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Тула (4872)74-02-29
Тюмень (3452)66-21-18
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Уфа (347)229-48-12
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Челябинск (351)202-03-61
Череповец (8202)49-02-64
Ярославль (4852)69-52-93

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HD35 Wireless data logger

One system
Unlimited applications

Agriculture &
Greenhouses

Pharma - Medical
Laboratories - Storage

Museums - Buildings - Hall
- Public Places - Institutions

Food - Warehouses

Renewables


Meteo - Hydro

General industry

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.
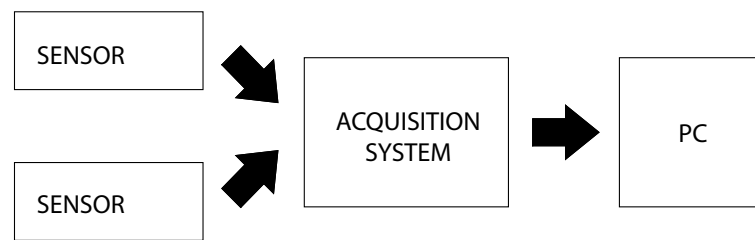
Data recording system

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**.
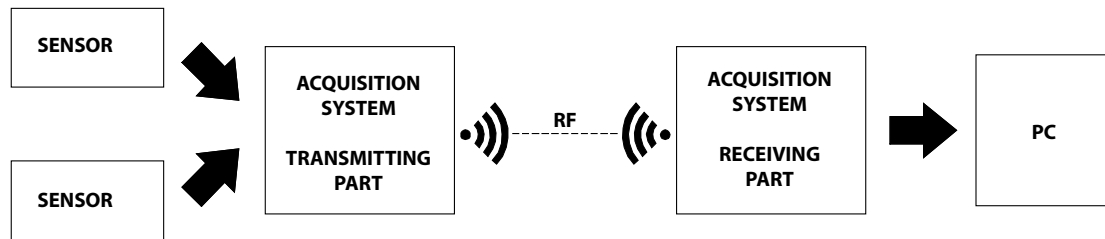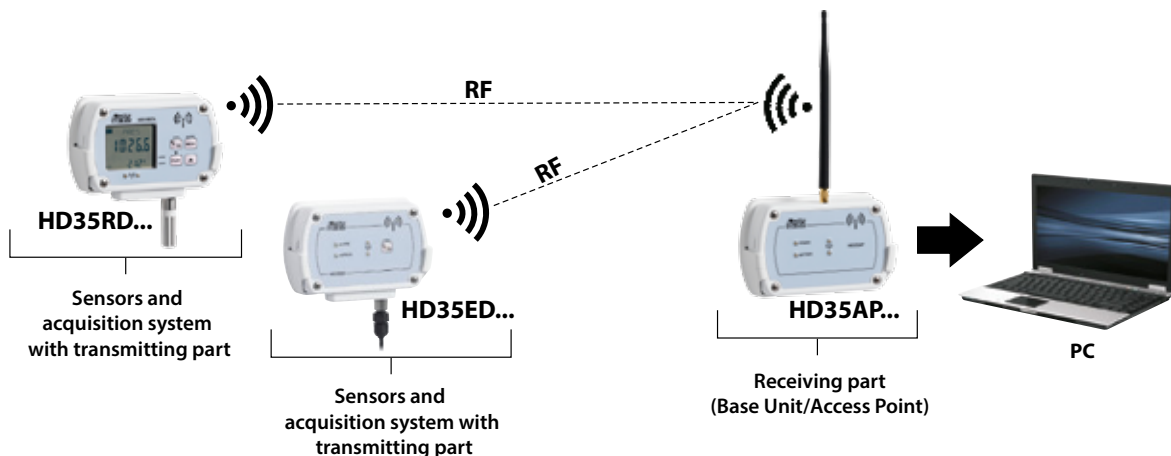

Wireless data recording system

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). Most of 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 software can be downloaded free of charge from the Delta OHM website.

Delta OHM wireless data recording system

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…

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 the PC, PLC or Internet:

- **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** and **HD35APR**. 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** and **HD35APR**. 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/GPRS** connection, available in **HD35APG** and **HD35APGMT**, or **3G/GSM/GPRS** connection, available in **HD35AP3G** and **HD35AP3GMT**. These versions are designed to operate even in the absence of a connection to the PC, being able to transmit the data via e-mail, FTP or HTTP (Cloud) via the GSM/3G network. They are therefore suitable for monitoring data in unattended installations and mobile installations (for example, during freight). They require an external power by connection to a power supply (optional).

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 and the RF signal quality 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.

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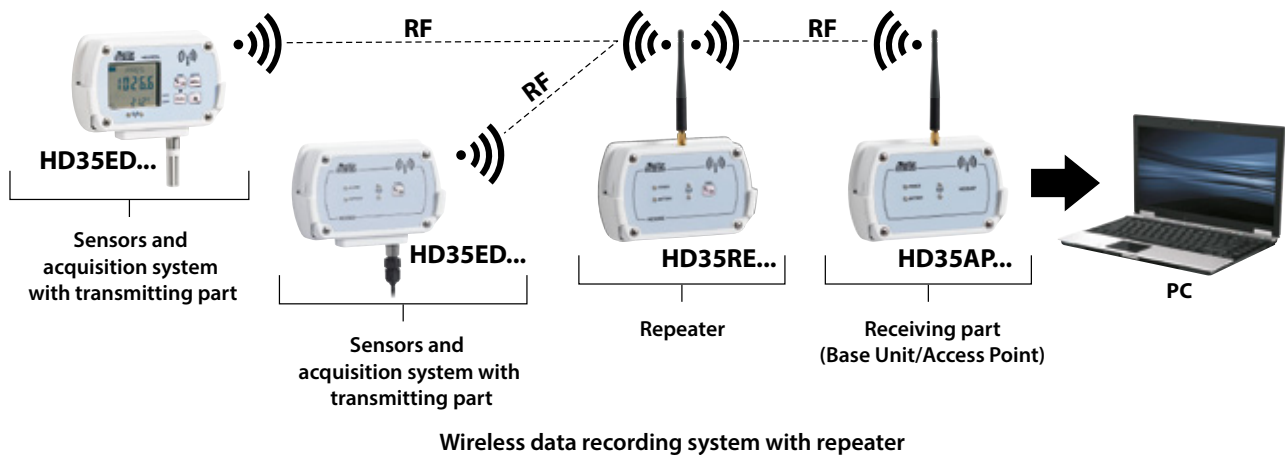
The repeaters are also useful to increase the distance in the **presence of obstacles**, for example when the HD35ED... devices and the base unit are installed in interior spaces separated by walls of reinforced concrete, or in **adverse weather conditions**, if the devices are installed in outdoor environments.

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 ETSI 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 units HD35APG… and HD35AP3G…).

- By sending an alarm e-mail to the set addresses (only with the base units HD35APG…, HD35AP3G…, HD35APW and HD35APR).

- 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. The alarm hysteresis and delay can be configured for each variable.
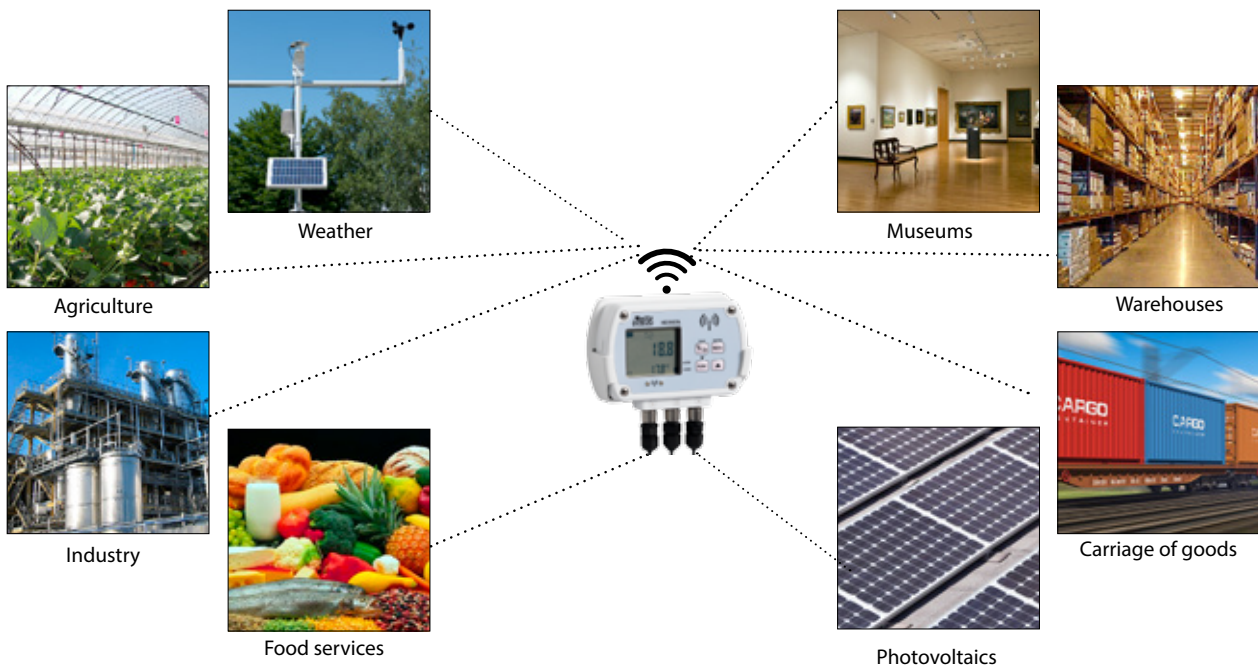
HD35AP… – HD35RE – HD35ED…

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
- Soil volumetric water content
- Level
- WBGT index

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.

Weather

Museums

Agriculture

Warehouses

Industry

Carriage of goods

Food services

Photovoltaics

Product information Wireless data loggers

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

– Sensors with RS485 MODBUS-RTU 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 goods

- Air conditioning

- Clean rooms

- Laboratories

- Industrial processes

- Buildings, offices, schools
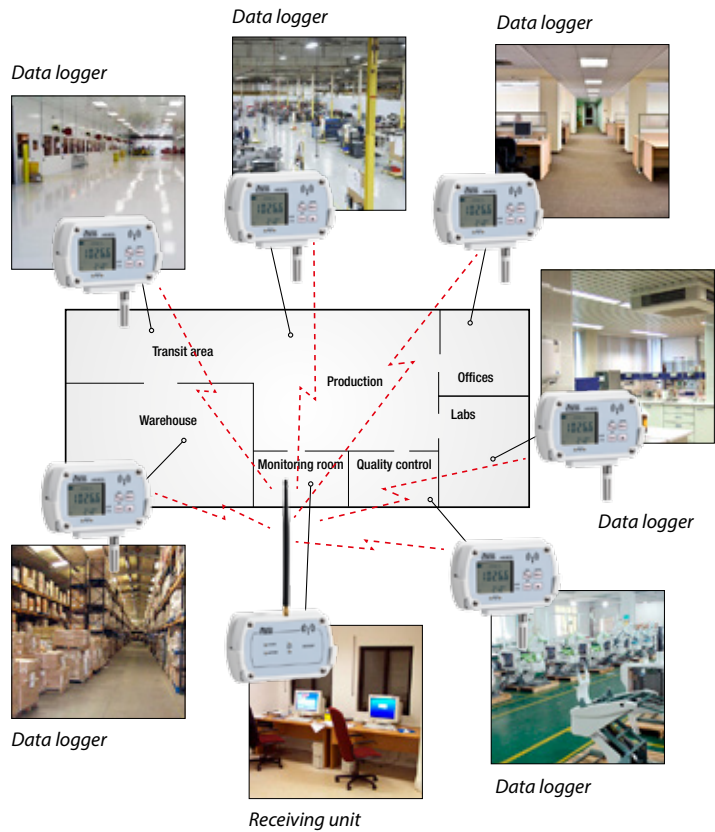
Data logger

Exemple of monitoring of an environment composed of several distinct areas

Example of application

Product information Wireless data loggers

SINGLE HD35… NETWORK ON A SINGLE FLOOR

Data logger

Data logger

Data logger

Data logger

Receiving base unit

Database

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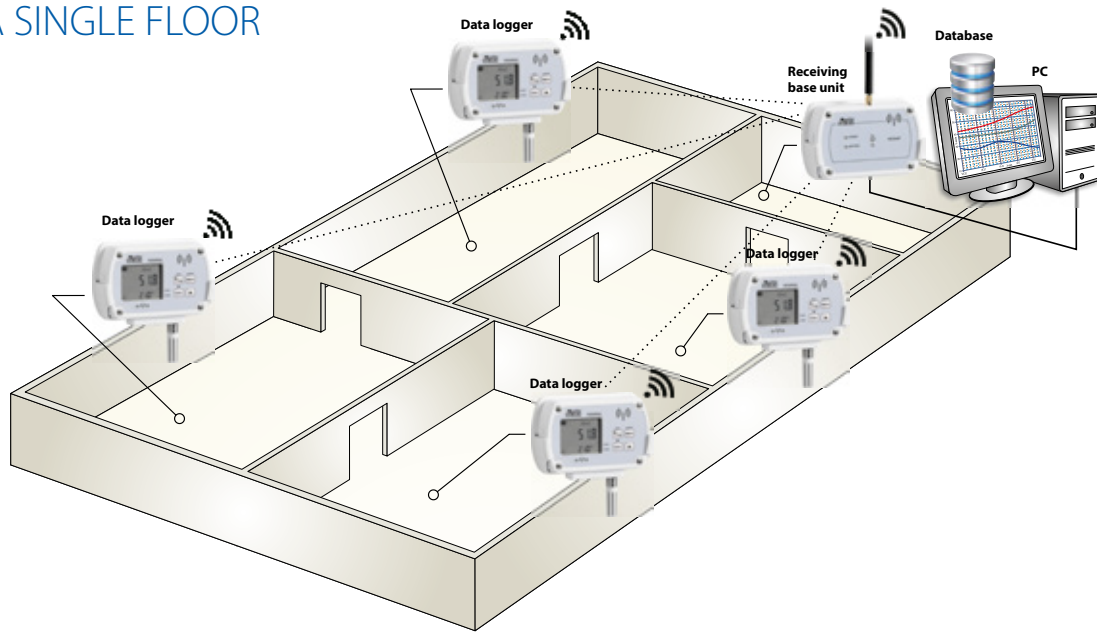
Exemple of monitoring of an environment composed of several distinct areas

SINGLE HD35… NETWORK ON MORE FLOORS

Data logger

Data logger

Receiving base unit

Data logger

Receiving base unit

Database

PC
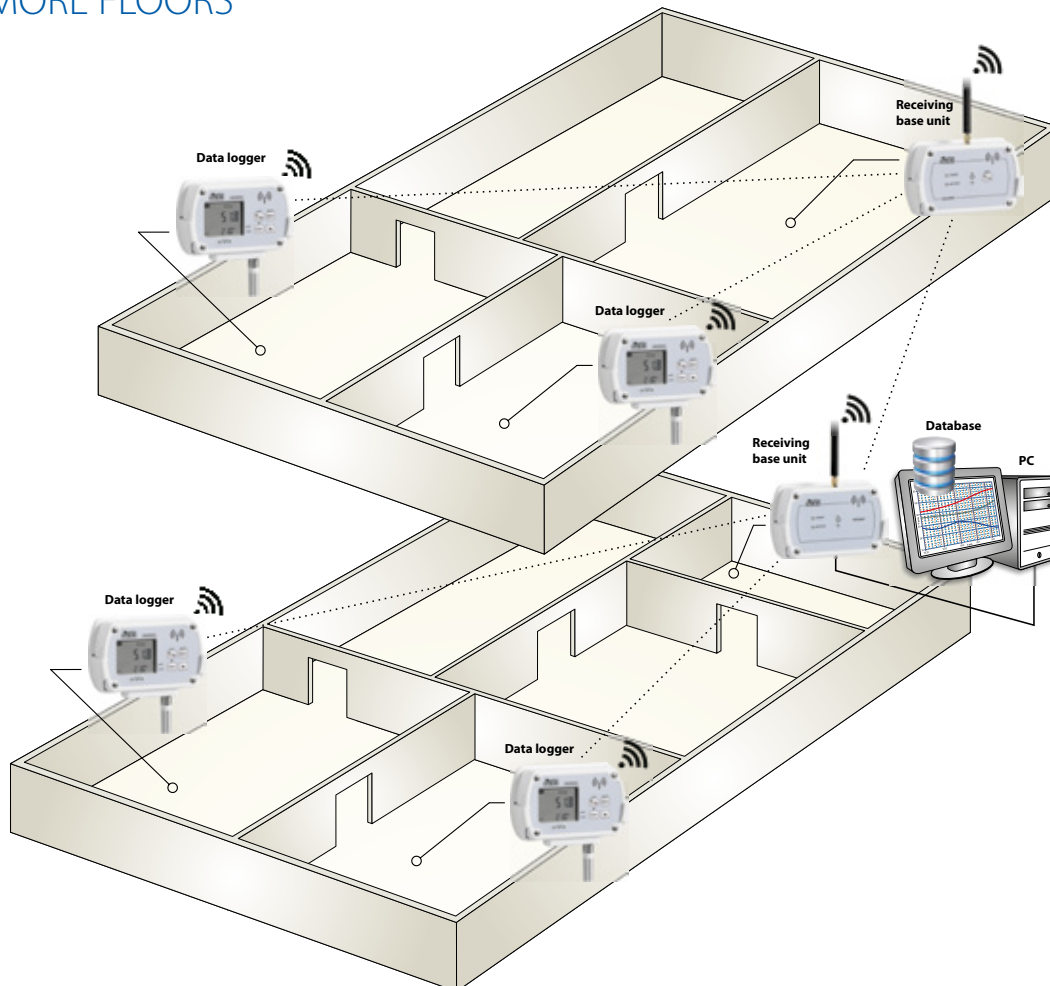
Data logger

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

INSTALLATION OF MORE HD35… NETWORKS

Receiving base unit

Data logger

Data logger

LAN

Database

Receiving base unit

PC

Data logger

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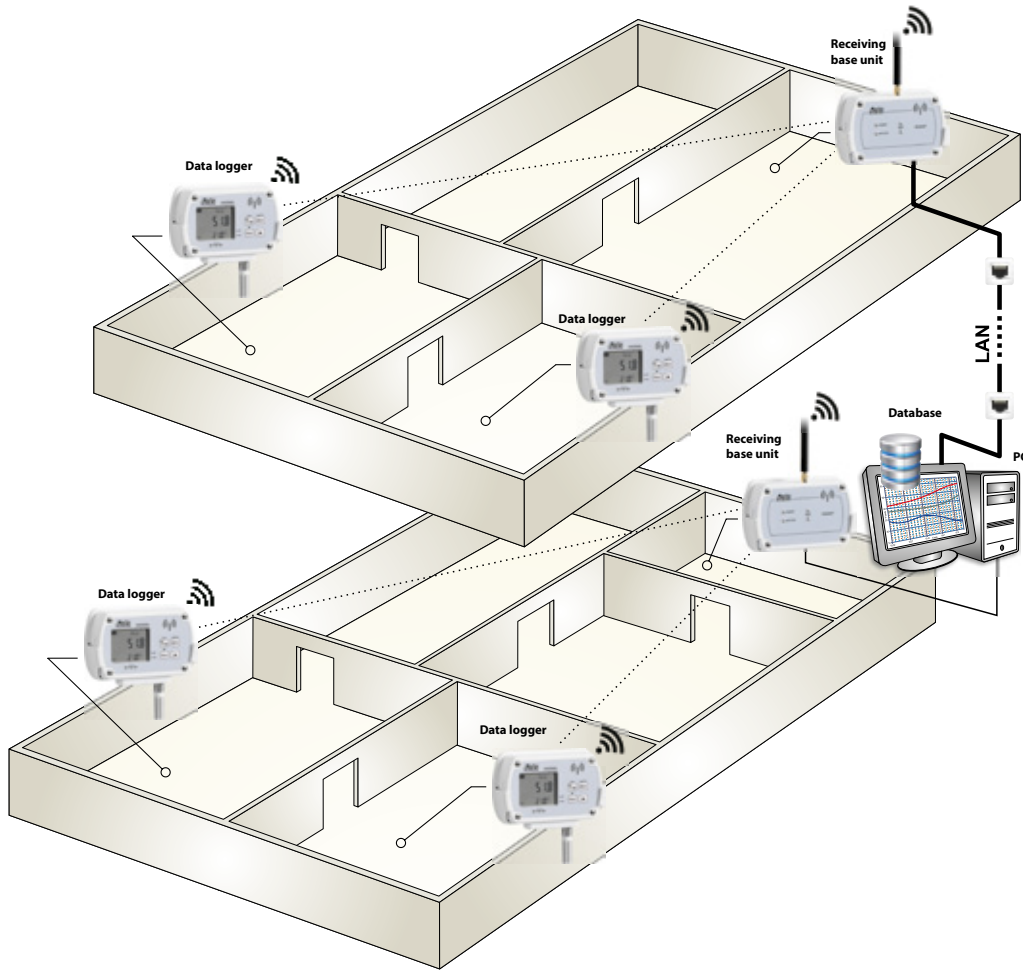
Example of monitoring of multi-storey buildings:
use of a base unit for each floor; the base unit upstairs is connected to the PC via local network (Ethernet or Wi-Fi).

Goods unloading

Transport

Data download

Datalogger

Receiving base unit

Datalogger

Goods
loading

Warehouse
and office
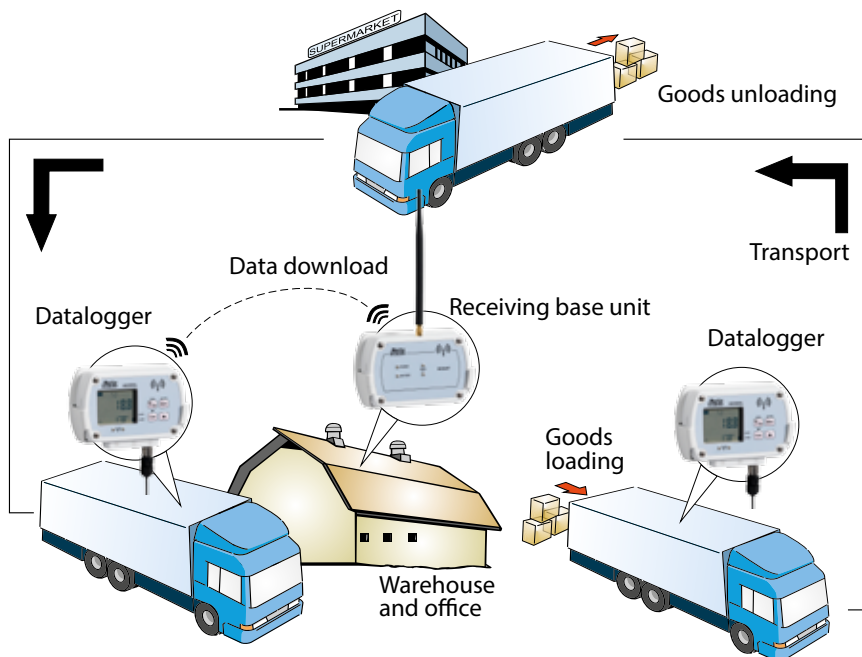
Monitoring of perishable (food, medicines, etc.) or fragile goods during transport

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 necessary with the HD35APW and HD35APG…/HD35AP3G… versions.

HD35RE… repeaters: the repeaters are devices able to act as a bridge between the base unit HD35AP… and the remote data loggers HD-35ED…. 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 and the RF signal quality 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 into 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).

- **HD35APS**, with:
  - o USB output
  - o **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:
  - o USB output
  - o **Wi-Fi** interface for the connection to the wireless local network
  - o **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**, to an **FTP** address and to an HTTP server (**Cloud**). The internal clock can be regularly synchronized automatically with a NIST reference server.
Allows using the **MODBUS TCP/IP** protocol (version of the MODBUS protocol for the communication via the Ethernet connection).
Multi-client feature: multiple PCs can be connected simultaneously via TCP/IP to the same base unit.

- **HD35APR**, version for 35 mm DIN rail, with:
  - o USB output
  - o **RS485** output with **MODBUS-RTU** protocol
  - o **Ethernet** interface for the cable connection to the local network

The base unit acts as a multiplexer to address the MODBUS commands from the PC/PLC to the devices in the network.
Permits (if the Internet connection via local network is available) sending alarm **e-mail** and the recorded data via **e-mail**, to an **FTP** address and to an HTTP server (**Cloud**).
Allows using the **MODBUS TCP/IP** protocol (version of the MODBUS protocol for the communication via the Ethernet connection).

Product information Wireless data loggers

Multi-client multiple PCs can be connected simultaneously via TCP/IP to the same base unit.

– **HD35APG / HD35APGMT / HD35AP3G / HD35AP3GMT**, with:
  - o USB output
  - o integrated **GSM/GPRS** (HD35APG…) or **3G/GSM/GPRS** (HD35AP3G…) module

Permits sending alarm **e-mail** or **SMS** and the recorded data via **e-mail**, to an **FTP** address and to an HTTP server (**Cloud**). The internal clock can be regularly synchronized automatically with a HTTP reference server.
Allows the communication with the PC via the GSM/3G network through the **GPRS/3G TCP/IP** protocol.
The HD35APGMT and HD35AP3GMT versions are in **IP 65** housing for outdoor.

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	HD35APR	HD35APG HD35APGMT HD35AP3G HD35AP3GMT
Connection systems						
USB	✓	✓	✓	✓	✓	✓
RS485			✓		✓	
Wi-Fi				✓		
Ethernet				✓	✓	
GSM/GPRS						✓
3G						Only HD35AP3G HD35AP3GMT
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				✓	✓	✓
Sending of data to an HTTP server (Cloud)				✓	✓	✓
Alarms						
Alarm thresholds	✓	✓	✓	✓	✓	✓
Alarm SMSes						✓
Alarm e-mails				✓	✓	✓

Base unit connection systems

HD35ED...

HD35ED...

HD35ED...

HD35ED...

HD35AP...

Database

PC

USB
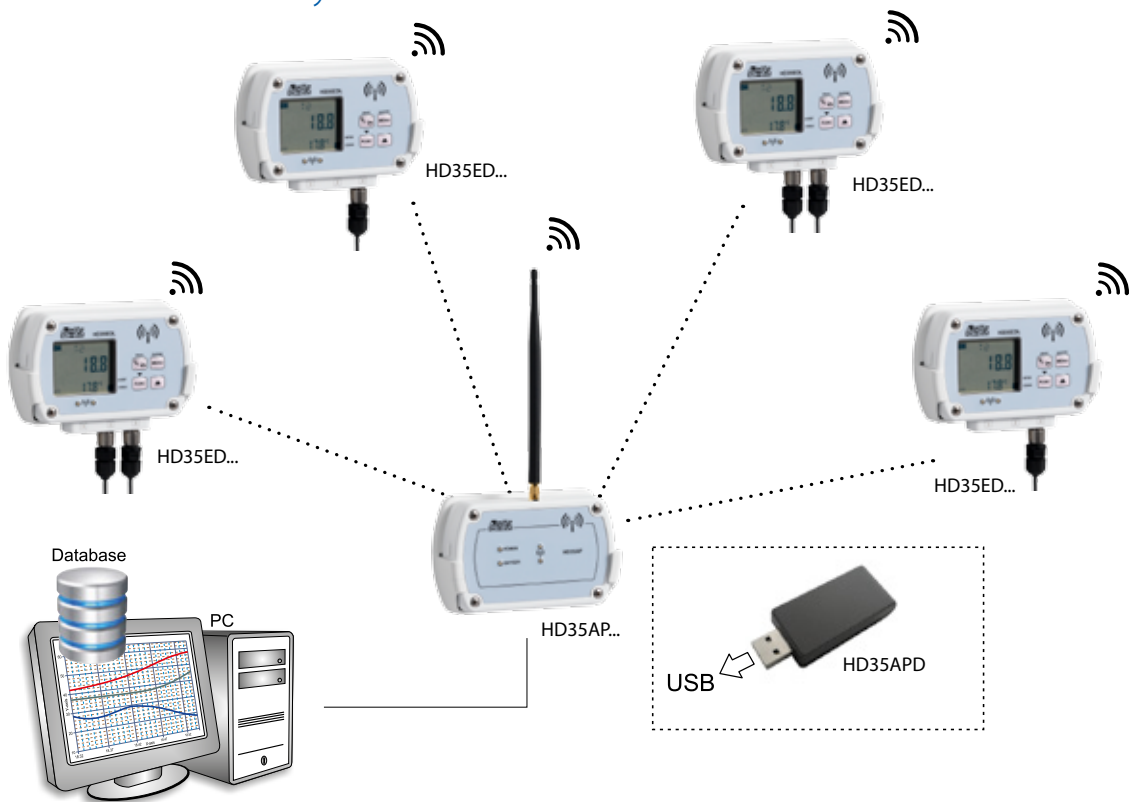
HD35APD

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

HD35ED...

HD35ED...

HD35ED...

HD35ED...

Power supply

Database

PC

PC

WI-FI

e-mail

FTP

Cloud
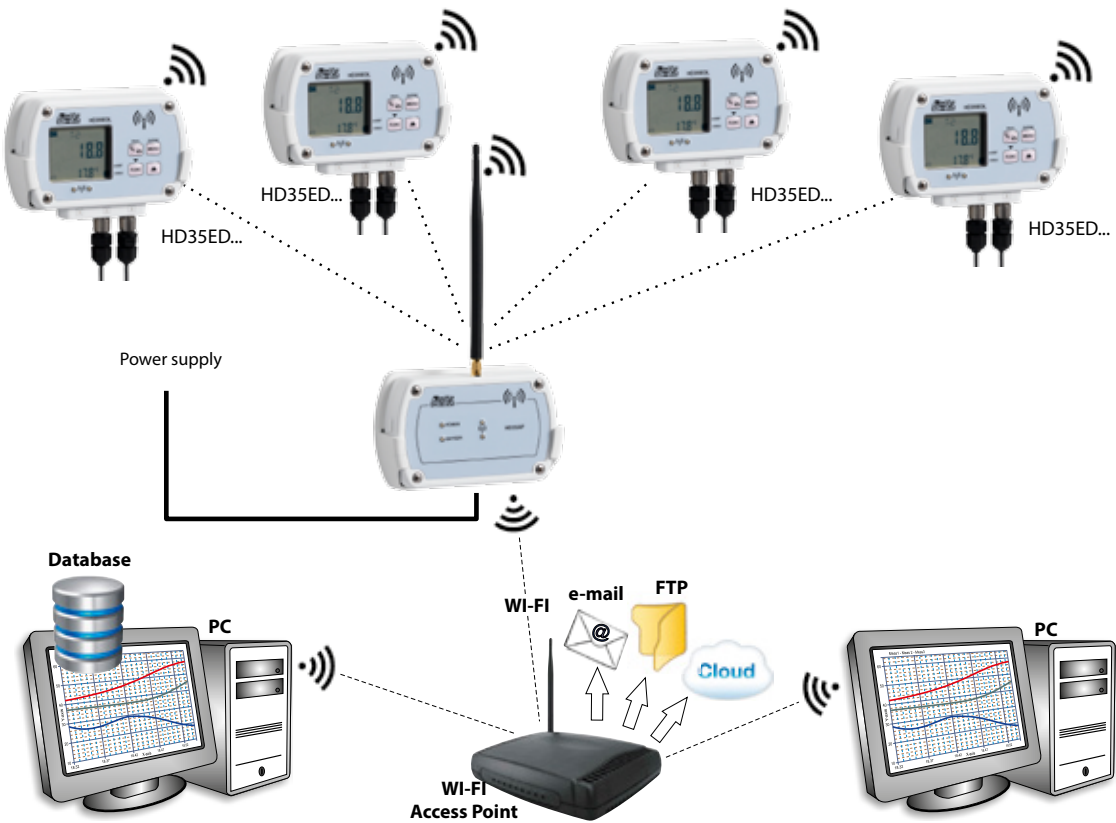
WI-FI
Access Point

Connection between PC and base unit via ETHERNET local network
Available in HD35APW and HD35APR

Product information Wireless data loggers

HD35ED...
HD35ED...
HD35ED...
HD35ED...

Power supply

HD35APw

Database

PC

ETHERNET

ETHERNET

PC

Modem/Router

e-mail

FTP

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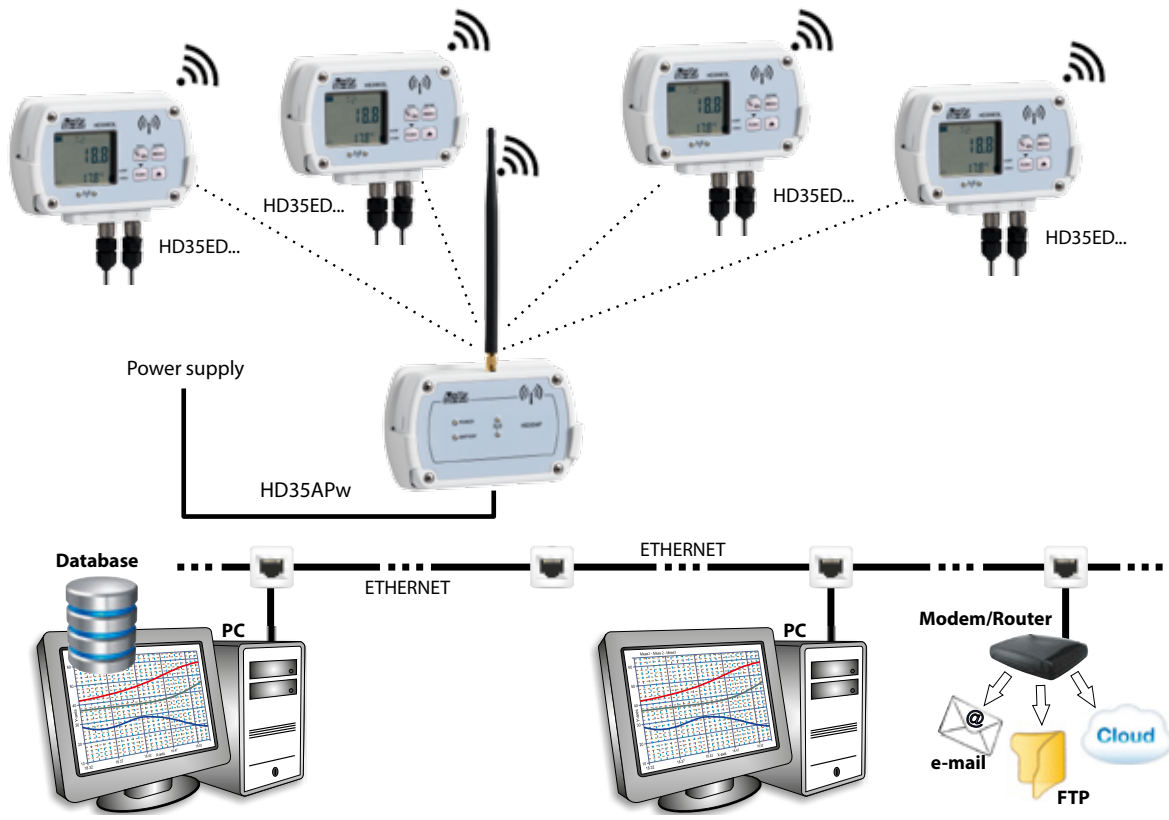
Connection between PC and base unit via Wi-Fi local network
Available in HD35APW

HD35ED...
HD35ED...
HD35ED...
HD35ED...

Power supply

HD35APS

PLC

PROGRAMMABLE
LOGIC
CONTROLLER

RS485 MODBUS-RTU

Other sensors

Other sensors
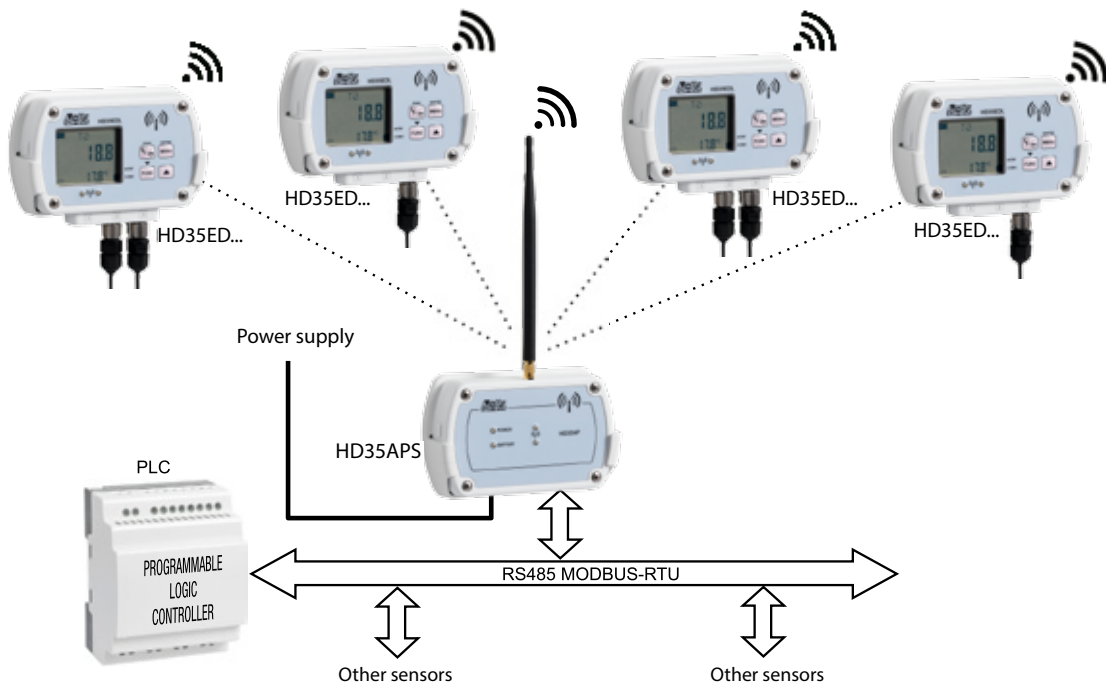
Connection between PLC and base unit via RS485 MODBUS-RTU network
Available in HD35APS and HD35APR

GSM/3G connection
Available in HD35APG…/HD35AP3G…

The **GSM/3G** 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/3G 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/3G functions of the unit.

Transmitting frequency

All the models (**except HD35APD and HD35APG…**) are available in three versions, depending on the transmitting frequency band:

– **868 MHz** (in compliance with the european normative ETSI 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 units HD35APD and HD35APG… are 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 921.5-928 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 to 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	HD35AP / HD35APS HD35APR / HD35APW HD35AP3G... / HD35RE...	HD35APG…	HD35APD
	868 MHz frequency band		
HD35ED... with internal antenna	300 m	300 m	180 m
HD35ED... with external antenna / HD35RE...	>500 m	>500 m	180 m
	902-928 MHz frequency band		
HD35ED... with internal antenna	180 m	180 m	180 m
HD35ED... with external antenna / HD35RE...	>500 m	>500 m	180 m
	915.9-929.7 MHz frequency band		
HD35ED... with internal antenna	300 m	---	---
HD35ED... with external antenna / HD35RE...	>500 m	---	---
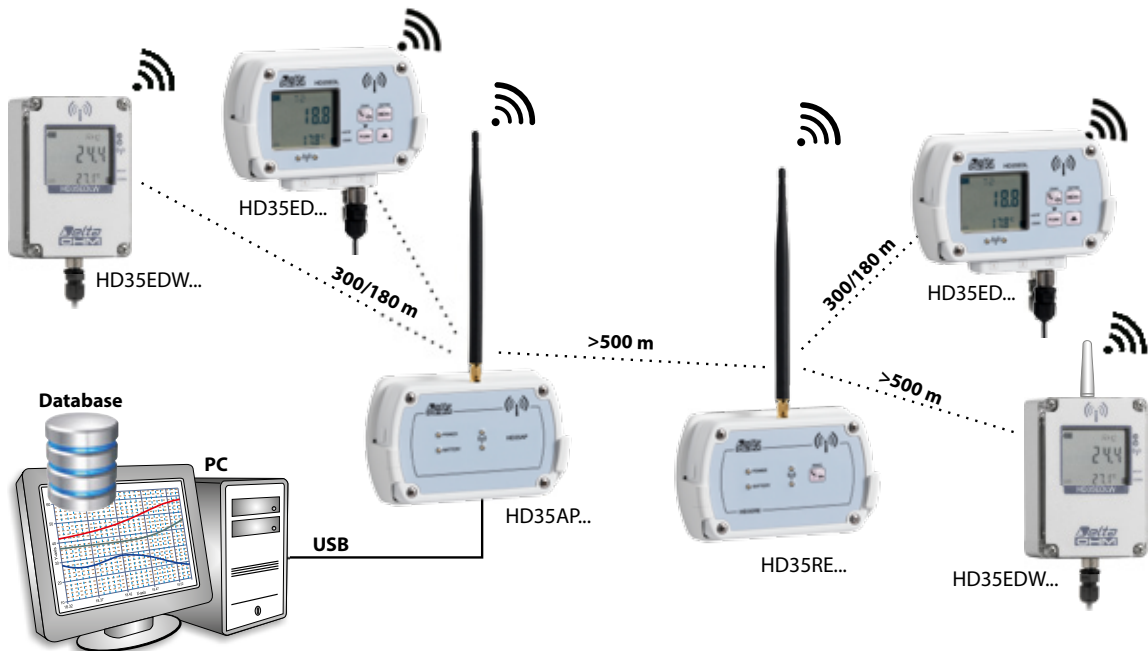
RF signal repeater
More repeaters in cascade can be used

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 (HD35REW does not act as repeater for HD35RE).
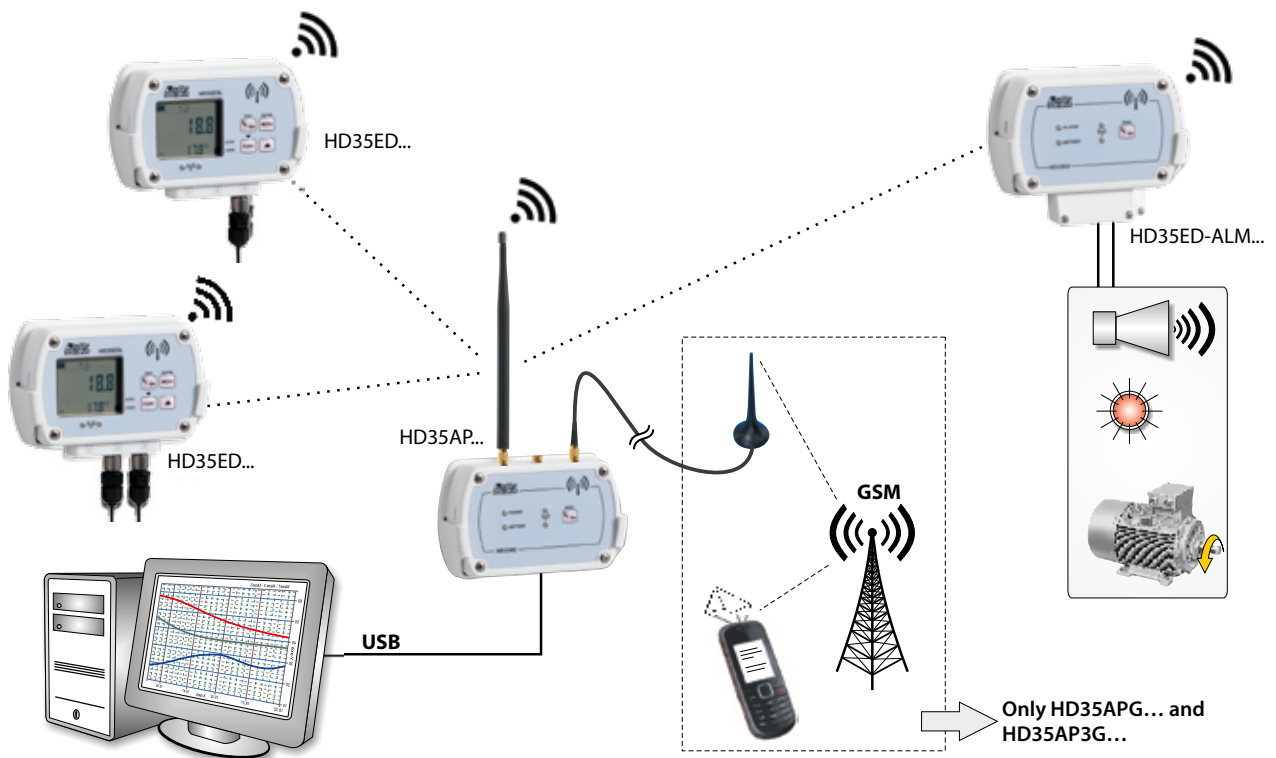
Alarms

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/GPRS/3G module (**HD35APG…/HD35AP3G…**) or the Wi-Fi/Ethernet interface (**HD35APW/HD35APR**) 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/GPRS/3G module (**HD35APG…/HD35AP3G…**), 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.

Signallling the alarm

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 (except for the measurements that detect the maximum, such as wind gust, rain rate, …). 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.
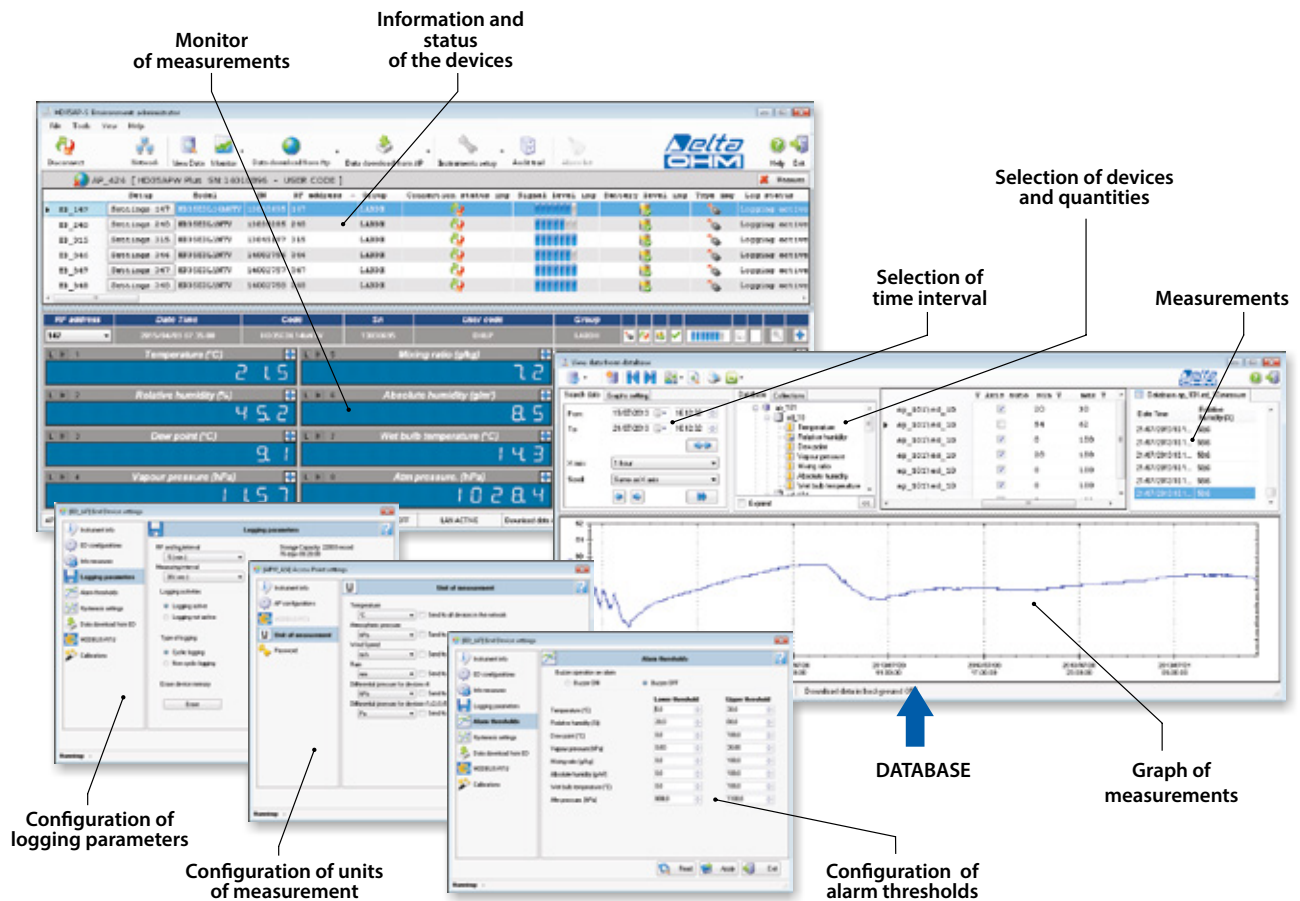
Software

The supplied PC basic software **HD35AP-S**, downloadable free of charge from the Delta OHM website, allows configuring all the devices of the system, viewing the connection status, the RF signal level and the battery charge level of each device, viewing the real time measurements both graphically and numerically, data downloading.

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.

Monitor of measurements

Information and status of the devices

Selection of devices and quantities

Selection of time interval

Measurements

DATABASE

Graph of measurements

Configuration of logging parameters

Configuration of units of measurement

Configuration of alarm thresholds

The connection to the database is **multi-client**: it is possible to store the data in a remote database on the local network to which the PC is connected and the data can be displayed from any PC on the local network running the software HD35AP-S.

The **HD35AP-CFR21** option (working with hardware key) allows, in addition to the features of the basic software, the protection of recorded data and configuration of the system in response to **FDA 21 CFR part 11** recommendations. In particular are available:

– The traceability of activities (audit trail) performed with the software; for example, which users connected and what changes were possibly made to the configuration of the system.

– The management of users access for the system configuration and viewing of data in the database. Each user can be assigned a different password for using the software. There are also three levels of access (Administrator, Super-user and standard User); for each level, the allowed operations can be defined.

Cloud

The base units equipped with Ethernet, Wi-Fi and GSM/3G connectivity can automatically send, at regular intervals, the data to an HTTP server, and in particular to the Delta OHM portal. This allows you to view the data from anywhere in the world, even by using mobile devices (tablet, smartphone, notebook), simply having an Internet connection and using a web browser. The data sending interval is configurable.

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.

If the base unit can connect to the Internet (via Wi-Fi, Ethernet, cellular network), the clock can be regularly synchronized automatically with a reference server.

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**
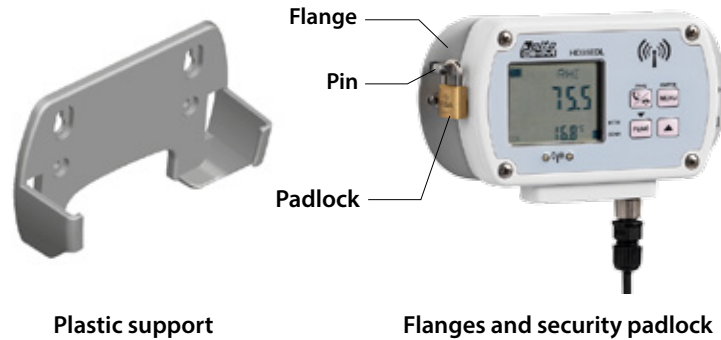
Conformities

The data loggers are in compliance with the standard **EN 12830**. The PC application software **HD35AP-S** (advanced version with HD35AP-CFR21 option) is designed in accordance with the **FDA 21 CFR part 11** recommendations.

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.
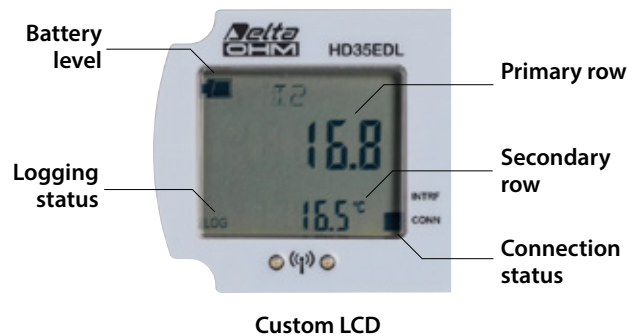
Custom LCD

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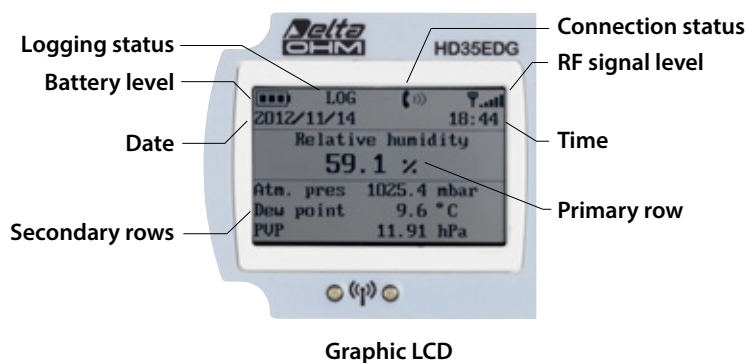
Graphic LCD
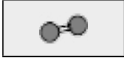
The data loggers with LCD can display the measured values in different units of measurement. For example, in the models measuring temperature the user can set °C or °F, or, in the models measuring atmospheric pressure, the unit of measurement can be set by the user in: hPa (= mbar), mmHg, inchHg, mmH_2O,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

The possibility to view information on the quality of the RF signal (Received Signal Strength Indication, Packet Error Rate) allows an easy positioning of the devices during system installation.

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) range 0…5,000 ppm, **B2** = Carbon dioxide range 0…10,000 ppm
💡	**I**	=	Illuminance low range (0...20,000 lux), **I2** = Illuminance high range (0...200,000 lux)
UV	**U**	=	UV irradiance (**U**=UVA, **UB**=UVB, **UC**=UVC)
☀️	**R**	=	Solar radiation (pyranometer)
☂️	**P**	=	Rainfall quantity
🍃	**L**	=	Leaf wetness
🌧️	**S**	=	Soil volumetric water content

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

TC = Probe with cable

TV (or TVl) = Fixed vertical probe without cable

TCV = Probe with cable + fixed vertical probe without cable

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

TAB. 3A: Data loggers in housing for indoor

Model	MEASURES									OPTIONAL LCD		INPUTS		Fig.
	NTC 10K	Pt100 Pt1000	RH	Patm	DP	Lux	UV	CO	CO₂	L Custom	G 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 / RH	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 / RH	C
HD35ED 1NI TV	•		•				•			•			•	D
HD35ED 14bNI… TCV	•		•	•			•			•		1	T / RH Patm	C
HD35ED 14bNI TV	•		•	•			•			•			•	D
HD35ED 1NIU TCV	•		•				UVA			•		1	T / RH	C
HD35ED 1NIU TV	•		•				UVA			•			•	D
HD35ED1NUBTCV	•		•				UVB			•		1	T / RH	C
HD35ED1NUCTCV	•		•				UVC			•		1	T / RH	C
HD35ED 14bNIU TCV	•		•	•			UVA			•		1	T / RH 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 Pt100/Pt1000 sensors, thermocouples K, J, T, N, E 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

the LCD type depends on the model

M12 connectors (from 1 to 3 depending on the model)

A

Fixed vertical RH and/or T probe

B

M12 connector

Fixed vertical RH + T probe

C

photometric/ UVA sensor

Fixed vertical RH + T probe

D

differential pressure inputs

E

differential pressure inputs

Fixed vertical RH + T probe

F

sensors protected by grid

G

terminal header inputs protected by cover

H
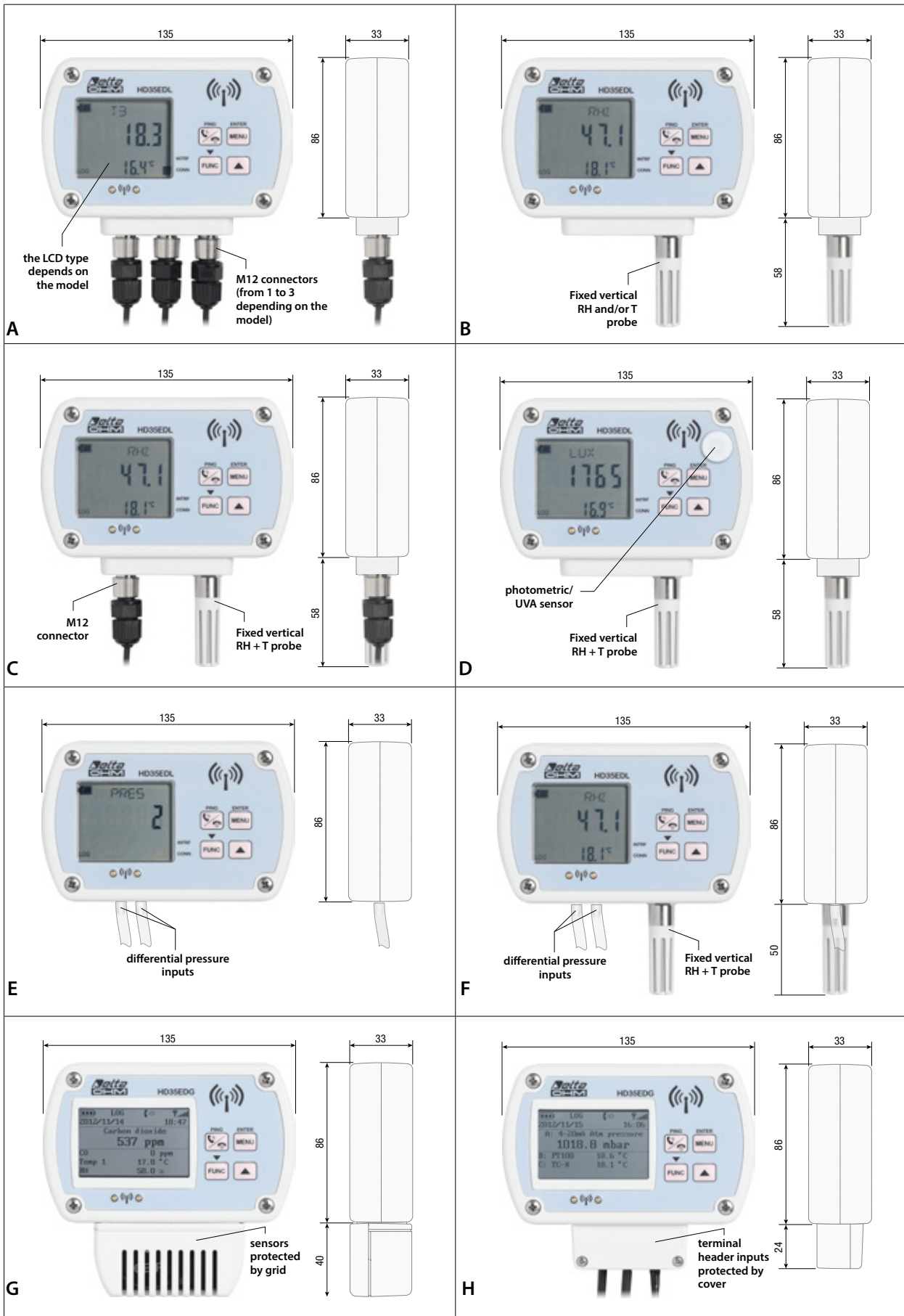
Technical specifications
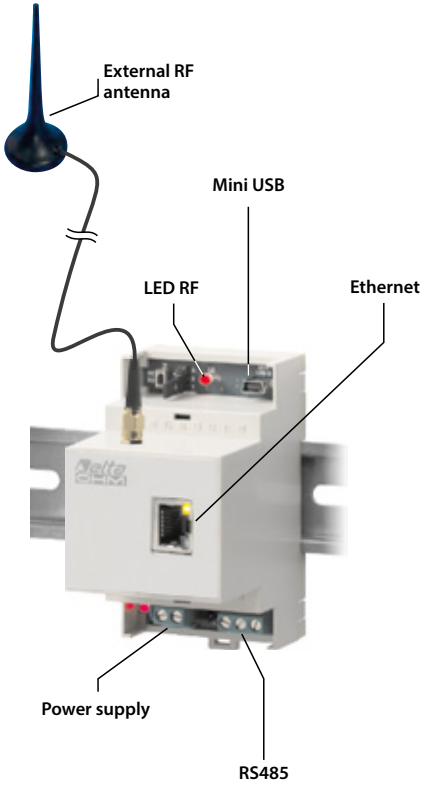
HD35AP – HD35APG/HD35AP3G – HD35APS – HD35APW base units		
	Versions	**HD35AP**: USB output only **HD35APS**: USB and RS485 MODBUS-RTU outputs **HD35APW**: USB output, Wi-Fi and Ethernet interface **HD35APG**: USB output and GSM/GPRS module **HD35AP3G**: USB output and 3G/GSM/GPRS module
	Power supply	Internal 3.7 V lithium-ion **rechargeable** battery, capacity 2250 mA/h, JST 3-pole connector **Optional** 6 Vdc external power adapter (**SWD06**) Powered directly from the PC USB port **(*)**
	Power consumption	≈30 mA (E, U) / ≈38 mA (J) without Ethernet/Wi-Fi and with typical GSM/3G activity **(**)** ≈180 mA with Ethernet, ≈150 mA with Wi-Fi
	Battery autonomy (typical)	**≈3 days (E, U) / > 2 days (J) if not connected to the local network and with typical GSM/3G activity** **(**)** **≈12 hours with Ethernet, ≈14 hours with Wi-Fi**
	Transmitting frequency	868 MHz, 902-928 MHz or 915.9-929.7 MHz (not for HD35APG) depending on the model
	Antenna	Fixed whip external RF antenna Whip external GSM/3G antenna with cable (HD35APG and HD35AP3G only)
	Transmitting range	See table 2
	Serial outputs	USB with Mini-USB type connector (cable **CP31**) 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**, to an **FTP** address or to an HTTP server (**Cloud**). Allows the **MODBUS TCP/IP** protocol.
	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**, to an **FTP** address or to an HTTP server (**Cloud**). Allows the **MODBUS TCP/IP** protocol.
	GSM/GPRS connection	Only in HD35APG and HD35AP3G models. For sending alarm **e-mail** or **SMS** and data via **e-mail**, to an **FTP** address or to an HTTP server (**Cloud**). Allows the **GPRS TCP/IP** protocol.
	3G connection	Only in HD35AP3G model. For sending alarm **e-mail** or **SMS** and data via **e-mail**, to an **FTP** address or to an HTTP server (**Cloud**). Allows the **3G 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	Plastic material 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

In the left column of the table:

External RF antenna

LEDs

POWER
BATTERY
HD35AP

Power supply connector **Mini USB**

RS485 M12 connector (HD35APS only)
or
RJ45 Ethernet connector (HD35APW only)

(*) The connection of the SWD06 external power supply is necessary if the Ethernet, Wi-Fi or GSM/3G transmission is used.

(**) The intensive use of the GSM/3G transmission can significantly increase the power consumption and reduce the battery life.

HD35APD base unit

Power supply	Powered directly from the PC USB port
Transmitting frequency	868 MHz or 902-928 MHz depending on the model (915.9-929.7 MHz not available)
Antenna	Internal
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

USB type A connector

HD35APR base unit

Power supply	8…30 Vdc
Power consumption	40 mA @ 24 Vdc
Internal battery	No
Transmitting frequency	868 MHz, 902-928 MHz or 915.9-929.7 MHz depending on the model
Antenna	Whip external RF antenna with cable
Transmitting range	See table 2
Serial outputs	USB with Mini-USB type connector (cable **CP31**) RS485 with **MODBUS-RTU** protocol
Ethernet connection	Yes. Permits (if the Internet connection is available) sending alarm **e-mail** and the recorded data via **e-mail**, to an **FTP** address or to an HTTP server (**Cloud**). Allows the **MODBUS TCP/IP** protocol.
Wi-Fi connection	No
GSM connection	No
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, RF communication status.
Working temperature and humidity range	-10…+60 °C / 0…85 %RH not condensing
Dimensions	53 x 90 x 69 mm
Weight	200 g approx.
Installation	35 mm DIN rail

External RF antenna

Mini USB

LED RF

Ethernet

Power supply

RS485

HD35APGMT/HD35AP3GMT base units

Versions	**HD35APGMT**: USB output and GSM/GPRS module **HD35AP3GMT**: USB output and 3G/GSM/GPRS module
Power supply	18…27 Vdc
Power consumption	< 16 mA during measurement < 1 A peak during GSM activity
Internal battery	12 V lead-acid rechargeable The battery charger is integrated in the box
Transmitting frequency	868 MHz, 902-928 MHz or 915.9-929.7 MHz (not for HD35APGMT) depending on the model
Antennas	Fixed whip external RF antenna Whip external GSM/3G antenna with cable
Transmitting range	See table 2
Output	USB with Mini-USB type connector (cable **CP31**)
Ethernet connection	No
Wi-Fi connection	No
GSM/GPRS connection	Yes, for sending alarm **e-mail** or **SMS** and data via **e-mail**, to an **FTP** address or to an HTTP server (**Cloud**). Allows the **GPRS TCP/IP** protocol.
3G connection	Only in HD35AP3GMT model. For sending alarm **e-mail** or **SMS** and data via **e-mail**, to an **FTP** address or to an HTTP server (**Cloud**). Allows the **3G 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, RF communication status.
Working temperature and humidity range	-40…+70 °C / 0…100 %RH
Housing	Dimensions: 270 x 170 x 110 mm (excluding antenna) Material: Polycarbonate (PC) Protection degree: IP 65 (with protective cap on the USB connector)
Weight	1 kg approx.
Installation	Fixing to a 40 mm diameter mast

External RF antenna

GSM/3G antenna

Mini USB

Power supply

HD35RE repeater

Power supply	Internal 3.7 V lithium-ion **rechargeable** battery, capacity 2250 mA/h, JST 3-pole connector **Optional** 6 Vdc external power adapter (**SWD06**) Powered directly from the PC USB port
Power consumption	≈30 mA (E, U) / ≈38 mA (J)
Battery autonomy	≈3 days (E, U) / > 2 days (J)
Transmitting frequency	868 MHz, 902-928 MHz or 915.9-929.7 MHz depending on the model
Antenna	Fixed whip external RF antenna
Transmitting range	See table 2
Serial outputs	USB with Mini-USB type connector (cable **CP31**) **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	Plastic material 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

External RF antenna

LEDs

Connection push-button

Power supply connector

Mini USB

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	Fixed whip external RF antenna
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 Dimensions: 80 x 120 x 55 mm (excluding antenna) 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**).

External RF antenna

LED

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:

o the alarm events may be reported with a certain delay;

o 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;

o to guarantee the same transmission reliability of a system with HD35RE repeaters, HD35ED… devices may be obliged to transmit the same packets several times: this could affect battery life.

Product information Wireless data loggers

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. 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 A, Molex 5264 2-pole connector.
Battery autonomy (*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); 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). 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	Plastic material Dimensions: see table 3B IP 50 protection degree (except versions with grid)
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.

Versions with LCD: **Versions without LCD:**
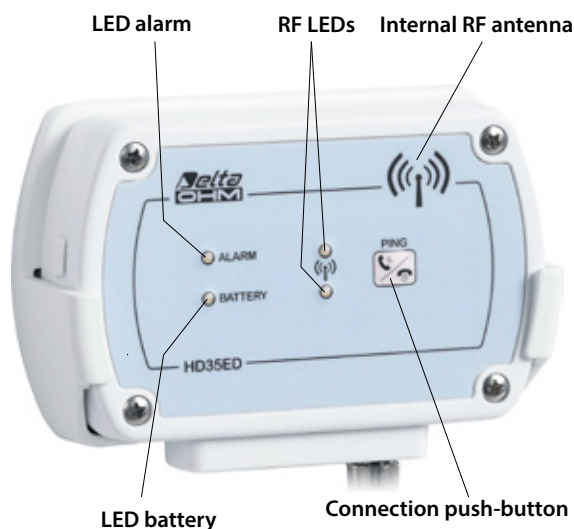
[*] Some models measuring several quantities may have a minimum interval greater than 1 second (see table 4).

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	1 s	T
HD35ED 7P/2 TC	from 52,000 to 68,000	2 s [***]	T
HD35ED 7P/3 TC	from 42,000 to 68,000	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, ΔP
HD35ED 4r…	68,000	1 s	ΔP
HD35ED 1NI… 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 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_2
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	**ΔP**: differential pressure
RH: relative humidity	**I**: illuminance
T_D: dew point	**UVA**: UVA irradiance
T_W: wet bulb temperature	**UVB**: UVB irradiance
AH: absolute humidity	**UVC**: UVC irradiance
MR: mixing ratio	**P_{UV}**: proportion of UV present (µW/lumen)
PVP: partial vapour pressure	**CO**: carbon monoxide
P_{ATM}: atmospheric pressure	**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).

[***] The minimum logging interval may be smaller if the data logger only stores some of the available 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") in HD35….**E** (868 MHz) and HD35….**U** (902-928 MHz) systems. 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.

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).
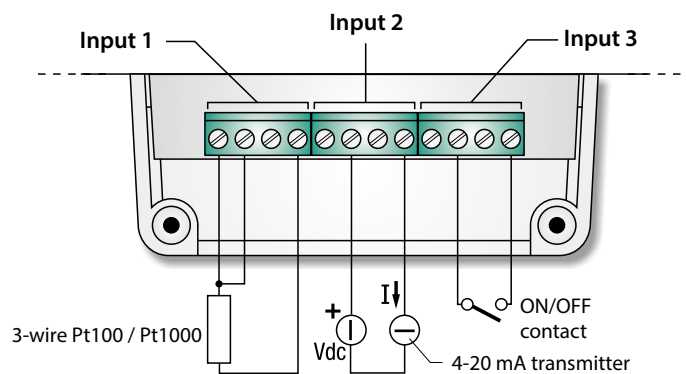
Example of connection of HD35EDH model inputs

HD35ED-ALM alarm module		
	Power supply	Internal 3.6 V lithium-thionyl chloride (Li-SOCl$_2$) **not rechargeable** battery, size A, 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 Contact: max 1A @ 30Vdc resistive load
	Working temperature and humidity range	-10…+70 °C / 0…85 %RH not condensing
	Housing	Plastic material 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

Waterproof versions for outdoor use and industrial applications (HD35EDW… 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 (IP65 for the models with CO_2 sensor).

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

Protection shield from solar radiations

Outdoor transmitting station with data logger of the series HD35EDW…

Receiving station with base unit HD35AP
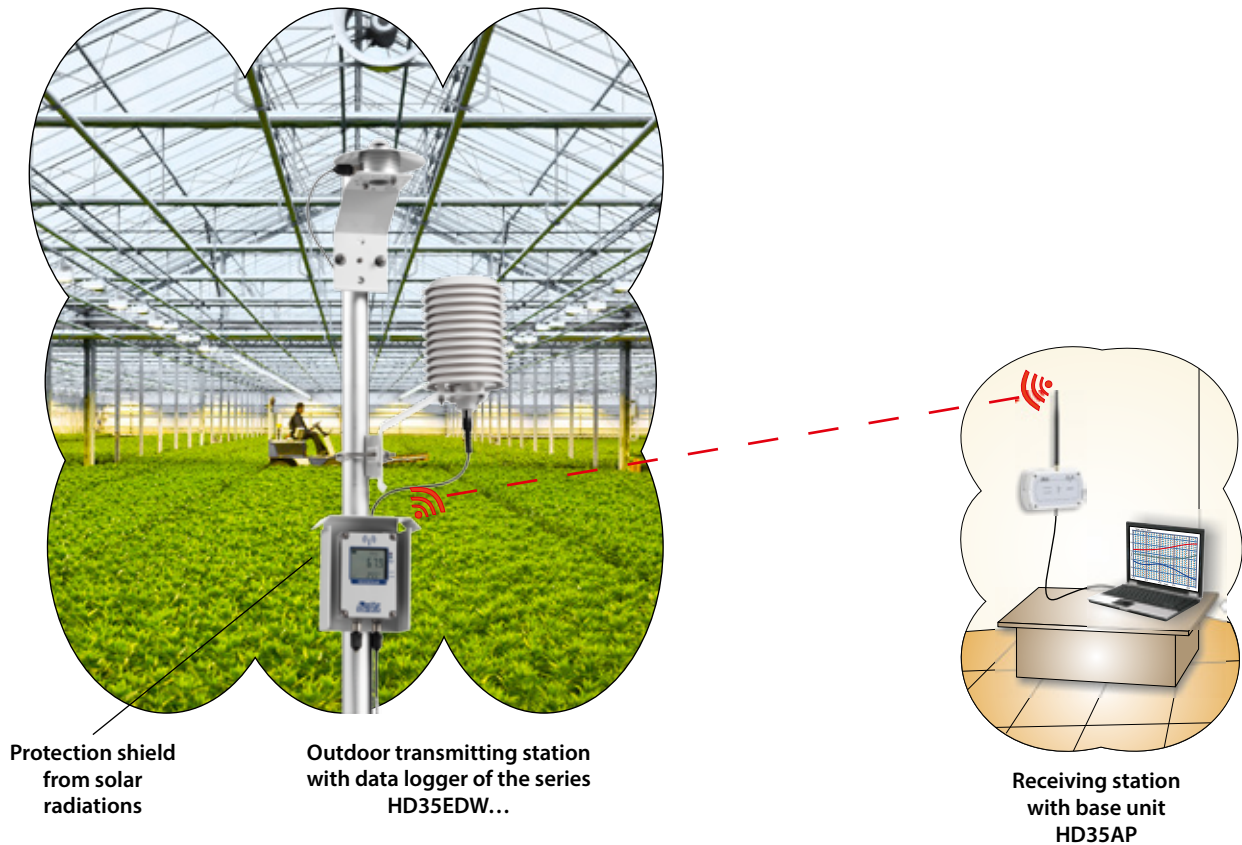
The housing of the waterproof versions can be wall mounted or, in the case of outdoor installation, fixed on a 40 mm diameter mast by means of the HD2003.77/40 clamping. For outdoor installation, the data logger can be supplied with the **protection shield from solar radiations**.

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.

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 / Lux	Rainfall	Leaf	CO₂	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 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 P TC-ALM								•				1		Q
HD35EDW NP TC	•							•				2		I
HD35EDW 1NP TC	•				•			•				2		I
HD35EDW 1NL TC	•				•				•			2		I
HD35EDW S TC	Soil temperature and volumetric water content											1		I
HD35EDW S/2 TC												2		I
HD35EDW S/3 TC												3		I
HD35EDW DP TC						Level(*)		•				1+ cable gland		P
HD35EDW 1NI2 TCV	•				•		Lux					1	T / RH	R
HD35EDW 1NB…TV	•				•					•			•	S
HD35EDW 1NB…I…TCV	•				•		Lux			•		1	T/RH/ CO₂	T
HD35EDW 1NB…F TCV	•				•		PAR			•		1	T/RH/ CO₂	T
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 Pt100/Pt1000 sensors, thermocouples K, J, T, N, E Sensors with voltage-free contact or potentiometric output											4 terminal header inputs		N
HD35EDW-MB	Sensors with RS485 MODBUS-RTU output Sensors with voltage-free contact output											2 terminal header inputs		N

(*) Measurement of pressure relative to the atmosphere for the calculation of a fluid level (e.g. water).

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

M12 connectors
(from 1 to 3
depending
on the model)

Fixed vertical
RH and/or T probe

Standard
TC connectors

Cable glands

USB

Alarm
reset button

Power supply and
contact alarm
output

M12
connector

M12
connector

Cable gland

M12
connector

Fixed
vertical
RH/T probe

Power
supply
cable
gland

Fixed
vertical
RH/T probe

CO_2
probe

Power
supply
cable
gland

M12
connector

Fixed
vertical
RH/T probe

CO_2
probe
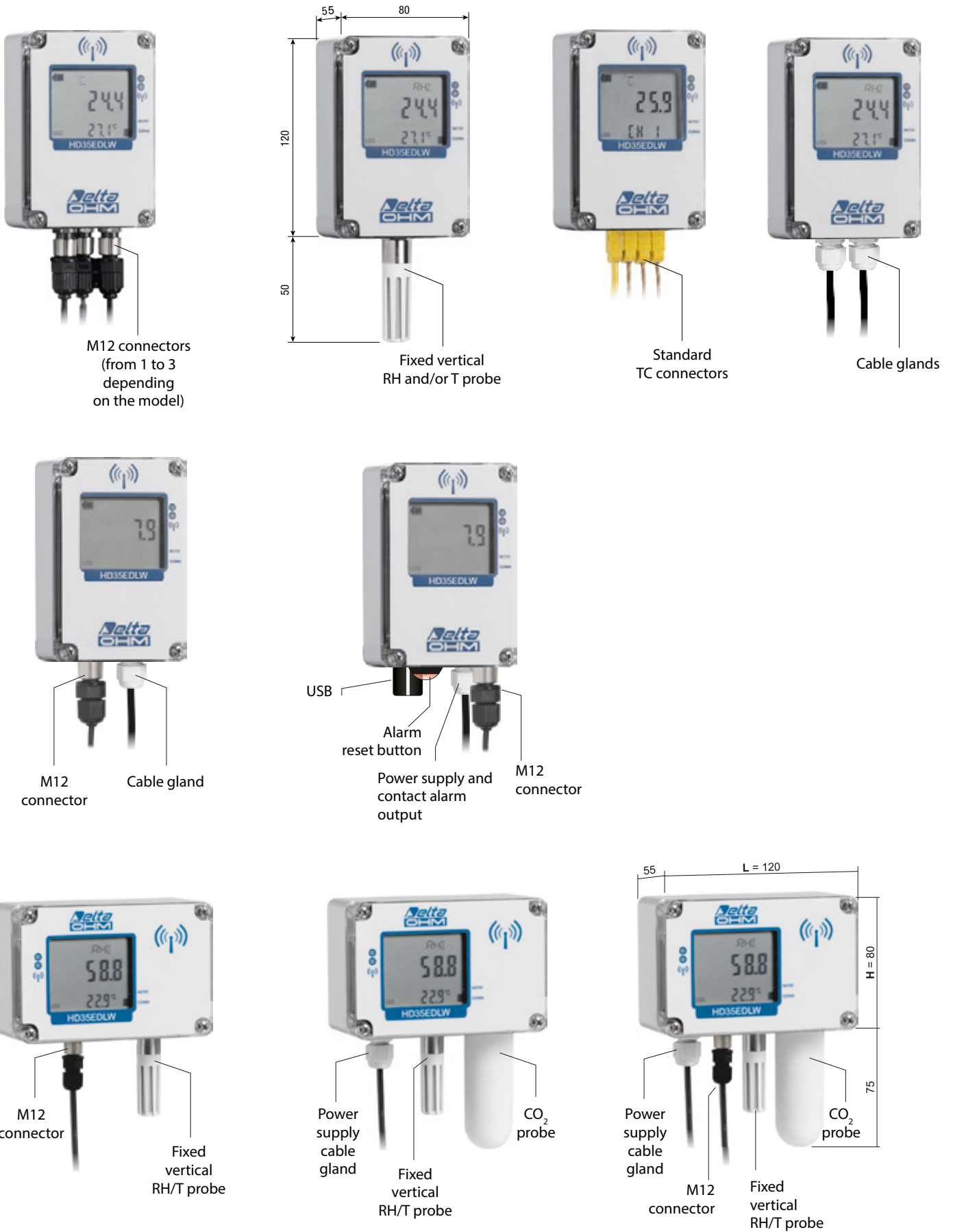
Technical specifications

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	Internal (default). On request, external fixed or with 3 m cable.
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. 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 A (size C for HD35EDWK/4TC, HD35EDWS/xTC and HD35EDWH), Molex 5264 2-pole connector. Optional 24 Vac/dc power supply. 7…30 Vdc external power supply (without internal battery) for HD35EDWPTC-ALM, HD35EDW-MB and the models with CO$_2$ probe.
Battery autonomy (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); 2 years typical for the other models, with 5 s measurement interval (10 s for HD35EDW7P/...TC, HD35EDW14bNTC, HD35EDW14b7PTC and 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
Housing	Material: Polycarbonate Dimensions: see table 6B Protection degree: IP 67 (IP65 for the models with CO$_2$ sensor)
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**, for versions L=80 mm, H=120 mm). **Optional** protection shield from solar radiations.

Versions without LCD: **Versions with LCD:**
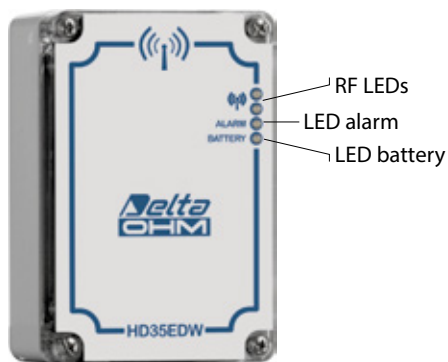
RF LEDs
LED alarm
LED battery

LCD   RF LEDs

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

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	1 s	T
HD35EDW 7P/2 TC	from 52,000 to 68,000	2 s [***]	T
HD35EDW 7P/3 TC	from 42,000 to 68,000	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	from 36,000 to 68,000	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, 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 RP TC	28,000	1 s	R, D_R, mV, P, D_P, I_P
HD35EDW P TC	36,000	1 s	P, D_P, I_P
HD35EDW NP TC	28,000	1 s	T, P, D_P, I_P
HD35EDW 1NP TC	22,000	1 s	T, RH, T_D, AH, 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, VWC
HD35EDW S/2 TC	36,000	1 s	T, VWC
HD35EDW S/3 TC	26,000	1 s	T, VWC
HD35EDW DP TC	28,000	1 s	F_L, P_{REL}, P, D_P, I_P
HD35EDW 1NI2 TCV	30,000	1 s	T, RH, T_D, AH, I
HD35EDW 1NB… TV	30,000	1 s [****]	T, RH, T_D, AH, CO_2
HD35EDW 1NB…I… TCV	26,000	1 s [****]	T, RH, T_D, AH, I, CO_2
HD35EDW 1NB…F TCV	26,000	1 s [****]	T, RH, T_D, AH, PAR, CO_2
HD35EDW WBGT	22,000	2 s	T, T_{NW}, T_G, RH, T_D, WBGT
HD35EDW H	from 28,000 to 58,000	5 s [***]	depends on the inputs configuration
HD35EDW-MB	from 14,000 to 52,000	1 s	depends on the sensors connected

[*] **List of the quantities:**

AH: absolute humidity
CO_2: carbon dioxide
D_P: daily rainfall quantity
D_R: daily solar radiation (Wh/m²)
F_L: fluid level
H_{LEAF}: leaf wetness
I: illuminance
I_P: rainfall rate (mm/h)
MR: mixing ratio
mV: pyranometer output in mV
P: rainfall quantity
PAR: Photosintetically Active Radiation

P_{ATM}: atmospheric pressure
P_{REL}: relative pressure
PVP: partial vapour pressure
R: solar radiation (pyranometer)
RH: relative humidity
T: temperature
T_D: dew point
T_G: globe thermometer temperature
T_{NW}: natural ventilation wet bulb temperature
T_W: wet bulb temperature
WBGT: WBGT index
VWC: soil volumetric water content

[**] 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).

[***] The minimum logging interval may be smaller if the data logger only stores some of the available quantities.

[****] CO_2 measurement is updated every 15 s.

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).
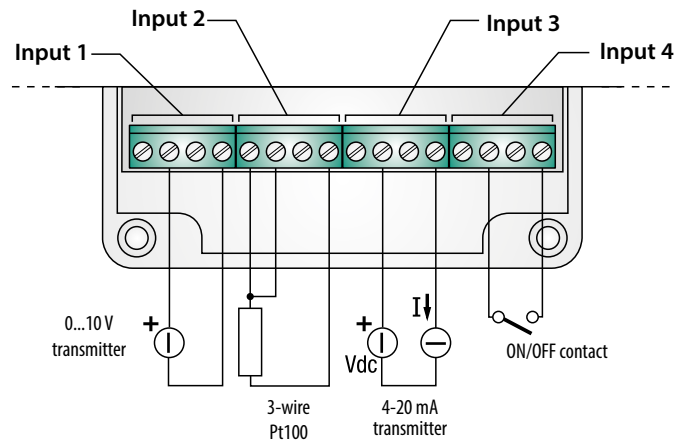
Example of connection of HD35EDWH model inputs

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

Version for weather stations (HD35EDM...TC)

An **IP67** waterproof version is available for meteorological applications, in a housing with front dimensions 120x122 mm. The 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;

It is also possible to connect only some of the probes.

Internal sensor for measuring the atmospheric pressure.

Calculated quantities (depending on the sensors available):
- – dew Point;
- – daily solar radiation in Wh/m^2 (Wh = watt-hour);
- – ainfall 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;

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	Internal (default). On request, external fixed or with 3 m cable.
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, 10 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 Dimensions: 120 x 122 x 56 mm (excluding antenna) 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**). **Optional** protection shield from solar radiations.
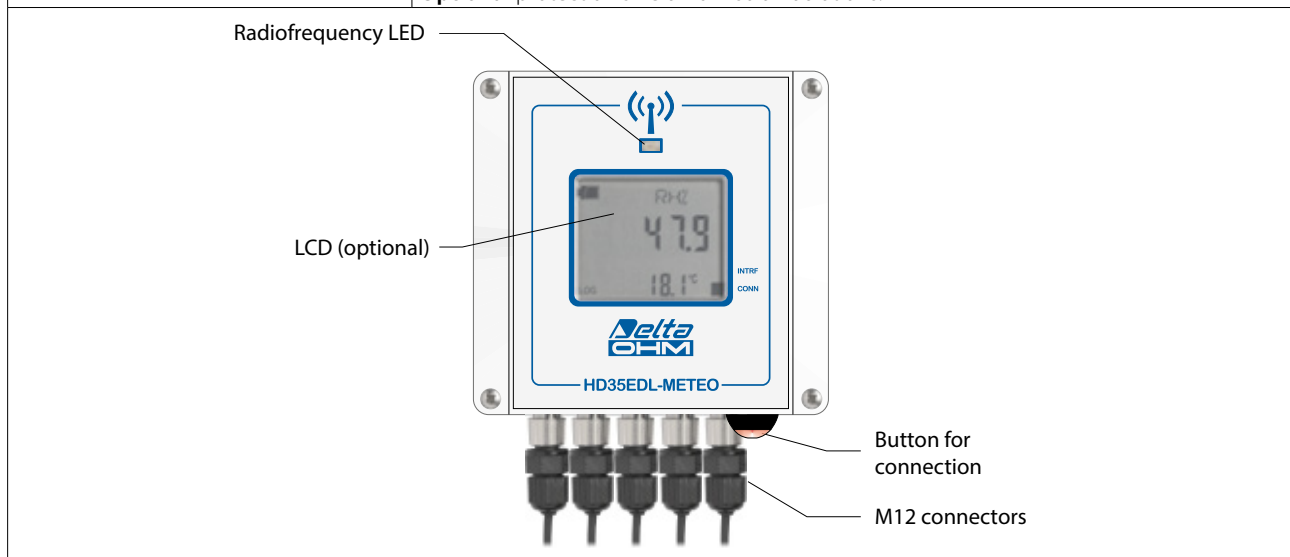
Radiofrequency LED

LCD (optional)

Button for connection

M12 connectors

HD35EDL-METEO

(*) 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	
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	
For HD35ED…TVI, HD35ED...B and HD35ED...AB 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 ±(0.2 – 0.05 * T) °C in the range T=-40…0 °C ±[0.2 + 0.032 * (T-60)] °C in the range T=+60…+105 °C
Stability	0.05 °C/year
Temperature - Pt100/Pt1000 sensor	
For HD35ED…7P…TC models	
Sensor	Pt100 / Pt1000 1/3 DIN thin film
Measuring range	-100…+350 °C max. for probes measuring only temperature
	(the measuring range can be limited by the operating temperature of the probe used)
	-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	
For HD35EDW…K…TC models	
Thermocouple type	K, J, T, N, E The inputs are isolated from each other (60 V insulation)
Measuring range	type K: -200…+1370 °C type J: -100…+750 °C type T: -200…+400 °C type N: -200…+1300 °C 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
	            ±0.2 °C (> 600 °C) type T: ±0.1 °C
	type N: ±0.1 °C (< 600 °C)
	            ±0.2 °C (> 600 °C)
	type E: ±0.1 °C (< 300 °C)
	            ±0.2 °C (> 300 °C)

Wet bulb temperature	
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
Probe reservoir capacity	15 cc (TP3501TC2) / 500 cc (TP3204)
Probe reservoir autonomy	96 hours @ 50 %RH and 23 °C (TP3501TC2) / 15 days @ 40 °C (TP3204)

Dry bulb temperature	
For the model HD35EDWWBGT	
Sensor	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	
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	
For HD35ED…TC and HD35ED…TV models	
Sensor	Capacitive
Measuring range	0…100 %RH
Resolution (of the instrument)	0.1 %
Accuracy	± 1.8 %RH (0…85 %RH) / ± 2.5 %RH (85…100 %RH) @ T=15…35 °C ± (2 + 1.5% measure)% @ T=remaining range
Sensor working temperature	-20…+80 °C standard -40…+150 °C with probe HP3517**E**…
Response time	T_{90} < 20 s (air speed = 2 m/s, without filter)
Stability	1%/year (in the whole temperature and RH range)
Relative humidity	
For HD35ED…TVI, HD35ED...B and HD35ED...AB models	
Sensor	Capacitive
Measuring range	0…100 %RH
Resolution (of the instrument)	0.1 %
Accuracy	± 2.5 %RH (0..85 %RH) / ± 3.5 %RH (85…100 %RH) @ T=23 °C
Temperature drift	0.05 %RH/K (0…60 °C)
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)
Stability	< 1%/year (@ 23 °C and 30…70 %RH)
Soil volumetric water content	
Measuring principle	Capacitive
Measuring range	0…60% VWC (Volumetric Water Content)
Resolution (of the instrument)	0.1%
Accuracy	± 3 % between 0 and 50% VWC (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 ± 1 hPa (300...1100 hPa) @ T=0...50°C
Stability	1 hPa/year
Temperature drift	±3 hPa between -20…+60 °C

Differential pressure					
Sensor	**range 1...4**: Piezoresistive **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. **range 5**: ± 3% of reading, ± 0.1 Pa @ 0 Pa 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 (CO2) – HD35ED… models for indoor	
Sensor	Non-Dispersive Infrared (NDIR)
Measuring range	0…5,000 ppm
Resolution (of the instrument)	1 ppm
Accuracy	± (50 ppm + 3% of the measure) @ 25 °C and 1013 hPa
Operating conditions	0…50 °C / 0…95%RH non-condensing / 950…1050 hPa
Response time	T_{90} < 120 s (air speed = 2 m/s)
Stability	5% of the measure/5 years (with autocalibration enabled)
Non-linearity	< 1% f.s.

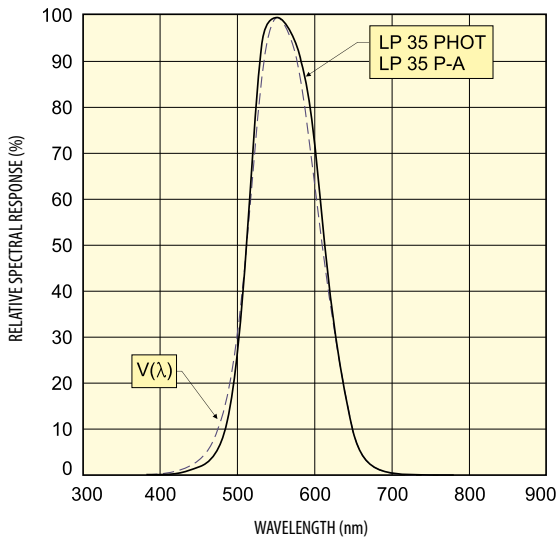| Carbon dioxide (CO2) – HD35EDW… models for outdoor	
Sensor	Non-Dispersive Infrared (NDIR)
Measuring range	**B**: 0…5,000 ppm **B2**: 0…10,000 ppm
Resolution (of the instrument)	1 ppm
Accuracy	**B**: ± (50 ppm + 3% of the measure) @ 25 °C and 1013 hPa **B2**: ± (100 ppm + 5% of the measure) @ 25 °C and 1013 hPa
Operating conditions	-20…60 °C / 0…95%RH non-condensing / 850…1100 hPa
Response time	T_{90} < 120 s (air speed = 2 m/s)
Stability	5% of the measure/5 years
Temperature drift	1 ppm/°C @ -20…45 °C

Product information Wireless data loggers

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°
Resolution (of the instrument)	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.	
Level	
Sensor	Sensor of pressure relative to the atmosphere
Pressure measuring range	0…1 bar
Level measuring range	Depends on the fluid density (configurable via software) For water: 0…10 m approx.
Resolution (of the instrument)	1 hPa / 0,01 m (for water)
Accuracy	± 0.8% f.s. @ 25 °C
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.	
Illuminance	
Sensor	Photodiode
Measuring range	**I**: 0…20,000 lux **I2**: 0…200,000 lux
Resolution (of the instrument)	**I**: 1 lux (0…2,000 lux), 10 lux (>2,000 lux) **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

Product information Wireless data loggers

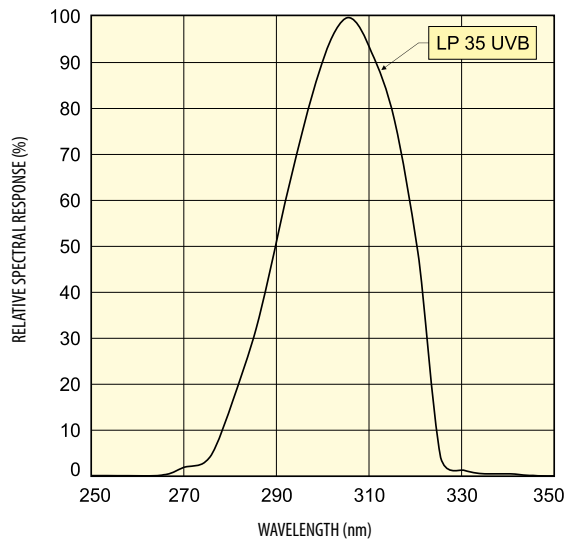| UVA irradiance	
Sensor	Photodiode
Measuring range	0…10,000 mW/m^2
Resolution (of the instrument)	1 mW/m^2 (0...2,000 mW/m^2) / 5 mW/m^2 (> 2,000... mW/m^2)
Spectral range	UVA, peak $\cong$ 360 nm
Spectral response	See graph 2
Calibration uncertainty	<5%
f_2 (response according to the cosine law)	<6%
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 $\cong$ 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 $\cong$ 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
PAR (Photosynthetically Active Radiation)	
Sensor	Photodiode
Measuring range	0…5000 µmol m^{-2} s^{-1}
Resolution (instrument)	0.2 µmol m^{-2} s^{-1} (0…500 µmol m^{-2} s^{-1}), 2 µmol m^{-2} s^{-1} (>500 µmol m^{-2} s^{-1})
Spectral range	400…700 nm
Calibration uncertainty	<5%
f_2 (response as cosine law)	<6%
f_3 (linearity)	<1%
f_4 (instrument reading error)	± 1 digit
f_5 (fatigue)	<0.5%
One year drift	<1%
Operating temperature	0…50 °C

Graph 1 Relative spectral response of the illuminance sensor

Graph 2 Relative spectral response of the UVA irradiance sensor
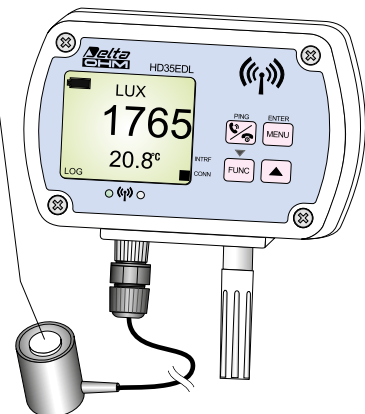

Graph 3 Relative spectral response of the UVB irradiance sensor

Graph 4 Relative spectral response of the UVC irradiance sensor

Illuminance and UVA sensor

LP BL3 jointed support

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

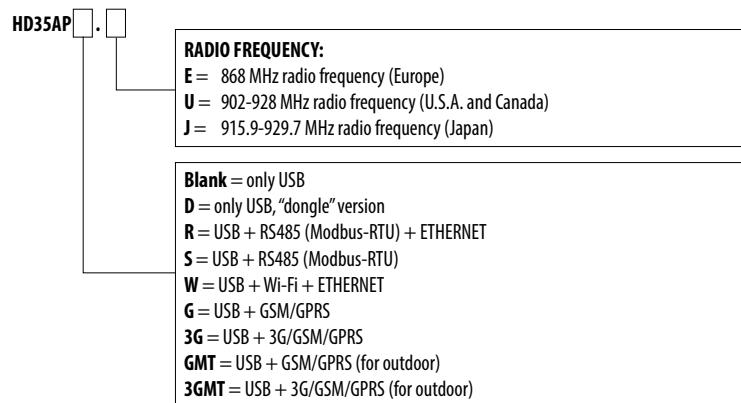| Pt100 / Pt1000	
Measuring range	-200…+650 °C
Resolution	0.1 °C
Accuracy	± 0.1 °C (excluding probe error)
Sensor coefficient	α=0.00385 °C^{-1}
Connection	2, 3 or 4 wires
Thermocouple	
Thermocouple type	K, J, T, N, E. The inputs are not isolated, **use thermocouples with isolated hot junction**.
Measuring range	type K: -200…+1370 °C type J: -100…+750 °C type T: -200…+400 °C type N: -200…+1300 °C 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
	             ±0.2 °C (> 600 °C) type T: ±0.1 °C
	type N: ±0.1 °C (< 600 °C)
	             ±0.2 °C (> 600 °C)
	type E: ±0.1 °C (< 300 °C)
	             ±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 bits
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. Depending on the model, in addition to the USB output is available: RS485 output with MODBUS-RTU protocol, Wi-Fi interface, Ethernet connection, GSM/GPRS/3G module. Powered by the PC USB port or external power adapter **SWD06** (**optional**, not for HD35APD, HD35APR, HD35APGMT and HD35AP3GMT) or solar panel (only HD35APGMT and HD35AP3GMT). It includes **HD35AP-S basic** software downloadable from Delta OHM web site. The unit is supplied with: **HD35-BAT1** lithium-ion (not for HD35APD, HD35APR, HD35APGMT and HD35AP3GMT) or 12 V lead-acid (only HD35APGMT and HD35AP3GMT) internal rechargeable battery, wall mount support **HD35.03** (not for HD35APD, HD35APR, HD35AP-GMT and HD35AP3GMT), operating manual.

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

The serial cable **CP31**, the external power adapter **SWD06** and the kit **HD35.11K** (pair of flanges, pin for padlock and padlock) for fixed installation **have to be ordered separately**.

HD35APD HD35APG and HD35APGMT 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)

Blank = only USB
D = only USB, "dongle" version
R = USB + RS485 (Modbus-RTU) + ETHERNET
S = USB + RS485 (Modbus-RTU)
W = USB + Wi-Fi + ETHERNET
G = USB + GSM/GPRS
3G = USB + 3G/GSM/GPRS
GMT = USB + GSM/GPRS (for outdoor)
3GMT = USB + 3G/GSM/GPRS (for outdoor)
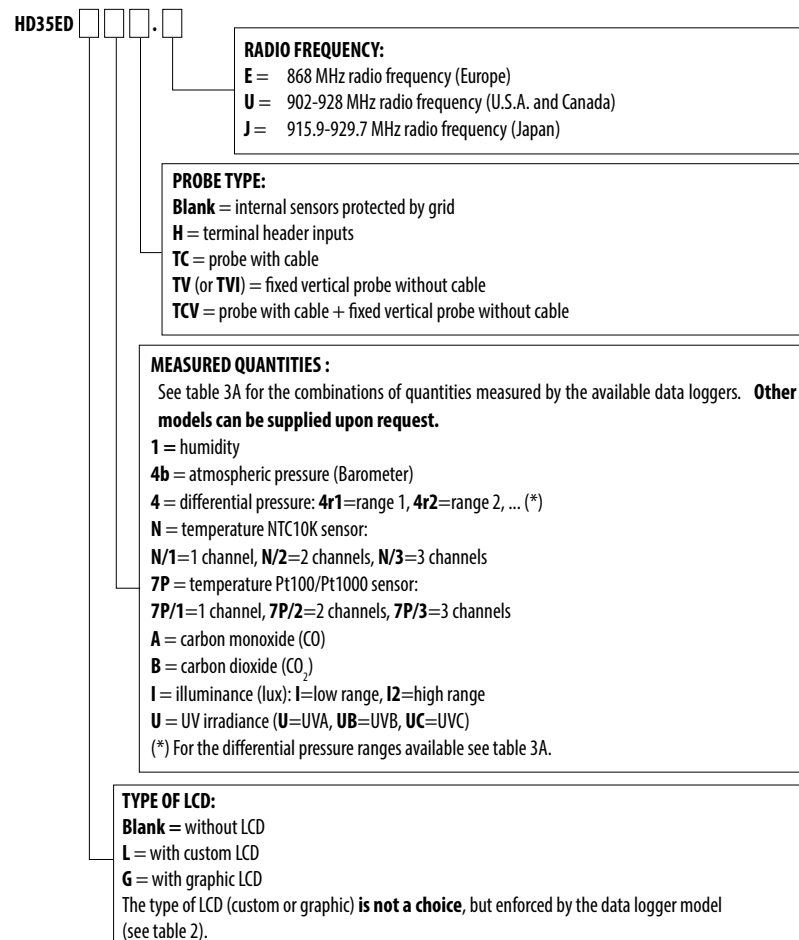
Data loggers

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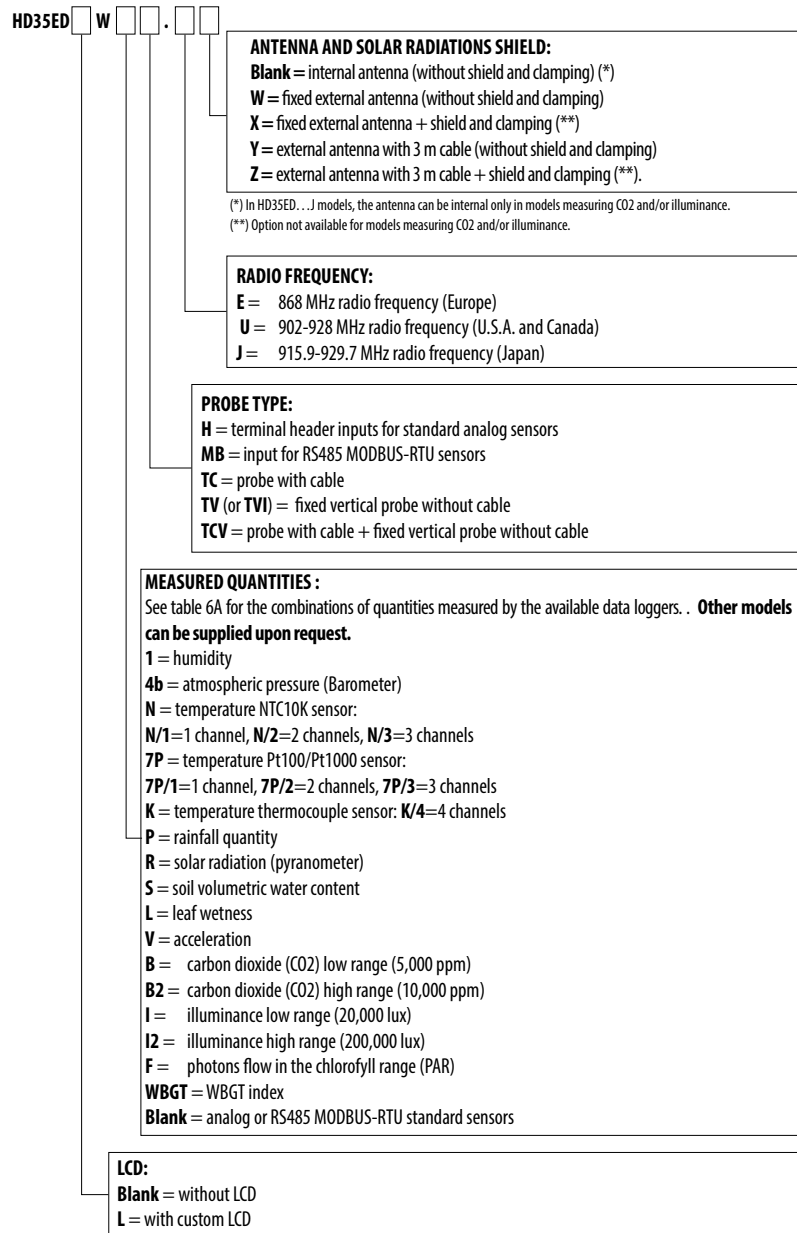
The kit **HD35.11K** (pair of flanges, pin for padlock and padlock) for the fixed installation of the housing for indoor use **has to be ordered separately**.

The external probes have to be ordered separately.

Data loggers in 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 (or **TVI**) = fixed vertical probe without cable
TCV = probe with cable + 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 (CO$_2$)
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).

Data loggers in waterproof 120 x 80 mm housing for outdoor use

HD35ED ☐ W ☐☐ . ☐☐

ANTENNA AND SOLAR RADIATIONS SHIELD:
Blank = internal antenna (without shield and clamping) (*)
W = fixed external antenna (without shield and clamping)
X = fixed external antenna + shield and clamping (**)
Y = external antenna with 3 m cable (without shield and clamping)
Z = external antenna with 3 m cable + shield and clamping (**).

(*) In HD35ED…J models, the antenna can be internal only in models measuring CO2 and/or illuminance.
(**) Option not available for models measuring CO2 and/or illuminance.

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 for standard analog sensors
MB = input for RS485 MODBUS-RTU sensors
TC = probe with cable
TV (or **TVI**) = fixed vertical probe without cable
TCV = probe with cable + 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 volumetric water content
L = leaf wetness
V = acceleration
B = carbon dioxide (CO2) low range (5,000 ppm)
B2 = carbon dioxide (CO2) high range (10,000 ppm)
I = illuminance low range (20,000 lux)
I2 = illuminance high range (200,000 lux)
F = photons flow in the chlorofyll range (PAR)
WBGT = WBGT index
Blank = analog or RS485 MODBUS-RTU standard sensors

LCD:
Blank = without LCD
L = with custom LCD

Data loggers in waterproof 120 x 122 mm housing for outdoor use

HD35EDM ☐ MTC . ☐ ☐

ANTENNA AND SOLAR RADIATIONS SHIELD:
Blank = internal antenna (without shield and clamping)
W = fixed external antenna (without shield and clamping)
X = fixed external antenna + shield and clamping
Y = external antenna with 3 m cable (without shield and clamping)
Z = external antenna with 3 m cable + shield and clamping

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)

LCD:
Blank = without LCD
L = with custom LCD

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 **CP31**, the external power adapter **SWD06** 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 flange **HD35.24W** for fixing to the wall **has to be ordered separately**.

HD35RE ☐ . ☐ ☐

ANTENNA AND SOLAR RADIATIONS SHIELD (only HD35REW):
W = fixed external antenna (without shield and clamping)
X = fixed external antenna + shield and clamping
Y = external antenna with 3 m cable (without shield and clamping)
Z = external antenna with 3 m cable + shield and clamping

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

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)
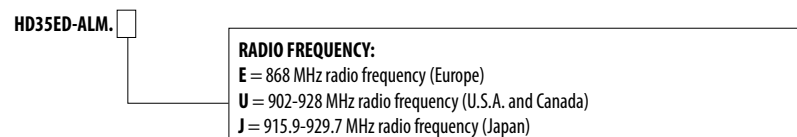
Temperature and relative humidity combined probes

HP3517…   Temperature and relative humidity combined probe.

TC1: L = 135
TC2: L = 150 (AISI 304)
TC3: L = 335
Ø14
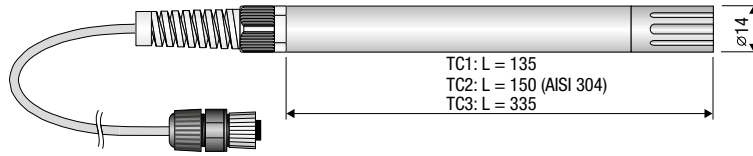
R.H. sensor	Capacitive
Temperature sensor	NTC 10 kΩ @ 25 °C (HP3517TC…) Pt100 1/3 DIN (HP3517**E**TC…)
R.H. sensor measuring range	0…100 %RH
Temperature sensor measuring range	-40…+105 °C (HP3517TC… with NTC 10 kΩ sensor) -40…+150 °C (HP3517ETC… with Pt100 sensor)
R.H. sensor operating range	-20…+80 °C standard -40…+150 °C with option **E**
Accuracy	± 1.8 %RH (0…85 %RH) / ± 2.5 %RH (85…100 %RH) @ T=15…35 °C ± (2 + 1.5 % measure)% @ T=remaining range
Cable length	2, 5 or 10 m standard
Connection	4-pole (HP3517TC…) or 8-pole (HP3517**E**TC…) M12 female connector
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.

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
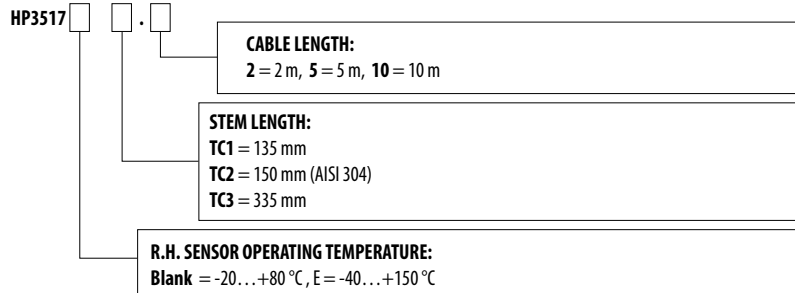
Pt100 and Pt1000 temperature probes

TP35.1…   4-wire 1/3 DIN **Pt1000** temperature probe.

50
Ø6
…/C

Temperature range	-50…+105 °C
Accuracy	1/3 DIN
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

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.
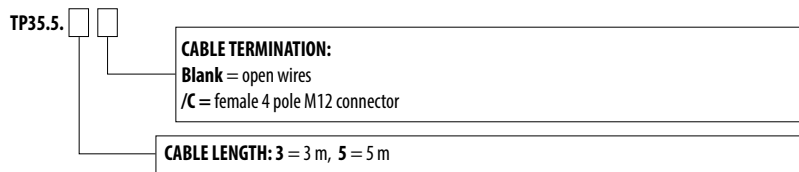

…/C

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, **10** = 10 m
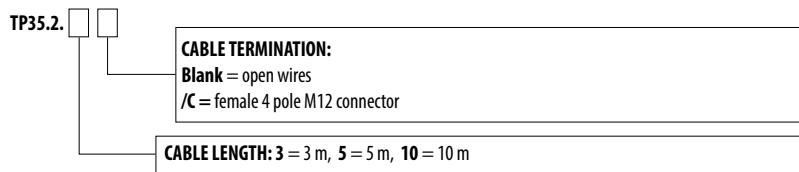
TP35.4…   4-wire 1/3 DIN **Pt100** temperature probe.

…/C

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

Product information Wireless data loggers

TP35.5... 3-wire 1/3 DIN **Pt1000** penetration temperature probe.
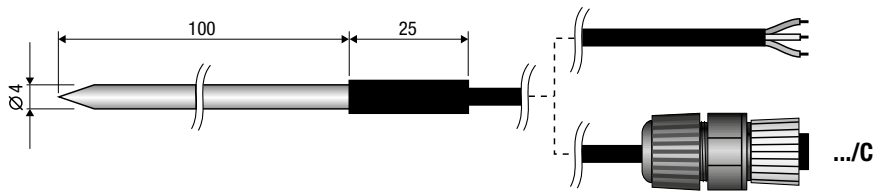
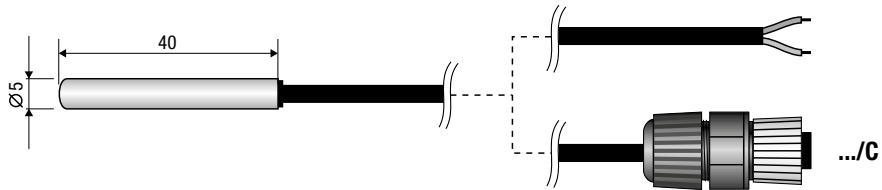|	
Temperature range	-40…+300 °C
Accuracy	1/3 DIN
Dimensions	Ø 4 x 100 mm
Cable length	3 or 5 m standard, **other lengths on request**
Connection	Open wires or 4-pole M12 female connector (option **/C**)
Material	AISI 316 stainless steel tube

TP35.5.☐☐

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

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

TP472I...   Wire wound 4-wire **Pt100** temperature probe.

Temperature range	-196…+500 °C
Dimensions	Ø 3 x 300 mm
Cable length	2 m
Connection	Open wires (option **/W**) or 4-pole M12 female connector (option **/C**)
Material	AISI 316 stainless steel tube

TP472I☐

CABLE TERMINATION:
Blank = open wires
/C = female 4 pole M12 connector
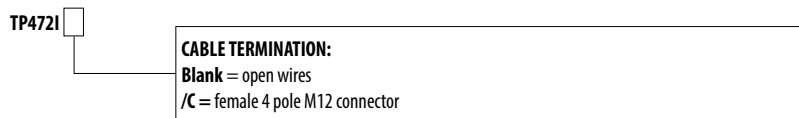
TP35878ISS...   1/3 DIN **Pt100** contact temperature probe for solar panel.

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: 3 = 3 m, **5** = 5 m, **10** = 10 m
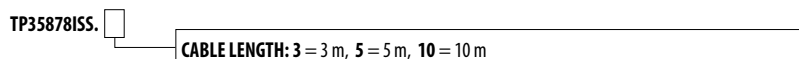
TP35.5AF.5…   4-wire class A wire wound **Pt100** temperature probe.

.../C
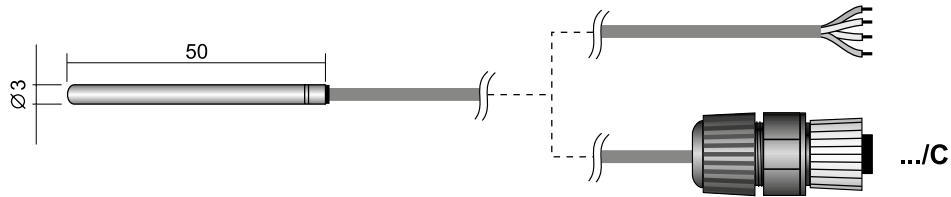
Temperature range	-110…+180 ℃
Accuracy	Class A
Dimensions	Ø 3 x 50 mm
Cable length	5 m standard, **other lengths on request**
	Shield: Inox + PTFE
Connection	Open wires or 4-pole M12 female connector (option **/C**)
Material	AISI 316 stainless steel tube

TP35.5AF.5☐

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

TP35.5AF1.2…   4-wire class A wire wound **Pt100** temperature probe.

.../C
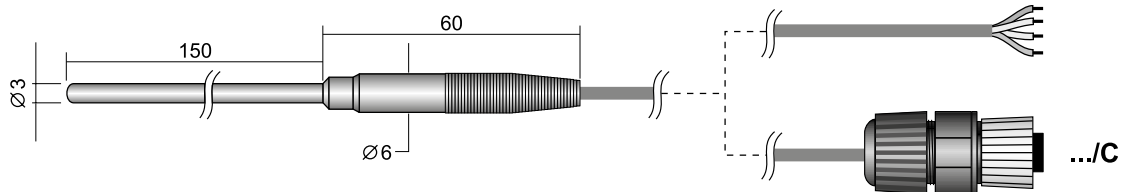
Temperature range	-110…+180 ℃
Accuracy	Class A
Dimensions	Ø 3 x 150 mm
Cable length	2 m standard, **other lengths on request**
	Shield: Inox + PTFE
Connection	Open wires or 4-pole M12 female connector (option **/C**)
Material	AISI 316 stainless steel tube

TP35.5AF1.2☐

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

Note: the temperature only probes with Pt100/Pt1000 sensor and 4-pole M12 connector can not be connected to the input for HP3517ETC… temperature and relative humidity combined probes with 8-pole M12 connector.

NTC 10KW @ 25 °C temperature probes

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

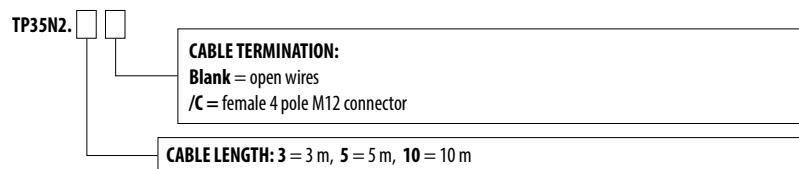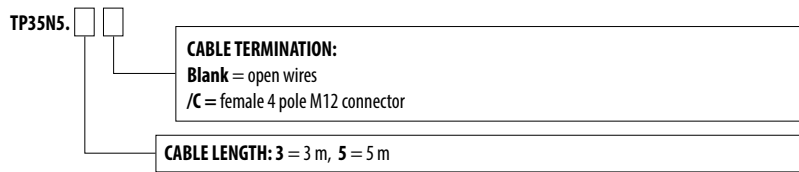|	
Temperature range	-20…+75 °C
Accuracy	±0.3 °C in the range 0…+70 °C / ±0.4 °C outside
Dimensions	Ø 5 x 40 mm
Cable length	3, 5 or 10 m standard, **other lengths on request**
Connection	Open wires or 4-pole M12 female connector (option **/C**)
Material	AISI 316 stainless steel tube

TP35N1.

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

CABLE LENGTH: **3** = 3 m, **5** = 5 m, **10** = 10 m
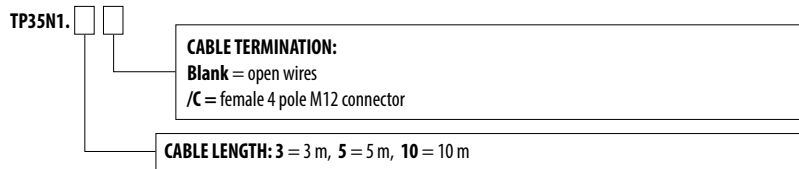
TP35N2…   **NTC 10KΩ @ 25 °C** temperature probe.
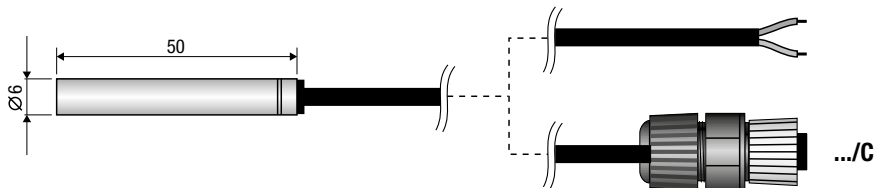
Temperature range	0…+75 °C
Accuracy	±0.3 °C
Dimensions	Ø 6 x 50 mm
Cable length	3, 5 or 10 m standard, **other lengths on request**
Connection	Open wires or 4-pole M12 female connector (option **/C**)
Material	AISI 316 stainless steel tube

TP35N2.

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

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

Product information Wireless data loggers

TP35N5…   **NTC 10KΩ @ 25 °C** penetration temperature probe.
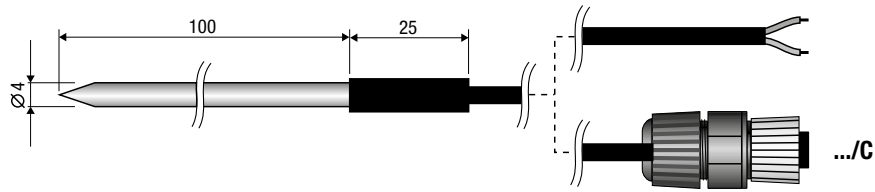
Temperature range	-20…+105 °C
Accuracy	±0.3 °C in the range 0…+70 °C / ±0.4 °C outside
Dimensions	Ø 4 x 100 mm
Cable length	3 or 5 m standard, **other lengths on request**
Connection	Open wires or 4-pole M12 female connector (option **/C**)
Material	AISI 316 stainless steel tube

TP35N5.☐☐

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

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

TP35N6…   **NTC 10KΩ @ 25 °C** environmental temperature probe, wall mounting.
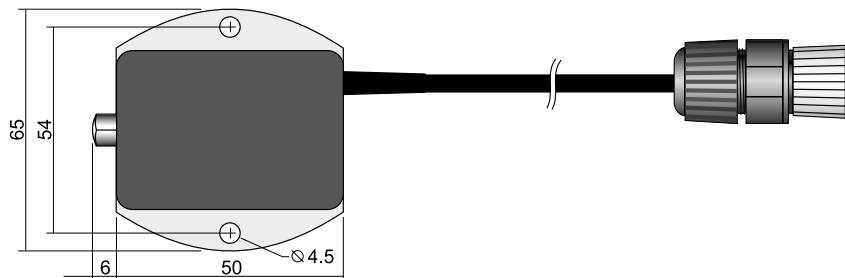
Temperature range	-20…+70 °C
Accuracy	±0.3 °C in the range 0…+70 °C / ±0.4 °C outside
Dimensions	56 x 65 x 20 mm (with the flange)
Cable length	5, 10, 15 or 20 m standard, **other lengths on request**
Connection	4-pole M12 female connector
Material	Plastic body, aluminum flange

TP35N6.☐ **/C**

CABLE LENGTH: 5 = 5 m, **10** = 10 m, **15** = 15 m, **20** = 20 m
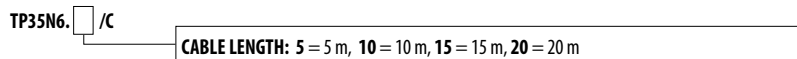
Product information Wireless data loggers

TP350N…   **NTC 10KΩ @ 25 °C** environmental temperature probe.

TC1: L = 135
TC2: L = 150 (AISI 304)
TC3: L = 335

Ø 14
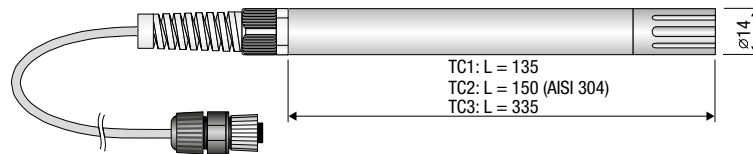
Temperature range	-40…+105 °C
Accuracy	±0.3 °C in the range 0…+70 °C / ±0.4 °C outside
Dimensions	Ø 14, L=135 mm (TC1) / 150 mm (TC2) / 335 mm (TC3)
Cable length	2, 5 or 10 m standard
Connection	4-pole M12 female connector
Material	Pocan (TC1 and TC3) or AISI 304 (TC2)

TP350N ☐ . ☐

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

STEM LENGTH:
TC1 = 135 mm
TC2 = 150 mm (AISI 304)
TC2 = 335 mm
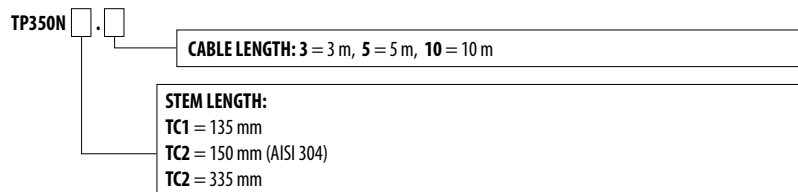
Thermocouple temperature probes

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

150   20   Ø 3
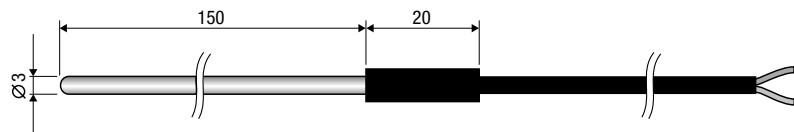
Max. temperature	-50…+750 °C
Accuracy	Class 1 according to IEC 60584-2
Dimensions	Ø 3 x 150 mm
Cable length	5 m standard, **other lengths on request**
Connection	Open wires
Material	AISI 316 stainless steel tube

Probes for WBGT measurement

TP3501TC2	Natural ventilation wet bulb probe. Pt100 sensor. Probe stem probe: Ø 14 mm, length 110 mm. 2 m cable with 4-pole M12 connector. Complete with two spare cotton wicks and 50 cc distilled water container.
TP3204	Natural ventilation wet bulb probe for long-lasting measurements. Capacity: 500 cc of distilled water. Pt100 sensor. 2 m cable with 4-pole M12 connector. Complete with 500 cc bottle and two spare cotton wicks.
TP3575TC2	Pt100 sensor globe-thermometer temperature probe, globe Ø 150 mm. Stem: Ø 14 mm, length 110 mm. 2 m cable with 4-pole M12 connector.
TP3576TC2	Pt100 sensor globe-thermometer temperature probe, globe Ø 50 mm. Stem: Ø 8 mm, length 170 mm. 2 m cable with 4-pole M12 connector.
TP3507TC2	Temperature probe. Pt100 1/3 DIN sensor. Probe stem: Ø 14 mm, length 140 mm. 2 m cable with 4-pole M12 connector.
HD32.2.7.1	Holder for probes, to be fixed on the tripod.
VTRAP30	Tripod, maximum height 280 mm.
HD9007A-3	6-ring protection from solar radiations for the HP3517ETC2… probe.
HD9007T26.2	Fitting for Ø 14 mm probes for the HD9007A-3 protection from solar radiations.
HD32.4.17	Bracket for fixing the WBGT measurement system to a wall or a mast.
HD2013.2.14	3-sector clamping for mast Ø 40 mm with 6 inputs Ø 16 mm.
HD3218K	Clamp shaft for fixing a probe to the HD2013.2.14 flange.

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 5 m.

LP 35 PHOT03BL   Photometric probe for measuring illuminance, CIE photopic filter, spectral response according to the standard photopic curve, diffuser for cosine correction, K5 dome. Measuring range: 0.1…200,000 lux. **The cable (CPM12 AA5…D) has to be ordered separately.**

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 5 m.

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 5 m.

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 5 m.

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 5 m.

LP 35 PAR   Radiometric probe for measuring **photons flow** in the field of photosynthesis of chlorophyll (PAR). Cosine correction. Measuring range 0...5000 µmol m^{-2}s^{-1}. Cable length 5 m. M12 connector.

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.**

LP SILICON-PYRA 04   Pyranometer with silicon photodiode for measuring the **global solar irradiance**, diffuser for cosine correction. Spectral range 350...1100 nm. Typical sensitivity: 10 **µ**V/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 ℃… +60 ℃. 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 ℃…+60 ℃. 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 ℃… +60 ℃. 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 ℃…+60 ℃. 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

HP3501.5   Leaf wetness sensor with double sensitive surface. IP 67 protection degree. 5 m cable ending with M12 connector.

HP3501.10   Leaf wetness sensor with double sensitive surface. IP 67 protection degree. 10 m cable ending with M12 connector.
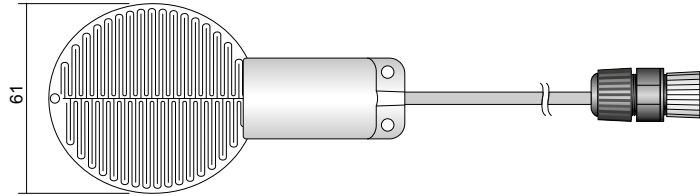
Soil volumetric water content sensors

HP3510.1.5   2-electrode probe for measuring the soil volumetric water content. With integrated NTC 10 kΩ temperature sensor. M12 connector. 5 m cable.

HP3510.1.10   2-electrode probe for measuring the soil volumetric water content. With integrated NTC 10 kΩ temperature sensor. M12 connector. 10 m cable.
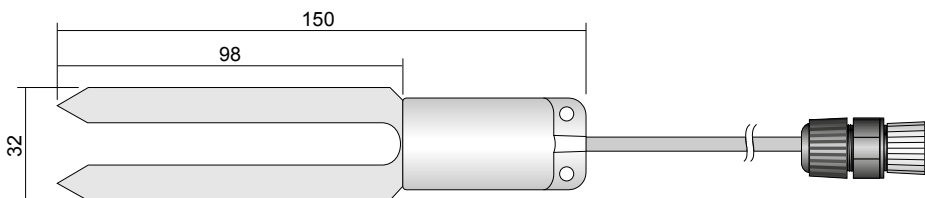
HP3510.2.5   3-electrode probe for measuring the soil volumetric water content in restricted volumes. With integrated NTC 10 kΩ temperature sensor. M12 connector. 5 m cable.

HP3510.2.10   3-electrode probe for measuring the soil volumetric water content in restricted volumes. With integrated NTC 10 kΩ temperature sensor. M12 connector. 10 m cable.
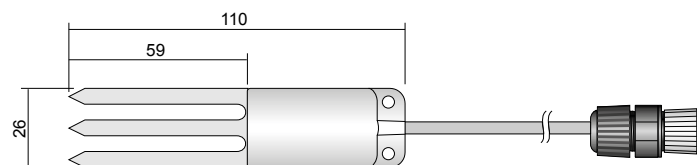
Wind speed and direction sensors

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.

Level sensors

HP712   Stainless steel level sensor. Measuring principle: detection of the pressure relative to the atmosphere. Measuring range 0…1 bar. Maximum overpressure 4.5 bar. Operating temperature -20…+80 °C. Protection degree IP 68. Resolution 0.1% f.s. Accuracy ± 0.8% f.s. @ 25 °C. Cable ended with open wires.

Ø 23.4

~116
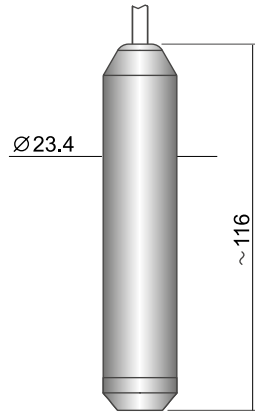
Accessories

HD35AP-S   CD-ROM with HD35AP-S basic software for the system configuration, the real time viewing of the measures and the data download in the database. For Windows® operating systems.

HD35AP-CFR21   Advanced version of the HD35AP-S software including, **in addition to the features of the basic software**, the management of the data logging system in accordance with the **FDA 21 CFR part 11 recommendations**. For Windows® operating systems.

CP31   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.

CPM12-8D.2   Cable with 8-pole M12 connector on one side, free wires on the other. Length 2 m. For RS485 connection of HD35APS base unit.

CPM12-8D.5   Cable with 8-pole M12 connector on one side, free wires on the other. Length 5 m. For RS485 connection of HD35APS base unit.

CPM12-8D.10   Cable with 8-pole M12 connector on one side, free wires on the other. Length 10 m. For RS485 connection of HD35APS base unit.

CPM12 AA4.2   Cable with 4-pole M12 connector on one side, free wires on the other. Length 2 m.

CPM12 AA4.5   Cable with 4-pole M12 connector on one side, free wires on the other. Length 5 m.

CPM12 AA4.10   Cable with 4-pole M12 connector on one side, free wires on the other. Length 10 m.

CPM12 AA4.20   Cable with 4-pole M12 connector on one side, free wires on the other. Length 20 m.

CPM12 AA4.2D   Cable with 4-pole M12 connector on both sides. Length 2 m.

CPM12 AA4.5D   Cable with 4-pole M12 connector on both sides. Length 5 m.

CPM12 AA4.10D   Cable with 4-pole M12 connector on both sides. Length 10 m.

CPM12 AA4.20D   Cable with 4-pole M12 connector on both sides. Length 20 m.

CPM12 AA5.2D   Cable with 5-pole M12 connector on both sides. Length 2 m.

CPM12 AA5.5D   Cable with 5-pole M12 connector on both sides. Length 5 m.

CPM12 AA5.10D   Cable with 5-pole M12 connector on both sides. Length 10 m.

CPM12 AA5.20D   Cable with 5-pole M12 connector on both sides. Length 20 m.

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.

Product information Wireless data loggers

HD35.11K	Pair of flanges made of anodized aluminum 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 in anodized aluminum alloy for fixing to the wall the models HD35EDW... in waterproof housing (versions L=80 mm, H=120 mm).
HD35.24C	Kit including the HD35.24W flange and a clamp for fixing the flange to a ∅ 40…50 mm mast.
HD35.37	Pair of flanges in anodized aluminum alloy for fixing to the wall the models HD35EDW... in waterproof housing (versions L=120 mm, H=80 mm).
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 A, 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, HD35EDWS/xTC, HD35EDWH and HD35EDLM…TC.
HD2003.71	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. Max. height 2 m.
HD2005.20.1	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. Max. height 3 m.
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.
HD31.B3A	Adapter for the calibration of the CO_2 sensor with the can. Only for the models HD35EDW... in waterproof housing.