

OPERATING MANUAL

HD50R-MB

Ethernet data logger



EN
V2.0



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1 Introduction

The HD50R-MB data logger allows several physical quantities to be monitored in a large variety of application fields.

To the “Master” **RS485 MODBUS-RTU** input you can connect a network of sensors for measuring, for example, temperature, humidity, atmospheric pressure, solar radiation, wind speed and direction, etc.

A voltage-free contact input allows connecting a rain gauge with contact output. The data logger calculates the rainfall rate in mm/h (by referring the rainfall quantity in the last five minutes to an hourly value) and the rainfall quantity in the last day.

The data logger can be connected to an **Ethernet** local network and allows the simultaneous operation of two communication protocols: proprietary and **Modbus TCP/IP**. The data logger manages up to 10 “TCP/IP Client” simultaneously. If the local network is connected to Internet, the data can be regularly sent to an **FTP** address, to the **Cloud** and via **e-mail**.

For each detected quantity, two alarm thresholds can be set by the user. Exceeding a threshold is signaled acoustically, by means of the internal buzzer, and remotely, by sending alarm **e-mails**. An alarm hysteresis and a delay in the generation of the alarm can be configured for each detected quantity.

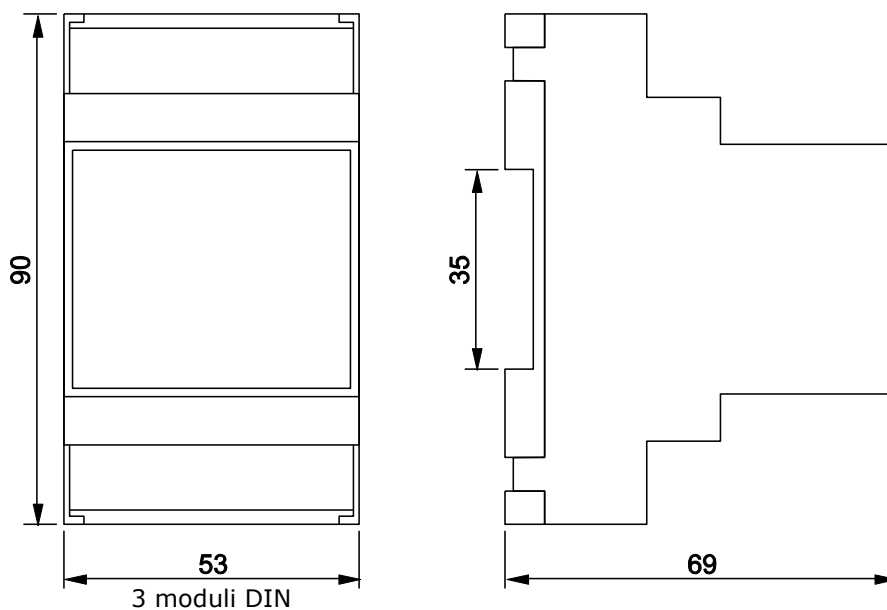
The PC software **HD35AP-S** allows configuring the data logger, viewing the real time measurements, downloading and viewing the data into a database. The HD35AP-S software allows connecting one data logger at a time. If there are several data loggers in the local network, the PC software **HDServer1** allows detecting automatically all the data loggers connected to the network and connecting simultaneously to all the data loggers; it also allows entering the data received by the data loggers into a database, viewing the data in the database and configuring the main measurement parameters of the devices (alarms, logging interval, ...). The **HD35AP-CFR21** software option (available with both HD35AP-S and HDServer1) allows the protection of recorded data and configuration in response to **FDA 21 CFR part 11** recommendations.

35 mm DIN rail installation.

2 Technical specifications

Measuring interval (*)	1, 2, 5, 10, 15, 30 s / 1, 2, 5, 10, 15, 30, 60 min
Logging interval (*)	1, 2, 5, 10, 15, 30 s / 1, 2, 5, 10, 15, 30, 60 min
Internal memory	Circular management or stop logging if memory is full. Number of storable samples from 259,000 a 890,500 depending on the number of acquired quantities.
Interfaces	Ethernet (RJ45 connector) with proprietary TCP/IP or Modbus TCP/IP protocol USB (mini-USB connector) Master RS485 Modbus-RTU (for acquiring the sensors)
Alarm	Acoustic by means of the internal buzzer and sending of e-mails
Power supply	External 7...30 Vdc
Consumption	40 mA @ 24 Vdc
LED indicators	Power supply and LAN connection
Operating conditions	-10...+60 °C / 0...85 %RH non-condensing
Housing	PC+ABS
Weight	200 g approx.
Installation	35 mm DIN rail

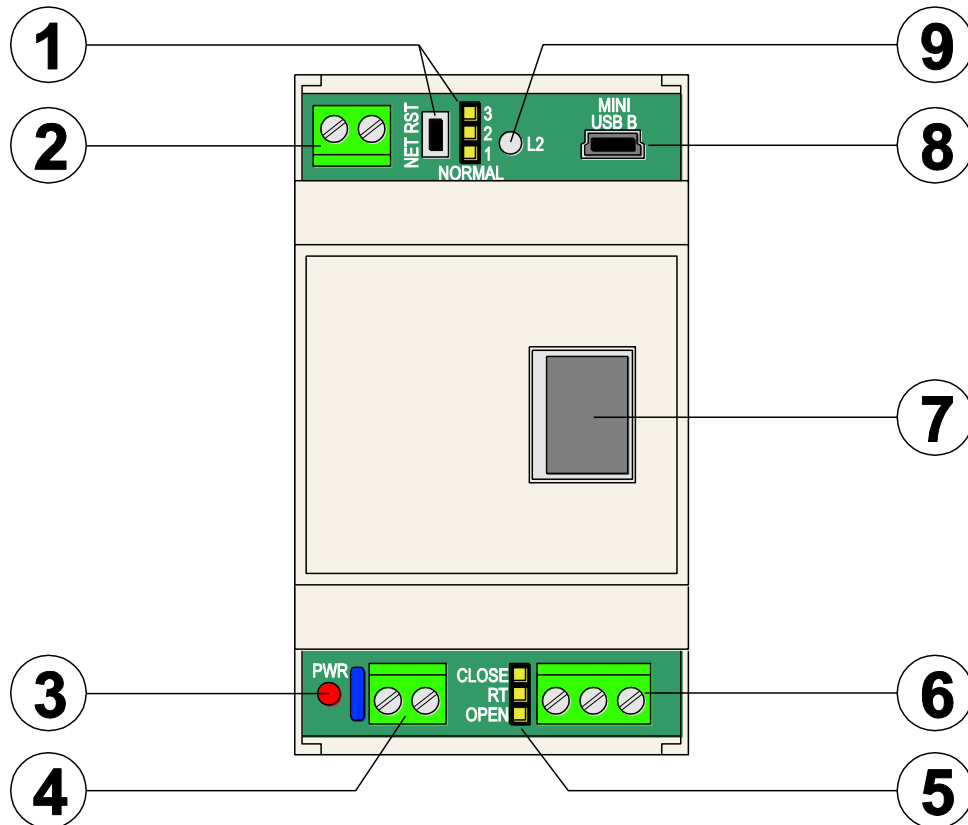
Dimensions (mm)



(*) The minimum interval may be greater than 1 s if the instrument acquires several sensors.

The measurement characteristics depend on the sensors connected.

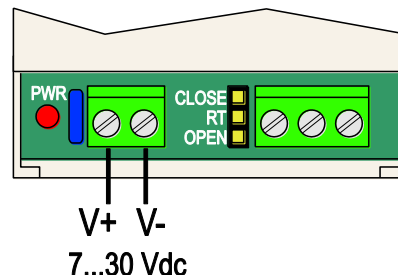
3 Description



1. Push-button and short-jumper for restoring the factory LAN configuration.
2. Input for contact rain gauge.
3. Red POWER LED: indicates the presence of the external power supply.
4. Power supply input.
5. RS485 line termination.
6. Input for RS485 Modbus-RTU sensors.
7. RJ45 connector for Ethernet connection.
8. Mini-USB connector.
9. Bicolor NETWORK LED: indicates the status of the connection to the LAN (blinks green when the unit is in normal operation mode; blinks red to signal problems in LAN connection).

4 Connections

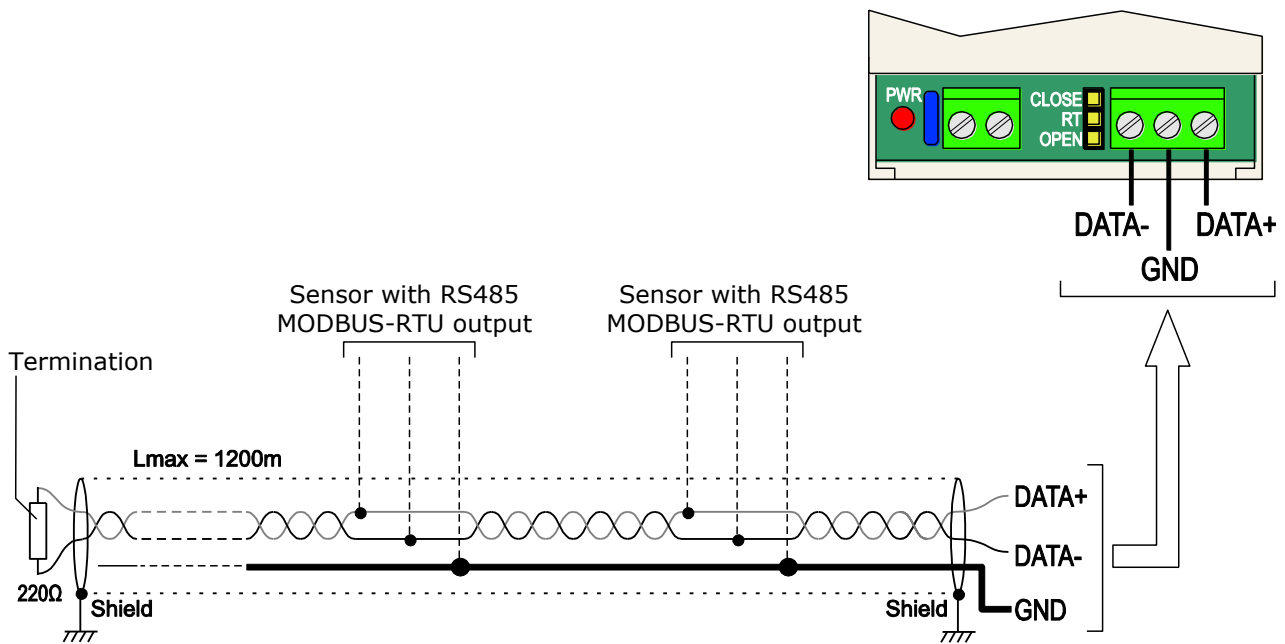
POWER SUPPLY



RS485 MODBUS-RTU CONNECTION

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

The RS485 ground is isolated from the power supply.



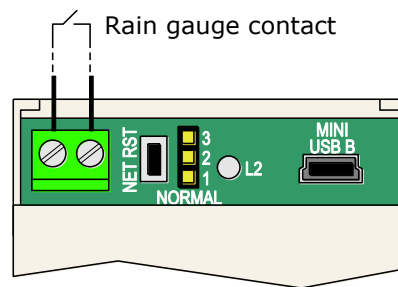
Line terminations must be placed at the ends of the network. If the instrument is at one end of the line, insert the termination placing the short jumper next to the RS485 connector between the "RT" and "CLOSE" indications. Otherwise, remove the termination placing the short jumper between the "RT" and "OPEN" indications.

The cable shield must be connected to both ends of the line.

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

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

RAIN GAUGE CONNECTION



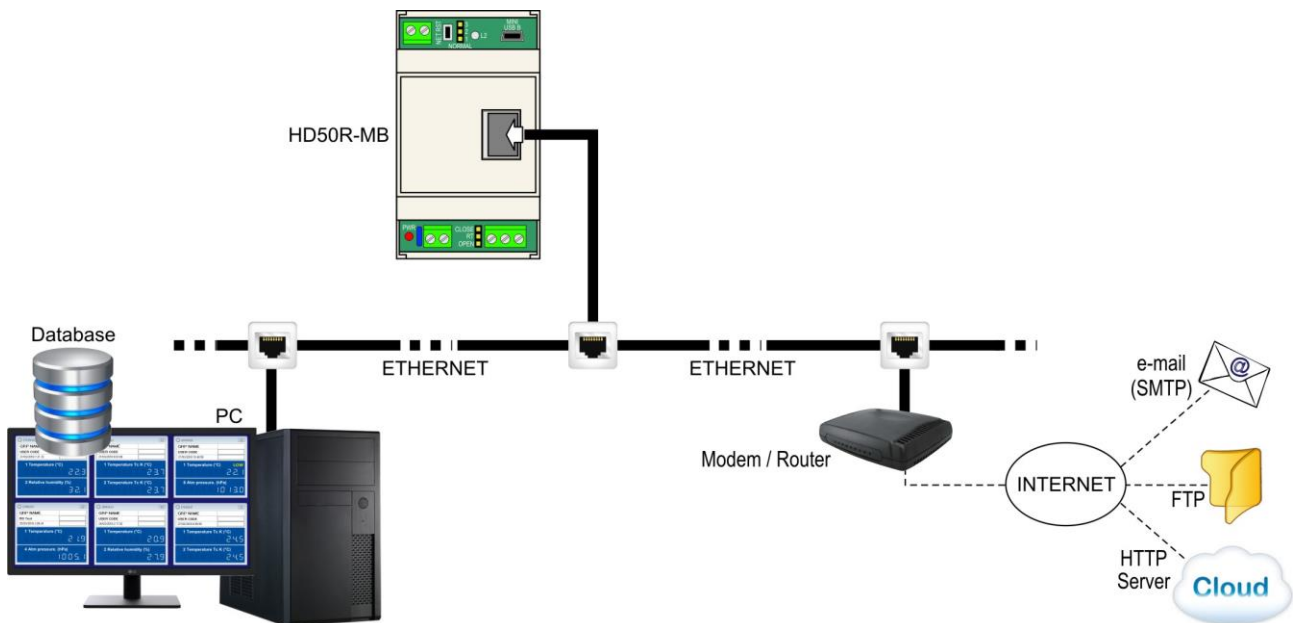
USB CONNECTION

The data logger can be connected to a PC via the mini-USB connector and the **CP23** cable.

USB connection doesn't require the installation of drivers: when the data logger is connected to a PC, Windows® operating system automatically recognizes the instrument as an HID device (Human Interface Device) and uses the drivers already included in the operating system.

ETHERNET CONNECTION

Connect the RJ45 connector of the data logger to a socket of the local network via a standard Ethernet cable.



The data logger is preset to get a dynamic IP address from the network DHCP server. The IP address can be displayed and changed by connecting the data logger to a PC via USB and using the HD35AP-S application software. A static IP address can also be set. The IP address can also be displayed by connecting the data logger to a PC via Ethernet and using the **HDServer1** software, which can automatically detect the data loggers connected to the network.

Thanks to the availability of two TCP/IP ports, each of which can operate with proprietary (for the connection with HD35AP-S software) or **MODBUS TCP/IP** protocol, and ten sockets (in total, to be divided between the two ports), the data logger allows the

simultaneous operation of two communication protocols (proprietary and Modbus TCP/IP) and manages up to **10 "TCP/IP Client"** simultaneously. The default setting of the ports is the following:

- Port number = 5100 for proprietary protocol (8 sockets)
- Port number = 502 for Modbus TCP/IP protocol (2 sockets)

The Ethernet settings can be changed with the HD35AP-S software. It is possible to restore the factory parameters by placing the short jumper next to the NET RST push-button between the "2" and "3" indications and then pressing the NET RST push-button. After the reset, replace the short jumper between the "2" and "1 (NORMAL)" indications.

If the local network is connected to Internet, the data can be regularly sent to an **FTP** address, to the **Cloud** and via **e-mail** (as attachments).

Note: if the communication with the Cloud is used, the maximum number of "clients" with proprietary or **MODBUS TCP/IP** protocol is nine.

5 Software

The parameters of the instrument (logging parameters, alarm thresholds, quantities to be acquired, network settings, etc.) can be configured by connecting the instrument to the PC via USB or Ethernet local network and using the **HD35AP-S**.

Some basic parameters (alarms, logging interval, user code, ...) can also be set with the **HDServer1** application software.

Both software can be downloaded from the website.

To download the data in a database, the **HD35AP-S** (it allows connecting one data logger at a time) or **HDServer1** (it allows connecting several data loggers simultaneously) application software and the **MySQL** database management system (included in the application software packages) must be installed.

HD35AP-CFR21 SOFTWARE OPTION

The **HD35AP-CFR21** option allows, in addition to the features of the basic software (both HD35AP-S and HDServer1), the protection of recorded data and instrument configuration in response to **FDA 21 CFR part 11** recommendations. In particular become 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 instrument.
- The management of users access for the instrument 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.

The HD35AP-CFR21 option works with USB hardware key to be connected to any PC connected to the same local network of the PC in which the basic software is installed.

6 Modbus

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

- Manufacturer (Delta OHM)
- Model
- Firmware version

The list of MODBUS registers is shown below. Depending on the connected sensors, some of the registers could not be significant for the system.

The following conventions have been used in the tables:

- Type: **b** = bit, **B** = 8 bits (Byte), **W** = 16 bits without sign (Word), **SW** = 16 bits with sign
- **(x10)** = decimal value expressed as an integer (e.g., if the content of the register is 184, the value is to be intended as 18,4).
- **(x100)** = centesimal value expressed as an integer (e.g., if the content of the register is 500, the value is to be intended as 5,00).

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

Indexes of the units of measurement

Index	Unit of meas.	Index	Unit of meas.	Index	Unit of meas.	Index	Unit of meas.	Index	Unit of meas.
0	°C	13	inchHg	26	J/m ²	39	inch	52	l/min
1	°F	14	inchH ₂ O	27	μJ/cm ²	40	counts	53	gallon/min
2	%UR	15	kgf/cm ²	28	V	41	mm/h	54	m ³ /min
3	g/m ³	16	PSI	29	mV	42	inch/h	55	m ³ /h
4	g/kg	17	m/s	30	mA	43	counts/h	56	μmol/(m ² s)
5	mbar	18	km/h	31	ppm	44	mW/m ²	57	mm/day
6	bar	19	ft/s	32	Hz	45	m	58	kV
7	Pa	20	mph	33	%	46	s	59	A
8	hPa	21	knot	34	degrees	47	μW/lumen	60	kA
9	kPa	22	W/m ²	35	lux	48	dB		
10	atm	23	μW/cm ²	36	m ² /s	49	dBA		
11	mmHg	24	Wh/m ²	37	g (*)	50	kWh		
12	mmH ₂ O	25	kWh/m ²	38	mm	51	l/s	255	Not defined

(*) Gravity acceleration

Discrete Inputs - Read-only parameters

Address	Type	Discrete Input description
7	b	If 1, at least a quantity is in alarm.

Coils - Read/Write parameters

Address	Type	Coil description
1	b	Logging status: 0=active, 1=inactive
2	b	Logging mode: 0=non cyclic, 1=cyclic
3	b	Set 1 to delete the device logging memory. Bit zeroing is automatic.
4	b	Buzzer activation in case of measurement alarm: 0=no, 1=yes

Address	Type	Coil description
9	b	Protection of configuration with password: 0=no, 1=yes Changing the parameter requires the Administrator password (see Holding Register 10036).

Input Registers - Read-only parameters

Address	Type	Input Register description
Measured values and status of measurement alarms		
0	SW	TEMPERATURE in the set measurement unit (x10).
1	B	Alarm for temperature: 0=OFF, 1= lower threshold alarm, 2= higher threshold alarm
2	SW	RELATIVE HUMIDITY in % (x10).
3	B	Relative humidity alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.
4	SW	DEW POINT in the set measurement unit (x10).
5	B	Dew Point alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.
6	SW	PARTIAL VAPOR PRESSURE in hPa (x100).
7	B	Partial vapor pressure alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.
8	SW	MIXING RATIO in g/Kg (x10).
9	B	Mixing ratio alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.
10	SW	ABSOLUTE HUMIDITY in g/m ³ (x10).
11	B	Absolute humidity alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.
12	SW	WET BULB TEMPERATURE in the set measurement unit (x10).
13	B	Wet bulb temperature alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.
18	SW	SOLAR RADIATION in W/m ² .
19	B	Alarm for solar radiation: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.
20	SW	ILLUMINANCE in lux.
21	B	Illuminance alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.
24	SW	ATMOSPHERIC PRESSURE in the set measurement unit (the multiplier depends on the set unit).
25	B	Atmospheric pressure alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.
30	SW	DAILY SOLAR RADIATION in Wh/m ² .
31	B	Alarm for daily solar radiation: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.
32	SW	CO₂ in ppm.
33	B	CO ₂ alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.
86	SW	RAIN RATE in counts/h.
87	B	Rain rate alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.
88	SW	DAILY RAIN in counts.
89	B	Daily rain alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.

Address	Type	Input Register description
92	SW	WIND SPEED (HD52.3D anemometer) in m/s (x100).
93	B	Wind speed (HD52.3D anemometer) alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.
94	SW	WIND DIRECTION (HD52.3D anemometer) in degrees (x10).
95	B	Wind direction (HD52.3D anemometer) alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.
118	SW	AIR SPEED (HD404...SR transmitter) in m/s (x100).
119	B	Air speed (HD404...SR transmitter) alarm: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.
122	SW	RAINFALL QUANTITY IN THE LAST HOUR in counts.
123	B	Alarm for rainfall quantity in the last hour: 0=OFF, 1=lower threshold alarm, 2=higher threshold alarm.
Measurement units and resolution		
5000	W	TEMPERATURE unit of measurement: 0=°C, 1=°F.
5004	W	DEW POINT unit of measurement: 0=°C, 1=°F.
5012	W	WET BULB TEMPERATURE unit of measurement: 0=°C, 1=°F.
5021	SW	ILLUMINANCE resolution: -2=100, -1=10, 0=1
5024	W	ATMOSPHERIC PRESSURE unit of measurement: see the table of indexes
5025	SW	ATMOSPHERIC PRESSURE resolution: ..., -2=100, -1=10, 0=1, 1=0.1, 2=0.01, ...
5052	W	WIND SPEED measurement unit: see TAB 12.1
5053	SW	WIND SPEED resolution: ..., -2=100, -1=10, 0=1, 1=0.1, 2=0.01, ...
General information		
10000	W	Year of last measurement.
10001	W	Month of last measurement.
10002	W	Day of last measurement.
10003	W	Hour of last measurement.
10004	W	Minutes of last measurement.
10005	W	Seconds of last measurement.
10013	W	Password level for the current connection: 0=no password, 1=user level, 2= administrator level

Holding Registers - Read/Write parameters

Address	Type	Holding Register description
Measurement alarm thresholds		
0	SW	TEMPERATURE lower alarm threshold in the set measurement unit (x10).
1	SW	Temperature higher alarm threshold in the set measurement unit (x10).
2	SW	RH lower alarm threshold in % (x10).
3	SW	RH higher alarm threshold in % (x10).
4	SW	DEW POINT lower alarm threshold in the set measurement unit (x10).
5	SW	Dew point higher alarm threshold in the set measurement unit (x10).
6	SW	PARTIAL VAPOR PRESSURE lower alarm threshold in hPa (x100).
7	SW	Partial vapor pressure higher alarm threshold in hPa (x100).
8	SW	MIXING RATIO lower alarm threshold in g/Kg (x10).
9	SW	Mixing ratio higher alarm threshold in g/Kg (x10).
10	SW	ABSOLUTE HUMIDITY lower alarm threshold in g/m ³ (x10).
11	SW	Absolute humidity higher alarm threshold in g/m ³ (x10).

Address	Type	Holding Register description
12	SW	WET BULB TEMPERATURE lower alarm threshold in the set measurement unit (x10).
13	SW	Wet bulb temperature higher alarm threshold in the set measurement unit (x10).
18	SW	Lower alarm threshold for SOLAR RADIATION in W/m ² .
19	SW	Higher alarm threshold for solar radiation in W/m ² .
20	SW	ILLUMINANCE lower alarm threshold in lux.
21	SW	Illuminance higher alarm threshold in lux
24	SW	ATMOSPHERIC PRESSURE lower alarm threshold in the set measurement unit (the multiplier depends on the set unit).
25	SW	Atmospheric pressure higher alarm threshold in the set measurement unit (the multiplier depends on the set unit).
30	SW	Lower alarm threshold for DAILY SOLAR RADIATION in Wh/m ² .
31	SW	Higher alarm threshold for daily solar radiation in Wh/m ² .
32	SW	CO₂ lower alarm threshold in ppm.
33	SW	CO ₂ higher alarm threshold in ppm.
86	SW	RAIN RATE lower alarm threshold in counts/h.
87	SW	Rain rate higher alarm threshold in counts/h.
88	SW	DAILY RAIN lower alarm threshold in counts.
89	SW	Daily rain higher alarm threshold in counts.
92	SW	WIND SPEED (ultrasonic anemometer) lower alarm threshold in m/s (x100).
93	SW	Wind speed (ultrasonic anemometer) higher alarm threshold in m/s (x100).
94	SW	WIND DIRECTION (ultrasonic anemometer) lower alarm threshold in degrees (x10).
95	SW	Wind direction (ultrasonic anemometer) higher alarm threshold in degrees (x10).
118	SW	AIR SPEED (HD404...SR transmitter) lower alarm threshold in m/s (x100).
119	SW	Air speed (HD404...SR transmitter) higher alarm threshold in m/s (x100).
122	SW	Lower alarm threshold for RAINFALL QUANTITY IN THE LAST HOUR in counts.
123	SW	Higher alarm threshold for rainfall quantity in the last hour in counts.
General information		
da 10000 a 10019	B	User code with ASCII codification. Acceptable values are in the set {32,...,126}.
10020	W	Current year
10021	W	Current month
10022	W	Current day
10023	W	Current hour
10024	W	Current minute
10025	W	Current second
10026	W	Measurement interval: 0=1s, 1=2s, 2=5s, 3=10s, 4=15s, 5=30s, 6=1min, 7=2min, 8=5min, 9=10min, 10=15min, 11=30min, 12=1h
10027	W	Logging interval: 0=1s, 1=2s, 2=5s, 3=10s, 4=15s, 5=30s, 6=1min, 7=2min, 8=5min, 9=10min, 10=15min, 11=30min, 12=1h
10036	W	Password to be supplied to enable configuration change commands. The reading provides the fixed value 32768.
da 10037 a 10046	B	Device group with ASCII codification. Acceptable values are in the set {32,...,126}.

Address	Type	Holding Register description
da 20000 a 20011	B	User code with ASCII codification of measurement #1.
da 20012 a 20023	B	User code with ASCII codification of measurement #2.
da 20024 a 20035	B	User code with ASCII codification of measurement #3.
da 20036 a 20047	B	User code with ASCII codification of measurement #4.
da 20048 a 20059	B	User code with ASCII codification of measurement #5.
da 20060 a 20071	B	User code with ASCII codification of measurement #6.
da 20072 a 20083	B	User code with ASCII codification of measurement #7.
da 20084 a 20095	B	User code with ASCII codification of measurement #8.
da 20096 a 20107	B	User code with ASCII codification of measurement #9.
da 20108 a 20119	B	User code with ASCII codification of measurement #10.
da 20120 a 20131	B	User code with ASCII codification of measurement #11.
da 20132 a 20143	B	User code with ASCII codification of measurement #12.

7 Maintenance

Do not use aggressive cleaning agents or incompatible with the materials indicated in the technical specifications. For cleaning, use a soft dry cloth or slightly dampened with clean water.

8 Safety instructions

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

Do not use the instrument in places where there are:

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

User obligations

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

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

9 Accessories ordering codes

The CP23 USB cable have to be ordered separately. The Ethernet cable is not included.

HD35AP-CFR21 Software option that adds to the features of the basic software (both HD35AP-S and HDServer1), the management of the data logging system in accordance with the **FDA 21 CFR part 11 recommendations**. For Windows® operating systems.

CP23 USB connection cable with mini-USB connector on the instrument side and A type USB connector on the PC side. Cable length 1.5 m.

NOTES

NOTES

WARRANTY

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

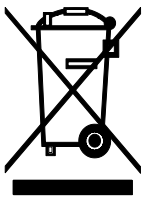
The manufacturer repairs the products that show defects of construction in accordance with the terms and conditions of warranty included in the manual of the product. For any dispute, the competent court is the Court of Padua. The Italian law and the "Convention on Contracts for the International Sales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

TECHNICAL INFORMATION

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

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

DISPOSAL INFORMATION



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

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



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