HD21AB

HD21AB17

IAQ MONITOR

ENGLISH

HD21AB
Indoor Air Quality Monitor

HD21AB

1. Input for CO_2 calibration.

2. Backlit graphic display.

3. **ESC** key: It allows to exit from the menu or, in case of a submenu, to exit from the current level display.

4. Navigation key ▲: It allows navigation through the menus. During normal operation, it is used to select the resetting of the statistical data and to scroll the displayed quantities upwards.

5. Navigation key ◄/**Func**: It allows navigation through the menus. In normal view, it allows to display the statistical data: maximum, minimum, and average.

6. **MEM** key: It allows to start and end the recording of data (logging).

7. Navigation key ▼: It allows navigation through the menus. During normal operation, it is used to cancel the resetting of the statistical data and to scroll the displayed quantities downwards.

8. **MENU** key: It allows to enter and exit the instrument's functioning parameter setting menu.

9. Navigation key ►/ **Unit**: It allows navigation through the menus. During normal operation, it changes the unit of measurement of the displayed main quantity.

10. **ENTER** key: In the menu, it confirms the data entered. In normal view, it allows to reset the statistical data.

11. **ON/OFF-Auto Off** key: It turns the instrument on and off. When pressed together with the **ESC** key, it disables the automatic turn off.

12. **USB** serial port (mini-USB connector).

13. Power supply input.

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12. **USB** serial port (mini-USB connector).

13. Power supply input.

14. Temperature-Humidity sensors.

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1. GENERAL CHARACTERISTICS

HD21AB and **HD21AB17 IAQ Monitors** are bench-top/portable instruments manufactured by **Delta Ohm** for the analysis of indoor air quality (IAQ, Indoor Air Quality).

The instruments simultaneously measure the parameters: CO_2 **Carbon Dioxide**, CO **Carbon Monoxide** and **Atmospheric Pressure**.

The **HD21AB17** instrument also measures **Temperature** and **Relative Humidity**, and it calculates **Dew Point**, **Wet Bulb Temperature**, **Absolute Humidity**, **Mixing Ratio** and **Enthalpy**.

HD21AB and HD21AB17 are dataloggers with a memory capacity of 67600 recordings, divided in 64 blocks. They use the **DeltaLog10 software from version 0.1.5.3**.

Reference Standards: **ASHRAE 62.1**, **Legislative Decree 81/2008**. These regulations apply to all confined spaces that could be used by people. Kitchens, baths, changing rooms and swimming pools are included, due to their high humidity. You should take into account, in regard to air quality, possible chemical, physical and biological contaminants.

The instruments have a wide Dot Matrix graphic display with a resolution of 160x160 dots.

The instruments typical applications are:

- Measurement of IAQ (*Indoor Air Quality*) and comfort conditions in schools, offices and indoor spaces.

- Analysis and study of the Sick Building Syndrome, and of the resulting consequences.

- Checking the HVAC (*Heating, Ventilation and Air Conditioning*) system efficiency.

- Examination of IAQ conditions in factories to optimize microclimate and improve productivity.

- Building Automation checks.

2. THE USER INTERFACE

The user interface consist of a **backlit LCD graphic display**, and the power-on and setting keys. When battery powered, and not pressing any key, the backlight turns off after about 1 minute. To turn it back on, press any key. When using an external power supply, the backlight is always on. Turn the instrument on and off with the **ON/OFF** key. When you turn the instrument on, the logo and model will be displayed for a few seconds, and then the main display.

The quantities detected by the instrument can be viewed with a larger character size, at the top of the display. The parameter displayed with a larger character is called **main quantity**. In order to select the parameter to be displayed as **main quantity**, use the ▲▼ keys. For some quantities, you can select the unit of measurement; temperature can be displayed as °C or °F.

2.1 THE HD21AB DISPLAY
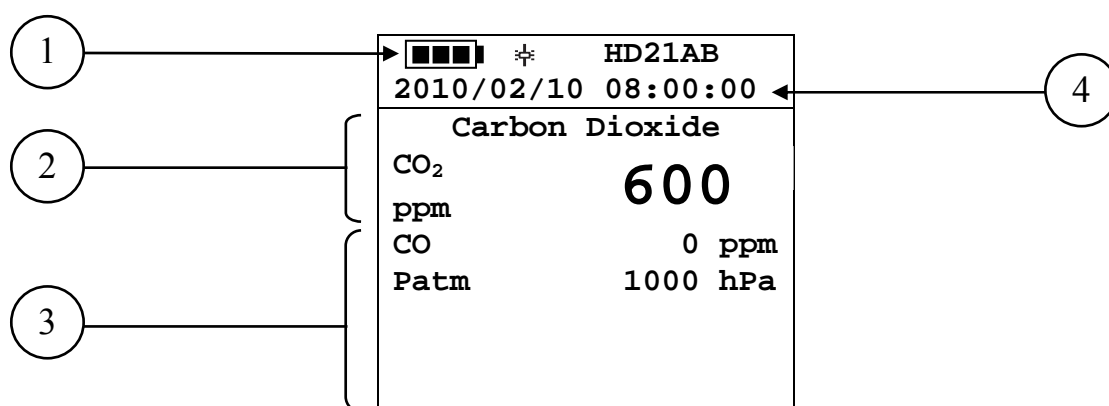
1. **Battery's charge status** and **instrument code**. In case the **logging** function is on, this line shows the current logging number and the time elapsed from logging start.
2. **Main quantity** (in this case, CO_2 Carbon Dioxide).
3. Display of **all other quantities**.
4. **Current date and time**.

The **detected quantities** are:

CO_2	Carbon Dioxide	ppm
CO	Carbon Monoxide	ppm
Patm	Atmospheric Pressure	hPa

2.2 THE HD21AB17 DISPLAY
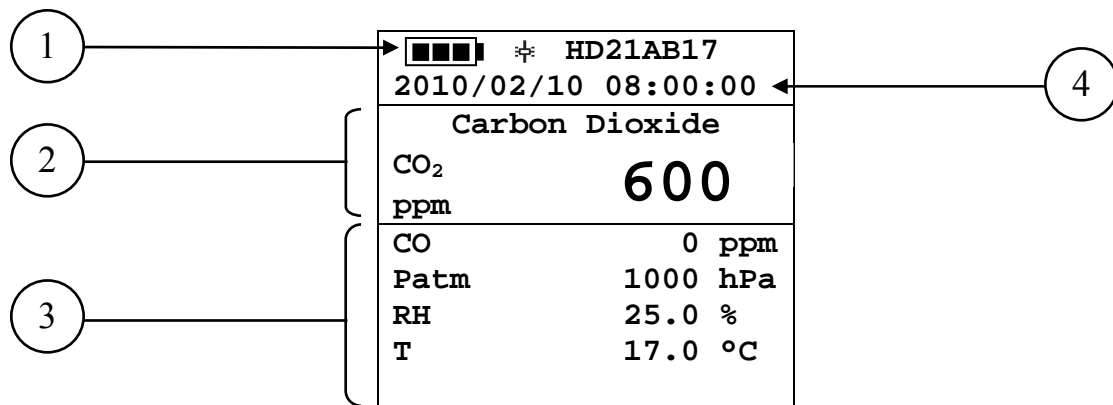
```
┌──────────────────────────┐
│▶ ■■■▮  ✳ HD21AB17         │
│2010/02/10 08:00:00 ◀      │
├──────────────────────────┤
│      Carbon Dioxide       │
│CO₂                        │
│              600          │
│ppm                        │
├──────────────────────────┤
│CO              0 ppm      │
│Patm         1000 hPa      │
│RH           25.0 %        │
│T            17.0 °C       │
└──────────────────────────┘
```

1. **Battery's charge status** and **instrument code**. In case the **logging** function is on, this line shows the current logging number and the time elapsed from logging start.
2. **Main quantity** (in this case, CO_2 Carbon Dioxide).
3. Display of **all other quantities**.
4. **Current date and time**.

The **detected and computed quantities** are:

CO₂	Carbon Dioxide	ppm
CO	Carbon Monoxide	ppm
RH	Relative Humidity	%
T	Temperature	°C – °F
Patm	Atmospheric Pressure	hPa
Td	Dew Point	°C – °F
Tw	Wet Bulb Temperature	°C – °F
AH	Absolute Humidity	g/m^3
r	Mixing Ratio	g/kg
H	Enthalpy	kJ/kg

2.3 THE KEYBOARD

The keys on the instrument perform the following functions:

ON/OFF AUTO/OFF   **ON-OFF/AUTO-OFF key**

It turns the instrument on and off.
When turning the instrument on, the first screen will be displayed. After few seconds the measured quantities will be displayed.

ON/OFF AUTO/OFF + **ESC**   **Auto Power Off**

The instrument has an AutoPowerOff function that automatically turns the instrument off after about 8 minutes if no key is pressed. The *AutoPowerOff* function can be disabled by holding the ESC key pressed down when turning the instrument on: the ❖ symbol will appear on the first line to remind the user that the instrument can only be turned off by pressing the **ON/OFF** key.
The *AutoPowerOff* function is disabled when:
- External power is used.
- During data download.
- During logging.

MENU   **MENU key**

It allows to enter to and exit from the instrument's functioning parameter setting menu.

ENTER   **ENTER key**

In the menu, it confirms the entered data.
During normal operation it confirms the resetting of the statistical data.

ESC   **ESC key**

It allows to exit from the menu or, in case of a submenu, to exit from the current level display.

MEM   **MEM key**

It allows to start and end a "logging" session; the data sending interval must be set in the menu.

Key ◄/FUNC

◄ allows navigation through the menus.

FUNC: In normal view, it allows to select the statistical data: maximum, minimum, and average.

Key ▲

It allows navigation through the menus. During normal operation, it is used to select the resetting of the statistical data and to scroll the displayed quantities.

Key ▼

It allows navigation through the menus. During normal operation, it is used to cancel the resetting of the statistical data and to scroll the displayed quantities.

Key ►/UNIT

It allows navigation through the menus.

During normal operation, it changes the unit of measurement of the **main quantity (HD21AB17 only)**.

If the **main quantity** is Relative Humidity (HD21AB17 only), by repeatedly pressing the UNIT key you can display the following quantities:

RH	Relative Humidity (%)
Td	Dew Point (°C - °F)
AH	Absolute Humidity (g/m^3)
r	Mixing Ratio (g/kg)
Tw	Wet Bulb Temperature (°C - °F)
H	Enthalpy (kJ/kg)

If the **main quantity** is Temperature (HD21AB17 only), by repeatedly pressing the UNIT key you can display the temperature in °C (Celsius degrees) or °F (Fahrenheit degrees).

3. OPERATION

During turning on, the following message is displayed for about 10 seconds:


```
Model HD21AB17
Indoor Air Quality
Firm.Ver.=01.00
```

In addition to the **Delta Ohm logo** the **instrument code and the firmware version** are displayed.

After about 10 seconds, the measurements will appear on the display:

HD21AB

```
[■■■]        HD21AB
2010/02/10 08:00:00
   Carbon Dioxide
CO₂
          600
ppm
CO            0 ppm
Patm      1000 hPa
```

CO₂: Carbon Dioxide
CO: Carbon Monoxide
Patm: Atmospheric Pressure

HD21AB17

```
[■■■]       HD21AB17
2010/02/10 08:00:00
   Carbon Dioxide
CO₂
          600
ppm
CO            0 ppm
Patm      1000 hPa
RH          25.0 %
T           17.0 °C
```

CO₂: Carbon Dioxide
CO: Carbon Monoxide
Patm: Atmospheric Pressure
RH: Relative Humidity
T: Temperature

3.1.1 "►/UNIT" key for the unit of measurement

It allows navigation through the menus. During normal operation, it changes the unit of measurement of the **main quantity (solo HD21AB17)**.

If the **main quantity** is Relative Humidity **(solo HD21AB17)**, by repeatedly pressing the UNIT key you can display the following quantities:

RH	Relative Humidity (%)
Td	Dew Point (°C - °F)
AH	Absolute Humidity (g/m^3)
r	Mixing Ratio (g/kg)
Tw	Wet Bulb Temperature (°C - °F)
H	Enthalpy (kJ/kg)

If the **main quantity** is Temperature **(solo HD21AB17)**, by repeatedly pressing the UNIT key you can display the temperature in °C (Celsius degrees) or °F (Fahrenheit degrees).

3.1.2 The maximum, minimum and average values of the captured quantities

By pressing the ◄/FUNC key you can display the maximum, minimum, average (AVG) or average in 1 minute (AVG 1min) values of the measured quantities.

To reset the statistical data (except for AVG 1min function) press the ◄/FUNC key until the "Reset? Yes No" message appears. Select Yes using the ▲▼keys, and confirm with ENTER.

Once selected, for example *max*, all displayed quantities indicate the maximum value. **The AVG average is calculated on the first five minutes of samples, and then on the current average.**

THE AVERAGE IN 1 MINUTE FUNCTION

By pressing the ◄/FUNC key you can select the **AVG 1min** (Average in 1 minute) function:

```
Function: AVG 1min
READY       00:00:60
    Carbon Dioxide
CO₂
            600
ppm
CO               0 ppm
Patm          1000 hPa
RH            25.0 %
T             17.0 °C
```

If the function is selected, the " **READY   00:00:60** " indication on the LCD blinks to prompt the user to start the 1 minute average calculation of the acquired values.

To start the calculation, press the **ENTER** key. The " **RUNNING** " indication and a countdown will appear on the display. During calculation, the instrument continuously emits one short beep per second.

```
┌─────────────────────────────┐
│ Function: AVG 1min          │
│ █RUNNING█████00:00:48███████ │
│      Carbon Dioxide         │
│ CO₂                         │
│              600            │
│ ppm                         │
├─────────────────────────────┤
│ CO              0  ppm      │
│ Patm         1000  hPa      │
│ RH           25.0  %        │
│ T            17.0  °C        │
│                             │
└─────────────────────────────┘
```

After 1 minute the instrument emits one long beep and displays the calculated average on the LCD.

```
┌─────────────────────────────┐
│ Function: AVG 1min          │
│ █AVG 1min████00:00:00███████ │
│      Carbon Dioxide         │
│ CO₂                         │
│              602            │
│ ppm                         │
├─────────────────────────────┤
│ CO              0  ppm      │
│ Patm         1000  hPa      │
│ RH           25.0  %        │
│ T            17.0  °C        │
│                             │
└─────────────────────────────┘
```

The calculated average is **frozen** on the LCD until the **ENTER** key is pressed.

To escape the 1min average calculation during the countdown, press the **ESC** key.

Note: when READY indication is displayed, the measurement values appearing on the LCD are the instant acquired values. When RUNNING indication is displayed, the measurement values appearing on the LCD are the continuously updated average values.

3.1.3 Instrument Setup

In order to set the instrument, you have to open the main menu by pressing **MENU**. See chapter 4 for further details.

3.1.4 Start of a new logging session

Press **MEM** to start a **Logging** session: This key starts and stops the logging of a data block to be saved in the instrument's internal memory. The data logging frequency is set in the **"Log Frequency"** menu parameter. The data logged between a start and subsequent stop represent a measurement block.

When the logging function is on, the *LOG* indication *and the logging session number* are displayed; a beep is issued each time a logging occurs.

To end the logging, press **MEM** again.

The instrument can turn off during logging between one capture and the next: The function is controlled by the *AutoPowerOff* parameter. When the logging interval is less than 5 minutes, the logging instrument remains on; with an interval of at least 5 minutes, it turns off between one capture and the next.

4. MAIN MENU

To access the programming menu press **MENU**:

```
        MAIN MENU

1) Informations
2) Logging
3) Serial
4) Settings
5) Probes Calibration
6) Language
▲▼ select
<ENTER> confirm
```

If you do not press any key within 2 minutes, the instrument goes back to the main display.
Use the arrows ▲ ▼ and press **ENTER** to select an item.
To exit the selected item and return to the previous menu, press **ESC**.
To exit immediately from the main menu, press **MENU** again.

4.1 INFO MENU

Enter the main menu by pressing **MENU**. Using the ▲ ▼ arrows, select **Informations** and confirm with **ENTER**.

```
        INFORMATIONS

1) Info Instrument
2) Info Sensors
3) Time / Date

▲▼ select
<ESC> exit/cancel
<ENTER> confirm
```

By selecting **Info Instrument**, the following information on the instrument will be displayed: instrument code, firmware date and version, serial number, instrument calibration date, identification code.

```
      INFO INSTRUMENT

Model HD21AB17
Firm.Ver.=01.00
Firm.Date=2010/02/10
Ser. Number=10010000
Calib: 2010/02/10


ID: 0000000000000000
```

To change the **ID**, press **ENTER**. Use the ◄► arrows to select the item, and edit it with the ▲▼ arrows. Proceed with the other items, and finally confirm with **ENTER**.

By selecting **Info Sensors**, the following information on the sensors will be displayed:

```
        INFO SENSORS


Type= CO2-CO Fw.V0R0
Cal = 2010/02/10
SN  = 10010000
```

INFO SENSORS:
Firmware type and version.
Calibration date.
Serial number of the sensors board.

Press **ESC** to return to the main menu. Press **MENU** to exit the menu.

Time/Date allows setting the date and time that will be shown at the top of the display.
To access the *Time/Date* submenu, proceed as follows:
1. Use the arrows ▲▼ to select *Time/Date*;
2. Press **ENTER**;
3. You will get the following message

```
        TIME / DATE


year/mm/dd hh:mm
2010/02/10 08:00:00
set 00 seconds!



◄► select
▲▼ set
<ENTER> confirm
```

4. Use the arrows ◄► to select the data to be set (year/month/day and hour:minutes);
5. Once selected, the data will start blinking;
6. Use the arrows ▼▲ to enter the correct value;
7. Press **ENTER** to confirm and return to the main menu;
8. Or press **ESC** to return to the menu without making any change;
9. Press **MENU** to exit immediately from the main menu.

NOTE: In regard to the time, you can set hours and minutes. The seconds are always set to 00 (set 00 seconds!).

4.2 LOGGING MENU

Enter the main menu by pressing **MENU**;
- Use the arrows ▲▼ to select **Logging**;
- Press **ENTER**: The parameter setting submenu for the logging sessions (to be captured) will be displayed.

```
        LOGGING MENU

1) Log frequency
2) Auto switch off
3) Start/Stop Log
4) Start Log Erase
5) Log File Manager


▲▼  select
<ENTER> confirm
```

4.2.1 Log Interval

Use this item to set the LOG interval (interval between two subsequent sample captures): To enter this setting, proceed as follows:

Once you have accessed the *LOGGING* submenu (previous par.) use the arrows ▲▼ to select *Log frequency*:

```
        LOGGING MENU
        LOG FREQUENCY


Insert interval
of memorization
 h:mm:ss  (1h max)
 0:00:15


▲▼  set
<ENTER> confirm
```

1. Use the arrows ▲▼ to select the interval duration from a minimum of 15 seconds to a maximum of one hour;
2. Press **ENTER** to confirm and return to the Logging menu;
3. Press **ESC** to return to the **Logging** menu without making any change;
4. Press **ESC** again to return to the main menu;
5. Press **MENU** to exit immediately from the menu.

These are the available values: 15 seconds - 30 seconds - 1 minute - 2 minutes - 5 minutes - 15 minutes - 20 minutes - 30 minutes - 1 hour

Logging interval	Storage capacity	Logging interval	Storage capacity
15 seconds	About 11 days and 17 hours	15 minutes	About 1 year and 339 days
30 seconds	About 23 days and 11 hours	20 minutes	About 2 years and 208 days
1 minute	About 46 days and 22 hours	30 minutes	About 3 years and 313 days
2 minutes	About 93 days and 21 hours	1 hour	About 7 years and 261 days
5 minutes	About 234 days and 17 hours		

4.2.2 AutoPowerOff– AutoPowerOff Mode

The *Auto switch off* item controls the instrument's automatic turning off during logging, between the capture of a sample and the next one. **When the interval is lower than 5 minutes, the instrument will always remain on**. With intervals greater than or equal to 5 minutes, it is possible to turn off the instrument between loggings: it will turn on one minute before sampling and will turn off immediately afterwards, thus increasing the battery life.

Once you have accessed the *LOGGING* submenu (previous paragraph) use the arrows ▲▼ to select *Auto switch off*. During configuration, the following is displayed:

- If the set *Log Interval* (see previous par.) is lower than 5 minutes, the following will be displayed

```
      LOGGING MENU
     AUTO SWITCH OFF
Logging frequency
setted < 5 min.
During log session
the instrument
will shut ON
between two samples


<ESC> exit/cancel
```

If the set *Log Interval* (see previous par.) is greater or equal to 5 minutes, the following will be displayed during configuration:

```
      LOGGING MENU
      AUTOPOWEROFF
Logging frequency
setted >= 5 min.
During log session
the instrument
will shut OFF
between two samples
▲▼ set
<ESC> exit/cancel
```

1. By using the arrows ▲▼ you can select:

   ON (the instrument stays on)
   OFF (the instrument stays off)

2. Press **ESC** to return to the *Logging* menu;
3. Press **ESC** again to return to the main menu;
4. Press **MENU** to exit immediately from the menu.

4.2.3 Start/Stop Log – Automatic Start

The logging start and end can be programmed by entering the date and time.
Set the logging start date and time using the arrows. Confirm the logging start date and time using ENTER. Then you are asked to set the data to end the recording. Set the logging end date and time using the arrows. Confirm the logging end date and time using ENTER.

To enter this setting, proceed as follows.

Once you have accessed the *LOGGING* submenu (previous par.) use the arrows ▲▼ to select *Start/Stop Log*: The following message will be displayed:

```
      START/STOP LOG
   Insert date START
  def.=5m>Actual Date
  2010/02/10 08:05:00




◄► select
▲▼ set
<ENTER> confirm
```

1. Use the arrows ◄► to select the data to be changed (year/month/day and hour/minutes/seconds);
2. Once selected, the data will start blinking;
3. Use the arrows ▼▲ to change its value;
4. Confirm by pressing **ENTER**;
5. Press **ESC** to return to the **Logging** menu without making any change;
6. Press **ESC** again to return to the main menu;
7. Press **MENU** to exit immediately from the menu.

After setting the logging start time, the logging end time (Enter stop time) window will be displayed:

```
      START/STOP LOG
    Insert END date
  def.=10m>Start date
  2010/02/10 08:10:00
  Logging ends
  at memory full

◄► select
▲▼ set
<ENTER> confirm
```

1. Use the arrows ◄► to select the data to be changed (year/month/day and hour/minutes/seconds);
2. Once selected, the data will start blinking;
3. Use the arrows ▼▲ to change its value;
4. Confirm by pressing **ENTER**;
5. Press **ESC** to return to the **Logging** menu without making any change;
6. Press **ESC** again to return to the main menu;
7. Press **MENU** to exit immediately from the menu.

8. Once both values have been set, a summary will be displayed showing the start and end time of the LOG session.

```
        LOGGING MENU
         SETTED LOG


START Date
2010/02/10 10:29:00
END Date
2010/02/10 10:39:00


<ESC> exit/cancel
<ENTER> confirm
```

9. Press **ENTER** to confirm or **ESC** to exit without enabling the automatic start: In both cases, you will return to the *LOGGING* menu.

10. Press **MENU** to exit immediately from the main menu.

When the instrument starts automatically a LOG session, a beep is issued on each capture and the blinking **LOG** message is shown at the top of the display.
Press **MEM** to stop the session before the set time.
To cancel the automatic start setting, use the **Start Log Erase** function as illustrated in the following paragraph.

NOTE: **The automatic logging session is started even when the instrument is off**. If it is off when the automatic logging session is started, the instrument, even if powered by the mains, is turned on few seconds earlier and remains on at the end of logging. If it is powered by the battery, it is turned on and off at each data capture, except when the interval is lower than 5 minutes. At the end of logging, it is turned off for good.
See paragraph 4.2.2 to set the automatic shut off.

4.2.4 Cancel Auto-Start

Once the LOG session start and end times are set, you can inhibit the session automatic start by using *Start Log Erase*.
Once you have accessed the *LOGGING* submenu:

1. Use the arrows ▲▼ to select *Start Log Erase*
2. The LOG session start and end times will be displayed:

```
      MENU LOGGING
    Auto-Start Erase

 Setted start:
 2010/02/10 10:29:00
 Setted end:
 2010/02/10 10:39:00
 Press ▲▼ for
 Auto-Start Erase
 <ENTER> confirm
```

3. By pressing ▲ the following message will be displayed:

```
      LOGGING MENU



      Auto-Start
      not active


 <ESC> exit/cancel
 <ENTER> confirm
```

4. Press **ENTER** to cancel the automatic start;
5. Press **ESC** to exit without cancelling the automatic start;
6. Press **ESC** again to exit from the submenus;
7. Or press **MENU** to exit immediately from the main menu.

See the previous paragraph to set a new automatic start time after cancelling the previous one.

4.2.5 Log File Manager

This item allows managing the logs captured: The instrument allows displaying of the captured data files and erasing the entire memory (***File Log Erase***).

The instrument can store up to 64 LOG sessions, progressively numbered from 00 to 63: The session list is arranged on 4 lines and 4 columns. If you have over 16 sessions, using the **MEM** function key you shift to the next screen. The current page (0, 1, 2 or 3) and the total data pages are displayed in the upper right corner.

```
LOG FILE            0/3
00- 01- 02- 03
04- 05- 06- 07
08- 09- 10- 11
12- 13- 14- 15
START Date:
2010/02/10 08:59:40
Record: 000039
▲▼◄►  select
<MEM> page change
```

Once you have accessed the ***LOGGING*** submenu:
1. Use the arrows ▲▼ to select **Log File Manager**: You will see the following submenu:

```
      LOGGING MENU
   LOG FILE MANAGER

1) See File Log
2) File Log Erase
3) Log lasting

▲▼  select
<ENTER> confirm
```

2. Use the arrows ▲ ▼ to select a menu item;
3. Press **ENTER** to confirm;
4. Press **ESC** to return to the menu;
5. Press **MENU** to exit immediately from the main menu.

See File Log:

Selecting this item you can view the logging sessions in the instrument:

```
LOG FILE           0/3
00- 01- 02- 03
04- 05- 06- 07
08- 09- 10- 11
12- 13- 14- 15
START Date:
2010/02/10 08:50:40
Record: 000039
▲▼◄► select
<MEM> page change
```

1. Use the arrows ▲ ▼ ◄ ► to select the log, and the **MEM** key to shift page.
2. Once a file is selected, the acquisition start date and time and the number of samples contained in the file (Rec) are displayed at the bottom of the display. **The files are stored in ascending order.** Each file is only identified by the date and time, **shown on the display**. In the example above, the file 00 is selected: The recording started at 08:50:40 on 10 February 2010. The file contains 39 samples.
3. press **ESC** to exit this menu;
4. Press **MENU** to exit immediately from the main menu.

File Log Erase (erasing all memory)

By selecting this item, the "**ERASE ALL LOGS SETTED FILES**" message will be displayed:

```
   MENU LOGGING
   ERASE ALL LOGS
    SETTED FILES




<MEM> confirm
<Esc> exit
```
```
   MENU LOGGING
   ERASE ALL LOGS
    SETTED FILES



   EMPTY MEMORY


<Esc> exit
```

1. Press **MEM** to erase all files;
2. Press **ESC** to cancel the operation and return to the previous menu level**;**
3. Press **MENU** to exit immediately from the main menu.

Log lasting (time set for recording)

It represents the recording duration: After this set time, the recording is ended. The recording can be stopped earlier by pressing **MEM**.

To disable this function, set the time to 0:00:00. In this case the recording ends by pressing MEM or when the memory is full.

```
        LOGGING MENU
        LOG LASTING


 h:mm:ss (1h max)
00:00:00
With setting:
00:00:00 Log stop
with key MEM
▲▼ set
<ESC> exit
```

Use the arrows to change the set time; the maximum allowed value is 1 hour.

Confirm with **ENTER**.

Press **ESC** to exit from this menu level without making changes.

Press **MENU** to exit immediately from the main menu.

4.3 SERIAL MENU (SERIAL COMMUNICATION)

The *Serial* submenu allows setting the record printing interval (*Print Interval*).

The LOG sessions can be downloaded on a PC, through the **USB** connection. The transfer speed is fixed at 460800 bps.

After downloading the data on the PC, using the dedicated software, they will be processed by this software for graphic display.

To access the *Serial* submenu, proceed as follows:
1. Press **MENU** on the instrument;
2. Use the arrows ▲▼ to select *Serial*;
3. Press **ENTER**;
4. You will get the *Serial* submenu.

```
     COMMUNICATION MENU
           SERIAL


1) Print Interval


▲▼ select
<ESC> exit/cancel
<ENTER> confirm
```

4.3.1 Print Interval

To set the *Print Interval*, proceed as follows:
1. Use the arrows ▲ ▼ to select the item;
2. Press **ENTER**: You will get the following message:

```
COMMUNICATION MENU
       SERIAL
   PRINT INTERVAL


h:mm:ss (1h max)
0:00:00


▼▲ set
<ESC> exit
<ENTER> confirm
```

3. Use the arrows ▼ ▲ to set the value;
4. Press **ENTER** to confirm and return to the previous page, or press **ESC** to cancel the change and exit the menu item;
5. Press **ESC** over and over to exit from the submenus;
6. Press **MENU** to exit immediately from the main menu.

The print interval can be set from 0 seconds to one hour:
0 s - 15 s - 30 s - 1 min. - 2 min. - 5 min. - 15 min. - 20 min. - 30 min. - 1 hour.

4.4 SETTINGS

To enter the *Settings* submenu, proceed as follows:
1. press the instrument **MENU** key;
2. Use the arrows ▼ ▲ to select *Settings*
3. press **ENTER**: the following message appears:

```
        SETTINGS

1)Contrast
2)Backlight




▼▲ select
<ESC> exit/cancel
<Enter> confirm
```

This menu item allows to:
1. Increase or decrease the display contrast.
2. Set the ON time of the display backlight.

4.4.1 Contrast

This item of the **Settings** menu allows to increase or decrease the display contrast.
To access the *Contrast* submenu, proceed as follows:

1. Use the arrows ▲▼ to select *Contrast*;
2. Press **ENTER**
3. You will get the following message

```
        CONTRAST LCD



Contrast set:
        012

▼▲ set
<ESC> exit/cancel

```

4. Use the arrows ◄► to decrease or increase the contrast;
5. Press **ENTER** or **ESC** to return to the main menu;
6. Press **MENU** to exit immediately from the main menu.

4.4.2 Backlight

This item of the **Settings** menu allows to set the ON time for the display backlight. To enter the *Backlight* submenu, proceed as follows:

1. Using the arrows ▼▲ select *Backlight.*
2. Press **ENTER**
3. The following message appears:

```
        BACKLIGHT

1) Always switch on
2)  5 seconds
3) 15 seconds
4) 30 seconds

▼▲ select
<ESC> exit/cancel
<Enter> confirm
```

4. Use the arrows ▼▲ to select the desired option
5. Press **ENTER** to confirm or press **ESC** more times to escape from the various menu levels
6. Press **MENU** to exit directly form the main menu.

4.5 SENSORS CALIBRATION

The instruments and sensors are calibrated in the factory; no calibration is usually required by the user. However, you can perform a new calibration.

You can perform the calibration of the CO (Carbon Monoxide) and CO_2 (Carbon Dioxide) sensors.

With the HD21AB17 instrument you can also perform the calibration of the RH (Relative Humidity) sensor.

No calibration is allowed for the Temperature sensor (HD21AB17).

To calibrate the probes correctly, a knowledge of and abiding by the physical phenomena on which the measurement is based is fundamental: this is the reason why it is recommended to abide by what is reported below carefully and only to perform new calibrations if technically proficient.

```
          SENSORS
         CALIBRATION


1) Calibration CO₂
2) Calibration CO
3) Calibration RH


▼▲ select
<ESC> exit/cancel
<ENTER> confirm
```

4.5.1 CO₂ Calibration

Use the arrows ▲ ▼ to select the **1) Calibration CO₂** item:

```
          SENSORS
         CALIBRATION


1) Calibration CO₂
2) Calibration CO
3) Calibration RH


▼▲ select
<ESC> exit/cancel
<ENTER> confirm
```

Confirm with ENTER. The following screen will appear:

```
         SENSORS
        CALIBRATION
       CALIBRATION CO₂


  CO₂      850    ppm




  <ESC> exit/cancel
  <ENTER> confirm
```

The instrument display shows the measured CO_2.
The CO_2 sensor can be calibrated:

- at 400ppm in clean air
- at 0ppm with nitrogen bottles (code MINICAN.12A).

The instrument can automatically detect the calibration methods used: whether 400ppm or 0ppm. The calibration should be performed at one point only: each new calibration cancels the previous one.

Proceed as follows:

1. Unscrew the hexagon slot peg located in front of the instrument. In the place of the peg, screw the small metal tube at the end of the plastic tube connecting to the bottle for calibration MINICAN.12A.

2. Let the inlet open if you want to perform a calibration at 400 ppm: For this second calibration procedure, **ensure the instrument is really in clean air.**

3. For the calibration at 0 ppm, after connecting the CO_2 input to the small tube from the nitrogen bottle, adjust the bottle flow meter to get a constant flow from 0.3 to 0.5 l/min.

4. Wait about 15 minutes before continuing.

5. Supply CO_2 for at least 2 minutes so as to stabilize the measurement.

6. Press ENTER on the instrument. After few seconds, the new value read by the probe will appear. Wait the two minutes necessary for calibration without changing the working conditions.

7. At the end, close the bottle spigot, unscrew the small tube from the instrument and close the hole using the M6 hexagon slot peg.

Input for
CO_2 calibration

4.5.2 CO Calibration

You can calibrate the **zero of the CO sensor** in clean air (the CO concentration is lower than 0.1 ppm outdoor) or using nitrogen bottles (code MINICAN.12A).

Use the arrows ▲▼ to select the **2) Calibration CO** item:

```
         SENSORS
       CALIBRATION


1) Calibration CO₂
2) Calibration CO
3) Calibration RH


▼▲ select
<ESC> exit/cancel
<ENTER> confirm
```

Confirm with ENTER. The following screen will appear:

```
         SENSORS
       CALIBRATION
       CALIBRATION CO


1) Cal zero
2) Sensitivity set


▼▲ select
<ESC> exit/cancel
<ENTER> confirm
```

Confirm with ENTER. The following screen will appear:

```
         SENSORS
       CALIBRATION
      CALIBRATION CO
          CAL ZERO


Cal zero        0 ppm



<ESC> exit/cancel
<ENTER> confirm
```

Place the instrument in a clean air environment (CO concentration is lower than 0.1 ppm outdoor). Turn the instrument on and wait at least 15 minutes so as to stabilize the measurement. Now press ENTER and wait the two minutes necessary for calibration without changing the working conditions.

**CO zero calibration with nitrogen bottle (code MINICAN.12A):**

Using a screwdriver, open the back small door of the instrument. Connect the tube from the MINICAN.12A bottle with the rubber cap on the CO sensor head.

Use the arrows ▲▼ to select the **2) Calibration CO** item:
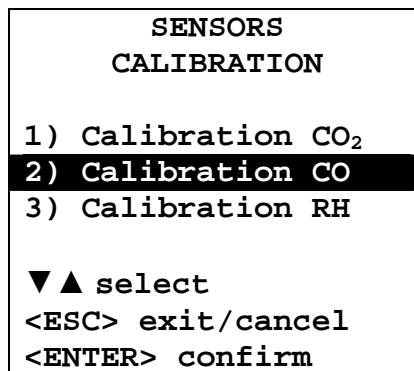
```
        SENSORS
       CALIBRATION


1) Calibration CO₂
2) Calibration CO
3) Calibration RH

▼▲ select
<ESC> exit/cancel
<ENTER> confirm
```

Confirm with ENTER. The following screen will appear:

```
        SENSORS
       CALIBRATION
     CO CALIBRATION

1) Cal zero
2) Sensitivity set

▼▲ select
<ESC> exit/cancel
<ENTER> confirm
```
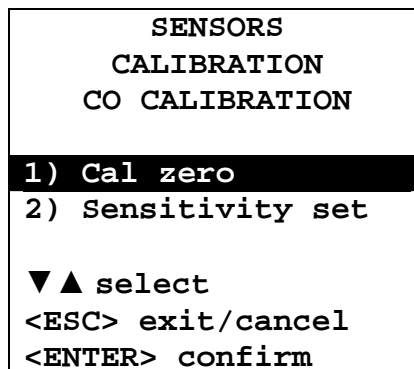
Confirm with ENTER. The following screen will appear:

```
            SENSORS
          CALIBRATION
        CO CALIBRATION
            CAL ZERO


Cal zero          0 ppm



<ESC> exit/cancel
<ENTER> confirm
```

- Wait about 15 minutes before continuing.
- Supply the gas adjusting the bottle flow meter to get a constant flow from 0.1 to 0.2 l/min.
- Press ENTER and wait the two minutes necessary for calibration without changing the working conditions.
- At the end, close the bottle spigot and remove the cap from the CO sensor.
- Insert the protection grid.

Replacement of the CO sensor:

In normal usage conditions, the CO sensor has an average life longer than 5 years. If you need to replace the CO sensor, order a new sensor (code **ECO-SURE-2E CO**).
To replace the CO sensor, follow this procedure:

1. Switch the instrument off.

2. On the instrument, open the sensor-holder small door using a screwdriver and extract the exhausted CO sensor.

3. Take a new CO sensor and note down the number printed on the edge that indicates its nA/ppm sensitivity.

4. Insert the new sensor electrodes in the terminals.

5. Turn the instrument on, and wait for at least 5 minutes so as to stabilize the measurement.
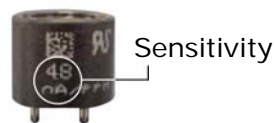
6. Use the arrows ▼ ▲ to select the **2) Calibration CO** item:

```
        SENSORS
       CALIBRATION


1) Calibration CO₂
2) Calibration CO
3) Calibration RH


▼▲ select
<ESC> exit/cancel
<ENTER> confirm
```

Confirm with ENTER. The following screen will appear:

```
        SENSORS
       CALIBRATION
      CALIBRATION CO


1) Cal zero
2) Set sensitivity


▼▲ select
<ESC> exit/cancel
<ENTER> confirm
```

Confirm with ENTER. The following screen will appear:

```
        SENSORS
       CALIBRATION
      CALIBRATION CO
      SENSITIVITY SET
Sens      50 nA/ppm
CO         0 ppm


▼▲ set
<ESC> exit/cancel
<ENTER> confirm
```

Use the arrows ▼ ▲ to change the CO sensor sensitivity value, and confirm using ENTER.

If necessary, perform the CO sensor calibration at zero ppm.

4.5.3 RH calibration (HD21AB17 only)

This procedure applies to **HD21AB17** instrument.
Before starting the calibration operation, you should **check** if you need a new calibration using the saturated solutions at 75.4%RH and 33%RH: You should proceed with the calibration, only if you find an error in one of the two above calibration points.

The calibration procedure removes the previous calibration data.
For a correct calibration of the sensor, **the first point should be 75%RH** and the second point 33%RH.
Use the arrows ▼▲ to select the **3) Calibration RH** item:

```
        SENSORS
       CALIBRATION

1) Calibration CO₂
2) Calibration CO
3) Calibration RH

▼▲ select
<ESC> exit/cancel
<ENTER> confirm
```

Confirm with ENTER. The following screen will appear:

```
        SENSORS
       CALIBRATION
     CALIBRATION RH

1) Cal RH 75%
2) Cal RH 33%

▼▲ select
<ESC> exit/cancel
<ENTER> confirm
```

1. Use the arrows ▼▲ to select the **1) RH Cal 75%** item; you will get the following page:

```
        SENSORS
       CALIBRATION
     CALIBRATION RH
       CAL RH 75%
Actual  T =   22.0°C
Actual RH =   28.1%
RH 75%    =   70.2%
▼▲ set
<ESC> exit/cancel
<ENTER> confirm
```

2. Use the arrows ▼▲ to enter the RH 75% nominal value.

3. Check that the salt solution container contains simultaneously:
   - Salt in solid state
   - Liquid solution and wet salt.

4. **The probe and the saturated solution for this operation should have the same temperature**, and therefore should be located in a room with a stable temperature for the entire calibration period.

5. Unscrew the probe protection; screw the M12×1 threaded ring.

6. **Should there be any liquid inside the measuring chamber, dry it with some blotting paper. The formation of liquids inside the measuring chamber, does not impair the measurement uncertainty of the solution or measurement.**

7. Screw the ring to the container with the saturated solution. Avoid any contact of the sensitive element with your hands or another object or liquid.

8. Once the sensor has been inserted, wait at least 30 minutes, if the probe and salts have the same temperature. Otherwise you should wait the time necessary to reach a balance.

9. After 30 minutes, press ENTER. The new calibration value has been captured.

10. Once the measurements have been acquired, repeat the same operations backwards.

11. To check the second calibration point, repeat the operations from point 1 to point 10.

Probe protection

Notes and warnings:
I. Store the salt solutions in a dark environment at a constant temperature of about 20°C.
II. The salt solutions are efficient and can be used until they have some salt to be dissolved and liquids. Usually, for the 33% RH and 11% RH solutions, you need to check the presence of salt in solid state, while for the 75% RH solution, you need to check the presence of liquid or wet salt.
III. In order to perform the best calibration, the temperature of the probe and of the solution should be as close as possible. Remember that plastic materials are bad heat exchangers. Any difference of tenths of degrees between sensors and salt saturated solutions can give errors in the RH measurements.
IV. Do not let hands or anything touch the sensitive element. Scratches or dirt alter the instrument measurement and can damage the sensor.
V. The measuring chamber must be closed, otherwise it will not reach a balance. Screw the probe all the way in the container thread.
VI. The tuning or calibration sequence of Delta Ohm instruments is as follows:
   - First solution: 75% RH.
   - Second solution: 33% RH.
   - The checking order is not mandatory.

VII. If the check, tuning or calibration, is performed at a different temperature than 20°C, the salt solution relative humidity reference value corresponding to the working temperature is outlined in the following table. The table indicates the relative humidity variation of the saturated salt according to the temperature variation.

Relative Humidity Balance values of some saturated salt solutions from 0°C to 100°C			
Temp. °C	Lithium chloride	Magnesium chloride	Sodium chloride
0	11.23 ± 0.54	33.66 ± 0.33	75.51 ± 0.34
5	11.26 ± 0.47	33.60 ± 0.28	75.65 ± 0.27
10	11.29 ± 0.41	33.47 ± 0.24	75.67 ± 0.22
15	11.30 ± 0.35	33.30 ± 0.21	75.61 ± 0.18
20	11.31 ± 0.31	33.07 ± 0.18	75.47 ± 0.14
25	11.30 ± 0.27	32.78 ± 0.16	75.29 ± 0.12
30	11.28 ± 0.24	32.44 ± 0.14	75.09 ± 0.11
35	11.25 ± 0.22	32.05 ± 0.13	74.87 ± 0.12
40	11.21 ± 0.21	31.60 ± 0.13	74.68 ± 0.13
45	11.16 ± 0.21	31.10 ± 0.13	74.52 ± 0.16
50	11.10 ± 0.22	30.54 ± 0.14	74.43 ± 0.19
55	11.03 ± 0.23	29.93 ± 0.16	74.41 ± 0.24
60	10.95 ± 0.26	29.26 ± 0.18	74.50 ± 0.30
65	10.86 ± 0.29	28.54 ± 0.21	74.71 ± 0.37
70	10.75 ± 0.33	27.77 ± 0.25	75.06 ± 0.45
75	10.64 ± 0.38	26.94 ± 0.29	75.58 ± 0.55
80	10.51 ± 0.44	26.05 ± 0.34	76.29 ± 0.65
85	10.38 ± 0.51	25.11 ± 0.39	
90	10.23 ± 0.59	24.12 ± 0.46	
95	10.07 ± 0.67	23.07 ± 0.52	
100	9.90 ± 0.77	21.97 ± 0.60	

4.6 LANGUAGE

It sets the language used by the instrument.
Using the ▲▼ arrows, select the desired language and confirm with ENTER.

```
        LANGUAGE

1) Italiano
2) English
3) Français
4) Español
5) Deutsch
▼▲ select
<ESC> exit/cancel
<ENTER> confirm
```

5. USB INTERFACE

HD21AB and **HD21AB17** are fitted with an USB 2.0 interface.

Optionally, you can receive on request the serial connection cable **CP23** with mini-USB connector on instrument's side and USB 2.0 connector on computer's side.

The USB connection requires the previous installation of the driver saved on the CD-ROM of the instrument software. **Install the driver before connecting the USB cable to the PC** (please see the details on chapter **6.1 Connection to the USB 2.0 port**).

Standard parameters of the instrument serial transmission are:
- Baud rate   460800 baud
- Parity   None
- N. bit   8
- Stop bit   1
- Protocol   Xon/Xoff

The USB 2.0 connection does not require the setting of parameters.

The instruments are provided with a complete set of commands and data queries to be sent via the PC.

All the commands transferred to the instrument must have the following structure:
XXCR where: **XX** is the command code and **CR** is the Carriage Return (ASCII 0D)
The XX command characters are exclusively upper case characters. Once a correct command is entered, the instrument responds with "&"; when any wrong combination of characters is entered, the instrument responds with "?".
The instrument response strings end with the sending of the CR command (Carriage Return) and LF (Line Feed).
Before sending commands to the instrument via the serial port, locking the keyboard to avoid functioning conflicts is recommended: Use the P0 command. When complete, restore the keyboard with the P1 command.

Command	Response	Description
P0	&	Ping (locks the instrument keyboard for 70 seconds)
P1	&	Unlocks the instrument keyboard
S0		
G0	`Model HD21AB17`	Instrument model
G1	`M=Indoor Air Quality`	Model description
G2	`SN=12345678`	Instrument serial number
G3	`Firm.Ver.=01.00`	Firmware version
G4	`Firm.Date=2010/02/10`	Firmware date
G5	`cal 2010/02/10 10:30:00`	Calibration date and time
C1		RH-T probe type, serial number, calibration date
C2		CO-CO_2 probe type, serial number, calibration date
GC		Print instrument's heading
GB	`ID=0000000000000000`	User code (set with T2xxxxxxxxxxxxxxxx)
HA		Print the current data measurement
LR		Print the instrument memory map
KInn		Print the information of Loggging nn
KRaaaa		Print the recorded data in page aaaa
KE	&	Stop the data download
LE	&	Erase stored data

Command	Response	Description
K1	&	Immediate printing of data
K0	&	Stop printing data
K4	&	Start logging data
K5	&	Stop logging data
KP	&	Auto-power-off function = ENABLE
KQ	&	Auto-power-off function = DISABLE
WC0	&	Setting SELF off
WC1	&	Setting SELF on
RA	`Sample print =    0sec`	Reading of PRINT interval set and label of the measurements
RL	`Sample log =   30sec`	Reading of LOG interval set
WA#	&	Setting PRINT interval. # is a hexadecimal number 0…D that represents the position of the interval in the list 0, 1, 5, 10, …, 3600 seconds.
WL#	&	Setting LOG interval. # is a hexadecimal number 1…D that represents the position of the interval in the list 15, …, 3600 seconds.

5.1 STORING AND TRANSFERRING DATA TO A PC

HD21AB and **HD21AB17** can be connected to a personal computer via an USB port, and exchange data and information through the DeltaLog10 software (from version 0.1.5.3) running in a Windows operating environment. It is possible to store the measured values in the internal memory using the *Logging* function (MEM key). If necessary, the data stored in the memory can be transferred later to a PC.

5.1.1 Logging Function

The *Logging* function allows recording of the measurements. The time interval between two consecutive measurements can be set from 15 seconds to 1 hour. The logging starts by pressing the **MEM** key and ends by pressing the same key again: The data memorized in this way form a continuous block of data.

See the description of the menu items on chapter "**4. MAIN MENU**".

If the automatic turning off option between two recordings (see par. *4.2.2 AutoPowerOff– AutoPowerOff Mode*) is enabled, upon pressing the **MEM** key the instrument logs the first data and turns off. 1 minute before the next logging instant, it turns on again to capture the new sample, and then turns off.

The data stored in the memory can be transferred to a PC through the DeltaLog10 software (from version 0.1.5.3). During data transfer the display shows the message DUMP; to stop the data transfer press ESC on the instrument or on the PC.

5.1.2 Clearing the memory

To clear the memory use the Erase Log function (see par. *4.2.5 Log File Manager*). The instrument starts clearing the internal memory; at the end of the operation, it goes back to normal display.

NOTES:
- Data transfer does not cause the memory to be erased: The operation can be repeated as many times as required.
- The stored data remain in the memory independently of the battery charge conditions.
- **The direct connection between instrument and printer via a USB connector does not work.**
- Some keys are disabled during *logging*. The following keys are enabled: **MEM**, **MENU**, **ENTER** and **ESC**.
- Pressing the **MEM** and **MENU** keys has no effect on the logged data if these keys are pressed **after** starting the recording, otherwise the following is valid.

5.1.3 Print function

Press **ENTER** to send the measured data directly to the USB port, in real time. The printed data units of measurements are the same as those used on the display. The function is started by pressing **ENTER**.

The time interval between two consecutive prints can be set from 15 second to 1 hour (please see the **Print interval** menu item at par. *4.3.1 Print Interval*). If the print interval is equal to 0, by pressing **ENTER** a single data is sent to the connected device. If the print interval is higher than 0, the data transfer continues until the operator stops it by pressing **ENTER** again.

6. CONNECTION TO A PC

HD21AB and **HD21AB17** are fitted with a **mini-USB** connector for connecting the instruments to the PC. Use the **CP23** cable for connection to the PC's USB port.

The instruments are supplied with the **DeltaLog10 software (from version 0.1.5.3).** The software manages the connection, data transfer, graphic presentation, and printing operations of the captured or logged measurements.

The CD-Rom with the DeltaLog10 software (from version 0.1.5.3) is complete with "On-line Help" (also in PDF format) describing its characteristics and functions. It also contains the instrument manual and the USB drivers.

The instruments are also compatible with the HyperTerminal communication program.

6.1 CONNECTION TO THE USB 2.0 PORT

This help illustrates the procedure for the correct installation of the USB drivers.

The procedure applies to Windows® operating systems: Xp, Vista and Windows 7.

For the Windows 98, ME and 2000, please see the "*Guide to installation of the USB drivers for Windows 98, ME and 2000*" in the section *Documentation of the* **DeltaLog10 (from version 0.1.5.3) CD-Rom**.

Do not connect the instrument to the USB port before installation of the drivers.

Proceed as follows:

1. **Do not connect the instrument to the USB port until you are expressly requested to do it.**

2. Insert the software CD-Rom and wait for the initial page.

   a. With Windows Vista and Windows 7, you will get the following page: Select "*Open folder to view files*".

b. In the next page, right click on "*Autorun*" and select "*Run as administrator*":
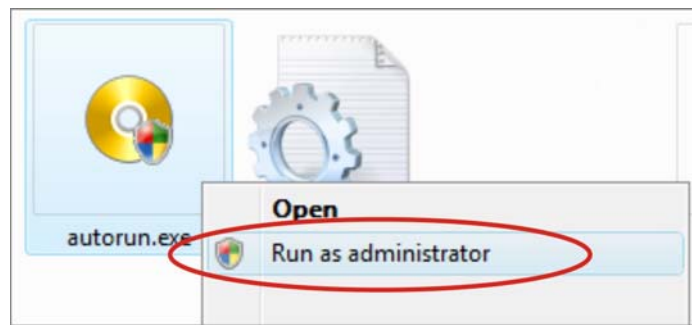

3. From the initial software page, click on "*USB drivers setup*" to start the USB drivers installation.

4. The application checks the presence of the drivers on the PC:
   - **If not installed**, the installation is started;
   - **If already installed**, you can proceed to remove them using this command (please see next chapter).
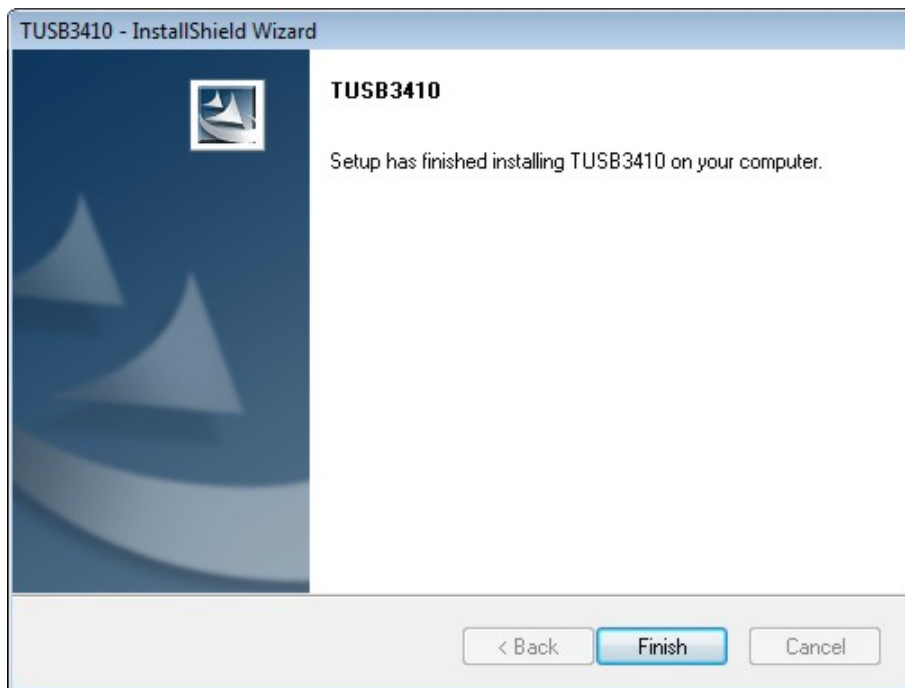
5. In the next page, press NEXT:
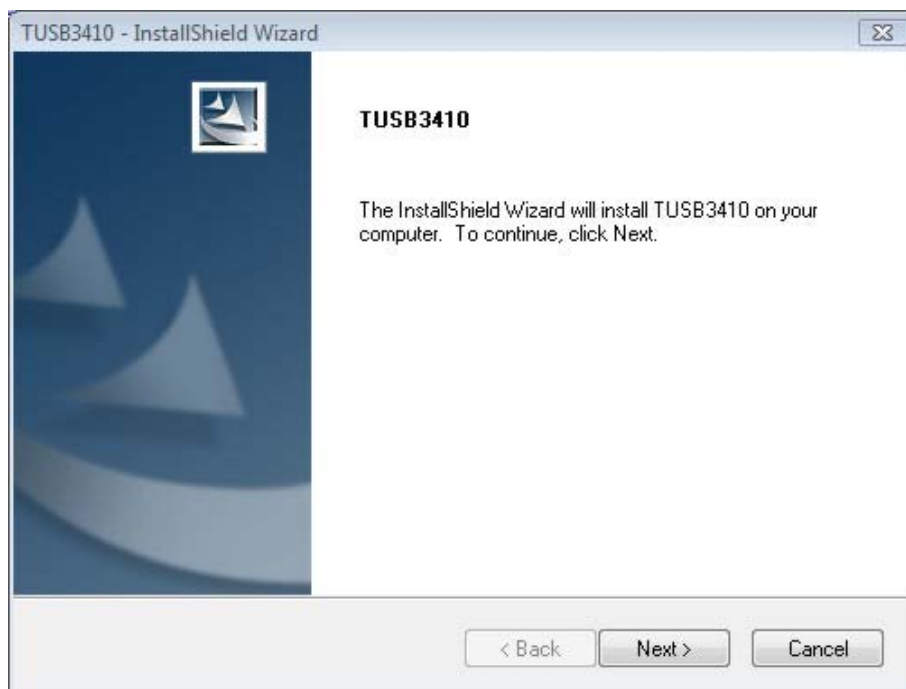
6. The installation wizard prompts the software user license: To proceed, the software usage terms must be accepted. Then press NEXT:
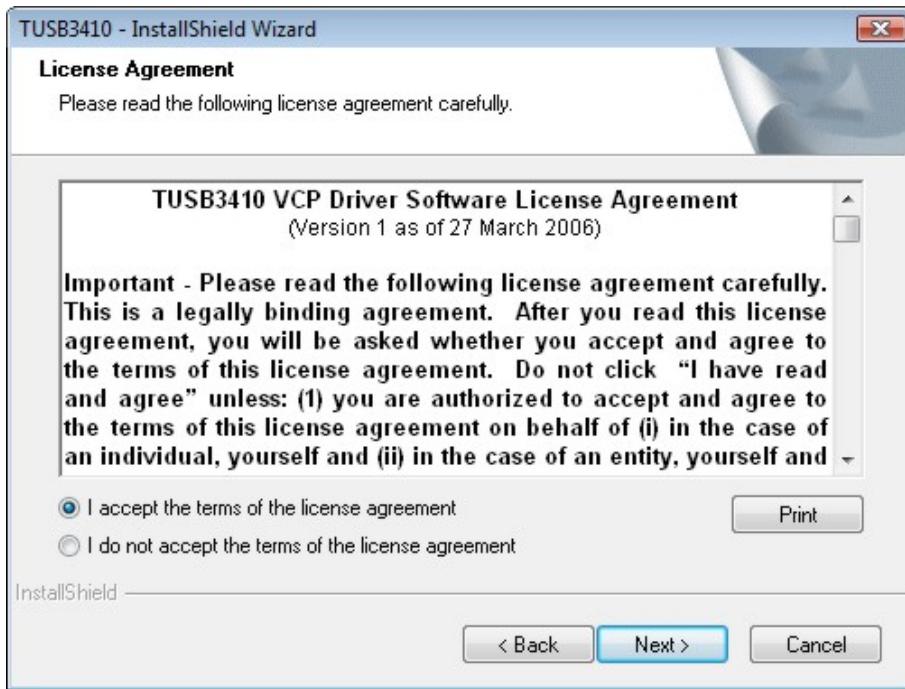
7. Wait for the file installation. At the end, you will get a confirmation message of the correct driver installation.

8. Press FINISH to close the installation program.

9. If the installation was started from the CD-Rom, you will get a message to connect the instrument to the USB port: Press OK and close the Delta Ohm software by pressing EXIT.

10. **Connect the instrument to the USB port and turn it on**: When Windows detects the new device, you will get the corresponding message.

11. Wait few seconds until the message that the new hardware is installed and ready for use appears.

12. The drive installation is now complete: The device will be automatically detected on each new connection.

In order to check if the entire operation was successful, proceed as follows:

On Windows XP:

Select "START >> Settings >> Control Panel", then double click on SYSTEM. Select "Hardware >> Device Manager".
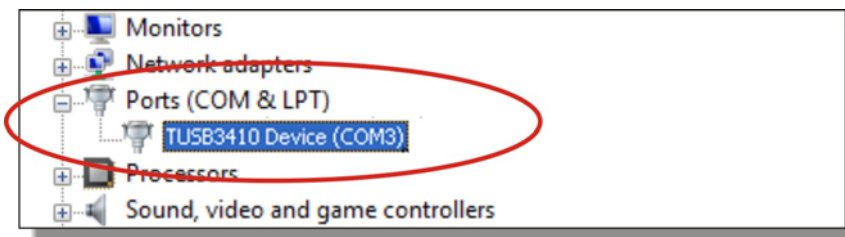
On Windows Vista and Windows 7:

Select "START >> Settings >> Control Panel", then double click on "Device Manager".

Connect the instrument to the USB port.

The *"Ports (COM and LPT) >> TUSB3410 Device (COM#)"* item should appear.

The # value is the number assigned to the virtual serial port.

When the USB cable is disconnected, this item disappears and comes back when it is connected again.

Note 1. If the instrument is connected to the USB port **before installing the drivers**, Windows XP opens the "*New hardware installation wizard*" page. On Windows Vista and Windows 7 you will get an installation error in "*Device Manager*": In both cases, cancel the operation, disconnect the device, and repeat the procedure illustrated at the beginning of this guide.

Note 2. If the drivers have been downloaded from the Delta Ohm web site:

a. Unzip the "*Driver_USB_TUSB3410.zip*" into a temporary folder on the PC.
b. On Windows XP: Run "*Setup.exe*" by double clicking on it.
   On Windows Vista and Windows 7, right click on "*Autorun*" and select "*Run as administrator*".
c. Proceed from point 4 in this chapter.

6.2 REMOVING THE USB DRIVERS

To remove the USB drivers, *proceed as follows*:

1. Disconnect the instrument from the PC.

2. On Windows XP use the control panel (START >> Settings >> Control Panel) to start "Add/Remove Software".

   On Windows Vista and Windows 7 use the control panel (START >> Settings >> Control Panel) to start "Programs and Features".

3. Select the "*Texas Instruments TUSB3410 drivers*" item and press "Change/Remove" or "Unistall".

4. The program prompts for the drivers removal. Confirm with OK to proceed.

5. Wait for the drivers removal.

6. The USB drivers removal is now complete.

7. INSTRUMENT SIGNALS AND FAULTS

The following table lists all error indications and information displayed by the instrument and supplied to the user in different operating situations:

Display indication	Explanation
- - - -	This appears if the sensor relevant to the indicated physical quantity is not present or is faulty.
OVFL	Overflow appears when the probe detects a value that exceeds the expected measurement range.
UFL	Underflow appears when the probe detects a lower value than the expected measurement range.
MEMORY FULL!!	The instrument cannot store further data, the memory space is full.
LOG	It indicates that a logging session is running.

8. BATTERY SYMBOL – MAINS POWER SUPPLY

The meter is provided with a pack of **4 x 1.2V-2200mA/h Ni-MH rechargeable batteries**, placed in the battery compartment.

The battery symbol ▮▮▮▮ on the display constantly shows the battery charge status. To the extent that batteries have discharged, the symbol "empties". When the charge decreases still further it starts blinking.

▮▮▮▮   ▮▮   ▮

In this case, batteries should be replaced as soon as possible.
If you continue to use it, the instrument can no longer ensure correct measurement and turns off. Data stored on memory will remain.
The battery symbol becomes [≈] when the external power supply is connected and the batteries charging process is ended.

The instrument can be powered by the mains using, for example, the stabilized power supply SWD10 input 100÷240 Vac output 12 Vdc – 1000mA.
The power supply positive (pole) must be connected to the central pin.
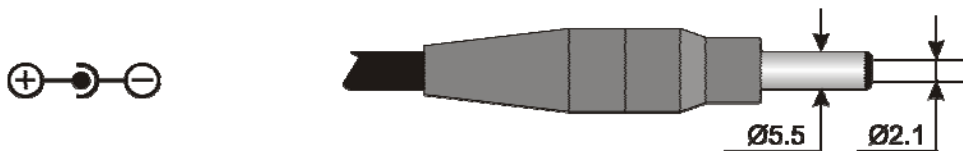
The external power supply connector has an external diameter of 5.5mm and an internal diameter of 2.1mm.

Warning:
The power supply has a double function: it **powers the meter and recharge** the Ni-MH battery pack.

8.1 BATTERIES RECHARGING

To recharge the battery pack use the **SWD10** battery charger supplied with the instrument.
Proceed as follows:
- Connect the battery charger plug to the mains socket, and the battery charger connector to the socket placed on the left side of the instrument. **The power supply must be 12Vdc.**
- The batteries recharging process is highlighted on the instrument display with a cyclic visualization of the batteries level:
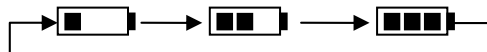
- Keep charging the batteries until the **[≈]** symbol appears on the display in the place of the battery symbol.

8.2 NOTES FOR THE BATTERIES USE

- At the first start up, it's necessary to completely recharge the batteries.
- The charge time of the batteries package is about 4 hours.
- The last of the batteries package in measurement working mode is about 8 hours.
- A new Ni-MH batteries package reaches the maximum of its performance only after being discharged and charged completely again at least twice or three times.
- The batteries package autonomy depends on the instrument use. Even if the instrument is in stand-by with the batteries package completely charges, it is autonomously charged during the time.
- The batteries package can be charge and discharge hundred of times, but using them the charge loses its own capacity. Replace the batteries package when the autonomy is reduced at some hours.
- Use only Delta Ohm batteries package code **BAT-40** and recharge it using **SWD10** battery charger or one that complies with the specifications indicated in the technical data.
- The Ni-MH batteries package lasts more if, sometimes, you act with cutting and you completely discharge it.
- Extreme temperatures weigh negatively on the performances of the batteries package.

8.3 REPLACEMENT OF THE BATTERY PACK

To replace the battery pack proceed as follows:
- Disconnect the external power supply, if connected.
- Remove, from the back of the instrument, the batteries compartment cover unscrewing the screw.
- Extract the connector paying attention to not break the wires.
- Remove the battery pack.
- Connect the new battery pack: the connector has a key that prevents a wrong insertion.
- Replace the pack in the batteries compartment.
- Close the batteries compartment with the closing screw.

8.4 BATTERIES DISPOSAL

Recycle the batteries or throw them in a suitable manner.
Don't throw the batteries to the waste.
Don't throw the batteries into the fire.

9. INSTRUMENT STORAGE

Instrument storage conditions:
- Temperature: -25…+65°C.
- Humidity: less than 90% RH without condensation.
- During storage avoid locations where:
  - humidity is high;
  - the instrument may be exposed to direct sunlight;
  - the instrument may be exposed to a source of high temperature;
  - the instrument may be exposed to strong vibrations;
  - the instrument may be exposed to steam, salt or any corrosive gas.

Some parts of the instrument are made of ABS plastic, polycarbonate: do not use any incompatible solvents for cleaning.

10. TECHNICAL CHARACTERISTICS

Instrument

Dimensions (Length x Width x Height)	210x90x40 mm (HD21AB)
	300x90x40 mm (HD21AB17 with probe)
Weight	470 g (batteries included)
Materials	ABS, rubber
Display	Backlit, Dot Matrix
	160x160 dots, visible area 52x42 mm

Operating conditions

Operating temperature	-5 … 50°C
Warehouse temperature	-25 … 65°C
Working relative humidity	0 … 85% RH without condensation

Instrument uncertainty   ± 1 digit @ 20°C

Power

Mains adapter (code SWD10)	12Vdc/1A
Batteries	4 x 1.2V Ni-MH rechargeable batteries AA type
Autonomy	8 hours of continuous use in measure mode
Power absorbed with instrument off	< 45μA

Security of stored data   Unlimited

Serial interface:

Socket:	mini-USB
Type:	USB 1.1 or 2.0 non insulated
Baud rate:	460800
Data bits:	8
Parity:	None
Stop bits:	1
Flow control:	Xon-Xoff
Cable length:	Max. 5 m

Memory   Divided in 64 blocks.

Storage capacity   67600 recordings.

Logging interval   Selectable among: 15, 30 seconds, 1, 2, 5, 15, 20, 30 minutes and 1 hour.

Logging interval	Storage capacity	Logging interval	Storage capacity
15 seconds	About 11 days and 17 hours	15 minutes	About 1 year and 339 days
30 seconds	About 23 days and 11 hours	20 minutes	About 2 years and 208 days
1 minute	About 46 days and 22 hours	30 minutes	About 3 years and 313 days
2 minutes	About 93 days and 21 hours	1 hour	About 7 years and 261 days
5 minutes	About 234 days and 17 hours		

10.1 TECHNICAL DATA OF THE SENSORS

CO_2 Carbon Dioxide

Sensor	NDIR Dual Wavelength
Measurement range	0 … 5000ppm
Sensor working range	-5 … 50°C
Accuracy	±50ppm+3% of measure
Resolution	1ppm
Temperature dependence	0.1%f.s./°C
Response time (T_{90})	< 120 sec (wind speed = 2m/sec)
Long-term stability	5% of measure/5 years

CO Carbon Monoxide

Sensor	Electrochemical cell
Measurement range	0 … 500ppm
Sensor working range	-5 … 50°C
Accuracy	±3ppm+3% of measure
Resolution	1ppm
Response time (T_{90})	< 50 sec
Long-term stability	5% of measure/year
Service life	> 5 years in normal environment conditions

Atmospheric Pressure Patm

Type of sensor	Piezo-resistive
Measurement range	750 … 1100 hPa
Accuracy	±1.5 hPa @ 25°C
Resolution	1 hPa
Long-term stability	2hPa/year
Temperature drift	±3hPa with temperature -20 … +60°C

Relative Humidity RH (HD21AB17 only)

Type of sensor	Capacitive
Sensor protection	Stainless steel grid filter (on request 20μm sintered filter P6 in AISI 316 or 10μm sintered filter P7 in PTFE)
Measurement range	0 … 100 % RH
Sensor working range	-20 … +60°C
Accuracy	±2% (10÷90% RH) ±2.5% in the remaining range
Resolution	0.1% RH
Temperature dependence	±2% on all temperature range
Hysteresis and repeatability	1% RH
Response time (T_{90})	< 20 sec (wind speed = 2m/sec) without filter
Long-term stability	1%/year

Temperature T (HD21AB17 only)

Type of sensor	NTC 10kΩ
Measurement range	-20 … +60°C
Accuracy	±0.2°C ±0.15% of measure
Resolution	0.1°C
Response time (T_{90})	< 30 sec (wind speed = 2m/sec)
Long-term stability	0.1°C/year

11. ORDERING CODES

HD21AB   IAQ Monitor datalogger kit. It measures CO, CO_2 and atmospheric pressure. Complete with: **DeltaLog10** software (**version 0.1.5.3 and later**) for data download, monitor, and data processing on Personal Computer, 4 x 1.2V NiMH rechargeable batteries, operating manual, case. **The cables must be ordered separately.**

HD21AB17   IAQ Monitor datalogger kit. It measures CO, CO_2, atmospheric pressure, temperature and relative humidity. Complete with: **DeltaLog10** software (**version 0.1.5.3 and later**) for data download, monitor, and data processing on Personal Computer, 4 x 1.2V NiMH rechargeable batteries, operating manual, case. **The cables must be ordered separately.**

11.1 ACCESSORIES

SWD10   Stabilized power supply at 100-240Vac/12Vdc-1A mains voltage.
CP23   Connection cable with male mini-USB connector on instrument's side and USB 2.0 male connector on PC's side.
BAT-40   Spare batteries with built-in temperature sensor.

11.1.1 Accessories for CO and CO_2 sensors

MINICAN.12A   Nitrogen bottle for CO and CO_2 sensor calibration at 0ppm. Volume 12 liters. **With adjustment valve.**
MINICAN.12A1   Nitrogen bottle for CO and CO_2 sensor calibration at 0ppm. Volume 12 liters. **Without adjustment valve.**
ECO-SURE-2E CO CO spare sensor.
HD37.36   Kit connection tube between instrument and MINICAN.12A for CO calibration.
HD37.37   Kit connection tube between instrument and MINICAN.12A for CO_2 calibration.

11.1.2 Accessories for humidity sensor

HD75   Saturated solution at 75.4%RH@20°C for calibration of relative humidity probes, ring M24x1.5 and M14x1.
HD33   Saturated solution at 33.0%RH@20°C for calibration of relative humidity probes, ring M24x1.5 and M14x1.
P5   Protection grid in stainless steel for Ø 14mm probes.
P6   Complete protection in 20μ sintered AISI 316 for Ø 14mm probes.
P7   Complete protection in 10μ sintered PTFE for Ø 14mm probes.
P8   Protection grid in stainless steel and Pocan for Ø 14mm probes, thread M12x1.

The Delta Ohm Metrological Laboratories are accredited by SIT in regards to Temperature, Humidity, Pressure, Photometry/Radiometry, Acoustics and Wind Speed. On request, the probes can be supplied with calibration certificate.

CERTIFICATO DI CONFORMITÀ DEL COSTRUTTORE
MANUFACTURER'S CERTIFICATE OF CONFORMITY

rilasciato da
issued by

DELTA OHM SRL MEASURING INSTRUMENTS

DATA
DATE   2010/05/12

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

We certify that below mentioned instruments have been tested and passed all production tests, confirming compliance with the manufacturer's published specification at the date of the test.
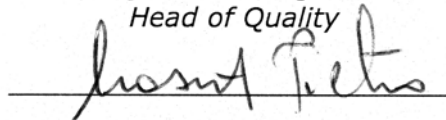
La riferibilità delle misure ai campioni internazionali e nazionali è garantita da una catena di riferibilità che ha origine dalla taratura dei campioni di prima linea dei laboratori accreditati di Delta OHM presso l'Istituto Primario Nazionale di Ricerca Metrologica.

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

Tipo Prodotto: **Indoor Air Quality Monitor**
Product Type: *Indoor Air Quality Monitor*

Nome Prodotto: **HD21AB – HD21AB17**
Product Name: *HD21AB – HD21AB17*

Responsabile Qualità
Head of Quality

GUARANTEE

TERMS OF GUARANTEE

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

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

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

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

Instrument Code: ❏ **HD21AB**   ❏ **HD21AB17**

Serial Number _____

RENEWALS

Date _____   Date _____

Inspector _____   Inspector _____

Date _____   Date _____

Inspector _____   Inspector _____

Date _____   Date _____

Inspector _____   Inspector _____

CE CONFORMITY	
Safety	EN61000-4-2, EN61010-1 LEVEL 3
Electrostatic discharges	EN61000-4-2 LEVEL 3
Fast electric transients	EN61000-4-4 LEVEL 3
Voltage variations	EN61000-4-11
Electromagnetic interference susceptibility	IEC1000-4-3
Electromagnetic interference emission	EN55022 class B