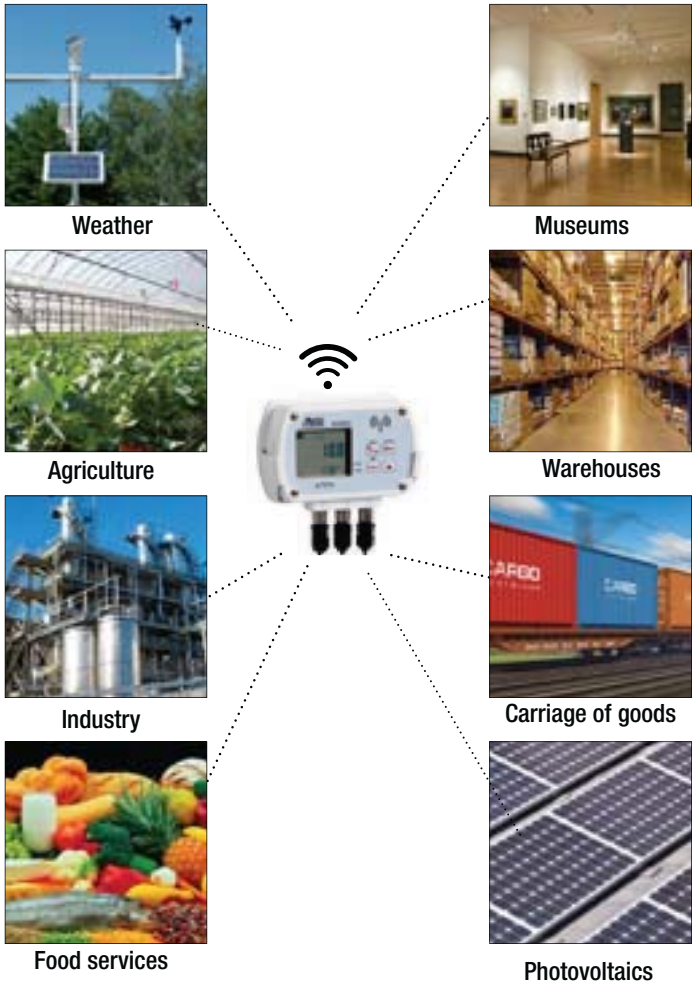
This allows extending the monitoring capability of the system to countless other quantities, in addition to those listed above.

**Typical application fields of the Delta OHM wireless data logging system are:**

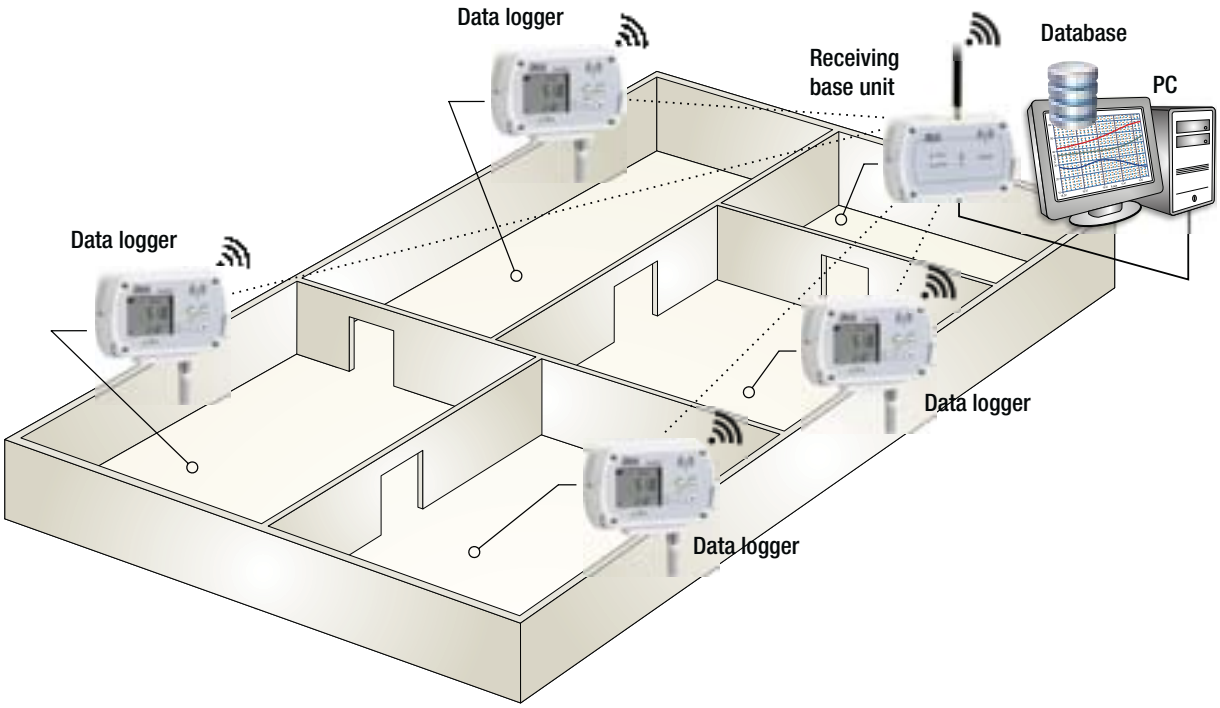
- Food services (refrigerated containers, cold storage, production and carriage of food)
- Health (storage of medicines, vaccines, blood, monitoring of incubators and operating rooms)
- Greenhouses and agriculture
- Environmental analyses (Air quality, meteorology and hydrology)
- Monitoring of solar panels
- Museums and document archives
- Transportation of perishable and fragile goods (monitoring of shocks by measuring the acceleration)
- Air conditioning
- Clean rooms
- Laboratories
- Industrial processes
- Buildings, offices, schools



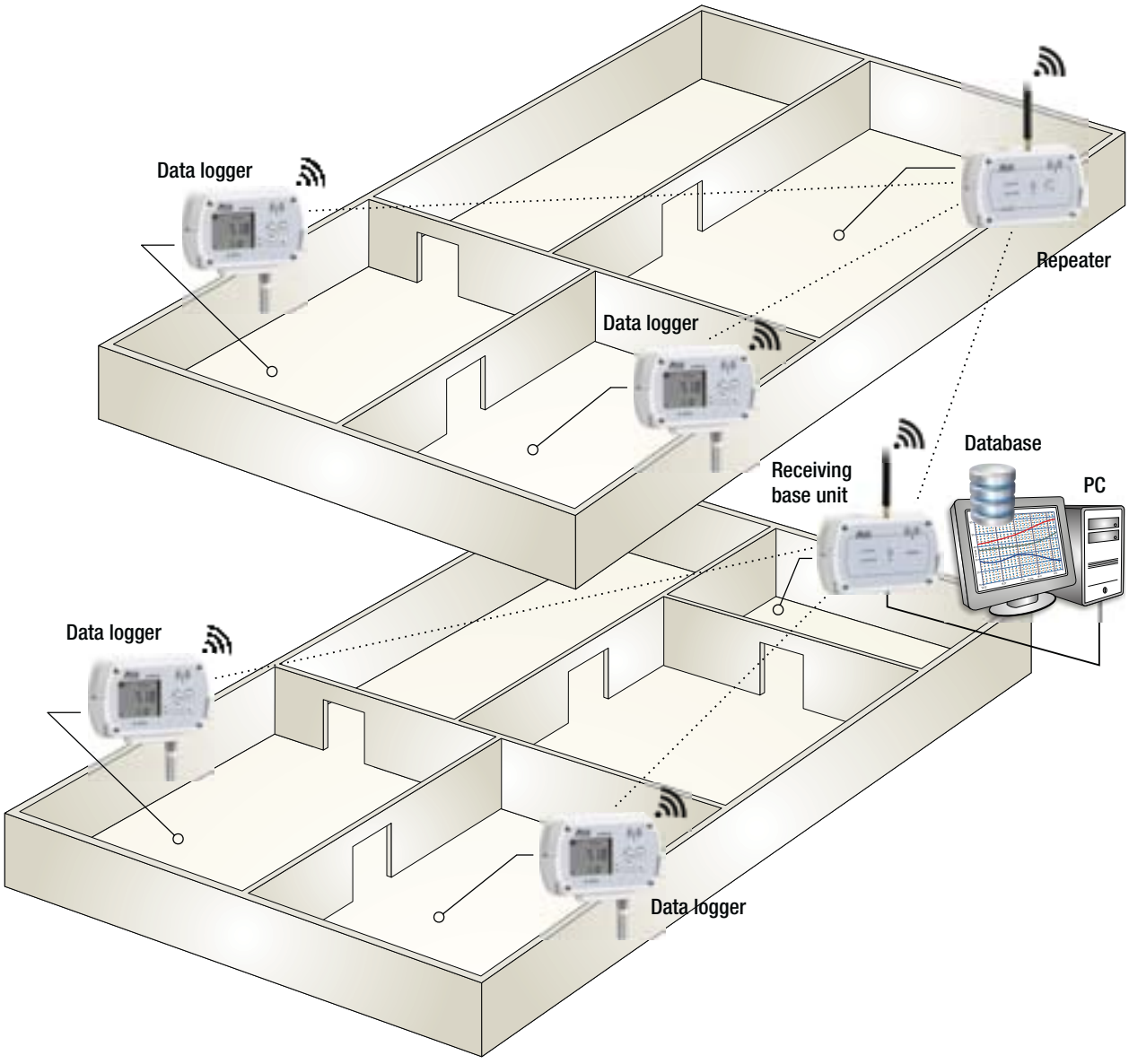

**Exemple of monitoring of an environment composed of several distinct areas**



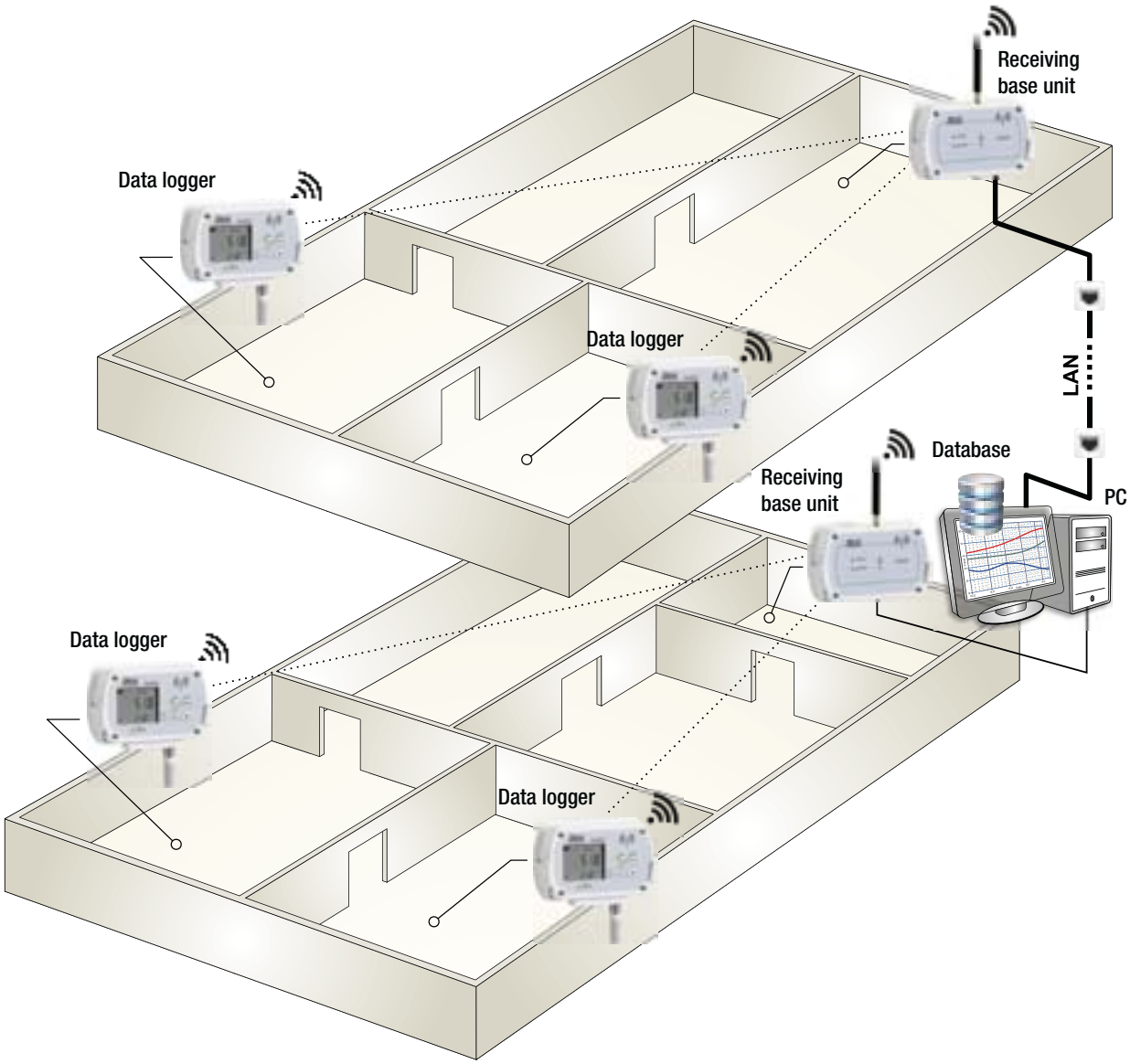
**Example of monitoring of an environment composed of several distinct areas**



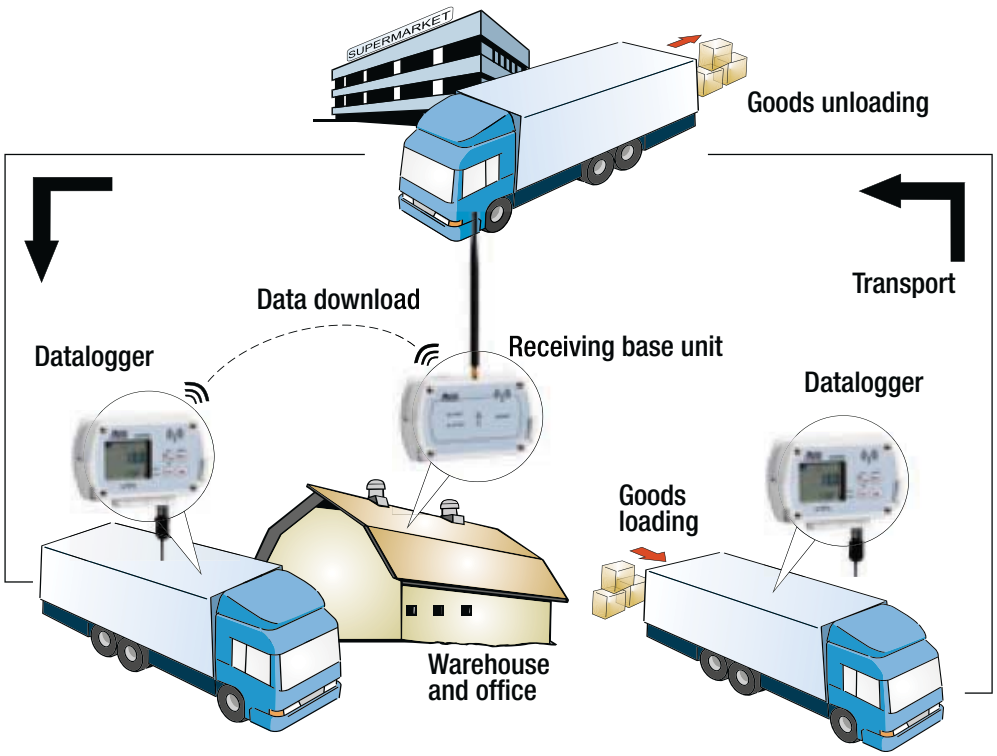

**Example of monitoring of multi-storey buildings:**
**the data loggers upstairs communicate with a repeater; the repeater communicates with the base unit downstairs.**



**Example of monitoring of multi-storey buildings:**
**use of a base unit for each floor; the base unit upstairs is connected to the PC via local network (Ethernet or Wi-Fi).**




**Monitoring of perishable (food, medicines, etc.) or fragile goods during transport**



## Components of the system

The system consists of the following components:

- **HD35AP…**: base unit
- **HD35RE…**: repeaters
- **HD35ED…**: series of data loggers
- **HD35ED-ALM**: remote alarm module

- **HD35AP… base unit**: the base unit is the interface between the data loggers of the system, placed in the measurement sites, and the PC. It communicates wirelessly with the remote data loggers.
  When connected to the PC via the USB connection, the base unit is directly powered by the PC USB port. In the absence of the USB connection, the power is supplied by the internal rechargeable battery or by the external power adapter (**optional**). The use of the external power adapter is recommended with the HD35APW and HD35APG versions.

- **HD35RE… repeaters**: the repeaters are devices able to act as a bridge between the base unit HD35AP… and the remote data loggers HD35ED…. They allow the increase of the communication distance among the data loggers and the base unit. More repeaters can be interposed between a data logger and the base unit to further increase the communication distance.

- **HD35ED… series of data loggers**: the data loggers are the remote devices connected to the measuring probes. They are installed in the environments to be monitored and are powered by the internal battery (not rechargeable) that allows a long working life. The acquired measurements are stored in the internal memory and sent to the base unit automatically at regular intervals or upon user request. Versions with or without LCD are available. The versions with LCD allow the measurements to be viewed also at the installation site and allow the data logger configuration through the front keyboard too.

-**HD35ED-ALM remote alarm module**: With relay outputs, the module allows to activate signalling devices (sirens, blinking lights, etc.) or actuators.

The system can consist of up to **255** devices (including the base unit and any repeaters). Each device is uniquely identified by its own address.

Thanks to the wireless transmission, the installation of the system is extremely simple and quick. The absence of cables allows a considerable saving in cost of material and labor, and allows the system components to be moved at any time without problems. Furthermore, it is not necessary to remove the data logger from its place or to go to the installation site to download the measured data in the PC.

## Unit base versions

The base unit is available in the following versions:

- **HD35AP**, with the USB output only.
- **HD35APD**,with the USB output only. “Dongle” version powered only by the PC USB port (without internal battery and without input for the external power supply). Available with internal (HD35APD) or external (HD35APD-EXT) antenna.
- **HD35APS**,with:
  - USB output
  - **RS485** output with **MODBUS-RTU** protocol

The base unit acts as a multiplexer to address the MODBUS commands from the PC/PLC to the devices in the network.

- **HD35APW**, with:
  - USB output
  - **Wi-Fi** interface for the connection to the wireless local network
  - **ETHERNET** interface for the cable connection to the local network

Permits (if the Internet connection via local network is available) sending alarm **e-mail** and the recorded data via **e-mail** or to an **FTP** address (*).

Allows using the **MODBUS TCP/IP** protocol (version of the MODBUS protocol for the communication via the ETHERNET connection).

**Multi-client** feature: multiple HD35APW base units can be connected to the same local network.

Integrated web server with monitor function.

- **HD35APG**,with:
  - USB output
  - integrated **GSM** module

Permits sending alarm **e-mail** or **SMS** and the recorded data via **e-mail** or to an **FTP** address (*).
Allows the communication with the PC via the GSM network through the **GPRS TCP/IP** protocol.

(*) **In the basic version, the data are sent via FTP with an interval of not less than 2 minutes and only if in the network there are up to 5 data loggers. For the full FTP functionality, the PLUS option has to be requested.**

**HD35ED…**

**HD35AP…**

**HD35RE…**

**HD35ED-ALM**

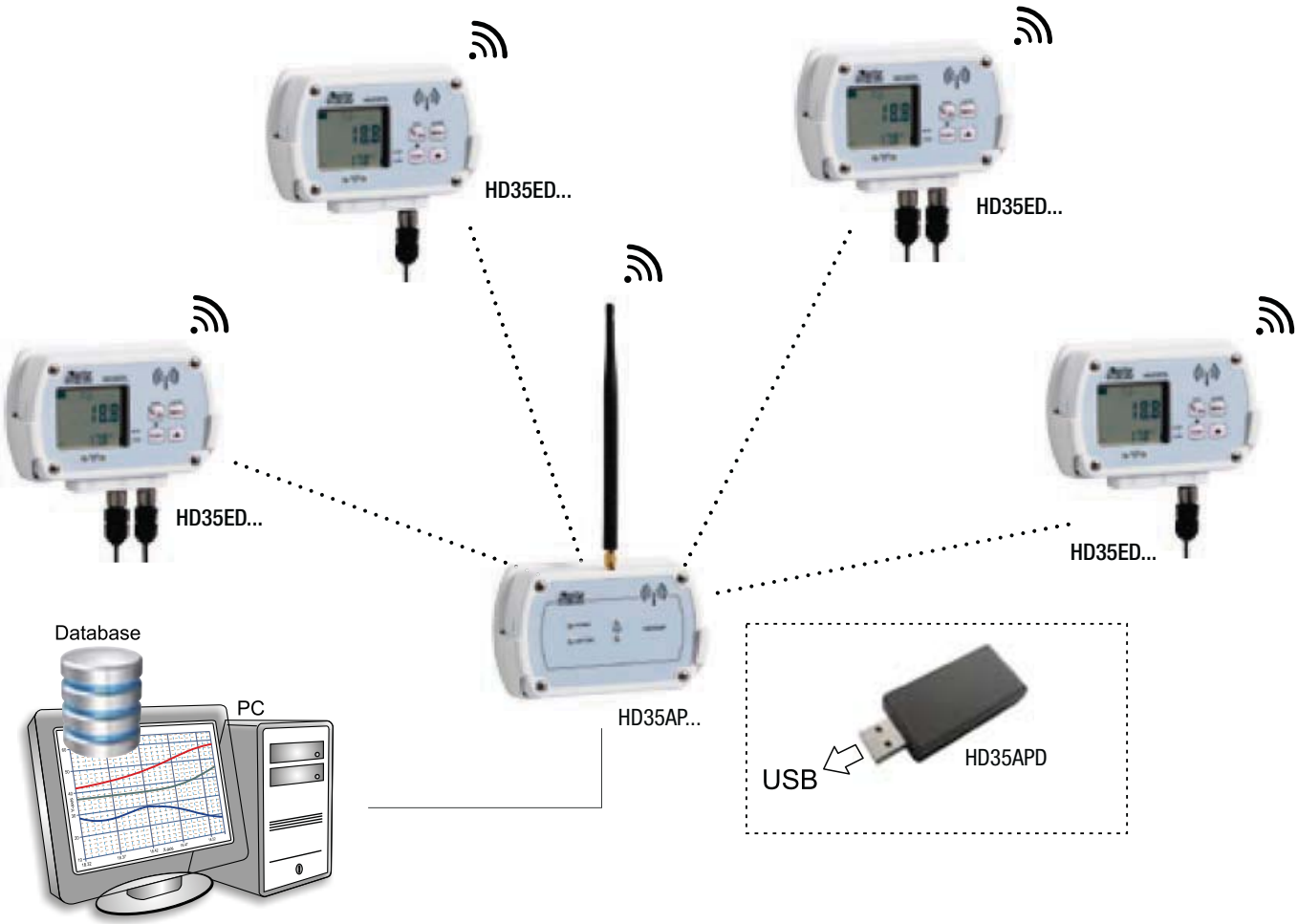
Table 1 summarizes the differences among the various versions of base units.

**TAB. 1: comparison among the versions of base units HD35AP...**

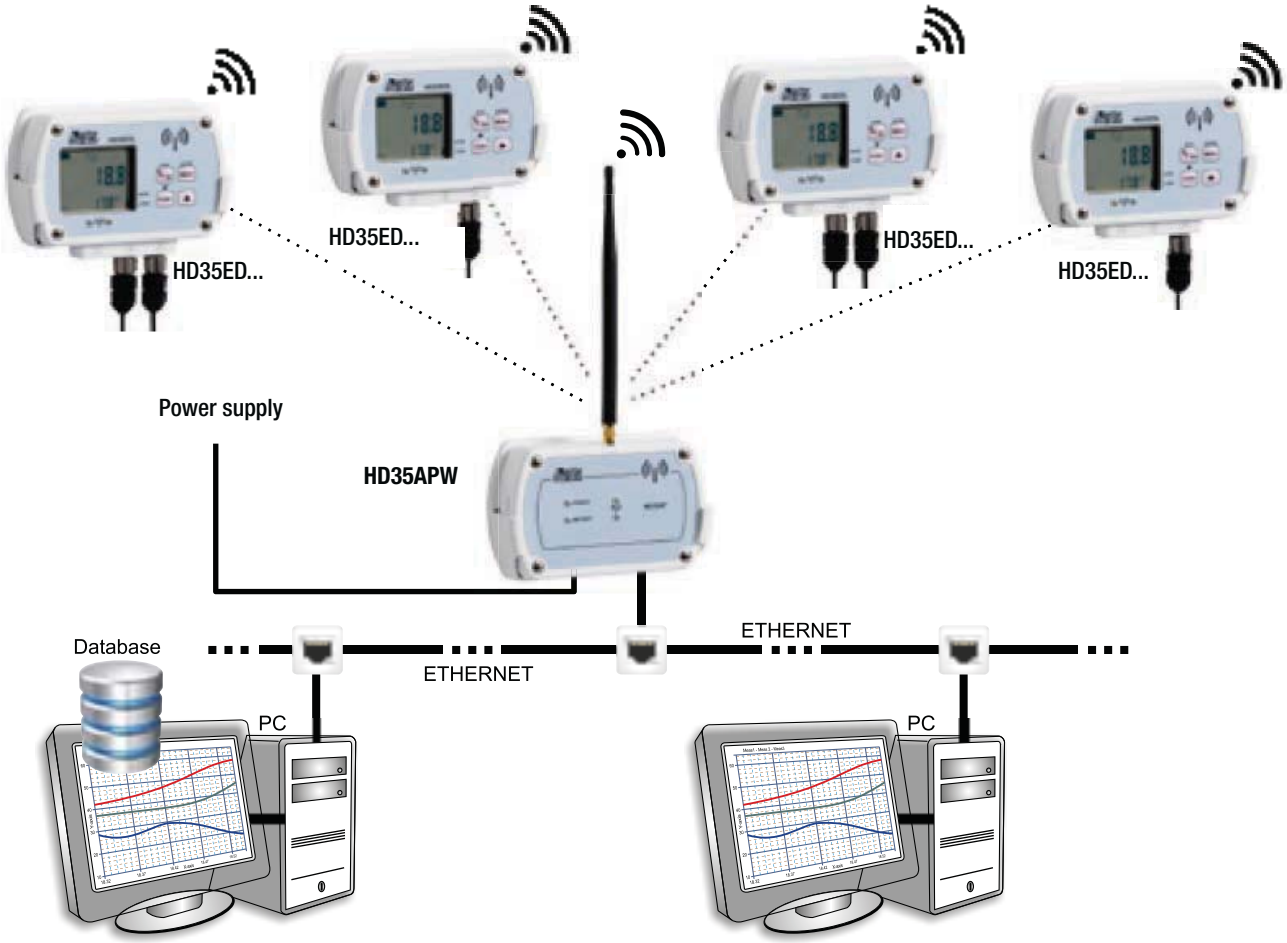
| | HD35AP | HD35APD | HD35APS | HD35APW | HD35APG |
|---|---|---|---|---|---|
| **Connection systems** | | | | | |
| USB | √ | √ | √ | √ | √ |
| RS485 | | | √ | | |
| Wi-Fi | | | | √ | |
| Ethernet | | | | √ | |
| GSM/GPRS | | | | | √ |
| **Protocols** | | | | | |
| Proprietary on USB | √ | √ | √ | √ | √ |
| Proprietary on TCP/IP | | | | √ | √ |
| Modbus RTU | | | √ | | |
| Modbus TCP/IP | | | | √ | |
| SMS commands | | | | | √ |
| **Data download** | | | | | |
| Automatical data download in the Database | √ | √ | √ | √ | √ |
| Sending of data via e-mail | | | | √ | √ |
| Sending of data to an FTP address | | | | √ | √ |
| Integrated web server | | | | √ | |
| **Alarms** | | | | | |
| Alarm thresholds | √ | √ | √ | √ | √ |
| Alarm SMS | | | | | √ |
| Alarm e-mails | | | | √ | √ |

## Base unit connection systems

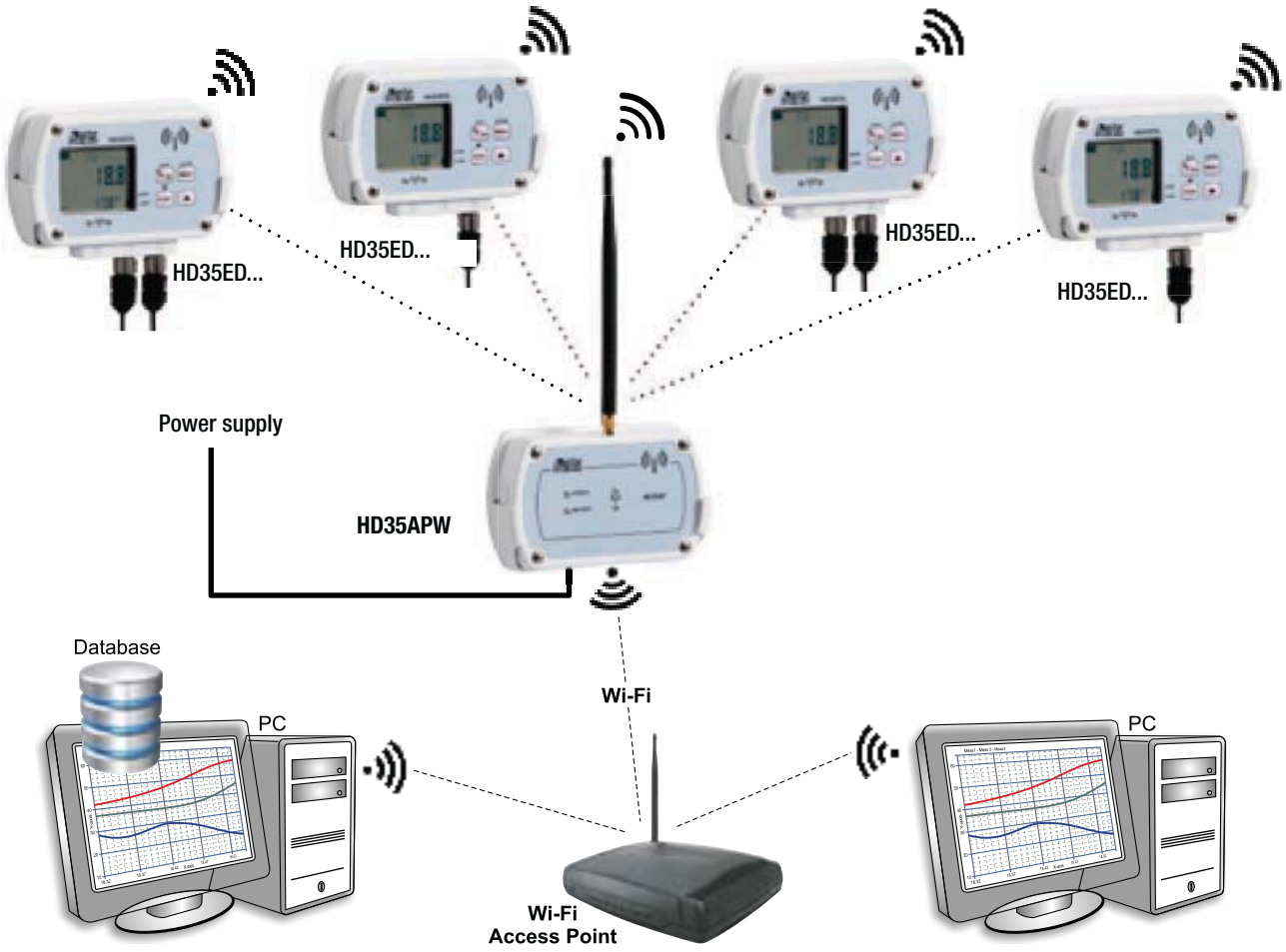
**USB direct connection between PC and HD35AP... base unit**
**Available in all the HD35AP... base units**



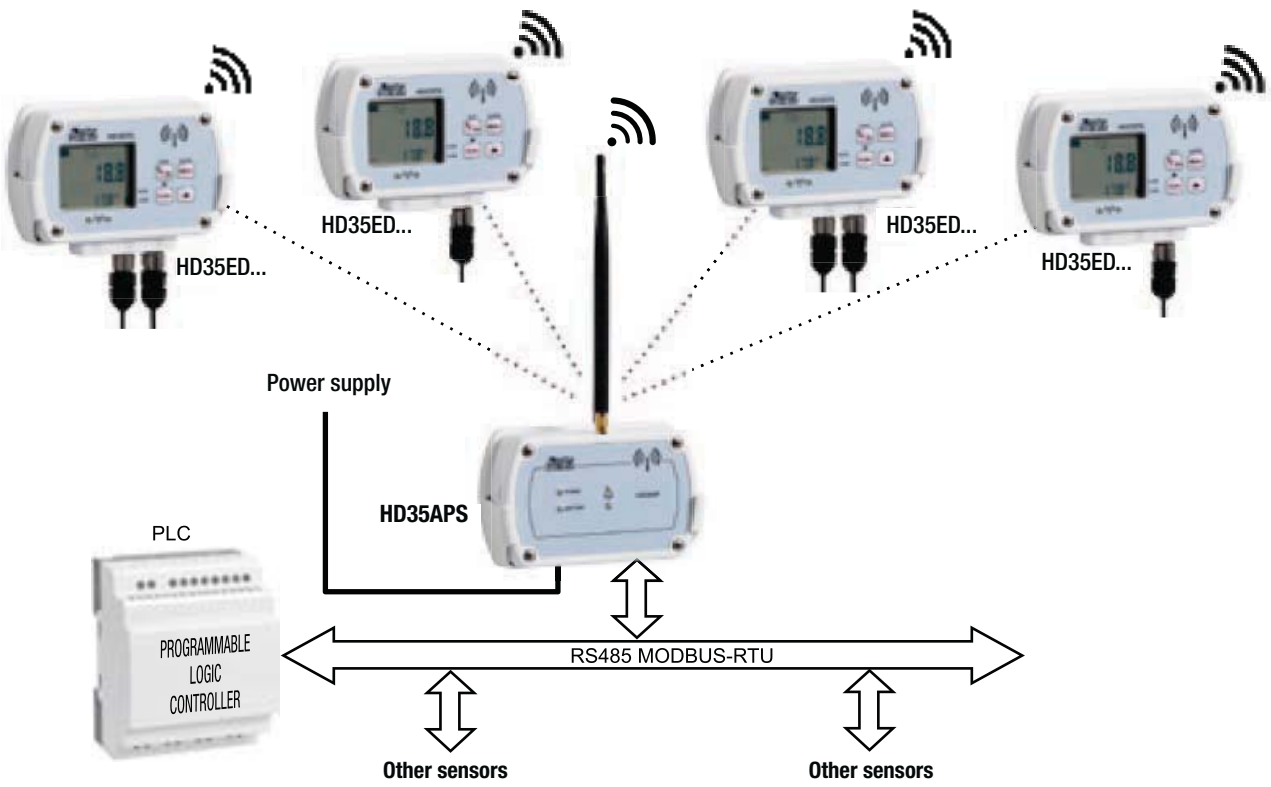
**Connection between PC and base unit via ETHERNET local network**
**Available only in HD35APW base unit**



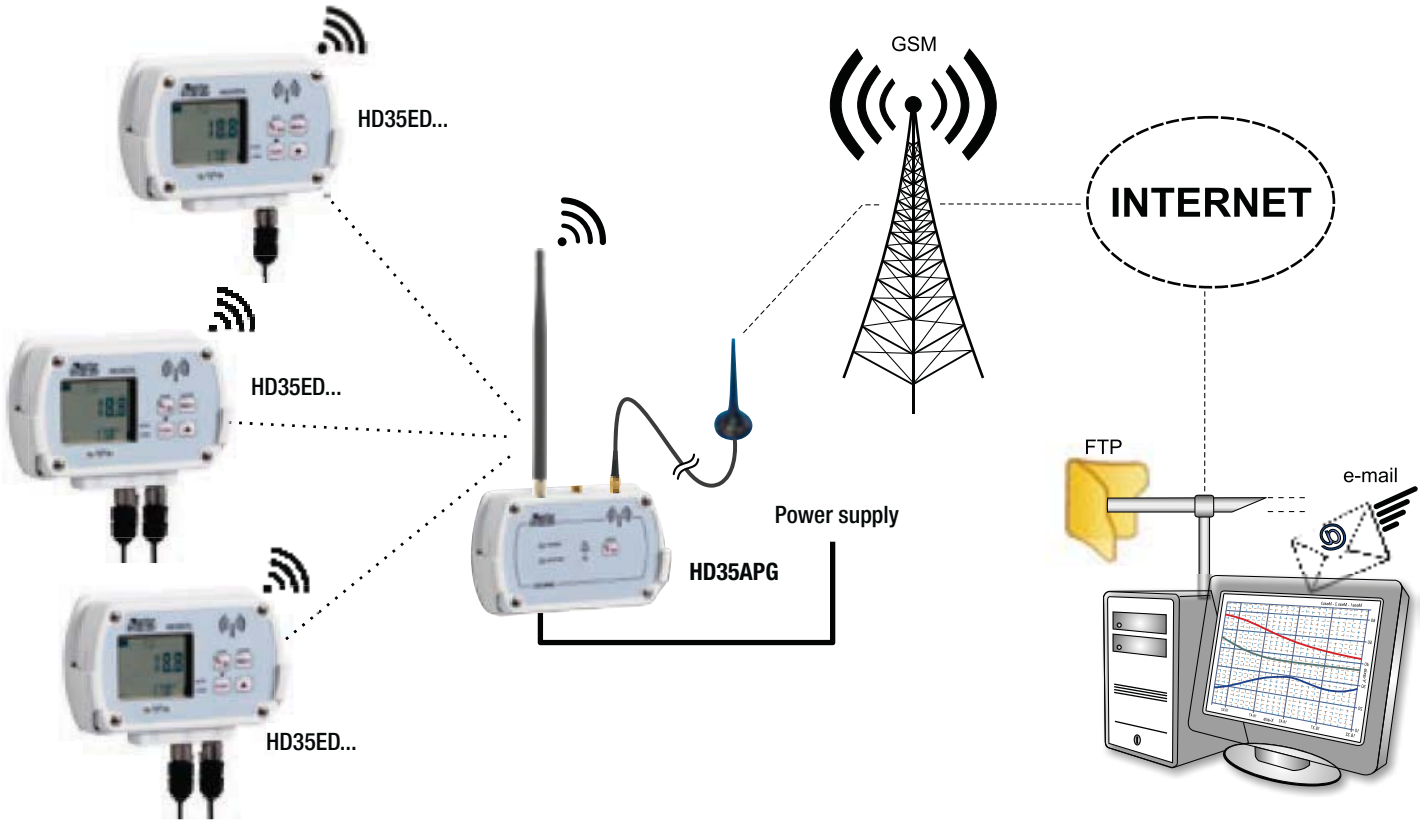

**Connection between PC and base unit via Wi-Fi local network**
**Available only in HD35APW base unit**



**Connection between PLC and base unit via RS485 MODBUS-RTU network**
**Available only in HD35APS base unit**




**GSM connection**
**Available only in HD35APG base unit**




The **GSM** connection also allows the monitoring of moving systems at a great distance, as for example in the case of the transport of perishable goods. Simply install the base unit in the moving system (for example inside a truck), in addition to the data loggers, to constantly keep under control the measured parameters from a fixed location. The communication through the **GPRS TCP/IP** protocol allows interacting with the base unit, in order to know and change the configuration of the system at any time. SMS messages can be sent to the base unit, to control the GSM functions of the unit.

## Transmitting frequency

All the models (**except HD35APD**...) are available in three versions, depending on the transmitting frequency band:

- **868 MHz** (in compliance with the european normative EN 300 220);
- **902-928 MHz** (in compliance with U.S. FCC part 15 section 247 and I.C. RSS-210 regulations);
- **915.9-929.7 MHz** (in compliance with ARIB STD-T108 standard).

The base unit HD35APD is available only with 868 MHz or 902-928 MHz frequency band.
The 902-928 MHz frequency band can be reduced to 915-928 MHz (Australia) or 921-928 MHz (New Zealand).
The wireless transmission of the Delta OHM system is extremely robust against radio frequency interference. The system is able to detect any RF interference in the transmission channel, and to transfer, upon request, the data communication in another channel of the same transmitting band. The correctness of the transmitted data is ensured by the **bidirectional** communication between the base unit and the remote data loggers.

## Transmitting range and repeaters

To increase the distance between the base unit and the data loggers, the **HD35RE...** repeaters are used. More repeaters in cascade can be used ("multi-hop" network). Depending on the RF frequency band, the typical transmitting range between two devices in open field (**the range could be reduced if there are obstacles between the devices**) is:

| **TAB. 2: transmitting range** | HD35RE... | HD35AP... (except HD35APD...) | HD35APD-EXT | HD35APD |
|---|---|---|---|---|
| | **868 MHz frequency band** | | | |
| HD35ED... with internal antenna | 300 m | 300 m | 300 m | 180 m |
| HD35ED... with external antenna HD35RE... | >500 m | >500 m | 300 m | 180 m |
| | **902-928 MHz frequency band** | | | |
| HD35ED... with internal antenna | 180 m | 180 m | 180 m | 180 m |
| HD35ED... with external antenna HD35RE... | >500 m | >500 m | 300 m | 180 m |
| | **915,9-929,7 MHz frequency band** | | | |
| HD35ED... with internal antenna | 300 m | 300 m | --- | --- |
| HD35ED... with external antenna HD35RE... | >500 m | >500 m | --- | --- |

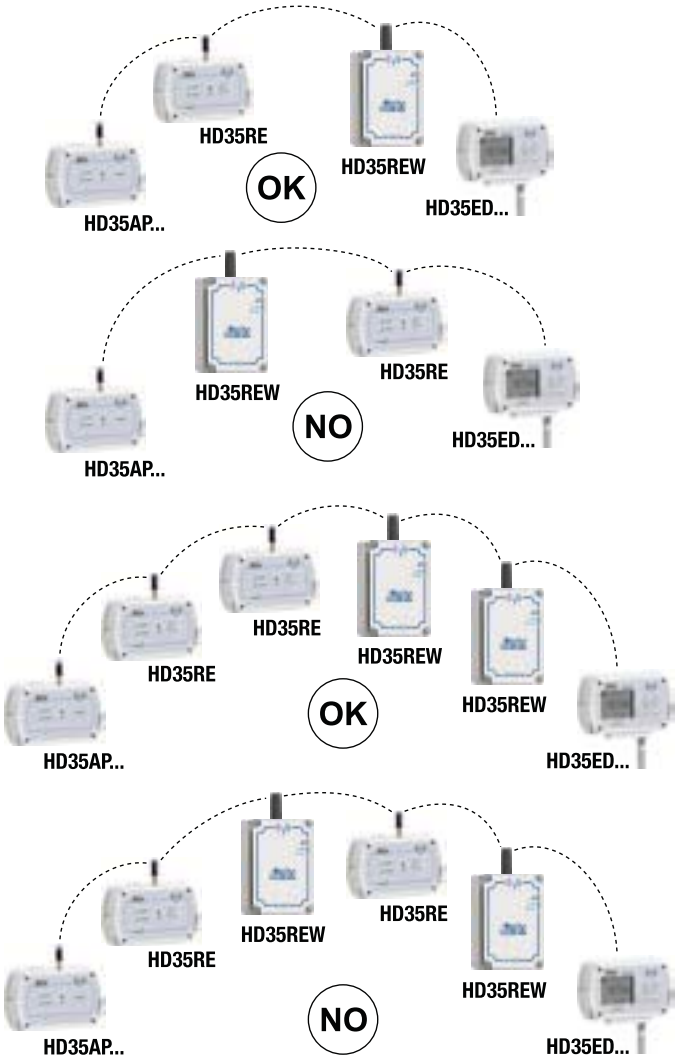
The repeaters are available in two versions:

- **HD35RE**: in housing for indoor, with external power supply and rechargeable internal backup battery;
- **HD35REW**: in IP 67 waterproof housing, with internal not rechargeable battery.

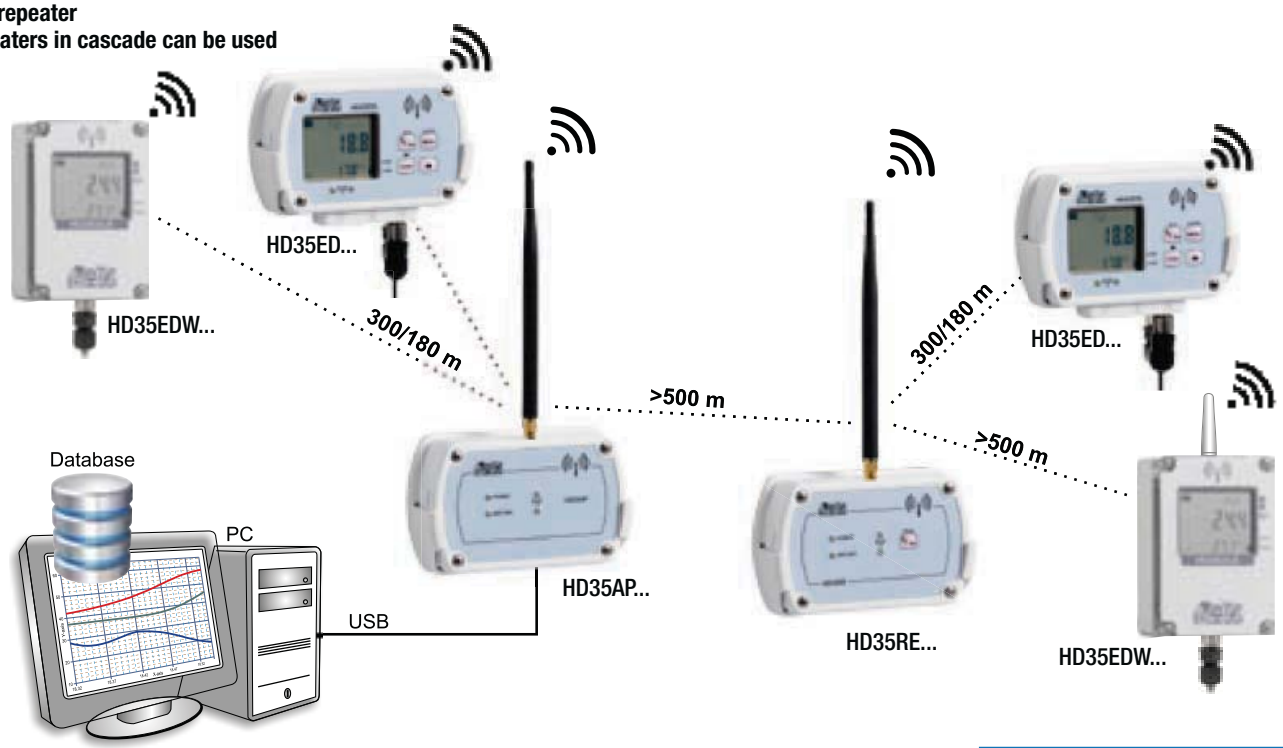
HD35REW is a low power repeater designed for environments where the external power supply is not available. To preserve the battery life, the use of HD35REW repeaters is recommended in systems with not a large number of devices and that do not transmit the measurements frequently.

Designing the system it should be taken into account that between a HD35REW repeater and a HD35ED... data logger or between two HD35REW repeaters, only HD35REW repeaters can be interposed, as shown in following examples.

## Arrangement of different types of repeaters




**RF signal repeater**
**More repeaters in cascade can be used**



## Alarms

For each measured quantity, two alarm thresholds can be set by the user (higher and lower threshold). When a threshold is exceeded, the internal buzzer of the data logger emits an acoustic signal and the alarm signal is immediately sent to the base unit and displayed on the PC. If the base unit is equipped with the GSM module (**HD35APG**) or the Wi-Fi/Ethernet interface (**HD35APW**) and the Internet connection is available, the alarm can be signalled by sending an e-mail. If the base unit is equipped with the GSM module (**HD35APG**), the alarm can be signalled also by sending an SMS.

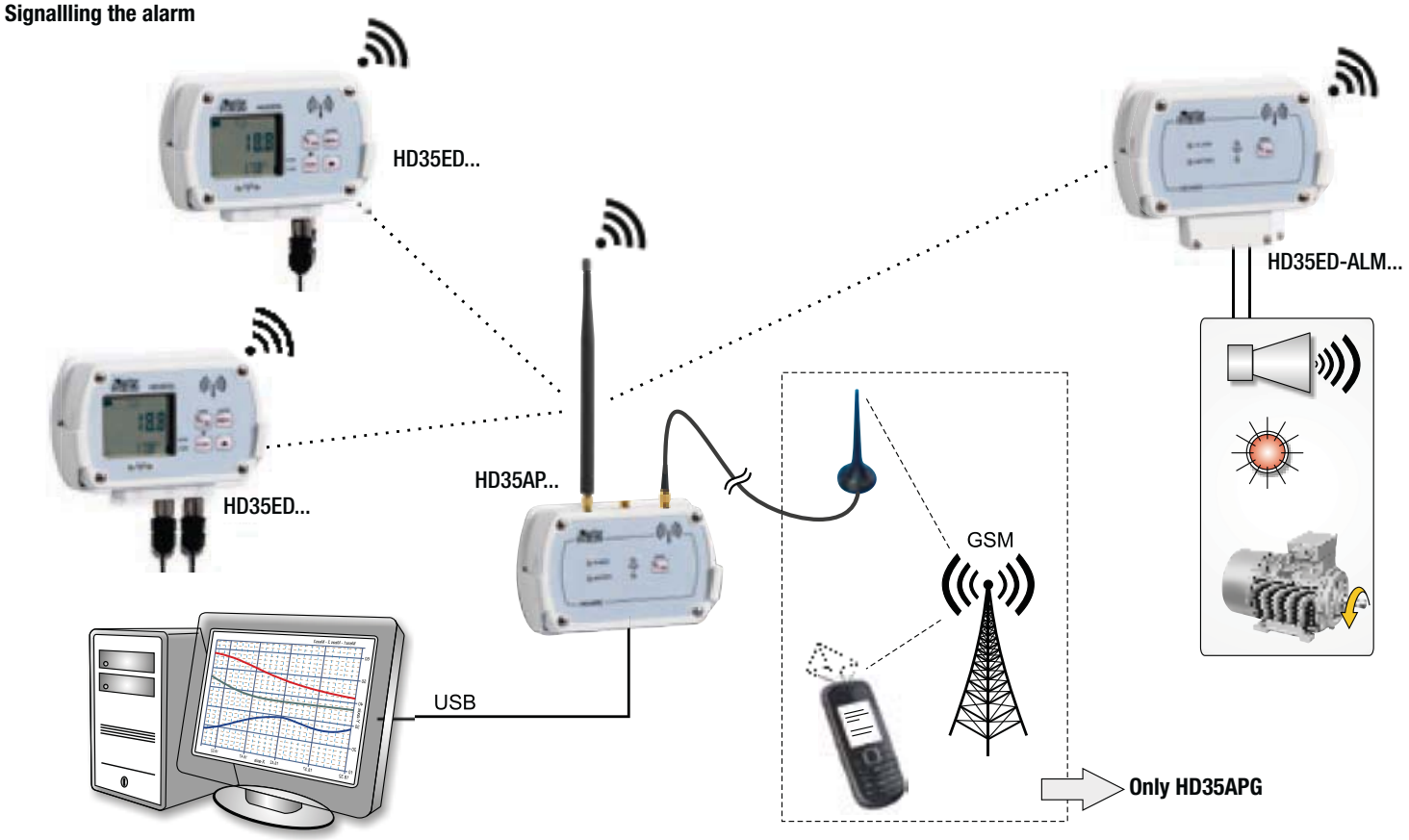
An alarm hysteresis and a delay in the generation of the alarm can be configured for each measured quantity. Alarm conditions according to the quality of the RF signal can be generated.

A wireless remote alarm module with relay output is available (**HD35ED-ALM**), so to allow activating more signalling devices (sirens, blinking lights, etc.) or actuators. The alarm module HD35ED-ALM works with all the versions of base unit.

## Logging

Each data logger of the system can be configured with a different measuring and logging interval. The stored value is the average of the measures acquired in the logging interval. The transmitted data are also stored in the internal memory of the data logger; when the data logger memory is full, it can be chosen to stop the logging or to continue overwriting the older data (cyclic logging). In addition to the individual loggers, after the transmission the data are also stored in the internal memory of the base unit; in this way the system is extremely safe against any data loss and it is not necessary to keep the PC always connected to the base unit. The memory of the base unit is managed cyclically.

**Signallling the alarm**




## Software

The supplied PC basic software **HD35AP-S** allows configuring all the devices of the system, to view the connection status, the RF signal level and the battery charge level of each device, to view the real time measurements both graphically and numerically, to download data.

The data can be downloaded:

- **automatically**, at regular intervals;
- **manually**, upon user request.

The data downloaded in the PC are entered in a database. The transfer of the sensor measurements in the database occurs in stages:

1. the HD35ED... data loggers transmit automatically at regular intervals the measurements to the HD35AP... base unit (which stores the measurements in its internal memory);
2. the data in the memory of the HD35AP... base unit are downloaded in the PC, automatically or upon user request, through the HD35AP-S software;
3. the HD35AP-S software enters the downloaded data in the database.

## Advanced (PLUS) functionalities

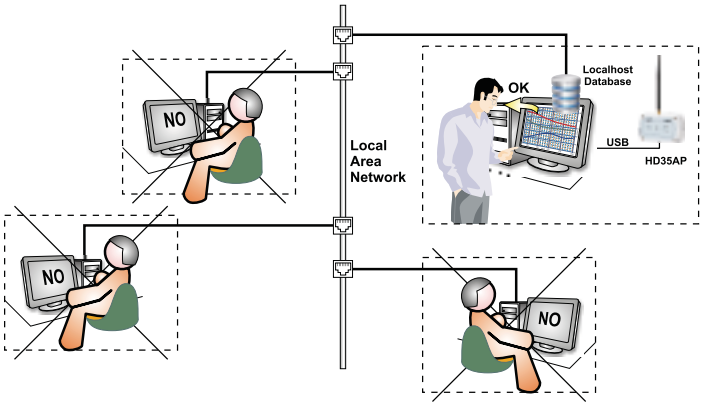
The system basic functionality allows managing only the data in the local database of the PC in which the HD35AP-S software is installed. Furthermore, limited FTP functionalities are allowed: the data are sent via FTP by the HD35APG or HD35APW base unit with an interval of not less than 2 minutes and only if in the network there are up to 5 data loggers.

For advanced applications, the **HD35AP-PLUS** option with the following additional features is available for a fee:

- **Multi-client** connection to the database: it is possible to store the data in either a local database or in a remote database on the local network to which the PC is connected; the display of the data can be done from any PC on the local network running the software HD35AP-S.
- Full FTP functionality: no limit on the data sending interval and on the number of data loggers.
- Recording of the software activities and users management in compliance with the recommendations of **FDA 21 CFR part 11**.

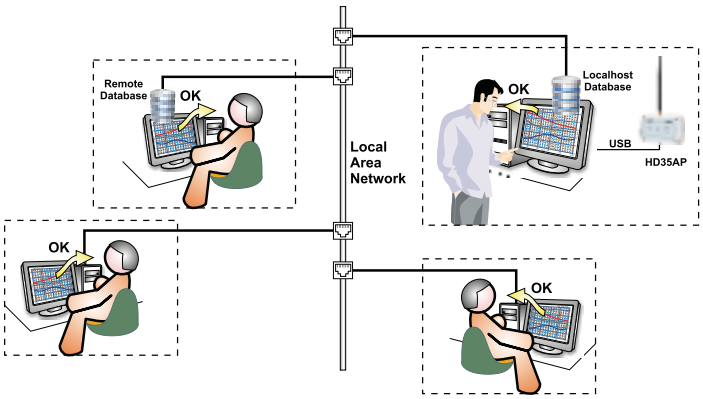
### BASIC FUNCTIONALITY

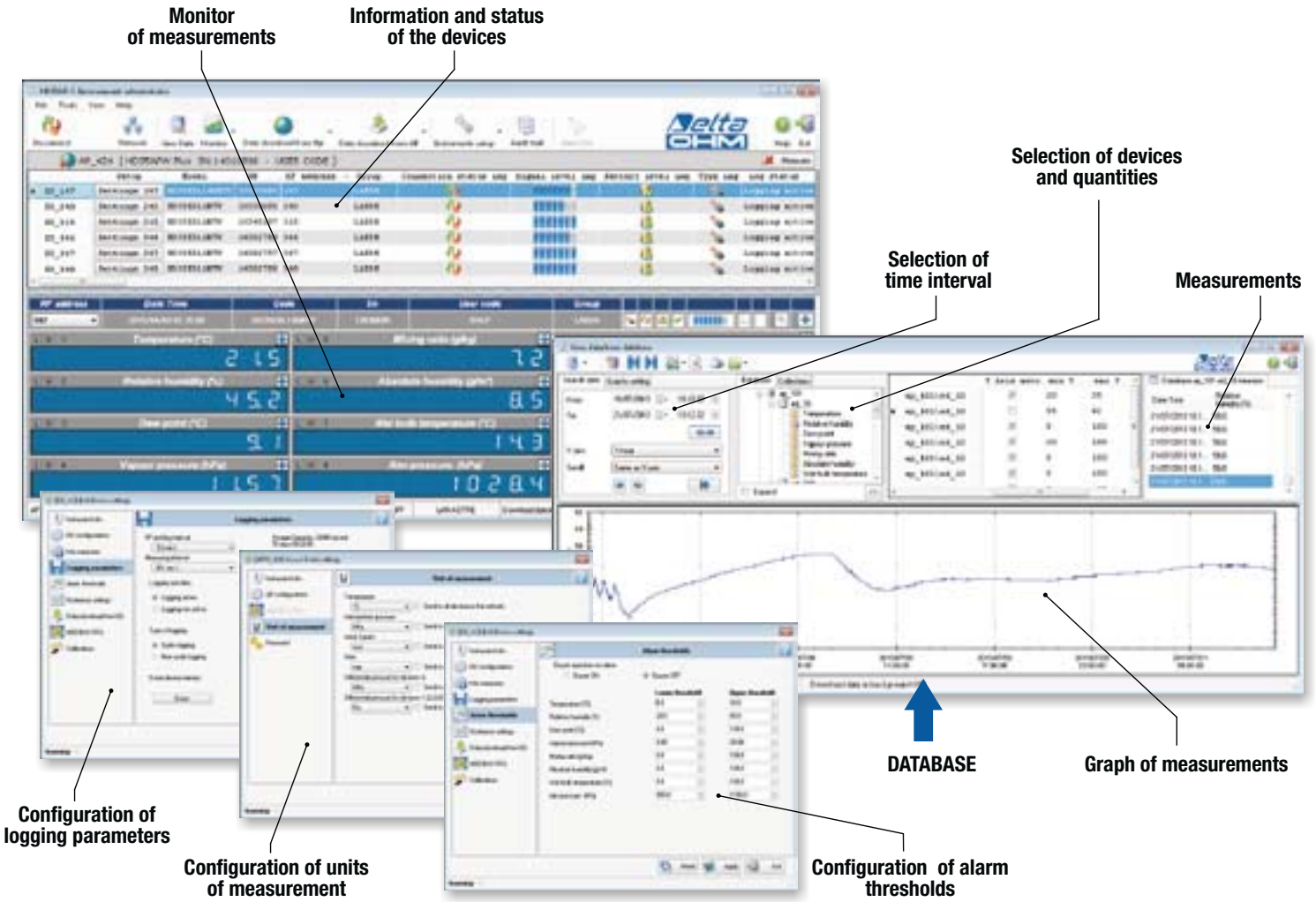
Storing and viewing of data only in the local database.




### PLUS FUNCTIONALITY

Storing of data in a local or remote database. Viewing of data from any PC of the local network in which the HD35AP-S software has been installed.



## Web server

In the systems using base units equipped with ETHERNET and Wi-Fi (**HD35APW**) connection, it is possible, thanks to the web server integrated in the base unit, to view in real time the measurements from any PC connected to the same local network of the base unit by simply using a web browser, without installing specific softwares in the PC.

## Configuration

The data logger equipped with LCD and keyboard can be also configured via the front keyboard. The access to the configuration parameters of the data logger via keyboard is password protected. There are two different passwords, one for the use of the data logger as operator (access to some settings only) and one for the use as administrator (access to all the configuration parameters). The changes done to a data logger configuration via keyboard are automatically transmitted to the base unit and also reported in the PC software, allowing an always updated viewing of the system from the PC connected to the base unit. The base unit keeps also track of the system parameters of each data logger (for example of the alarm thresholds, etc.); it is therefore not necessary to request the parameters to the various data loggers to know the system configuration, just connect the PC to the base unit to immediately get all the information needed.

## Internal clock

The internal clock of each data logger is continuously **synchronized** with the clock of the base unit, thereby eliminating any problems due to the drift of the data logger clock. This ensures that the data loggers of the system have all the same time, feature particularly useful if you want to compare the measures acquired by various data loggers at the same time.

## Indicators

The devices of the system are equipped with front LED indicating the communication status: any transmission difficulties due, for example, to the excessive distance among the devices or to the presence of obstacles are immediately highlighted.

The devices also report the charge status of the internal battery and the status of the alarm. The indication is on the display for the models provided with LCD and through LED indicators for the models without LCD.

## Installation

The practical wall mount plastic support allows quickly removing and replacing the devices of the system for service operations, for example to change the battery or to periodically check the calibration at a laboratory. Alternatively, a fixed installation can be realized, using the appropriate anodized aluminium alloy flanges to be fixed on the back of the instrument case. The use of the flanges makes it possible to prevent the removal of the instrument thanks to the possibility of applying a security padlock, inserted in a pin to be fixed to the wall.

**Plastic support**


**Flanges and security padlock**

## Conformities

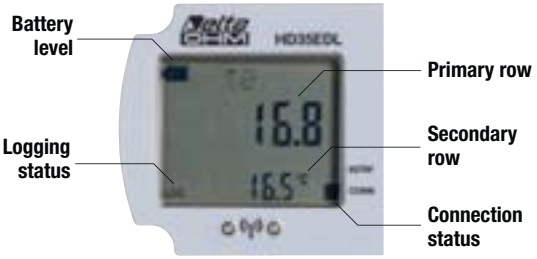
The data loggers are in compliance with the standard **EN 12830**. The PC application software **HD35AP-S** is designed in accordance with the **FDA 21 CFR part 11** recommendations: the operations are protected by passwords and, in the advanced version, it is kept track of all the operations performed.

## The display in the data loggers with optional LCD

Depending on the data logger model, the LCD is custom or graphic type. The models with custom LCD are identified by the **L** letter in the code. The models with graphic LCD are identified by the **G** letter in the code.

All the various quantities measured and calculated by the data logger can be viewed on the LCD. In the models with custom LCD that measure various quantities, the temperature is displayed in the secondary row.

Indications on the status of connection, logging (running/disabled) and battery charge level are provided.




**Custom LCD**

The models with graphic LCD allow viewing 3 measures at the same time in the secondary rows. The graphic display also shows the level of the RF signal, date and time.


**Graphic LCD**

The data loggers with LCD can display the measured values in different units of measurement. For example, in the models measuring temperature the user can set °C or °F, or, in the models measuring atmospheric pressure, the unit of measurement can be set by the user in: hPa (= mbar), mmHg, inchHg, $mmH_2O$, $inchH_2O$, atm.

## Available data loggers

The following tables list the **HD35ED…** data logger models available. Other models, in addition to those listed, can be supplied upon request for quantities.

To highlight the physical quantities measured by the data loggers, the ordering codes include some characters that identify 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/1** = 1 channel, **N/2** = 2 channels, **N/3** = 3 channels) |
| **7P** | = | Temperature with Pt100/Pt1000 sensor (**7P/1** = 1 channel, **7P/2** = 2 channels, **7P/3** = 3 channels) |
| **K** | = | Temperature with thermocouple sensor (**K/4** = 4 channels) |
| **A** | = | Carbon monoxide (CO) |
| **B** | = | Carbon dioxide ($CO_2$) |
| **I**<br>**I2** | =<br>= | Illuminance low range (0...20,000 lux),<br>Illuminance high range (0...200,000 lux) |
| **U** | = | UV irradiance (**U**=UVA, **UB**=UVB, **UC**=UVC) |
| **R** | = | Solar radiation (pyranometer) |
| **P** | = | Rainfall quantity |
| **V** | = | Acceleration |
| **L** | = | Leaf wetness |
| **S** | = | Soil moisture |

To indicate the fixed probe or the probe with cable, the following indications are used:

| | | |
|---|---|---|
| **TC** | = | Probe with cable |
| **TV** | = | Temperature and/or R.H. fixed vertical probe without cable, with high accuracy R.H. sensor |
| **TVI** | = | Temperature and R.H. fixed vertical probe without cable |
| **TCV** | = | Illuminance/UV irradiance or temperature only probe with cable and temperature/R.H. fixed vertical probe without cable, with high accuracy R.H. sensor |

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

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

**TAB. 3A: Data loggers in housing for indoor**

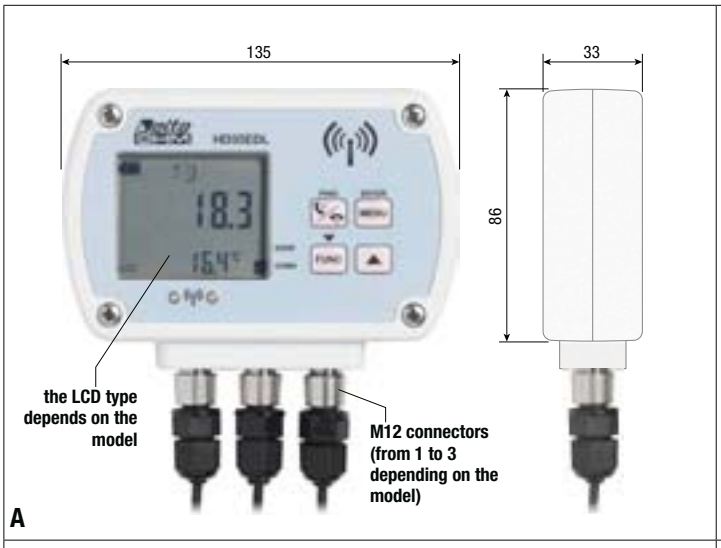
| Model | MEASURES | | | | | | | | | OPTIONAL LCD | | INPUTS | | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NTC 10K | Pt100 Pt1000 | UR | Patm | ΔP | Lux | UV | CO | $CO_2$ | L<br>Custom | G<br>Graphic | Number of M12 connectors | Built-in sensors | |
| HD35ED 7P/1 TC | | • | | | | | | | | | • | 1 | | A |
| HD35ED 7P/2 TC | | • | | | | | | | | | • | 2 | | A |
| HD35ED 7P/3 TC | | • | | | | | | | | | • | 3 | | A |
| HD35ED N/1 TC | • | | | | | | | | | • | | 1 | | A |
| HD35ED N/2 TC | • | | | | | | | | | • | | 2 | | A |
| HD35ED N/3 TC | • | | | | | | | | | • | | 3 | | A |
| HD35ED N TV | • | | | | | | | | | • | | | • | B |
| HD35ED 1 TV | | | • | | | | | | | • | | | • | B |
| HD35ED 1 TVI | | | • | | | | | | | • | | | • | B |
| HD35ED 1N TC | • | | • | | | | | | | • | | 1 | | A |
| HD35ED 17P TC | | • | • | | | | | | | • | | 1 | | A |
| HD35ED 1N TV | • | | • | | | | | | | • | | | • | B |
| HD35ED 1N TVI | Sensor integrated in RH module | | • | | | | | | | • | | | • | B |
| HD35ED 1N/2 TC | • | | • | | | | | | | • | | 2 | | A |
| HD35ED 1N/2 TCV | • | | • | | | | | | | • | | 1 | T / UR | C |
| HD35ED 14bN TC | • | | • | • | | | | | | • | | 1 | Patm | A |
| HD35ED 14bN TV | • | | • | • | | | | | | • | | | • | B |
| HD35ED 14bN TVI | Sensor integrated in RH module | | • | • | | | | | | | • | | • | B |
| HD35ED 1N4r…TV (*) | • | | • | | • | | | | | • | | | • | F |
| HD35ED 4r… (*) | | | | | • | | | | | • | | | • | E |
| HD35ED 1NI TCV | • | | • | | | • | | | | • | | 1 | T / UR | C |
| HD35ED 1NI2 TCV | • | | • | | | • | | | | • | | 1 | T / UR | C |
| HD35ED 1NI TV | • | | • | | | • | | | | • | | | • | D |
| HD35ED 14bNI TCV | • | | • | • | | • | | | | • | | 1 | T / UR Patm | C |
| HD35ED 14bNI2 TCV | • | | • | • | | • | | | | • | | 1 | T / UR Patm | C |
| HD35ED 14bNI TV | • | | • | • | | • | | | | • | | | • | D |
| HD35ED 1NIU TCV | • | | • | | | • | UVA | | | • | | 1 | T / UR | C |
| HD35ED 1NIU TV | • | | • | | | • | UVA | | | • | | | • | D |
| HD35ED1NUBTCV | • | | • | | | | UVB | | | • | | 1 | T / UR | C |
| HD35ED1NUCTCV | • | | • | | | | UVC | | | • | | 1 | T / UR | C |
| HD35ED 14bNIU TCV | • | | • | • | | • | UVA | | | • | | 1 | T / UR Patm | C |
| HD35ED 14bNIU TV | • | | • | • | | • | UVA | | | • | | | • | D |
| HD35ED 1NB | Sensor integrated in RH module | | • | | | | | | • | | • | | • | G |
| HD35ED 1NAB | | | • | | | | | • | • | | • | | • | G |
| HD35ED 14bNAB | | | • | • | | | | • | • | | • | | • | G |
| HD35ED H | Transmitters with 0÷20 mA, 4÷20 mA, 0÷50 mV or 0÷1 V output<br>Pt100 / Pt1000 sensors, thermocouples K, J, T, N, E<br>Sensors with voltage-free contact or potentiometric output | | | | | | | | | | • | 3 terminal header inputs | | H |

**(*) Differential pressure ranges available**

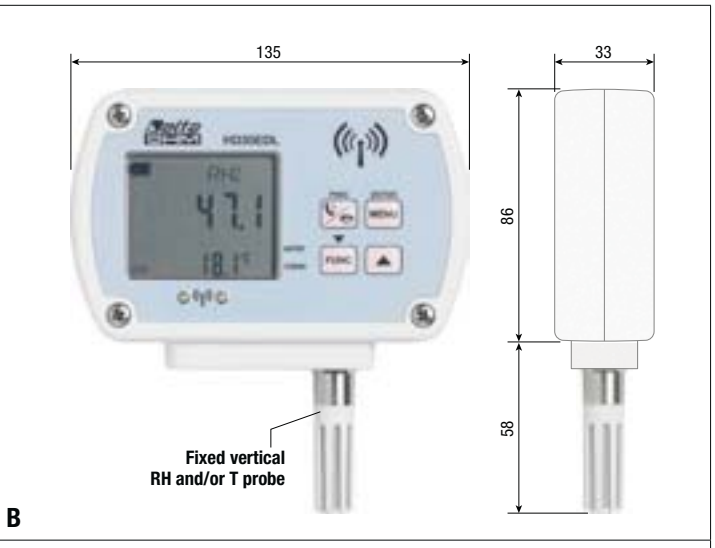
| Model | Measuring range |
|---|---|
| HD35ED...4r1... | -2.5…+2.5 hPa (mbar) |
| HD35ED...4r2... | -10…+10 hPa (mbar) |
| HD35ED...4r3... | -100…+100 hPa (mbar) |
| HD35ED...4r4... | -2000…+2000 hPa (= 2 bar) |
| HD35ED...4r5... (**) | -125…+125 Pa (for clean rooms) |

(**) The model r5 measures dynamic pressures (not suitable for the measurement of static pressures) and requires a small air flow between the two pressure inputs. Metal inputs with tube clamp ring to minimize pressure losses.

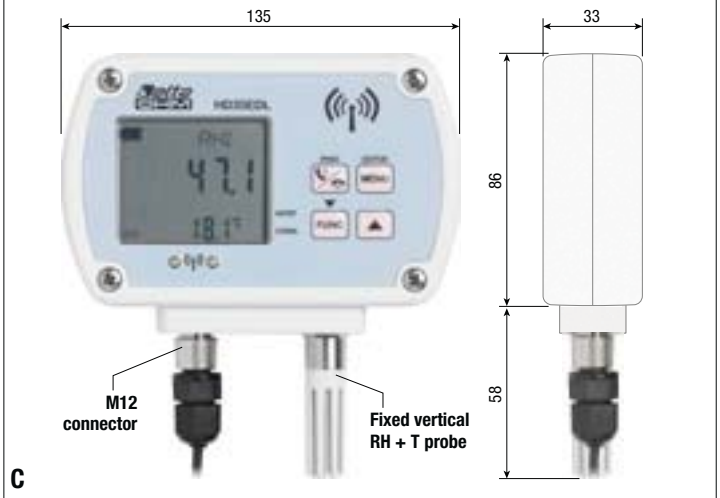
## TAB. 3B: Data loggers in housing for indoor – Images



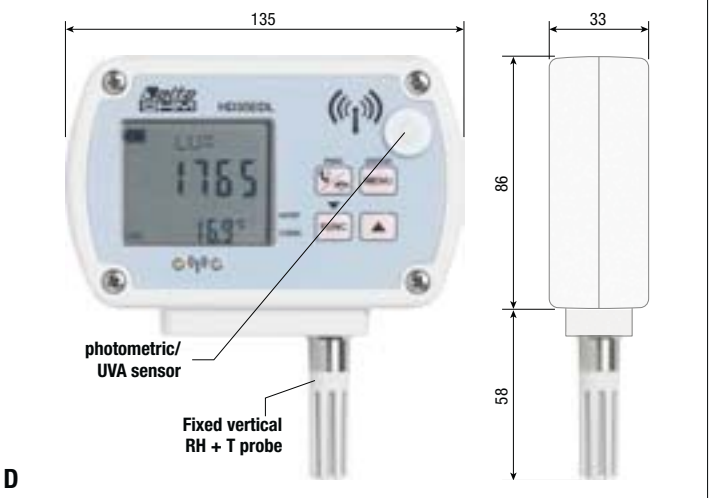

A



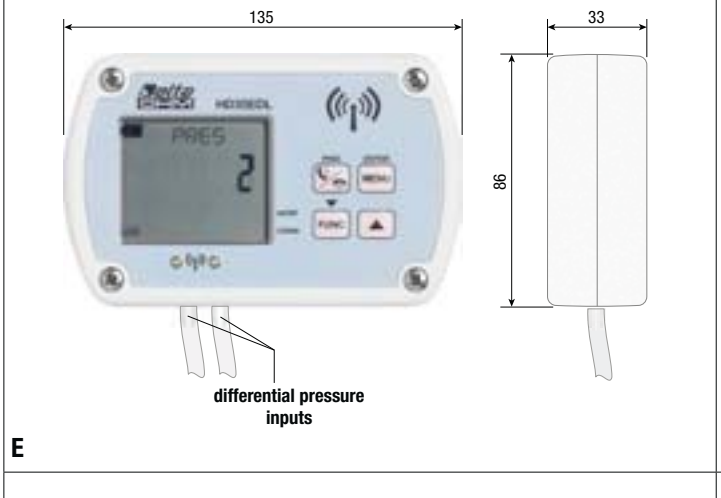

B



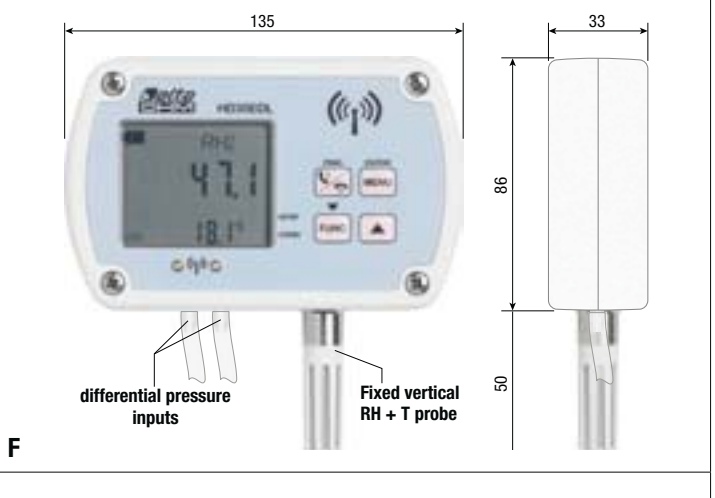

C



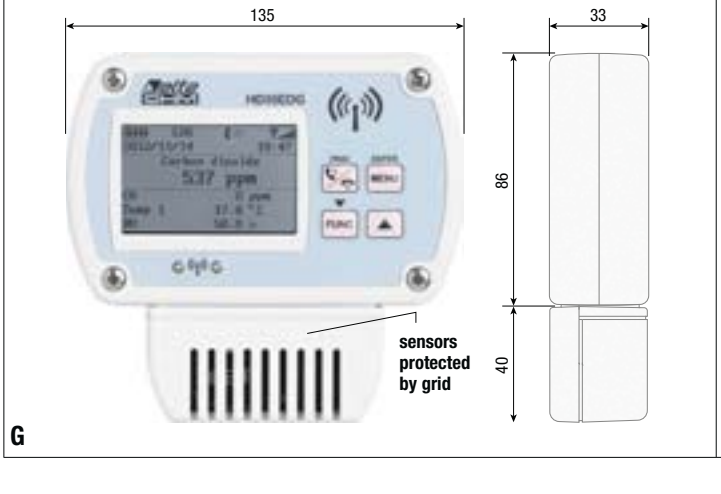

D



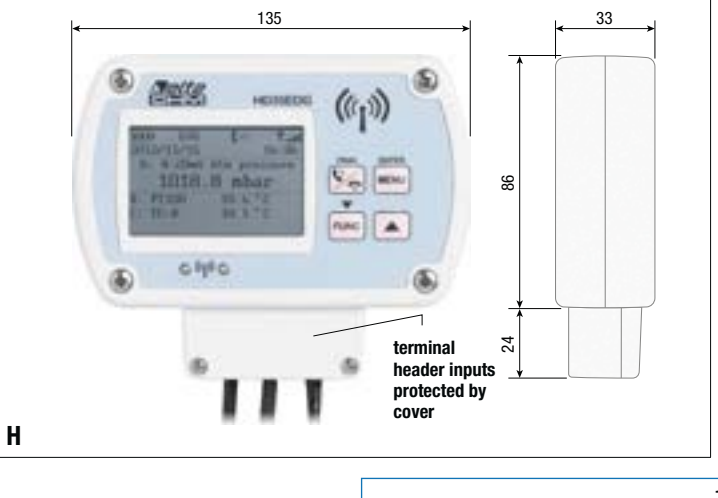

E




F



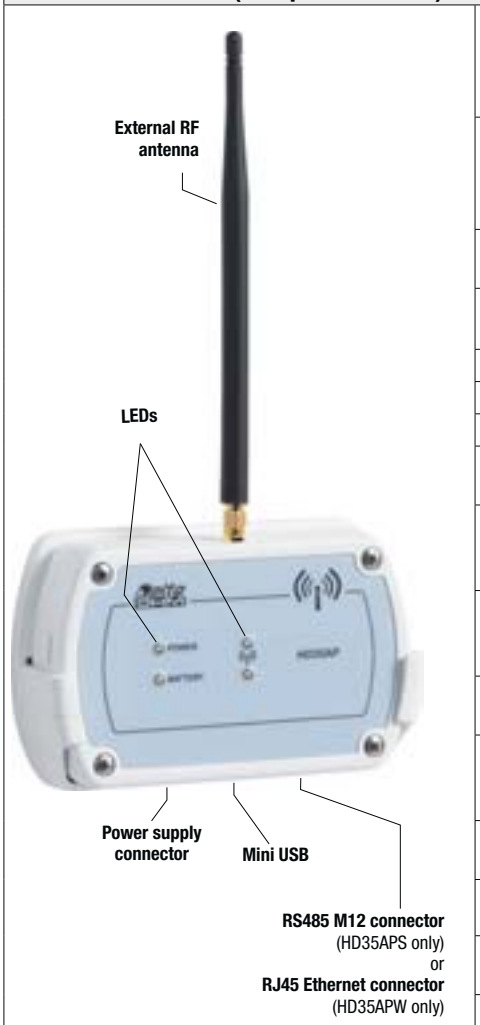

G




H

## TECHNICAL SPECIFICATIONS

### HD35AP… base unit (except HD35APD...)



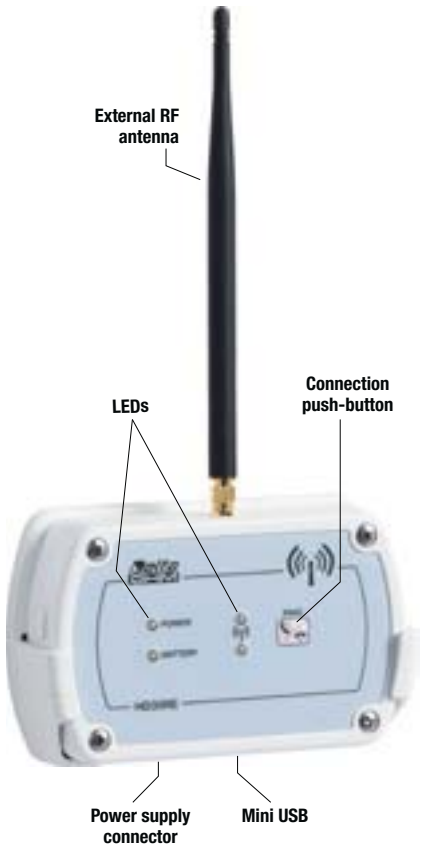

| | |
|---|---|
| *Versions* | **HD35AP**: USB output only<br>**HD35APS**: USB and RS485 MODBUS-RTU outputs<br>**HD35APW**: USB output, Wi-Fi and ETHERNET interface<br>**HD35APG**: USB output and GSM module |
| *Power supply* | Internal 3.7 V lithium-ion **rechargeable** battery, capacity 2250 mA/h, JST 3-pole connector<br>**Optional** 6 Vdc external power adapter (**SWD06**)<br>Powered directly from the PC USB port (*) |
| *Power consumption* | 30 mA without Ethernet/Wi-Fi and with typical GSM activity (**)<br>160 mA with Ethernet, 275 mA with Wi-Fi |
| *Battery autonomy (typical)* | **3 days if not connected to the local network and with typical GSM activity (**)**<br>**11 hours with Ethernet, 8 hours with Wi-Fi** |
| *Transmitting frequency* | 868 MHz, 902-928 MHz or 915.9-929.7 MHz depending on the model |
| *Antenna* | Whip external |
| *Transmitting range* | See table 2 |
| *Serial outputs* | USB with Mini-USB type connector (cable **CP23**)<br>RS485 with **MODBUS-RTU** protocol (HD35APS only) |
| *Ethernet connection* | Only in HD35APW model. Permits (if the Internet connection is available) sending alarm **e-mail** and the recorded data via **e-mail** or to an **FTP** address (***). Allows the **MODBUS TCP/IP** protocol. With integrated Web server. |
| *Wi-Fi connection* | Only in HD35APW model. Permits (if the Internet connection is available) sending alarm **e-mail** and the recorded data via **e-mail** or to an **FTP** address (***). Allows the **MODBUS TCP/IP** protocol. With integrated Web server. |
| *GSM connection* | Only in HD35APG model. For sending alarm **e-mail** or **SMS** and data via **e-mail** or **FTP** (***). Allows the **GPRS TCP/IP** protocol. |
| *Internal memory* | The number of samples that can be stored depends on the type of data loggers connected. The capacity is 226,700 samples if all the data loggers record 7 quantities. |
| *LED indicators* | Presence of external power supply, battery charge level, RF communication status. |
| *Working temperature and humidity range* | -10…+60 °C / 0…85 %RH not condensing |
| *Housing* | Material: LURAN® S 777K<br>Dimensions: 135 x 86 x 33 mm (excluding antenna) |
| *Weight* | 200 g approx. (including battery) |
| *Installation* | Wall mount support (**supplied**) for removable installation or flanges (**optional**) for fixed installation |

(*) The connection of the SWD06 external power supply is recommended if the Ethernet, Wi-Fi or GSM transmission is used.
(**) The intensive use of the GSM transmission can significantly increase the power consumption and reduce the battery life.
(***) In the basic version, the data are sent via FTP with an interval of not less than 2 minutes and only if in the network there are up to 5 data loggers. For the full FTP functionality, the PLUS option has to be requested.

### HD35APD... base unit


| | |
|---|---|
| *Versions* | **HD35APD**: with internal antenna<br>**HD35APD-EXT**: with whip external antenna |
| *Power supply* | Powered directly from the PC USB port |
| *Transmitting frequency* | 868 MHz or 902-928 MHz depending on the model<br>(915.9-929.7 MHz not available) |
| *Transmitting range* | See table 2 |
| *Output* | USB with type A connector |
| *Internal memory* | The number of samples that can be stored depends on the type of data loggers connected. The capacity is 226,700 samples if all the data loggers record 7 quantities. |
| *LED indicators* | RF communication status |
| *Working temperature and humidity range* | -10…+60 °C / 0…85 %RH not condensing |
| *Dimensions* | 62 x 25,5 x 13,2 mm (excluding antenna) |

## HD35RE repeater




| | |
|---|---|
| *Power supply* | Internal 3.7 V lithium-ion **rechargeable** battery, capacity 2250 mA/h, JST 3-pole connector<br>**Optional** 6 Vdc external power adapter (**SWD06**)<br>Powered directly from the PC USB port |
| *Power consumption* | 30 mA |
| *Battery autonomy* | 3 days typical |
| *Transmitting frequency* | 868 MHz, 902-928 MHz or 915.9-929.7 MHz depending on the model |
| *Antenna* | Whip external |
| *Transmitting range* | See table 2 |
| *Serial outputs* | USB with Mini-USB type connector (cable **CP23**)<br>**Only for configuration and firmware update, not for data download** |
| *LED indicators* | Presence of external power supply, battery charge level, RF communication status. |
| *Keyboard* | Push-button for connection / PING (for testing RF) |
| *Working temperature and humidity range* | -10…+60 °C / 0…85 %RH not condensing |
| *Housing* | Material: LURAN® S 777K<br>Dimensions: 135 x 86 x 33 mm (excluding antenna) |
| *Weight* | 200 g approx. (including battery) |
| *Installation* | Wall mount support (**supplied**) for removable installation or flanges (**optional**) for fixed installation |

## HD35REW repeater


| | |
|---|---|
| *Power supply* | Internal 3.6 V lithium-thionyl chloride (Li-$SOCl_2$) **not rechargeable** battery, capacity 8400 mA/h, size C, Molex 5264 2-pole connector |
| *Battery autonomy* | 2 years typical (repeating the signal of 5 data loggers transmitting every 30 s) |
| *Transmitting frequency* | 868 MHz, 902-928 MHz or 915.9-929.7 MHz depending on the model |
| *Antenna* | Whip external |
| *Transmitting range* | See table 2 |
| *LED indicators* | Battery charge level, RF communication status. |
| *Push-buttons* | Push-button for connection inside the instrument |
| *Working temperature and humidity range* | -20…+70 °C / 0…100 %RH not condensing |
| *Housing* | Material: Polycarbonate<br>Dimensions: 80 x 120 x 55 mm (excluding antenna)<br>Protection degree: IP 67 |
| *Weight* | 250 g approx. (including battery) |
| *Installation* | Wall mounted or fixed to the 40 mm diameter mast by means of the HD2003.77/40 clamping (**optional**).<br>Protection shield from solar radiations HD9217TF1 (**optional**) for outdoor installation. |

**Warning**: unlike HD35RE repeaters, which have external power supply, the HD35REW repeaters are powered only by the internal battery. To extend the battery life, the RF stage of the HD35REW repeaters is not continuously active; therefore, the HD35REW repeaters are subject to the following restrictions:

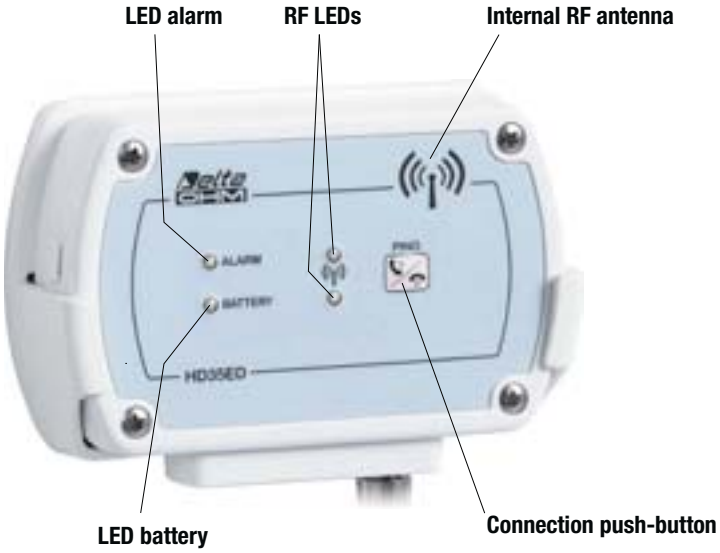
- the alarm events may be reported with a certain delay;
- the reconfiguration of the system may take longer; furthermore, if the configuration of a data logger with LCD is changed via the logger keyboard, the change is not notified to the base unit and to the HD35AP-S software.

| HD35ED… data loggers in housing for indoor use | |
|---|---|
| *Transmitting frequency* | 868 MHz, 902-928 MHz or 915.9-929.7 MHz depending on the model |
| *Antenna* | Internal |
| *Transmitting range* | See table 2 |
| *Measuring interval*(*) | 1, 2, 5, 10, 15, 30 s / 1, 2, 5, 10, 15, 30, 60 min |
| *Logging and transmitting interval*(*) | 1, 2, 5, 10, 15, 30 s / 1, 2, 5, 10, 15, 30, 60 min |
| *Internal memory* | Circular management or stop logging if full.<br>The number of samples that can be stored depends on the number of acquired quantities (see table 4). |
| *Alarm* | Acoustic by means of the internal buzzer |
| *Power supply* | Internal 3.6 V lithium-thionyl chloride (Li-$SOCl_2$) **not rechargeable** battery, size AA, Molex 5264 2-pole connector.<br>In the models in housing with grid, a connector for external power supply (**SWD 06**) is available. |
| *Battery autonomy*<br>*(without repeaters, direct communication with HD35AP..)* | 1.5 years typical for $CO/CO_2$ models (with 2 min measurement and logging intervals) and for ΔP range r5 model (with 30 s measurement and logging intervals);<br>2 years typical for the other models, with 5 s measurement interval (10 s for HD35EDH) and 30 s logging interval. |
| *Display* | Optional. Custom or graphic LCD depending on the model (see table 3A). |
| *Keyboard* | Push-buttons for connection / PING (for testing RF).<br>The models with LCD are provided with buttons for configuration and scrolling of the measured values. |
| *LED indicators* | RF communication status. The models without LCD are provided with alarm LED and battery level LED. |
| *Working temperature and humidity range* | -20…+70 °C (-10…+70 °C for the models with grid) / 0…85 %RH not condensing |
| *Housing* | Material: LURAN® S 777K<br>Dimensions: see table 3B<br>Protection degree: IP 64 (versions with M12 connectors) |
| *Connectors for external probes with cable* | Depending on the model, M12 connectors or terminal header inputs 3.5 mm pitch. |
| *Weight* | 200 g approx. (version with LCD, including battery) |
| *Installation* | Wall mount support (**supplied**) for removable installation or flanges (**optional**) for fixed installation. |

(*) Some models measuring several quantities may have a minimum interval greater than 1 second (see table 4).

**VERSIONS WITH LCD:**


**VERSIONS WITHOUT LCD:**



**TAB. 4: Capacity of the internal memory of the data logger in housing for indoor**

| Model | Number of samples that can be stored (**) | Minimum logging interval | Stored quantities (*) |
|---|---|---|---|
| HD35ED 7P/1 TC | 68.000 | 5 s | T |
| HD35ED 7P/2 TC | 52.000 | 5 s | T |
| HD35ED 7P/3 TC | 42.000 | 5 s | T |
| HD35ED N/1 TC | 68.000 | 1 s | T |
| HD35ED N/2 TC | 52.000 | 1 s | T |
| HD35ED N/3 TC | 42.000 | 1 s | T |
| HD35ED N TV | 68.000 | 1 s | T |
| HD35ED 1 TV | 68.000 | 1 s | RH |
| HD35ED 1 TVI | 68.000 | 1 s | RH |
| HD35ED 1N TC | 24.000 | 1 s | T, RH, $T_D$, $T_W$, AH, MR, PVP |
| HD35ED 17P TC | 24.000 | 1 s | T, RH, $T_D$, $T_W$, AH, MR, PVP |
| HD35ED 1N TV | 24.000 | 1 s | T, RH, $T_D$, $T_W$, AH, MR, PVP |
| HD35ED 1N TVI | 24.000 | 1 s | T, RH, $T_D$, $T_W$, AH, MR, PVP |
| HD35ED 1N/2 TC | 22.000 | 1 s | T, RH, $T_D$, $T_W$, AH, MR, PVP |
| HD35ED 1N/2 TCV | 22.000 | 1 s | T, RH, $T_D$, $T_W$, AH, MR, PVP |
| HD35ED 14bN TC | 22.000 | 2 s | T, RH, $T_D$, $T_W$, AH, MR, PVP, $P_{ATM}$ |
| HD35ED 14bN TV | 22.000 | 2 s | T, RH, $T_D$, $T_W$, AH, MR, PVP, $P_{ATM}$ |
| HD35ED 14bN TVI | 22.000 | 2 s | T, RH, $T_D$, $T_W$, AH, MR, PVP, $P_{ATM}$ |
| HD35ED 1N4r…TV | 22.000 | 1 s | T, RH, $T_D$, $T_W$, AH, MR, PVP, $\Delta$P |
| HD35ED 4r… | 68.000 | 1 s | $\Delta$P |
| HD35ED 1NI TCV | 44.000 | 1 s | T, RH, $T_D$, $T_W$, AH, MR, PVP, I |
| HD35ED 1NI2 TCV | 44.000 | 1 s | T, RH, $T_D$, $T_W$, AH, MR, PVP, I |
| HD35ED 1NI TV | 44.000 | 1 s | T, RH, $T_D$, $T_W$, AH, MR, PVP, I |
| HD35ED 14bNI TCV | 36.000 | 2 s | T, RH, $T_D$, $T_W$, AH, MR, PVP, $P_{ATM}$, I |
| HD35ED 14bNI2 TCV | 36.000 | 2 s | T, RH, $T_D$, $T_W$, AH, MR, PVP, $P_{ATM}$, I |
| HD35ED 14bNI TV | 36.000 | 2 s | T, RH, $T_D$, $T_W$, AH, MR, PVP, $P_{ATM}$, I |
| HD35ED 1NIU TCV | 32.000 | 1 s | T, RH, $T_D$, $T_W$, AH, MR, PVP, I, UVA, $P_{UV}$ |
| HD35ED 1NIU TV | 32.000 | 1 s | T, RH, $T_D$, $T_W$, AH, MR, PVP, I, UVA, $P_{UV}$ |
| HD35ED1NUBTCV | 44.000 | 1 s | T, RH, $T_D$, $T_W$, AH, MR, PVP, UVB |
| HD35ED1NUCTCV | 44.000 | 1 s | T, RH, $T_D$, $T_W$, AH, MR, PVP, UVC |
| HD35ED 14bNIU TCV | 32.000 | 2 s | T, RH, $T_D$, $T_W$, AH, MR, PVP, $P_{ATM}$, I, UVA, $P_{UV}$ |
| HD35ED 14bNIU TV | 32.000 | 2 s | T, RH, $T_D$, $T_W$, AH, MR, PVP, $P_{ATM}$, I, UVA, $P_{UV}$ |
| HD35ED 1NB | 44.000 | 10 s | T, RH, $T_D$, $T_W$, AH, MR, PVP, CO |
| HD35ED 1NAB | 36.000 | 10 s | T, RH, $T_D$, $T_W$, AH, MR, PVP, CO, $CO_2$ |
| HD35ED 14bNAB | 32.000 | 10 s | T, RH, $T_D$, $T_W$, AH, MR, PVP, $P_{ATM}$, CO, $CO_2$ |
| HD35ED H | from 36,000 to 68,000 | 5 s | depends on the inputs configuration |

(*) **List of the quantities:**

**T**: temperature
**RH**: relative humidity
**$T_D$**: dew point
**$T_W$**: wet bulb temperature
**AH**: absolute humidity
**MR**: mixing ratio
**PVP**: partial vapour pressure
**$P_{ATM}$**: atmospheric pressure
**⊠P**: differential pressure
**I**: illuminance
**UVA**: UVA irradiance
**UVB**: UVB irradiance
**UVC**: UVC irradiance
**$P_{UV}$**: proportion of UV present (µW/lumen)
**CO**: carbon monoxide
**$CO_2$**: carbon dioxide

(**) One sample consists of all the quantities measured and calculated by the data logger at the same instant of acquisition. For example, the model HD35ED1NAB measures four quantities and calculates five quantities (the derived humidity quantities) and one sample includes one temperature measure, one CO measure, one $CO_2$ measure and six humidity measures (the relative humidity measure plus the five derived quantities).

**TAB. 5: Number of data loggers in the system as a function of the data transmission interval**

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

Table 5 refers to the case of direct connection among the base unit and the data loggers (1 “Hop”). If repeaters are present, the transmission of the data requires more time and the number of data loggers manageable by the base unit could be lower than that reported in table 5.

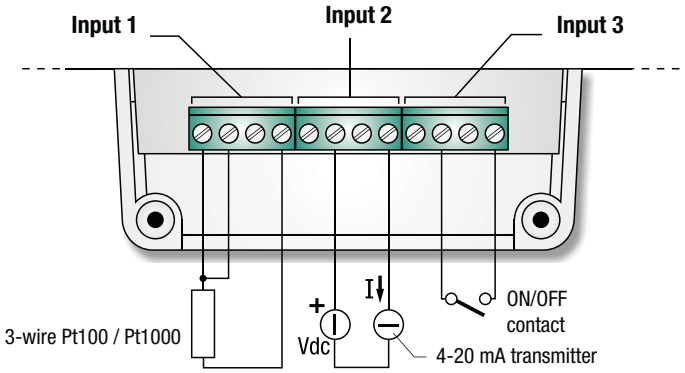
**The number of devices in the system (base unit + repeaters + data loggers) should not exceed 255.**

## HD35ED-ALM alarm module

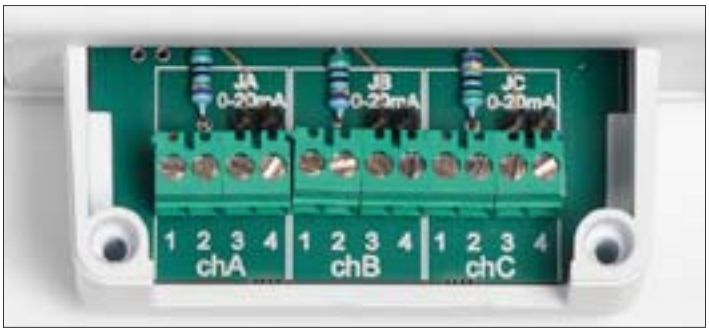

| | |
|---|---|
| *Power supply* | Internal 3.6 V lithium-thionyl chloride (Li-SOCl$_2$) **not rechargeable** battery, size AA, Molex 5264 2-pole connector |
| *Battery autonomy* | 1 year in typical operating conditions (**the actual autonomy depends on how often the alarm condition is generated**) |
| *Transmitting frequency* | 868 MHz, 902-928 MHz or 915.9-929.7 MHz depending on the model |
| *Antenna* | Internal |
| *Transmitting range* | See table 2 |
| *Keyboard* | Push-button for connection / PING (for testing RF) |
| *LED indicators* | Presence of alarm, battery charge level, RF communication status. |
| *Relay* | 2 bistable relays with voltage-free contact<br>Contact: max 1A @ 30Vdc resistive load |
| *Working temperature and humidity range* | -10…+70 °C / 0…85 %RH not condensing |
| *Housing* | Material: LURAN® S 777K<br>Dimensions: 135 x 110 x 33 mm |
| *Weight* | 200 g approx. (including battery) |
| *Installation* | Wall mount support (**supplied**) for removable installation or flanges (**optional**) for fixed installation |

### Terminal header in the model HD35EDH

The model HD35EDH is equipped with three terminal header inputs. Each input can be configured as input for: Pt100/Pt1000, thermocouple, 0/4…20 mA (the shunt resistance is internal), 0…50 mV, 0…1 V or potentiometer. Only input 3 can also be configured as pulse counter (counting of switchings of a voltage-free contact).




**Example of connection of HD35EDH model inputs**




### Waterproof versions for outdoor use

**Waterproof versions for outdoor use and industrial applications** (HD35ED**W**… series)

For outdoor use or in severe environmental conditions (e.g. in the case of industrial applications), data loggers in housing with front dimensions 120 x 80 mm and **IP 67** protection degree are available.

To ensure IP 67 seal, the data loggers have no front keys.

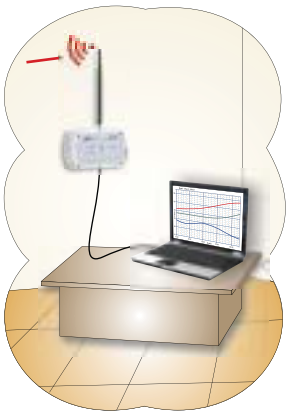
The housing of the waterproof versions can be wall mounted or, in the case of outdoor installation, fixed on a 40 mm diameter mast by means of the HD2003.77/40 clamping. For outdoor installation, the data logger can be supplied with the **protection shield from solar radiations (HD9217TF1)**.

For outdoor installation on a mast, the data logger can be supplied with the mast clamping already mounted on the back of the housing and provided with internal over-voltage protection devices, connected to the clamping. For the correct operation of the protection devices, the yellow/green cable with faston connector fixed to the clamping must be connected to ground.

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

**Protection shield from solar radiations**

**Outdoor transmitting station with data logger of the series HD35EDW…**



**Receiving station with base unit HD35AP**

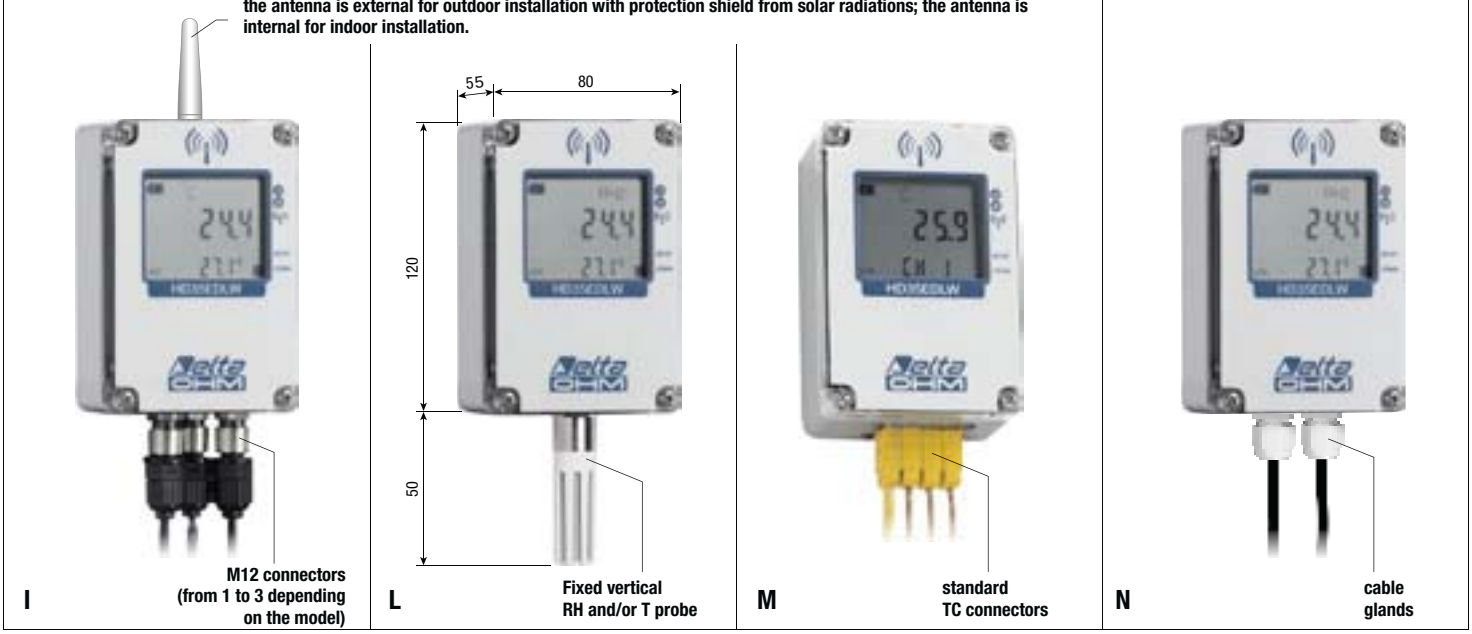
## Available data loggers

The following tables list the **HD35EDW…** data logger models available in waterproof housing. Other models, in addition to those listed, can be supplied upon request for quantities.
All the models **HD35EDW…** are also available with **custom LCD** (option **L**).

### TAB. 6A: Data loggers in waterproof housing for outdoor

| Model | MEASURES | | | | | | | | | | | INPUTS | | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NTC 10K | Pt100 Pt1000 | TC | Solar panel | RH | Patm | PYRA | Rainfall | a | Leaf | WBGT | Number of M12 connectors | Built-in sensors | |
| HD35EDW 7P/1 TC | | • | | | | | | | | | | 1 | | I |
| HD35EDW 7P/2 TC | | • | | | | | | | | | | 2 | | I |
| HD35EDW 7P/3 TC | | • | | | | | | | | | | 3 | | I |
| HD35EDW N/1 TC | • | | | | | | | | | | | 1 | | I |
| HD35EDW N/2 TC | • | | | | | | | | | | | 2 | | I |
| HD35EDW N/3 TC | • | | | | | | | | | | | 3 | | I |
| HD35EDW N TV | • | | | | | | | | | | | | • | L |
| HD35EDW K/4 TC | | | • | | | | | | | | | 4 standard TC conn. | | M |
| HD35EDW 1 TV | | | | | • | | | | | | | | • | L |
| HD35EDW 1 TVI | | | | | • | | | | | | | | • | L |
| HD35EDW 1N TC | • | | | | • | | | | | | | 1 | | I |
| HD35EDW 17P TC | | • | | | • | | | | | | | 1 | | I |
| HD35EDW 1N TV | • | | | | • | | | | | | | | • | L |
| HD35EDW 1N TVI | Sensor integrated in RH module | | | | • | | | | | | | | • | L |
| HD35EDW 1N/2 TC | • | | | | • | | | | | | | 2 | | I |
| HD35EDW 14bN TC | • | | | | • | • | | | | | | 1 | Patm | I |
| HD35EDW 14b7P TC | | • | | | • | • | | | | | | 1 | Patm | I |
| HD35EDW 1NV | Sensor integrated in RH module | | | | • | | | | • | | | | • | L |
| HD35EDW R TC | | | | | | | • | | | | | 1 | | I |
| HD35EDW 1NR TC | • | | | | • | | • | | | | | 2 | | I |
| HD35EDW 7PR TC | | | | • | | | • | | | | | 2 | | I |
| HD35EDW 1N7PR TC | • | | | • | • | | • | | | | | 3 | | I |
| HD35EDW RP TC | | | | | | | • | • | | | | 2 | | I |
| HD35EDW P TC | | | | | | | | • | | | | 1 | | I |
| HD35EDW 1NL TC | • | | | | • | | | | | • | | 2 | | I |
| HD35EDW S TC | Soil temperature and moisture | | | | | | | | | | | 1 | | I |
| HD35EDW WBGT | | • | | | | | | | | | • | 3 | | I |
| HD35EDW H | Transmitters with 0÷20 mA, 4÷20 mA, 0÷50 mV, 0÷1 V or 0÷10 V output<br>Pt100 / Pt1000 sensors, thermocouples K, J, T, N, E<br>Sensors with voltage-free contact or potentiometric output | | | | | | | | | | | 4 terminal header inputs | | N |

### TAB. 6B: Data loggers in waterproof housing for outdoor – Images



## TECHNICAL SPECIFICATIONS

| **HD35EDW… data loggers in waterproof housing for outdoor use** | |
|---|---|
| *Transmitting frequency* | 868 MHz, 902-928 MHz or 915.9-929.7 MHz depending on the model |
| *Antenna* | External for outdoor installation with protection shield from solar radiations. Internal for indoor installation. |
| *Transmitting range* | See table 2 |
| *Measuring interval* (*) | 1, 2, 5, 10, 15, 30 s / 1, 2, 5, 10, 15, 30, 60 min |
| *Logging and transmitting interval* (*) | 1, 2, 5, 10, 15, 30 s / 1, 2, 5, 10, 15, 30, 60 min |
| *Internal memory* | Circular management or stop logging when full.<br>The number of samples that can be stored depends on the number of acquired quantities (see table 7). |
| *Alarm* | Acoustic by means of the internal buzzer |
| *Power supply* | Internal 3.6 V lithium-thionyl chloride (Li-$SOCl_2$) **not rechargeable** battery, size AA (size C for HD35EDWK/4TC and HD35EDWH), Molex 5264 2-pole connector.<br>Optional 24 Vac/dc power supply. |
| *Battery autonomy*<br>*(without repeaters, direct communication with HD35AP...)* | 4 years typical for HD35EDWK/4 and HD35EDWH models (with 10 s measurement interval and 30 s logging interval);<br>2 years typical for the other models, with 5 s measurement interval (10 s for HD35EDW7P/...TC, HD35EDW14bNTC, HD35EDW14b7PTC, HD35EDWWBGT) and 30 s logging interval. |
| *Display* | Optional custom LCD |
| *Push-buttons* | Push-button for connection inside the instrument |
| *LED indicators* | RF communication status. The models without LCD are provided with alarm LED and battery level LED. |
| *Working temperature and humidity range* | -20…+70 °C / 0…100 %RH<br>(-10…+60 °C for HD35EDW1NV) |
| *Housing* | Material: Polycarbonate<br>Dimensions: see table 6B<br>Protection degree: IP 67 |
| *Connectors for external probes* | Depending on the model: M12 connectors, thermocouple connectors or terminal header inputs 3.5 mm pitch. |
| *Weight* | 250 g approx. (including battery) |
| *Installation* | Wall mounted or fixed to the 40 mm diameter mast by means of the HD2003.77/40 clamping (**optional**).<br>Protection shield from solar radiations HD9217TF1 (**optional**) for outdoor installation. |

(*) Some models measuring several quantities may have a minimum interval greater than 1 second (see table 7).

**VERSION WITH LCD:**


**VERSION WITHOUT LCD:**

## TAB. 7: Capacity of the internal memory of the data loggers in housing for outdoor

| Model | Number of samples that can be stored (**) | Minimum logging interval | Stored quantities (*) |
|---|---|---|---|
| HD35EDW 7P/1 TC | 68.000 | 5 s | T |
| HD35EDW 7P/2 TC | 52.000 | 5 s | T |
| HD35EDW 7P/3 TC | 42.000 | 5 s | T |
| HD35EDW N/1 TC | 68.000 | 1 s | T |
| HD35EDW N/2 TC | 52.000 | 1 s | T |
| HD35EDW N/3 TC | 42.000 | 1 s | T |
| HD35EDW N TV | 68.000 | 1 s | T |
| HD35EDW K/4 TC | 36.000 | 5 s | T |
| HD35EDW 1 TV | 68.000 | 1 s | RH |
| HD35EDW 1 TVI | 68.000 | 1 s | RH |
| HD35EDW 1N TC | 24.000 | 1 s | T, RH, $T_D$, $T_W$, AH, MR, PVP |
| HD35EDW 17P TC | 24.000 | 1 s | T, RH, $T_D$, $T_W$, AH, MR, PVP |
| HD35EDW 1N TV | 24.000 | 1 s | T, RH, $T_D$, $T_W$, AH, MR, PVP |
| HD35EDW 1N TVI | 24.000 | 1 s | T, RH, $T_D$, $T_W$, AH, MR, PVP |
| HD35EDW 1N/2 TC | 22.000 | 1 s | T, RH, $T_D$, $T_W$, AH, MR, PVP |
| HD35EDW 14bN TC | 22.000 | 2 s | T, RH, $T_D$, $T_W$, AH, MR, PVP, $P_{ATM}$ |
| HD35EDW 14b7P TC | 22.000 | 2 s | T, RH, $T_D$, $T_W$, AH, MR, PVP, $P_{ATM}$ |
| HD35EDW R TC | 42.000 | 1 s | R, $D_R$, mV |
| HD35EDW 1NR TC | 24.000 | 1 s | T, RH, $T_D$, $T_W$, AH, R, $D_R$, mV |
| HD35EDW 7PR TC | 36.000 | 1 s | T, R, $D_R$, mV |
| HD35EDW 1N7PR TC | 22.000 | 1 s | T, RH, $T_D$, AH, R, $D_R$, mV |
| HD35EDW P TC | 36.000 | 1 s | P, $D_P$, $I_P$ |
| HD35EDW 1NL TC | 22.000 | 1 s | T, RH, $T_D$, $T_W$, AH, MR, PVP, $H_{LEAF}$ |
| HD35EDW S TC | 52.000 | 1 s | T, $H_{SOIL}$ |
| HD35EDW WBGT | 30.000 | 5 s | T, $T_W$, WBGT |
| HD35EDW H | from 28,000 to 58,000 | 5 s | depends on the inputs configuration |

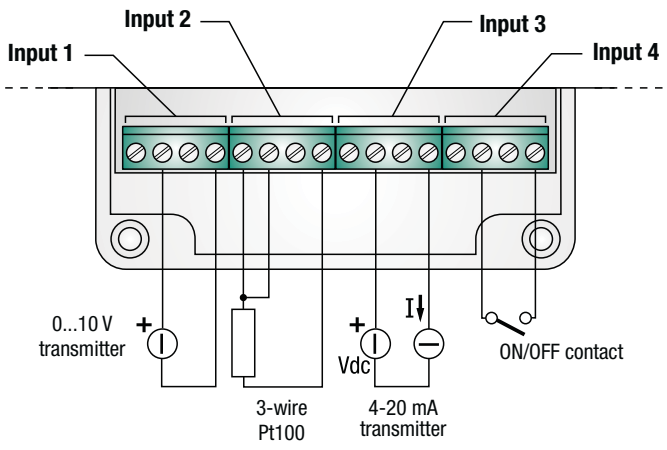
(*) **List of the quantities:**

**T**: temperature
**RH**: relative humidity
$\mathbf{T_D}$: dew point
$\mathbf{T_W}$: wet bulb temperature
**AH**: absolute humidity
**MR**: mixing ratio
**PVP**: partial vapour pressure
$\mathbf{P_{ATM}}$: atmospheric pressure
**R**: solar radiation (pyranometer)
$\mathbf{D_R}$: daily solar radiation ($Wh/m^2$)
**mV**: pyranometer output in mV
**P**: rainfall quantity
$\mathbf{D_P}$: daily rainfall quantity
$\mathbf{I_P}$: rainfall rate (mm/h)
$\mathbf{H_{LEAF}}$: leaf wetness
$\mathbf{H_{SOIL}}$: soil moisture
**WBGT**: WBGT index

(**) One sample consists of all the quantities measured and calculated by the data logger at the same instant of acquisition. For example, the model HD35EDW1NTC measures two quantities and calculates five quantities (the derived humidity quantities) and one sample includes one temperature measure and six humidity measurements (the relative humidity measure plus the five derived quantities).

## Terminal header in the model HD35EDWH

The model HD35EDWH is equipped with four terminal header inputs. Each input can be configured as input for: Pt100/Pt1000, thermocouple, 0/4…20 mA (the shunt resistance is internal), 0…50 mV, 0…1 V, 0…10 V or potentiometer. Only input 4 can also be configured as pulse counter (counting of switchings of a voltage-free contact).




**Example of connection of HD35EDWH model inputs**

The model HD35EDWH is also available with 7...28 Vdc external power supply (HD35EDWH**E**, without battery).

## Versions for weather stations (HD35EDM...TC)

**IP67** waterproof versions are available for meteorological applications, in a housing with front dimensions 120x122 mm. The complete model has:

- one input for relative humidity and temperature with NTC sensor combined probe or, alternatively, for temperature only probe with NTC sensor;
- one input for pyranometer;
- one input for rain gauge;
- one input for cup anemometer;
- one input for wind direction vane;
- one internal sensor for measuring the atmospheric pressure.

**In all HD35EDM...TC models, only one probe of each type can be connected.**

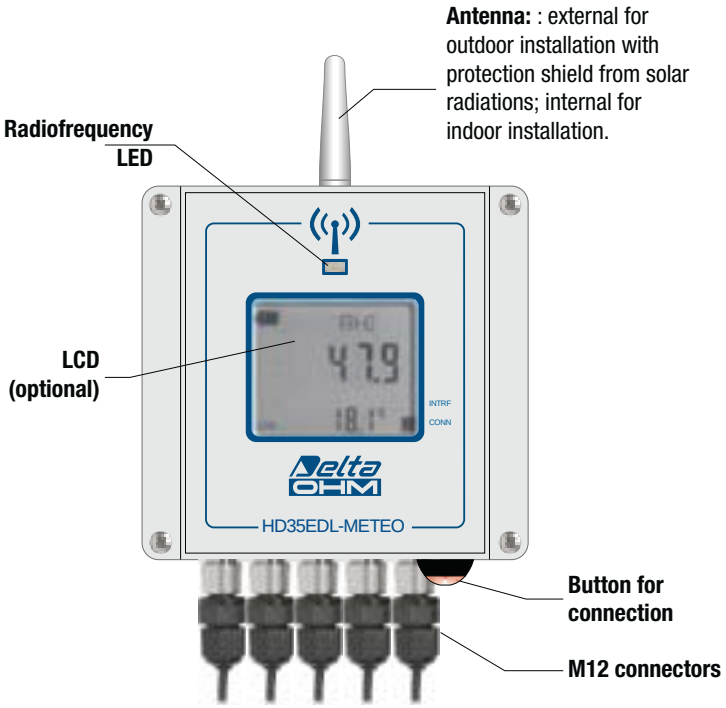
Calculated quantities (depending on the sensors available):

- dew Point;
- daily solar radiation in Wh/m² (Wh = watt-hour);
- rainfall rate in mm/h;
- rainfall statistics;
- Felt air temperature as a function of the wind speed: **Wind Chill** index;
- **wind gust**: maximum wind speed obtained from the 3 seconds averages of the measurements acquired once per second;
- dominant wind direction: direction of the wind speed average vector.

All the values acquired by the data logger can be simultaneously displayed in real time on the monitor of the PC.

| **HD35EDM...TC data loggers in waterproof 120 x 122 mm housing for outdoor** | |
|---|---|
| *Transmitting frequency* | 868 MHz, 902-928 MHz or 915.9-929.7 MHz depending on the model |
| *Antenna* | External for outdoor installation with protection shield from solar radiations. Internal for indoor installation. |
| *Transmitting range* | See table 2 |
| *Measuring interval* (*) | 1, 2, 5, 10, 15, 30 s / 1, 2, 5, 10, 15, 30, 60 min |
| *Logging and transmitting interval* (*) | 1, 2, 5, 10, 15, 30 s / 1, 2, 5, 10, 15, 30, 60 min |
| *Internal memory* | Circular management or stop logging when full. Number of samples: from 28,000 to 58,000 depending on the number of detected quantities. |
| *Alarm* | Acoustic by means of the internal buzzer |
| *Power supply* | Internal 3.6 V lithium-thionyl chloride (Li-$SOCl_2$) **not rechargeable** battery, size C, capacity 8400 mAh, Molex 5264 2-pole connector. |
| *Battery autonomy* | 4 years typ. (without repeaters, 5 s measurement interval and 30 s logging interval) |
| *Display* | Optional custom LCD |
| *Push-buttons* | Watertight push-button for connection / PING (for testing RF), located at the bottom of the housing. |
| *LED indicators* | RF communication status (2-color LED) |
| *Working temperature and humidity range* | -20…+70 °C / 0…100 %RH |
| *Housing* | Material: Polycarbonate<br>Dimensions: 120 x 122 x 56 mm (excluding antenna)<br>Protection degree: IP 67 |
| *Connectors for external probes* | M12 connectors |
| *Weight* | 600 g approx. (including battery and fixing clamping) |
| *Installation* | Fixed to the 40 mm diameter mast by means of the HD2003.77/40 clamping (**optional**).<br>Protection shield from solar radiations HD32MT4.6 (**optional**) for outdoor installation. |

(*) Some models measuring several quantities may have a minimum interval greater than 1 second.




## MEASUREMENT CHARACTERISTICS (instrument in line with the sensor)

**Measurement characteristics for all data loggers except the versions with terminal header inputs:**

| | |
|---|---|
| **Temperature – NTC10K sensor**<br>For HD35ED…N…TC and HD35ED…TV models | |
| Sensor | NTC 10 kΩ @ 25 °C |
| Measuring range | -40…+105 °C |
| Resolution (of the 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 the RH module**<br>For HD35ED…TVI, HD35ED...B, HD35ED...AB and HD35EDW1NV models | |
| Sensor | Sensor integrated in the humidity module |
| Measuring range | -40…+105 °C |
| Resolution (of the instrument) | 0.1 °C |
| Accuracy | ±0.2 °C in the range 0…+60 °C<br>±(0.2 – 0.05 * T) °C in the range T=-40…0 °C<br>±[0.2 + 0.032 * (T-60)] °C in the range T=+60…+105 °C |
| Stability | 0.05 °C/year |
| **Temperature - Pt100/Pt1000 sensor**<br>For HD35ED…7P…TC models | |
| Sensor | Pt100 / Pt1000 1/3 DIN thin film |
| Measuring range | -100…+350 °C max. for probes measuring only temperature<br>(the measuring range can be limited by the operating temperature of the probe used)<br>-40…+150 °C for T/RH combined probes HD3517ETC… |
| Resolution (of the instrument) | 0.1 °C |
| Accuracy | 1/3 DIN |
| Stability | 0.1 °C/year |

| **Temperature - Thermocouple sensor**<br>For HD35EDW…K…TC models | |
|---|---|
| Thermocouple type | K, J, T, N, E<br>The inputs are isolated from each other (60 V insulation) |
| Measuring range | type K: -200…+1370 °C type J: -100…+750 °C<br>type T: -200…+400 °C type N: -200…+1300 °C<br>type E: -200…+750 °C |
| Resolution | 0.1 °C |
| Accuracy (excluding probe error) | type K: ±0.1 °C (< 600 °C) type J: ±0.1 °C<br>±0.2 °C (> 600 °C) type T: ±0.1 °C<br>type N: ±0.1 °C (< 600 °C)<br>±0.2 °C (> 600 °C)<br>type E: ±0.1 °C (< 300 °C)<br>±0.2 °C (> 300 °C) |
| **Wet bulb temperature**<br>For the model HD35EDWWBGT | |
| Sensor | Pt100 |
| Measuring range | +4…+80 °C |
| Resolution (of the instrument) | 0.1 °C |
| Accuracy | Class A |
| Stability | 0.1 °C/year |
| **Dry bulb temperature**<br>For the model HD35EDWWBGT | |
| Sensor | Thin film Pt100 |
| Measuring range | -40…+100 °C |
| Resolution (of the instrument) | 0.1 °C |
| Accuracy | 1/3 DIN |
| Stability | 0.1 °C/year |
| **Globe-thermometer temperature**<br>For the model HD35EDWWBGT | |
| Sensor | Pt100 |
| Measuring range | -10…+100 °C |
| Resolution (of the instrument) | 0.1 °C |
| Accuracy | 1/3 DIN |
| Stability | 0.1 °C/year |
| **Relative humidity – High accuracy sensor**<br>For HD35ED…TC and HD35ED…TV models | |
| Sensor | Capacitive |
| Measuring range | 0…100 %RH |
| Resolution (of the instrument) | 0.1 % |
| Accuracy | ± 1.5 %RH (0..90 %RH) / ± 2 %RH (remaining range) |
| Sensor working temperature | -20…+80 °C standard<br>-40…+150 °C with probe HP3517**E**… |
| Response time | $T_{90}$ < 20 s (air speed = 2 m/s, without filter) |
| Temperature drift | ±2% in all the working temperature range |
| Stability | 1%/year |
| **Relative humidity**<br>For HD35ED…TVI, HD35ED...B, HD35ED...AB and HD35EDW1NV models | |
| Sensor | Capacitive |
| Measuring range | 0…100 %RH |
| Resolution (of the instrument) | 0.1 % |
| Accuracy | ± 1.8 %RH (0..80 %RH)<br>±[1.8 + 0,11 * (UR-80)] %RH (remaining range) |
| Sensor working 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% in all the working temperature range |
| Stability | < 0.5%/year |

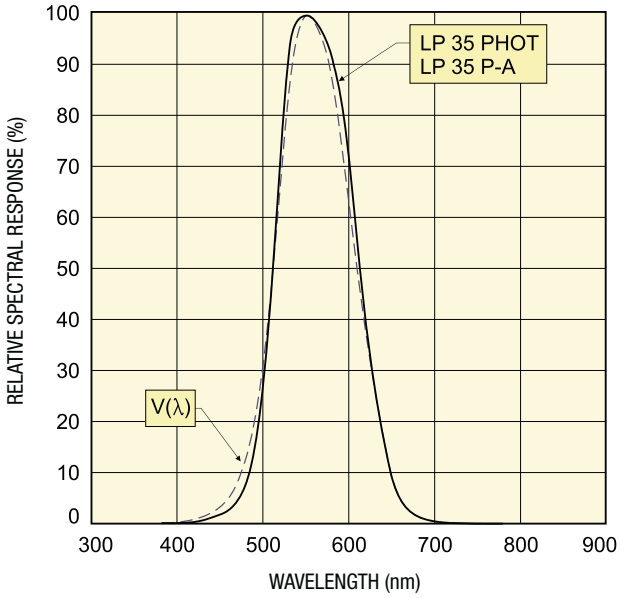
| **Soil moisture** | |
|---|---|
| Measuring principle | Capacitive |
| Measuring range | 0…100% VWC (Volumetric Water Content) |
| Resolution (of the instrument) | 0.1% |
| Accuracy | ± 3 % between 0 and 0.57 $m^3/m^3$ (standard mineral soil up to 5 mS/cm) |
| Sensor working temperature | -40…+60 °C |
| **Leaf wetness** | |
| Sensor | Capacitive |
| Measuring range | 0…100% of leaf area wetness |
| Resolution (of the instrument) | 0.1% |
| Accuracy (@ 23 °C) | ± 5 % |
| Sensor working temperature | -30…+60 °C |
| **Atmospheric pressure** | |
| Sensor | Piezoresistive |
| Measuring range | 300…1100 hPa |
| Resolution (of the instrument) | 0.1 hPa |
| Accuracy | ± 0.5 hPa (800...1100 hPa) @ T=25°C<br>± 1 hPa (300...1100 hPa) @ T=0...50°C |
| Stability | 1 hPa/anno |
| Temperature drift | ±3 hPa between -20…+60 °C |

| **Differential pressure** | | | | | |
|---|---|---|---|---|---|
| Sensor | **range 1...4**: Piezoresistive<br>**range 5**: Thermal mass flow sensing element | | | | |
| Measuring range | Depending on the model: | | | | |
| | **range 1** | **range 2** | **range 3** | **range 4** | **range 5** |
| | ±2.5 hPa | ±10 hPa | ±100 hPa | ±2000 hPa | ±125 Pa |
| Resolution (of the instrument) | 0.001 hPa | 0.005 hPa | 0.05 hPa | 1 hPa | 0.01 Pa |
| Accuracy | **range 1...4**: ± 1% f.s.<br>**range 5**: ± 3% of reading, ± 0.1 Pa @ 0 Pa<br>over the entire compensated temperature range (0…50 °C) | | | | |
| Connection | Tube Ø 5 mm. In the model r5 it is recommended to use tubes with at least 5 mm internal diameter. | | | | |

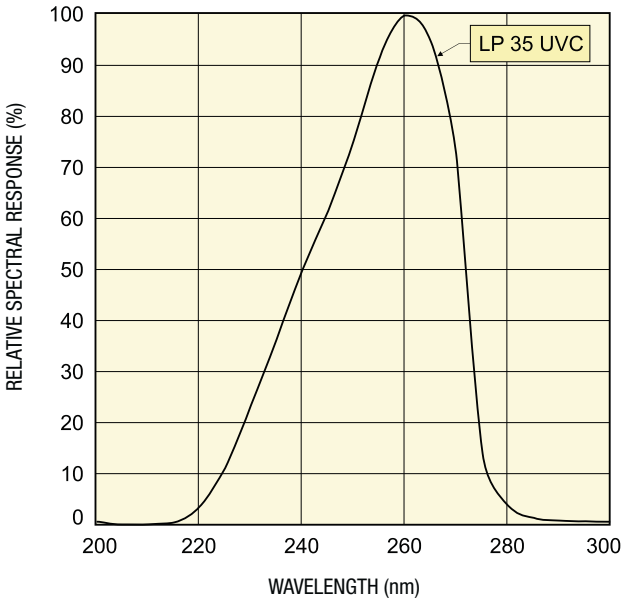
| **Carbon monoxide (CO)** | |
|---|---|
| Sensor | Electrochemical cell |
| Measuring range | 0 … 500 ppm |
| Resolution (of the instrument) | 1 ppm |
| Accuracy | ±3 ppm+3% of the measure |
| Working temperature | -5…50 °C |
| Response time | $T_{90}$ < 50 s |
| Stability | 5% of the measure/year |
| Sensor life | > 5 years under normal environmental conditions |
| **Carbon dioxide ($CO_2$)** | |
| Sensor | Non-Dispersive Infrared (NDIR) |
| Measuring range | 0…5000 ppm |
| Resolution (of the instrument) | 1 ppm |
| Accuracy | ±(50 ppm+3% of the measure) @ 20 °C and 1013 hPa |
| Working temperature | -5…50 °C |
| Response time | $T_{90}$ < 120 s (air speed = 2 m/s) |
| Stability | 5% of the measure/5 years |
| Temperature drift | 0.1% f.s. / °C |

| **Acceleration** | |
|---|---|
| Sensor | Tri-axial accelerometer |
| Measuring range | 0…16 g |
| Resolution (of the instrument) | < 0,05 g (function of measured value) |
| Accuracy | < 0,1 g (function of measured value) |
| **Wind speed – Characteristics of the HD54.3 cup anemometer** | |
| Sensor | Passive 3-cup anemometer |
| Measuring range | 1…65 m/s |
| Resolution (of the instrument) | 0.1 m/s |
| Accuracy | ± 0.14 m/s @ 10 m/s installed on a flat terrain site |
| Offset | 0.35 m/s |
| Gain | 0.765 m $s^{-1}$/Hz |
| Distance constant (63% recovery) | 2.55 m @ 5 m/s / 2.56 m @ 10 m/s (ASTM D 5096-02) |
| **Wind direction – Characteristics of the HD54.D vane** | |
| Sensor | Continuous rotation potentiometric vane |
| Measuring range | 0…359.9° |
| Resolution (of the instrument) | 0.1° |
| Accuracy | < 1% |
| Dead band | 4° typical, 8° max. |
| Threshold | 1 m/s |
| **Rainfall quantity** | |
| Sensor | Tipping bucket with NC or NO configurable contact |
| Resolution (of the instrument) | Configurable 0.1 – 0.2 – 0.5 mm/tipping |
| Other characteristics not reported depends on the sensor connected, please refer to the data sheet of the chosen rain gauge. | |
| **Solar radiation** | |
| Sensor | Thermopile |
| Measuring range | 0…2000 W/$m^2$ |
| Resolution (of the instrument) | 1 W/$m^2$ |
| Sensitivity | Configurable in mV/(kW $m^{-2}$) |
| Other characteristics not reported depends on the sensor connected, please refer to the data sheet of the chosen pyranometer. The instrument also displays the mV signal of the pyranometer. | |
| **Illuminace** | |
| Sensor | Photodiode |
| Measuring range | **I**: 0…20,000 lux<br>**I2**: 0…200,000 lux |
| Resolution (of the instrument) | **I**: 1 lux (0…2,000 lux), 10 lux (>2,000 lux)<br>**I2**: 10 lux (0…20,000 lux), 100 lux (>20,000 lux) |
| Spectral range | According to photopic curve V(λ) |
| Spectral response | See graph 1 |
| α (temperature coefficient) $f_6(T)$ | <0.05% K |
| Calibration uncertainty | <4% |
| f'1 (according to photopic curve V(λ)) | <6% |
| $f_2$ (response according to the cosine law) | <3% |
| $f_3$ (linearity) | <1% |
| $f_4$ (instrument reading error) | <0.5% |
| $f_5$ (fatigue) | <0.5% |
| Class | B |
| Drift after 1 year | <1% |
| Operating temperature | 0…50 °C |
| Reference Standard | CIE n°69 – UNI 11142 |

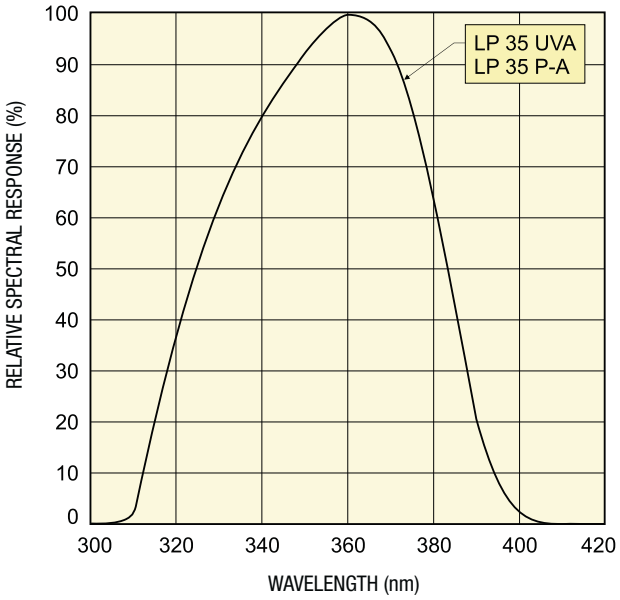
| **UVA irradiance** | |
|---|---|
| Sensor | Photodiode |
| Measuring range | 0…10,000 mW/$m^2$ |
| Resolution (of the instrument) | 1 mW/$m^2$ (0...2,000 mW/$m^2$) / 5 mW/$m^2$ (> 2,000... mW/$m^2$) |
| Spectral range | UVA, peak ≅ 360 nm |
| Spectral response | See graph 2 |
| Calibration uncertainty | <5% |
| $f_2$ (response according to the cosine law) | <6% |
| $f_3$ (linearity) | <1% |
| $f_4$ (instrument reading error) | ±1 digit |
| $f_5$ (fatigue) | <0.5% |
| Drift after 1 year | <2% |
| Operating temperature | 0…50 °C |
| **UVB irradiance** | |
| Sensor | Photodiode |
| Measuring range | 0…100 W/$m^2$ |
| Resolution (of the instrument) | 0.01 W/$m^2$ (0...10 W/$m^2$) / 0.1 W/$m^2$ (10...100 W/$m^2$) |
| Spectral range | UVB, peak ≅ 305 nm |
| Spectral response | See graph 3 |
| Calibration uncertainty | <5% |
| $f_2$ (response according to the cosine law) | <6% |
| $f_3$ (linearity) | <2% |
| $f_4$ (instrument reading error) | ± 1 digit |
| $f_5$ (fatigue) | <0.5% |
| Drift after 1 year | <2% |
| Operating temperature | 0…50 °C |
| **UVC irradiance** | |
| Sensor | Photodiode |
| Measuring range | 0…100 W/$m^2$ |
| Resolution (of the instrument) | 0.01 W/$m^2$ (0...10 W/$m^2$) / 0.1 W/$m^2$ (10...100 W/$m^2$) |
| Spectral range | UVC, peak ≅ 260 nm |
| Spectral response | See graph 4 |
| Calibration uncertainty | <5% |
| $f_2$ (response according to the cosine law) | <6% |
| $f_3$ (linearity) | <1% |
| $f_4$ (instrument reading error) | ± 1 digit |
| $f_5$ (fatigue) | <0.5% |
| Drift after 1 year | <2% |
| Operating temperature | 0…50 °C |




**Graph 1 Relative spectral response of the illuminance sensor**

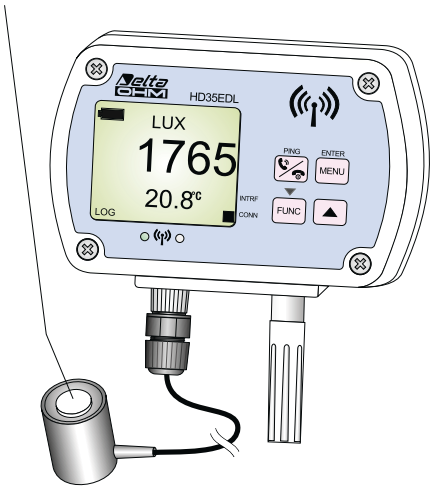


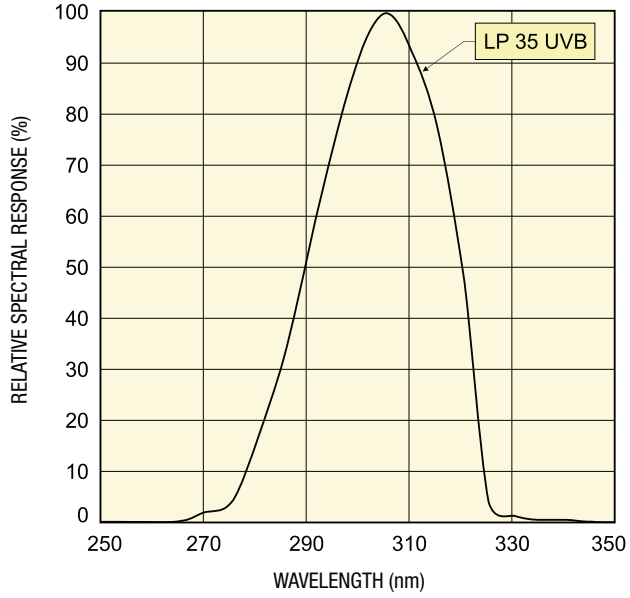

**Graph 4 Relative spectral response of the UVC irradiance sensor**




**Graph 2 Relative spectral response of the UVA irradiance sensor**

**Illuminance and UVA sensor**




**Graph 3 Relative spectral response of the UVB irradiance sensor**

**LP BL3**
**jointed support**

## Characteristics of the terminal header inputs (HD35ED...H):

| | |
|---|---|
| **Pt100 / Pt1000** | |
| Measuring range | -200…+650 °C |
| Resolution | 0.1 °C |
| Accuracy | ± 0.1 °C (excluding probe error) |
| Sensor coefficient | $\alpha$=0.00385 °C$^{-1}$ |
| Connection | 2, 3 or 4 wires |
| **Thermocouple** | |
| Thermocouple type | K, J, T, N, E.<br>The inputs are not isolated, **use thermocouples with isolated hot junction**. |
| Measuring range | type K: -200…+1370 °C type J: -100…+750 °C<br>type T: -200…+400 °C type N: -200…+1300 °C<br>type E: -200…+750 °C |
| Resolution | 0.1 °C |
| Accuracy (excluding probe error) | type K: ±0.1 °C (< 600 °C) type J: ±0.1 °C<br>±0.2 °C (> 600 °C) type T: ±0.1 °C<br>type N: ±0.1 °C (< 600 °C)<br>±0.2 °C (> 600 °C)<br>type E: ±0.1 °C (< 300 °C)<br>±0.2 °C (> 300 °C) |
| **0/4…20 mA input** | |
| Shunt resistance | Internal (50 Ω) |
| Resolution | 16 bits |
| Accuracy | ± 2 µA |
| **0…50 mV, 0…1 V and 0…10 V inputs** (0...10 V only in HD35EDWH) | |
| Input resistance | 100 MΩ |
| Resolution | 16 bits |
| Accuracy | ± 0.01% f.s. |
| **Input for counting the switchings of a voltage-free contact** | |
| Switching frequency | 50 Hz max. |
| Hold Time | 10 ms min. |
| **Potentiometric input** | |
| Potentiometer | Tipically 10 kΩ. |
| Resolution | 16 bit |
| Accuracy | ± 0,01% f.s. |

## ORDERING CODES

### Base unit

**HD35AP…** Base unit for the interfacing between the PC and the data loggers of the system. USB connection. In addition to the 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**). Powered by the PC USB port or external power adapter **SWD06** (**optional**). The unit is supplied with: internal lithium-ion rechargeable battery **HD35-BAT1**, software **HD35AP-S basic**, wall mount support **HD35.03**, operating manual.

**The radio frequency (868, 902-928 or 915.9-929.7 MHz) has to be specified when ordering.**

The serial cable **CP23** and the kit **HD35.11K** (pair of flanges, pin for padlock and padlock) for fixed installation **have to be ordered separately**.

HD35APD and HD35APD-EXT are without internal battery, without input for the external power supply and do not require the serial cable and the support. HD35APD and HD35APD-EXT are not available with radio frequency 915.9-929.7 MHz (Japan).

**HD35AP** ☐.☐

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

**TYPE OF CONNECTION:**
**Blank** = USB output only
**D** = USB output only, dongle version with internal antenna
**D-EXT** = USB output only, dongle version with external antenna
**S** = USB output and RS485 output with MODBUS-RTU protocol
**W** = USB output, Wi-Fi interface and ETHERNET connection with Web server integrated
**G** = USB output and GSM module

### Repeaters

**HD35RE** RF signal repeater. Housing for indoor. Powered by the PC USB port or external power adapter **SWD06** (**optional**). Supplied with: internal lithium-ion rechargeable battery **HD35-BAT1**, wall mount support **HD35.03**, operating manual.

**The radio frequency (868, 902-928 or 915.9-929.7 MHz) has to be specified when ordering.**

The serial cable **CP23** and the kit **HD35.11K** (pair of flanges, pin for padlock and padlock) for fixed installation **have to be ordered separately**.

**HD35REW** RF signal repeater. Waterproof housing. Powered by the internal battery. Supplied with: internal lithium-ion rechargeable battery **BAT-2013DB**, operating manual.

**The radio frequency (868, 902-928 or 915.9-929.7 MHz) has to be specified when ordering.**

The shield from solar radiations **HD9217TF1** and the clamp **HD2003.77/40** for fixing to the mast or the flange **HD35.24W** for fixing to the wall **have to be ordered separately**.

**HD35RE** ☐.☐

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

**HOUSING:**
**Blank** = for indoor
**W** = waterproof

## Alarm module

**HD35ED-ALM** Module with two relay outputs for signalling alarm events. Powered by the internal 3.6V not rechargeable lithium-thionyl chloride (Li-$SOCl_2$) battery. Supplied with: internal 3.6V not rechargeable lithium-thionyl chloride (Li-$SOCl_2$) battery **HD35-BAT2**, wall mount support **HD35.03**, operating manual.

**The radio frequency (868, 902-928 or 915.9-929.7 MHz) has to be specified when ordering.**

The kit **HD35.11K** (pair of flanges, pin for padlock and padlock) for fixed installation **has to be ordered separately**.

**HD35ED-ALM .** ☐

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

## Data loggers

**HD35ED…** Wireless data logger that stores the measures in the internal memory and transmits the acquired data to the base unit automatically at regular intervals or upon request. **Optional LCD**. Acoustic alarm with internal buzzer. Powered by the internal not rechargeable battery. Supplied with: internal 3.6V not rechargeable lithium-thionyl chloride (Li-$SOCl_2$) battery, wall mount support **HD35.03** (models for indoor only), operating manual.

**The radio frequency (868, 902-928 or 915.9-929.7 MHz) has to be specified when ordering.**

The kit **HD35.11K** (pair of flanges, pin for padlock and padlock) for the fixed installation of the housing for indoor use **has to be ordered separately**.

For the versions in waterproof housing, **please specify when ordering whether the installation will be outdoor with protection shield from solar radiations and if the housing has to be supplied with the mast clamping HD2003.77/40 already installed**.

**The external probes have to be ordered separately.**

## HOUSING FOR INDOOR USE

**HD35ED** ☐☐☐**.** ☐

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

**PROBE TYPE:**
**Blank** = internal sensors protected by grid
**H** = terminal header inputs
**TC** = probe with cable
**TV** = combined T/R.H. fixed vertical probe without cable, with high accuracy R.H. sensor
**TVI** = combined T/R.H. fixed vertical probe without cable

**MEASURED QUANTITIES :**
See table 3A for the combinations of quantities measured by the available data loggers. **Other models can be supplied upon request.**
**1 =** humidity
**4b** = atmospheric pressure (Barometer)
**4** = differential pressure: **4r1**=range 1, **4r2**=range 2, ... (**)
**N** = temperature NTC10K sensor:
**N/1**=1 channel, **N/2**=2 channels, **N/3**=3 channels
**7P** = temperature Pt100/Pt1000 sensor:
**7P/1**=1 channel, **7P/2**=2 channels, **7P/3**=3 channels
**A** = carbon monoxide (CO)
**B** = carbon dioxide (CO2)
**I** = illuminance (lux): **I**=low range, **I2**=high range
**U** = UV irradiance (**U**=UVA, **UB**=UVB, **UC**=UVC)
**(**)** For the differential pressure ranges available see table 3A.

**TYPE OF LCD:**
**Blank =** without LCD
**L** = with custom LCD
**G** = with graphic LCD
The type of LCD (custom or graphic) **is not a choice**, but enforced by the data logger model (see table 2).

## WATERPROOF 120 X 80 mm HOUSING FOR OUTDOOR USE

**HD35ED** ☐**W**☐☐**.** ☐

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

**PROBE TYPE:**
**H** = terminal header inputs
**TC** = probe with cable
**TV** = combined T/R.H. fixed vertical probe without cable, with high accuracy R.H. sensor
**TVI** = combined T/R.H. fixed vertical probe without cable

**MEASURED QUANTITIES :**
See table 6A for the combinations of quantities measured by the available data loggers. **Other models can be supplied upon request.**
**1** = humidity
**4b** = atmospheric pressure (Barometer)
**N** = temperature NTC10K sensor:
**N/1**=1 channel, **N/2**=2 channels, **N/3**=3 channels
**7P** = temperature Pt100/Pt1000 sensor:
**7P/1**=1 channel, **7P/2**=2 channels, **7P/3**=3 channels
**K** = temperature thermocouple sensor: **K/4**=4 channels
**P** = rainfall quantity
**R** = solar radiation (pyranometer)
**S** = soil moisture and temperature
**L** = leaf wetness
**V** = acceleration
**WBGT** = WBGT index

**LCD:**
**Blank** = without LCD
**L** = with custom LCD

## WATERPROOF 120 X 122 mm HOUSING FOR OUTDOOR USE

**HD35ED** ☐**M**☐**TC .** ☐

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

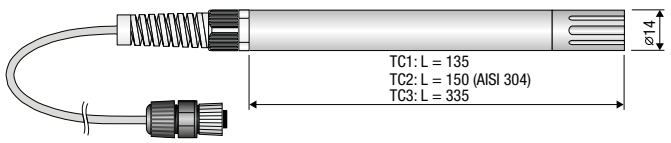
**MEASURED QUANTITIES:**
**1** = humidity
**4b** = atmospheric pressure (Barometer)
**N** = temperature NTC10K sensor
**P** = rainfall quantity
**R** = solar radiation (pyranometer)
**W** = wind speed (cup anemometer)
**D** = wind direction (vane)

**LCD:**
**Blank** = without LCD
**L** = with custom LCD

## Probes

### Temperature and relative humidity combined probes

**HP3517…** Temperature and relative humidity combined probe with high accuracy R.H. sensor.




| | |
|---|---|
| *R.H. sensor* | Capacitive |
| *Temperature sensor* | NTC 10 kΩ @ 25 °C (HP3517TC…)<br>Pt100 1/3 DIN (HP3517**E**TC…) |
| *R.H. sensor measuring range* | 0…100 %RH |
| *Temperature sensor measuring range* | -40…+105 °C (HP3517TC… with NTC 10 kΩ sensor)<br>-40…+150 °C (HP3517ETC… with Pt100 sensor) |
| *R.H. sensor operating range* | -20…+80 °C standard<br>-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 |

**HP3517** ☐☐. ☐

**CABLE LENGTH:**
**2** = 2 m, **5** = 5 m, **10** = 10 m

**STEM LENGTH:**
**TC1** = 135 mm
**TC2** = 150 mm (AISI 304)
**TC3** = 335 mm

**R.H. SENSOR OPERATING TEMPERATURE:**
**Blank** = -20…+80 °C
**E** = -40…+150 °C

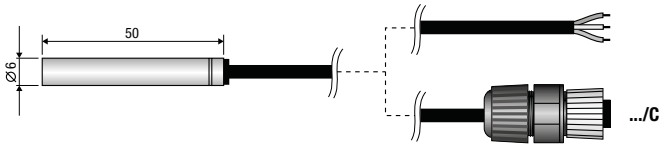
**HD9007A-1** 12-ring protection from solar radiations. Supplied with mounting bracket.

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

**HD9007T26.2** Fitting for Ø 14 mm probes for the protections from solar radiations HD9007A-1 and HD9007A-2.

### Pt100 and Pt1000 temperature probes

**TP35.1…** 3-wire 1/3 DIN **Pt1000** temperature probe..



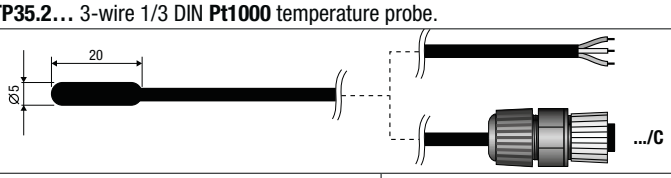

| | |
|---|---|
| *Temperature range* | -50…+105 °C |
| *Accuracy* | 1/3 DIN |
| *Dimensions* | Ø 6 x 50 mm |
| *Cable length* | 3, 5 or 10 m standard, **other lengths on request** |
| *Connection* | Open wires or 4-pole M12 female connector (option **/C**) |
| *Material* | AISI 316 stainless steel tube |

**TP35.1.** ☐☐

**CABLE TERMINATION:**
**Blank** = open wires
**/C** = female 4 pole M12 connector

**CABLE LENGTH:**
**3** = 3 m
**5** = 5 m
**10** = 10 m

**TP35.2…** 3-wire 1/3 DIN **Pt1000** temperature probe.



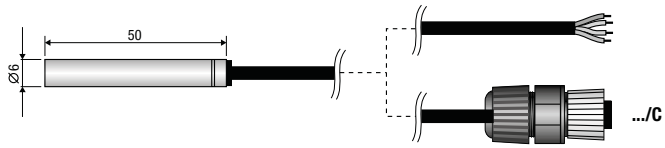

| | |
|---|---|
| *Temperature range* | 0…+70 °C |
| *Accuracy* | 1/3 DIN |
| *Dimensions* | Ø 5 x 20 mm |
| *Cable length* | 3 or 5 m standard, **other lengths on request** |
| *Connection* | Open wires or 4-pole M12 female connector (option **/C**) |
| *Material* | Thermoplastic rubber |

**TP35.2.** ☐☐

**CABLE TERMINATION:**
**Blank =** open wires
**/C** = female 4 pole M12 connector

**CABLE LENGTH :**
**3** = 3 m
**5** = 5 m

**TP35.4…** 4-wire 1/3 DIN **Pt100** temperature probe..



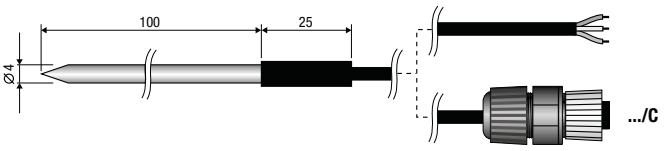

| | |
|---|---|
| *Temperature range* | -50…+105 °C |
| *Accuracy* | 1/3 DIN |
| *Dimensions* | Ø 6 x 50 mm |
| *Cable length* | 3, 5 or 10 m standard, **other lengths on request** |
| *Connection* | Open wires or 4-pole M12 female connector (option **/C**) |
| *Material* | AISI 316 stainless steel tube |

**TP35.4.** ☐☐

**CABLE TERMINATION:**
**Blank** = open wires
**/C** = female 4 pole M12 connector

**CABLE LENGTH:**
**3** = 3 m
**5** = 5 m
**10** = 10 m

**TP35.5…** 3-wire 1/3 DIN **Pt1000** penetration temperature probe.




| | |
|---|---|
| *Temperature range* | -40…+300 °C |
| *Accuracy* | 1/3 DIN |
| *Dimensions* | Ø 4 x 100 mm |
| *Cable length* | 3 or 5 m standard, **other lengths on request** |
| *Connection* | Open wires or 4-pole M12 female connector (option **/C**) |
| *Material* | AISI 316 stainless steel tube |

**TP35.5.** ☐☐

**CABLE TERMINATION:**
**Blank** = open wires
**/C** = female 4 pole M12 connector

**CABLE LENGTH:**
**3** = 3 m
**5** = 5 m

**TP35878ISS…** 1/3 DIN **Pt100** contact temperature probe for solar panel.


| | |
|---|---|
| *Temperature range* | -40…+85 °C |
| *Accuracy* | 1/3 DIN |
| *Dimensions* | Ø 30 mm |
| *Cable length* | 5 or 10 m standard, **other lengths on request** |
| *Connection* | 4-pole M12 female connector |

**TP35878ISS.** ☐

**CABLE LENGTH**
**5** = 5 m,
**10** = 10 m

**TP35.5AF.5** Stainless steel temperature probe. 4-wire class A wire wound Pt100 sensor. Stem dimensions: Ø 3 x 60 mm. Cable length: 5 m. Cable termination: open wires. Shield: Inox + Teflon.

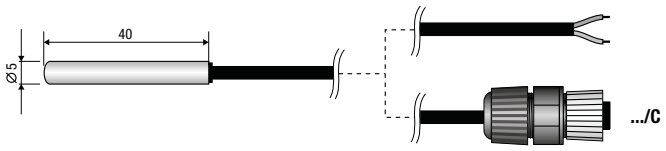
**TP35.5AF.5/C** Stainless steel temperature probe. 4-wire class A wire wound Pt100 sensor. Stem dimensions: Ø 3 x 60 mm. Cable length: 5 m. Cable termination: 4-pole M12 female connector. Shield: Inox + Teflon.

**TP35.5AF1.2** Stainless steel temperature probe. 4-wire class A wire wound Pt100 sensor. Stem dimensions: Ø 12 x 150 mm. Cable length: 2 m. Cable termination: open wires. Teflon insulated cable.

**TP35.5AF1.2/C** Stainless steel temperature probe. 4-wire class A wire wound Pt100 sensor. Stem dimensions: Ø 12 x 150 mm. Cable length: 2 m. Cable termination: 4-pole M12 female connector. Teflon insulated cable.

**NTC 10K@ 25 °C temperature probes**

**TP35N1… NTC 10K@ 25 °C**. temperature probe.



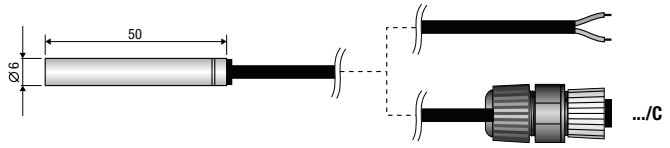

| | |
|---|---|
| *Temperature range* | -20…+85 °C |
| *Accuracy* | ±0.3 °C in the range 0…+70 °C / ±0.4 °C outside |
| *Dimensions* | Ø 5 x 40 mm |
| *Cable length* | 3, 5 or 10 m standard, **other lengths on request** |
| *Connection* | Open wires or 4-pole M12 female connector (option **/C**) |
| *Material* | AISI 316 stainless steel tube |

**TP3N1.** ☐☐

**CABLE TERMINATION:**
**Blank =** open wires
**/C** = female 4 pole M12 connector

**CABLE LENGTH:**
**3** = 3 m
**5** = 5 m
**10** = 10 m

**TP35N2… NTC 10K@ 25 °C**. temperature probe.



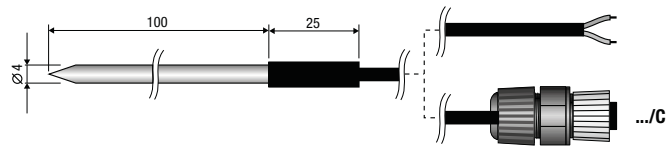

| | |
|---|---|
| *Temperature range* | 0…+70 °C |
| *Accuracy* | ±0.3 °C |
| *Dimensions* | Ø 6 x 50 mm |
| *Cable length* | 3, 5 or 10 m standard, **other lengths on request** |
| *Connection* | Open wires or 4-pole M12 female connector (option **/C**) |
| *Material* | AISI 316 stainless steel tube |

**TP3N2.** ☐☐

**CABLE TERMINATION:**
**Blank =** open wires
**/C** = female 4 pole M12 connector

**CABLE LENGTH**
**3** = 3 m
**5** = 5 m
**10** = 10 m

**TP35N5… NTC 10K@ 25 °C**. penetration temperature probe.




| | |
|---|---|
| *Temperature range* | -20…+105 °C |
| *Accuracy* | ±0.3 °C in the range 0…+70 °C / ±0.4 °C outside |
| *Dimensions* | Ø 4 x 100 mm |
| *Cable length* | 3 or 5 m standard, **other lengths on request** |
| *Connection* | Open wires or 4-pole M12 female connector (option **/C**) |
| *Material* | AISI 316 stainless steel tube |

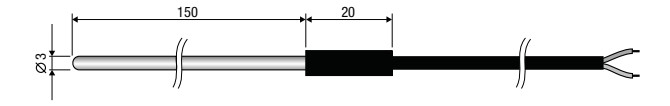
**TP35N5.** ☐☐

**CABLE TERMINATION:**
**Blank =** open wires
**/C** = female 4 pole M12 connector

**CABLE LENGTH:**
**3** = 3 m
**5** = 5 m

**Thermocouple temperature probes**

**TP35K6.5** K-type thermocouple probe with isolated hot junction.




| | |
|---|---|
| *Max. temperature* | -50…+750 °C |
| *Accuracy* | Class 1 according to IEC 60584-2 |
| *Dimensions* | Ø 3 x 150 mm |
| *Cable length* | 5 m standard, **other lengths on request** |
| *Connection* | Open wires |
| *Material* | AISI 316 stainless steel tube |

### Temperature probes for WBGT measurement

**TP3501TC2**: Natural ventilation wet bulb probe. Pt100 sensor. Probe stem probe: Ø 14 mm, length 110 mm. Complete with two spare cotton wicks and 50 cc distilled water container.

**TP3575TC2**: Pt100 sensor globe-thermometer temperature probe, globe Ø 150 mm. Stem: Ø 14 mm, length 110 mm.

**TP3576TC2**: Pt100 sensor globe-thermometer temperature probe, globe Ø 50 mm. Stem: Ø 8 mm, length 170 mm.

**TP3507TC2**: Temperature probe. Pt100 1/3 DIN sensor. Probe stem: Ø 14 mm, length 140 mm.

**HD32.2.7**: Holder for 4 probes, to be fixed on the tripod.

**VTRAP30**: Tripod, maximum height 280 mm.

### Photometric - radiometric probes

**LP 35 PHOT** Photometric probe for measuring illuminance, CIE photopic filter, spectral response according to the standard photopic curve, diffuser for cosine correction. Measuring range: 0.1…200,000 lux. Cable length 2m.

**LP 35 P-A** Combined probe with two sensors for measuring illuminance, with standard photopic spectral response, and irradiance in the **UVA** spectral range 315 nm…400 nm, diffuser for cosine correction. Illuminance measuring range: 0.3…20.000 lux. Irradiance measuring range: 1…10.000 mW/m$^2$. Cable length 2m.

**LP 35 UVA** Radiometric probe for measuring irradiance in the **UVA** spectral range 315 nm…400 nm, diffuser for cosine correction. Measuring range: 1…10.000 mW/m$^2$. Cable length 2m.

**LP 35 UVB** Radiometric probe for measuring irradiance in the **UVB** spectral range 280 nm…315 nm, diffuser for cosine correction. Measuring range: 1×10$^{-3}$…100 W/m$^2$. Cable length 2m.

**LP 35 UVC** Radiometric probe for measuring irradiance in the **UVC** spectral range 220 nm…280 nm, diffuser for cosine correction. Measuring range: 1×10$^{-3}$…100 W/m$^2$. Cable length 2m.

**LP BL** Base with levelling device. Upon request for assembly with the probe when placing the order. For photometric and radiometric probes.

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

### Pyranometers

**LP PYRA 02** **First Class** pyranometer according to ISO 9060. Output in µV/(Wm$^{-2}$). Supplied with: shade disk, cartridge with silica-gel crystals, 2 spare sachets, levelling device, connector and calibration report. **On request 5 or 10 m cables with 4-pole M12 connectors**.

**LP PYRA 03** **Second Class** pyranometer according to ISO 9060. Output in µV/(Wm$^{-2}$). Supplied with levelling device and calibration report. **On request shade disk and 5 or 10 m cables with 4-pole M12 connectors.**

**LPSILICON-PYRA04** Pyranometer with silicon photodiode for measuring the **global solar irradiance**, diffuser for cosine correction. Spectral range 350...1100 nm. Typical sensitivity: 10 µV/W m$^{-2}$. Measuring range: 0…2000 W/m$^2$. Fixed cable 5 m long.

### Rain gauges

**HD2013** Rain gauge with tipping bucket, area 400 cm$^2$, for temperature range +4 °C… +60 °C. Standard resolution 0.2 mm. On request when placing the order resolution 0.1 or 0.5 mm. Output contact normally closed.

**HD2013R** Rain gauge with tipping bucket, area 400 cm$^2$, equipped with heater for temperature range -20 °C…+60 °C. Standard resolution 0.2 mm. On request when placing the order resolution 0.1 or 0.5 mm. Output contact normally closed. Power voltage 12 Vdc or 24 Vdc ± 10% / power absorption 165 W.

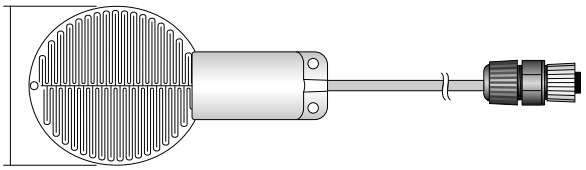
**HD2015** Rain gauge with tipping bucket, area 200 cm$^2$, for temperature range +4 °C… +60 °C. Standard resolution 0.2 mm. On request when placing the order resolution 0.1 or 0.5 mm. Output contact normally closed.

**HD2015R** Rain gauge with tipping bucket, area 200 cm$^2$, equipped with heater for temperature range -20 °C…+60 °C. Standard resolution 0.2 mm. On request when placing the order resolution 0.1 or 0.5 mm. Output contact normally closed. Power voltage 12 Vdc or 24 Vdc ± 10% / power absorption 50 W.

### Leaf wetness sensors

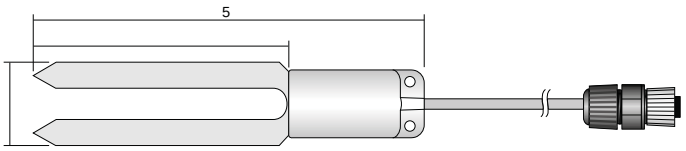
**HD3501.5** Leaf wetness sensor with double sensitive surface. IP 67 protection degree. 5 m cable ending with M12 connector.

**HD3501.10** Leaf wetness sensor with double sensitive surface. IP 67 protection degree. 10 m cable ending with M12 connector.

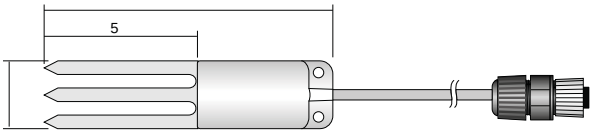


### Soil moisture sensors

**HD3510.1** 2-electrode probe for measuring the soil humidity. With integrated NTC 10 kΩ temperature sensor. M12 connector. 5 m cable




**HD3510.2** 3-electrode probe for measuring the soil humidity in restricted volumes. With integrated NTC 10 kΩ temperature sensor. M12 connector. 5 m cable.




### Wind speed and direction sensors

**HD54.3** Passive cup anemometer. Measuring range: 1…65 m/s. Operating conditions: -40…+60 °C / 0…100% RH. Rod mounting. Height 81 mm assembled.

**HD54.D** Wind direction vane probe. Measuring range: 0…360°. Dead band: typical 4°, maximum 8°. Threshold: 1 m/s. Operating conditions: -40…+60 °C / 0…100% RH. Rod mounting. Dimensions: 210 x 120 mm.

### Accessories

**HD35AP-S** Further copy of the CD-ROM with HD35AP-S basic software for the system configuration, the real time viewing of the measures and the data download. The access to the data is allowed only from the PC where the Data Base is installed. For Windows® operating systems.

**HD35AP-PLUS** Advanced version of the HD35AP-S software that provides access to the Data Base from all the PCs connected in the network to the server where the Data Base is installed. For Windows® operating systems.

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

**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** Mains power adapter 100-240 Vac / 6 Vdc - 1 A.

**HD35.03** Plastic support for the removable installation of base unit, repeaters and data loggers in housing for indoor use.

**HD35.11K** Pair of flanges made of anodized aluminium alloy for the fixed installation of base unit, repeaters and data loggers in housing for indoor use. Pin for padlock and padlock included.

**HD35.24W** Flange for fixing to the wall the models HD35EDW... in waterproof housing.

**HD35-ANT** Spare external RF antenna for the base units HD35AP… (except HD35APD-EXT) and the repeater HD35RE (not for HD35REW).

**HD35-ANT2** Spare external RF antenna for the base unit HD35APD-EXT.

**HD35-ANT3** Spare external RF antenna for the repeater HD35REW and the data loggers HD35EDW... with external antenna.

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

**HD35-BAT2** 3.6 V lithium-thionyl chloride (Li-$SOCl_2$) **not rechargeable** battery, size AA, 2-pole Molex 5264 connector. For the alarm module HD35ED-ALM and the data loggers HD35ED….

**BAT-2013DB** 3.6 V lithium-thionyl chloride (Li-$SOCl_2$) **not rechargeable** battery, size C, 2-pole Molex 5264 connector. For the repeater HD35REW and the data loggers HD35EDWK/4TC, HD35EDWH and HD35EDM... TC.

**HD2003.77/40** Clamp to fix the waterproof housing to the 40 mm diameter mast.

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

**HD2003.75** Pointed grounding rod for 40 mm diameter mast.

**HD2003.78** Flange for 40 mm diameter mast, to be fastened on the floor.

**HD2005.20** Anodized aluminum tripod kit with adjustable legs for installing environmental sensors. It can be fixed on a flat base with screws or to the ground with pegs.

**HD9217TF1** Protection shield from solar radiations for outdoor installation. For the HD35EDW… waterproof data loggers.

**HD32MT4.6** Protection shield from solar radiations for outdoor installation. For the HD35EDM…TC waterproof data loggers.

### Accessories for humidity probes

**HD75** 75% RH saturated solution for checking the relative humidity sensors, supplied with threaded ring for 14 mm diameter probes M12×1 thread.

**HD33** 33% RH saturated solution for checking the relative humidity sensors, supplied with threaded ring for 14 mm diameter probes M12×1 thread.

### Accessories for CO sensor

**MINICAN.12A** Nitrogen can for CO calibration at 0 ppm. Volume 20 litres. **With regulating valve**.

**MINICAN.12A1** Nitrogen can for CO calibration at 0 ppm. Volume 20 litres. **Without regulating valve**.

**ECO-SURE-2E CO** CO spare sensor.

**HD37.36** Connection tube kit between instrument and nitrogen can for CO calibration.

MANUFACTURE OF PORTABLE, BENCH TOP AND PROCESS SCIENTIFIC INSTRUMENTS
Current and voltage loop transmitters and regulators
Temperature - Humidity, Dew point - Pressure - CO, $CO_2$
Air speed - Light - Optical Radiation
Acoustics - Vibration
Data logger - Data logger wireless
Microclimate
pH - Conductivity - Dissolved Oxygen - Turbidity
Elements for weather stations

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LAT N° 124 Signatory of EA, IAF and ILAC Mutual Recognition Agreements
Temperature - Humidity - Pressure - Air speed
Photometry/Radiometry - Acoustics

CE CONFORMITY
- **Safety:** EN61000-4-2, EN61010-1 Level 3
- **Electrostatic discharge:** EN61000-4-2 Level 3
- **Electric fast transients:** EN61000-4-4 Level 3, EN61000-4-5 Level 3
- **Voltage variations:** EN61000-4-11
- **Electromagnetic interference susceptibility:** IEC1000-4-3
- **Electromagnetic interference emission:** EN55022 class B

RoHS 2002/95/EC

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