OPERATING MANUAL

HD37AB1347

IAQ Monitor

EN

V4.0

senseca

Contents

1 Introduction

The **HD37AB1347 IAQ Monitor** is an instrument for the analysis of indoor air quality (IAQ, Indoor Air Quality).

The instrument simultaneously measures the following parameters, using the **P37AB147** SICRAM probe: CO_2 **Carbon Dioxide**, CO **Carbon Monoxide**, **Temperature**, **Relative Humidity**, it calculates **Dew Point**, **Wet Bulb Temperature**, **Absolute Humidity**, **Mixing Ratio**, **Enthalpy** and **Atmospheric Pressure**. You can also connect **Temperature** and **Humidity** SICRAM combined probes, **Hot-Wire Sensor Wind Speed** SICRAM probes, **Vane Wind Speed** SICRAM probes, and **Temperature** SICRAM probes **with Pt100 sensor**, to the instrument.

The instrument, using a proper procedure, calculates the percentage of external air input (**% Outside Air**) according to CO_2 Carbon Dioxide, temperature, and **Ventilation Rate.**

The HD37AB1347 is a datalogger with a memory capacity of 67600 recordings per each of the two inputs, divided in 64 blocks. It uses the **DeltaLog10 software** downloadable from the website.

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, or the input of non-sufficiently purified external air (Ventilation Rate).

The instrument has a wide Dot Matrix graphic display with a resolution of 160x160 dots.

The instrument typical applications, using the above range of probes, 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 Description

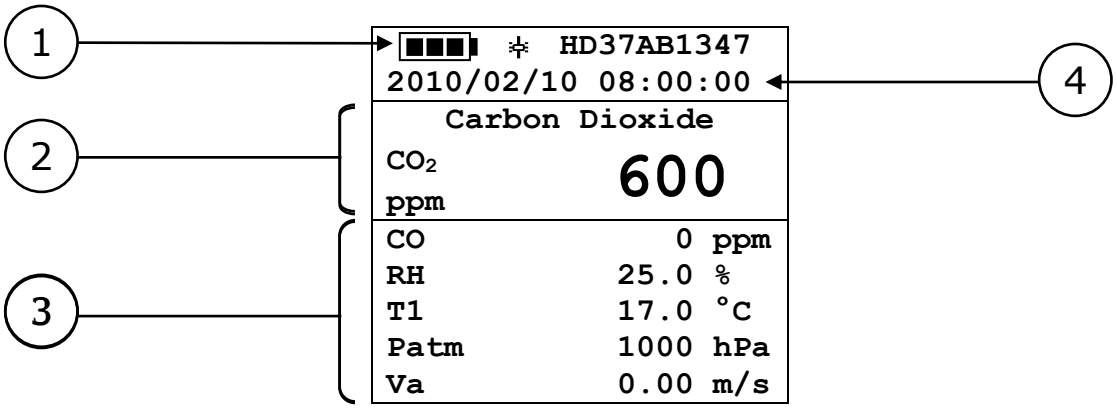
1. **Indoor Air Quality** input for the **SICRAM** probes:
   - P37AB147: It measures CO_2 Carbon Dioxide, CO Carbon Monoxide, Relative Humidity RH, Temperature T, and Atmospheric Pressure Patm.
   - **Humidity** and **Temperature** combined probes.
   - **Temperature** probes **with Pt100 sensor**.
2. Power supply input.
3. Backlit graphic display.
4. **ESC** key: It allows to exit from the menu or, in case of a submenu, to exit from the current level display.
5. 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.
6. Navigation key ◄**/Func**: It allows navigation through the menus. In normal view, it allows to display the statistical data: maximum, minimum, and average.
7. **MEM** key: It allows to start and end the recording of data (logging).
8. 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.
9. **MENU** key: It allows to enter and exit the instrument's functioning parameter setting menu.
10. Navigation key ►**/ Unit**: It allows navigation through the menus. During normal operation, it changes the unit of measurement of the displayed main quantity.
11. **ENTER** key: In the menu, it confirms the data entered. In normal view, it allows to reset the statistical data and to print them on the HD40.1 printer.
12. **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.
13. **RS232** and **USB** serial port.
14. **Temp-Air Velocity** input (temperature and wind speed probes) for the **SICRAM** probes:
    - **Hot-Wire Sensor Wind Speed** probes.
    - **Vane Wind Speed** probes.
    - **Temperature** probes **with Pt100 sensor**.

3 User interface

The user interface consists 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**. 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.

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 and computed quantities** are:

CO_2	Carbon Dioxide	ppm
CO	Carbon Monoxide	ppm
RH	Relative Humidity	%
T1	Temperature detected by the probe connected to input 1	°C – °F
Patm	Atmospheric Pressure	hPa
Va	Wind Speed	m/s – km/h – ft/min – mph – knot
FVa	Flow Rate	L/s – m3/h – m3/min – m3/h – ft3/s ft3/min
T2	Temperature detected by the probe connected to input 2	°C – °F
Td	Dew Point	°C – °F

Tw	Wet Bulb Temperature	°C – °F
AH	Absolute Humidity	g/m3
r	Mixing Ratio	g/kg
H	Enthalpy	kJ/kg

Keyboard

The keys on the instrument perform the following functions:

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.

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 key

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

ENTER key

In the menu, it confirms the entered data.
During normal operation:

- It confirms the resetting of the statistical data.
- It prints the current data on the HD40.1 printer.

ESC key

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

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.**

If the **main quantity** is Relative Humidity 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 by repeatedly pressing the UNIT key you can display the temperature in °C or °F.

If the **main quantity** is Wind Speed, by repeatedly pressing the UNIT key you can display the Wind Speed in m/s – km/h – ft/min – mph – knot.

If the **main quantity** is Flow Rate, by repeatedly pressing the UNIT key you can display the Flow Rate in L/s – m^3/s – m^3/min – m^3/h – ft^3/s – ft^3/min.

4 Operation

Before turning the instrument on, connect the SICRAM probes to the inputs in the upper part of the instrument.

The following probes can be connected:

Input 1 **Indoor Air Quality** for the **SICRAM** probes:

- P37AB147: It measures CO_2 Carbon Dioxide, CO Carbon Monoxide, Relative Humidity RH, Temperature T, and Atmospheric Pressure Patm.
- **Humidity** and **Temperature** combined probes.
- **Temperature** probes **with Pt100 sensor**.

Input 2 **Temp-Air Velocity** for the **SICRAM** probes:

- **Hot-Wire Sensor Wind Speed** probes.
- **Vane Wind Speed** probes.
- **Temperature** probes **with Pt100 sensor**.

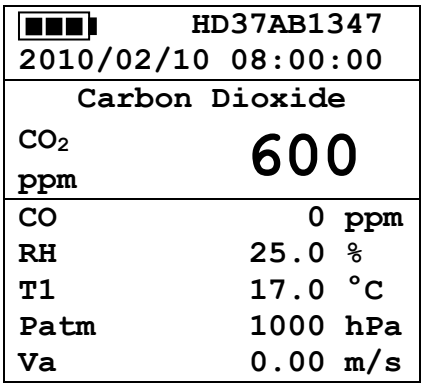
<u>Note</u>: Connect the probes when the instrument is off. If a new probe is connected and the instrument is on, it won't be detected. You need to turn the instrument off and on.

<u>Note</u>: If you connect two temperature probes with Pt100 sensor to the two inputs, only the Indoor Air Quality input probe will be detected. The Temp – Air Velocity input probe will be ignored.

If a probe is disconnected when the instrument is on, you will get an acoustic signal (one beep per second) and an indication on the display relevant to the physical quantity being disconnected. The **LOST** message will be displayed.

During turning on, the instrument code and the firmware version are displayed for about 10 seconds.

Connect the probes. Turn on the instrument: after about 10 seconds, the measurements will appear on the display:



CO_2: Carbon Dioxide
CO: Carbon Monoxide
RH: Relative Humidity
T1: Temperature detected by the probe connected to input 1
Patm: Atmospheric Pressure
Va: Wind Speed

4.1 "►/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.**

If the **main quantity** is Relative Humidity, 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 by repeatedly pressing the UNIT key, you can display the temperature in °C or °F.

If the **main quantity** is Wind Speed, by repeatedly pressing the UNIT key you can display the Wind Speed in m/s – km/h – ft/min – mph – knot.

If the **main quantity** is Flow Rate, by repeatedly pressing the UNIT key you can display the Flow Rate in L/s – m^3/s – m^3/min – m^3/h – ft^3/s – ft^3/min.

4.2 Immediate printing of data

By pressing **Enter**, you can print the current data on the **HD40.1** printer. Example:

```
========================
Model HD37AB1347
Indoor Air Quality
========================
Firm.Ver.=01.00
Firm.Date=2010/01/15
SN=12345678
User ID=0000000000000000
------------------------
Probe Ch.1 description
Type: CO2-C0 Fw.V0R0
Data cal.:2010/01/15
Serial N.:10010060
------------------------
Probe Ch.2 description
Type: Hot wire
Data cal.:2010/01/15
Serial N.: 10010100
========================
Date=2010/01/15 15:00:00
CO2          850  ppm
C0             0  ppm
RH          29.2  %
T1          22.7  °C
Patm         1010  hPa
Va          0.00  m/s
T2          22.0  °C
FVa          0.0  l/s
DP           3.8  °C
AH           5.9  g/m3
MR           5.0  g/kg
TW          12.8  °C
H          35.5 kJ/kg
========================
```

NOTES
Instrument model
Instrument firmware version
Instrument firmware date
Instrument serial number
Identification Code
Description of the probe connected to input 1
Description of the probe connected to input 2
Date and time
Carbon Dioxide
Carbon Monoxide
Relative Humidity
Temperature detected at input 1
Atmospheric Pressure
Wind Speed
Temperature detected at input 2
Flow Rate
Dew Point
Absolute Humidity
Mixing Ratio
Wet Bulb Temperature
Enthalpy

4.3 Maximum, minimum and average values of the captured quantities

By pressing the ◄/FUNC key you can display the maximum, minimum and average values of the measured quantities.

To reset the statistical data, press the ◄/FUNC key until the "Reset? Yes No" message appears. Select Yes using the ▲▼keys, and confirm with ENTER.

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

4.4 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.

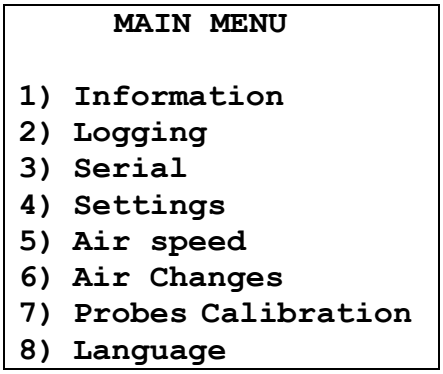
When the logging function is on, the ***LOG*** indication ***and the logging session number*** are displayed; a beep is issued each time a logging occurs.

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.

5 Menu

To access the configuration menu, press **MENU**:



If you do not press any key within 2 minutes, the instrument goes back to the main display.

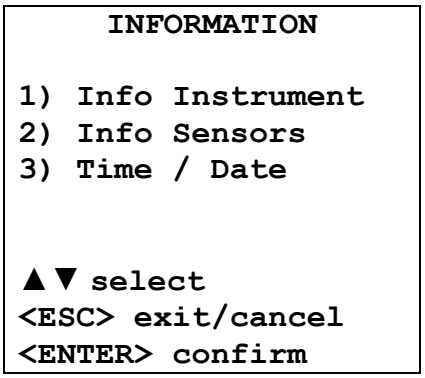
Use the arrows ▲▼ and press **ENTER** to select an item.

To exit the selected item and return to the previous menu, press **ESC**.

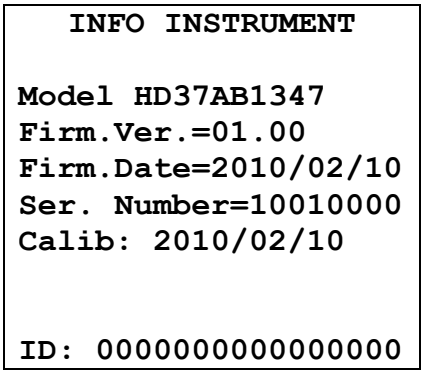
To exit immediately from the main menu, press **MENU** again.

5.1 Info Menu

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



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.



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 Probes**, the following information on the probes connected to the inputs will be displayed:

```
     INFO PROBES
       Input 1
Type= CO2-CO Fw.V0R0
Cal = 2010/02/10
SN  = 10010000

       Input 2
Type= Hot wire
Cal = 2010/02/10
SN  = 10010001
```

INFO PROBES:
Description of the probe connected to input 1, Indoor Air Quality.
Calibration date of the probe connected to input 1, Indoor Air Quality.
Serial number of the probe connected to input 1, Indoor Air Quality.
Description of the probe connected to input 2, Temp – Air Velocity.
Calibration date of the probe connected to input 2, Temp – Air Velocity.
Serial number of the probe connected to input 2, Temp – Air Velocity.

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

5.2 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
```

5.3 Log Interval

Use this item to set the LOG interval (interval between two subsequent sample captures).

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 – 30; 1 - 2 - 5 – 15 - 20 - 30 min.; 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		

5.4 Log Interval

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.

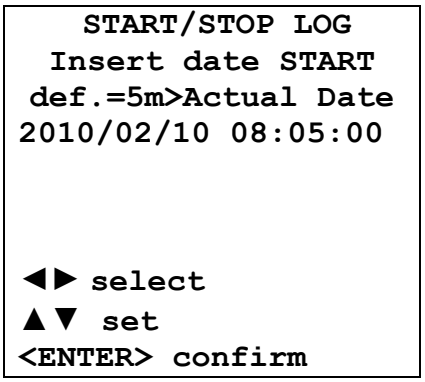
5.5 Start/Stop Log – Automatic Start

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.

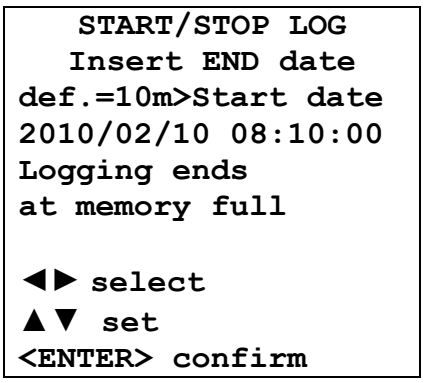
To enter this setting, proceed as follows.

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

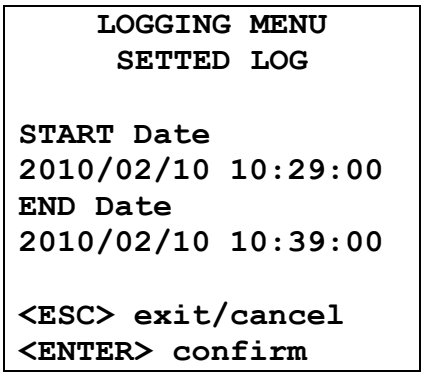


1. Use the arrows ◄► to select the data to be changed (year/month/day and hour/minutes/seconds).
2. Once selected, the data will start blinking.
3. Use the arrows ▼▲ to change its value.
4. Confirm by pressing ENTER.
5. Press ESC to return to the Logging menu without making any change.
6. Press ESC again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



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.



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 automatically starts 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.

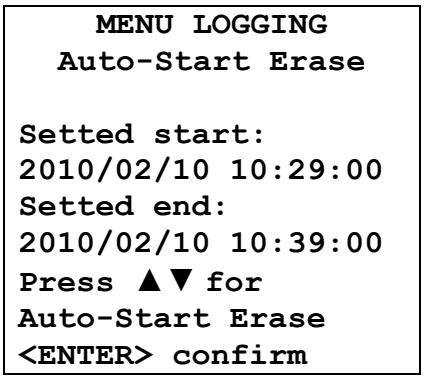
Note: **The automatic logging session is started even when the instrument is off**. If it is off when the automatic logging session is started, the instrument, even if powered by the mains, is turned on few seconds earlier and remains on at the end of logging. If it is powered by the battery, it is turned 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 *Auto Power Off* to set the automatic shut off.

5.6 Cancel Auto-Start

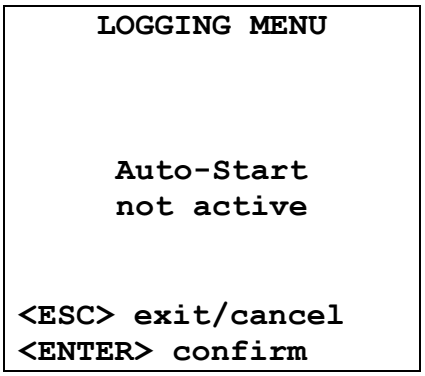
Once the LOG session starting and ending times are set, you can inhibit the session automatic start by using ***Start Log Erase***.

Once you have accessed the ***LOGGING*** submenu:

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



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



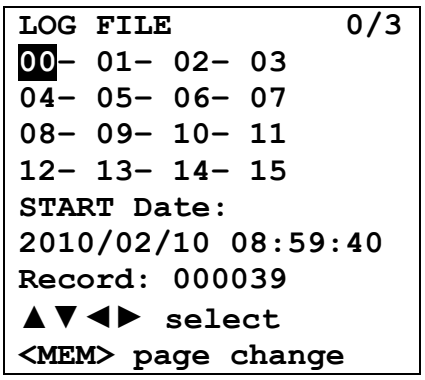
4. Press **ENTER** to cancel the automatic start.
5. Press **ESC** to exit without cancelling the automatic start.
6. Press **ESC** again to exit from the submenus.
7. Or press **MENU** to exit immediately from the main menu.

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

5.7 Log File Manager

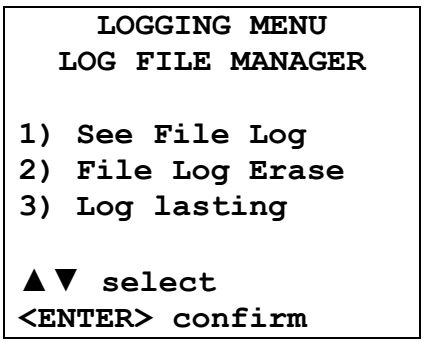
This item allows managing the logs captured: The instrument allows displaying of the captured data files and erasing the entire memory (***File Log Erase***).

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.



Once you have accessed the ***LOGGING*** submenu:

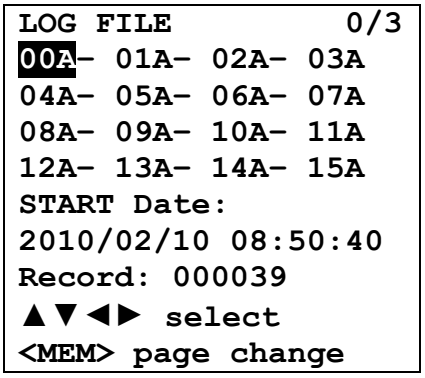
1. Use the arrows ▲▼ to select **Log File Manager**: You will see the following submenu:



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.

Viewing Log files:

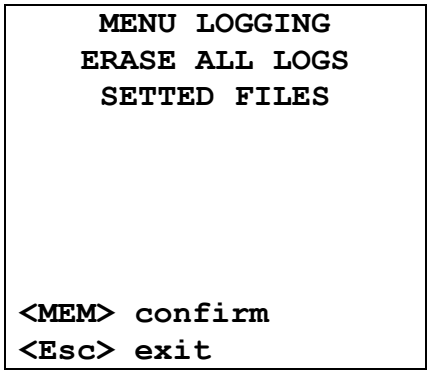
Selecting this item, you can view the logging sessions in the instrument:

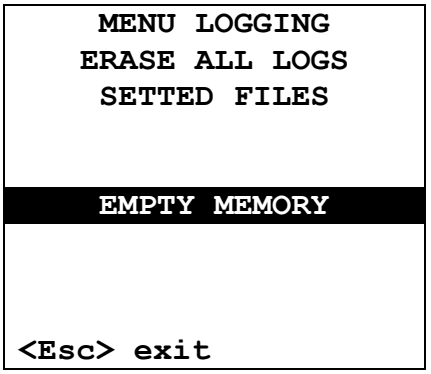


1. Use the arrows ▲▼◄► to select the log, and the **MEM** key to shift page. The session number is followed by the A letter if the session contains acquired measures only, or by the D letter if the session is related to the ventilation rate calculation.
2. Once a file is selected, the acquisition start 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:





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.

5.8 Serial Menu (Serial Communication)

The ***Serial*** submenu allows setting the data transfer speed via serial port (***Baud Rate***) and the record printing interval (***Print Interval***).

The LOG sessions can be downloaded on a PC, via serial **RS232** or **USB** connection.

In case of serial connection, the transfer speed can be set by the user (see next par.) but it cannot be higher than 38400 bps.

In case of 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.

The instrument can be connected directly to a **HD40.1 printer**.

To access the ***Serial*** submenu:

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) Baudrate
2) Print Interval


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

5.9 The Baud Rate

The ***Baud Rate*** indicates the speed used for the serial communication with the PC.

To set the ***Baud Rate***, proceed as follows:

1. Use the arrows ▲▼ to select the item.
2. Press **ENTER**: You will get the following message:

```
COMMUNICATION MENU
      SERIAL
   SET BAUDRATE

Baud Rate: 38,400


▲▼ 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.

WARNING: The communication between instrument and PC (or serial port printer) only works if the instrument and PC baud rates are the same. If the USB connection is used, this parameter value is automatically set.

NOTE: When setting the baud rate, check the printer speed.

5.10 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
```

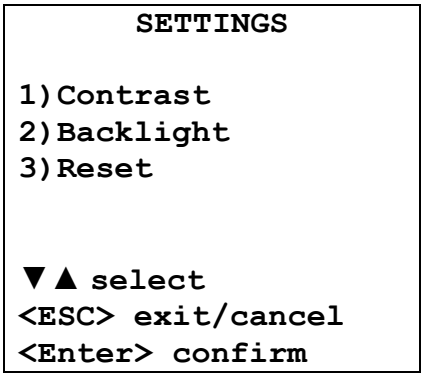
3. Use the arrows ▼▲ to set the value.
4. Press **ENTER** to confirm and return to the previous page or press **ESC** to cancel the change and exit the menu item.
5. Press **ESC** over and over to exit from the submenus.
6. Press **MENU** to exit immediately from the main menu.

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

5.11 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:



This menu item allows to:

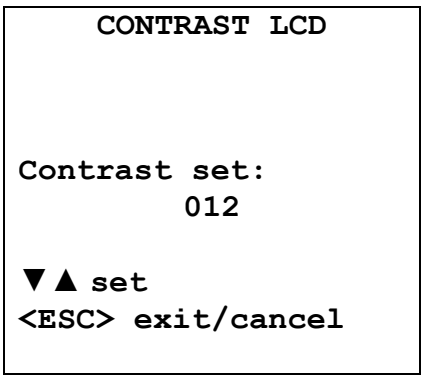
1. Increase or decrease the display contrast.
2. Set the ON time of the display backlight.
3. Perform the complete reset of the instrument.

5.12 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



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.

5.13 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.

5.14 Reset

To enter the ***Reset*** submenu to carry out a complete reset of the instrument, proceed as follows:

1. Press **MENU** on the instrument.
2. Use the arrows ▲▼ to select ***Reset***.
3. Press **ENTER**: You will get the following message:

```
        RESET

1)Reset

Factory values
reset

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

4. Use the arrows ▲▼ to select ***Reset***
5. Press **ENTER** to confirm, or press **ESC** over and over to exit from the submenus;
6. Press **MENU** to exit immediately from the main menu.

Note: after the reset, the date blinks to signal that it is necessary to set it.

5.15 Air speed

This menu item allows to set the measure unit for speed, flow rate and section for the flow rate calculation. To enter the ***Air Speed*** submenu, proceed as follows:

1. Press the instrument **MENU** key.
2. Use the arrows ▼▲ to select ***Air Speed***.
3. Press **ENTER**.
4. The following message appears:

```
      AIR SPEED

1)speed m/s
2)flow  L/s
3)section 6.4515 m²


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

Speed

This item of the **Air Speed** menu allows to set the speed measure unit. To enter the ***Speed*** submenu, proceed as follows:

1. Use the arrows ▼▲ to select ***Speed***.
2. Press **ENTER**.
3. The following message appears:

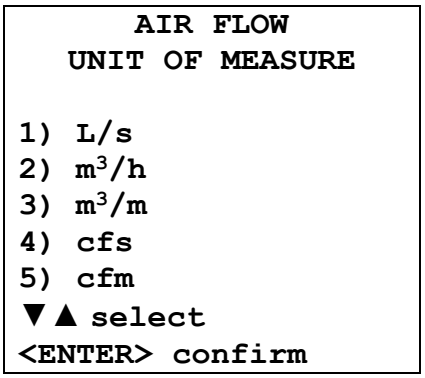
```
      AIR SPEED
   UNIT OF MEASURE

1) m/s
2) km/h
3) fpm
4) mph
5) knot
▼▲ select
<ENTER> confirm
```

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

Flow rate

This item of the **Air Speed** menu allows to set the flow rate measure unit. To enter the ***Flow Rate*** submenu, proceed as follows:

1. Use the arrows ▼▲ to select ***Flow***.
2. Press **ENTER**.
3. The following message appears:



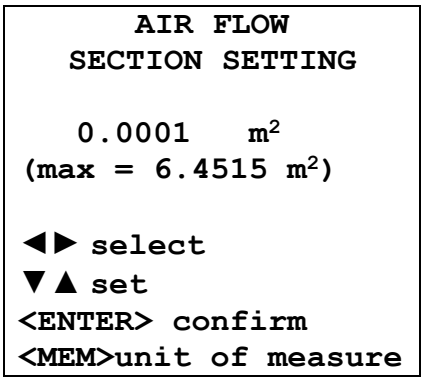
4. Use the arrows ▼▲ to select the desired flow rate measure unit.
5. Press **ENTER** to confirm or press **ESC** more times to escape from the various menu levels.
6. Press **MENU** to exit directly from the main menu.

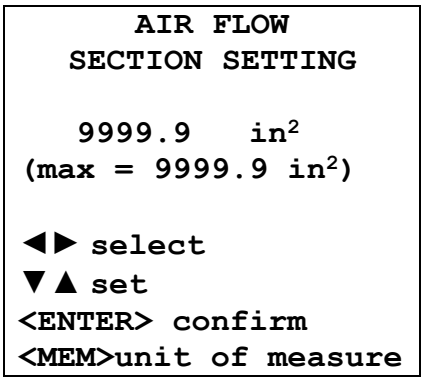
Section

This item of the **Air Speed** menu allows to set the section for the flow rate calculation.

To enter the ***Section*** submenu, proceed as follows.

1. Use the arrows ▼▲ to select ***Section***.
2. Press **ENTER**.
3. The following message appears:





4. Use the arrows ◄► to select the digit to be changed.
5. Use the arrows ▼▲ to set the value of the selected digit.
6. Press **MEM** to change the section measure unit between m^2 or $inch^2$.
7. Press **ENTER** to confirm or press **ESC** more times to escape from the various menu levels.
8. Press **MENU** to exit directly from the main menu.

5.16 Ventilation rate

To calculate the ventilation rate, you need the following parameters:

- Calculation of the percentage of outdoor air inlet in the environment (% Outdoor Air).
- Calculation of the air flow circulating in the environment being examined.
- Number of people usually present in the environment being examined.

Definition of % outdoor air

The percentage of air inlet in the environment (% Outdoor Air) can be calculated measuring the CO_2 Carbon Dioxide or the Temperature T.

Generally, you should measure the CO_2 Carbon Dioxide when there is a lot of people in the environment being examined. Instead, you should use the temperature T when the indoor/outdoor temperature difference is very large.

To calculate the outdoor air percentage, you need to detect CO2 concentration or temperature T in three different points: outdoor air, inlet air and return air, using the following equation:

$$\%OA = \frac{(X_R - X_S)}{(X_R - X_O)} \cdot 100\%$$

Where:

X_R = CO_2 concentration or temperature T in **return** air
X_S = CO_2 concentration or temperature T in **inlet** air
X_O = CO_2 concentration or temperature T in **outdoor** air

Example

Let's suppose you have performed the following CO_2 measurement in a working environment:

CO_2 in outdoor air	= X_O	= 400 ppm
CO_2 in inlet air	= X_S	= 660 ppm
CO_2 in return air	= X_R	= 850 ppm

$$\%OA = \frac{(X_R - X_S)}{(X_R - X_O)} \cdot 100\% = \frac{(850-660)}{(850-400)} \cdot 100\% = \frac{(190)}{(450)} \cdot 100\% = 42.2\%$$

The same equation can be used if you know the temperatures T. Let's suppose the measurement is performed in winter:

T in outdoor air	= X_O	= 0 °C
T in inlet air (before conditioning)	= X_S	= 10 °C
T in return air	= X_R	= 23 °C

$$\%OA = \frac{(X_R - X_S)}{(X_R - X_O)} \cdot 100\% = \frac{(23-10)}{(23-0)} \cdot 100\% = \frac{(13)}{(23)} \cdot 100\% = 56.5\%$$

The calculation of the percentage of outdoor air is not meaningful, if it is not correlated to the air flow in the environment.

Let's suppose, for example, that the environment is an office. The ASHRAE 62.1 norm recommends a ventilation rate of about 8.5 L/s×person.
Let's suppose that you have the following measurements:

Air Flow = *500 L/s*
Number of occupants = *10 people*
% Outdoor Air = *17%OA*

$$\frac{500L/s \cdot 17\%OA}{10people} = 8.5L/s \times person$$

In this case, the ASHRAE 62.1 norm recommendation of a ventilation rate of about 8.5 L/s×person was met.

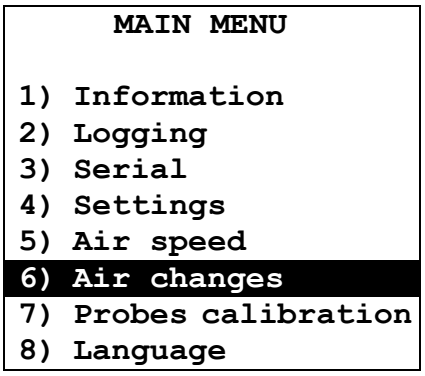
If, in the same environment, you have an air flow = *100 L/s*, you need a %OA = 85% to meet the ASHRAE 62.1 norm.

$$\frac{100L/s \cdot 85\%OA}{10people} = 8.5L/s \times person$$

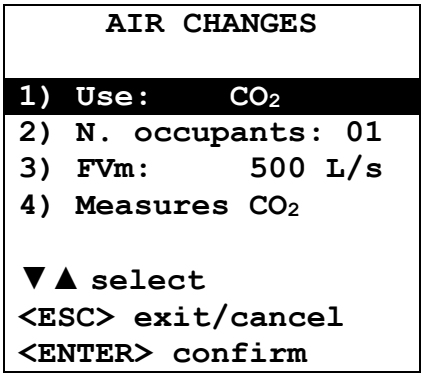
In this example you can see that only correlating the %OA value with the air flow value you can check if the ventilation rate meets the ASHRAE 62.1 norm.

Outdoor air calculation

Use the arrows ▲▼ to select the **6) Air changes** menu item.

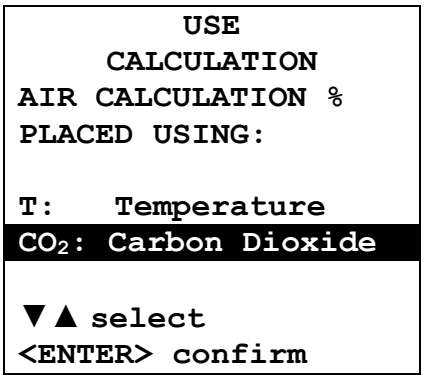


After confirming with ENTER, the following screen will appear:



1) Use

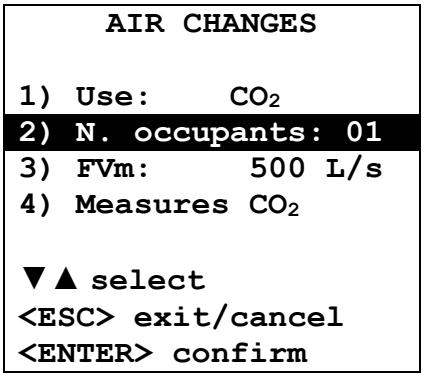
The **1) Use** menu item indicates the quantity used to calculate the %OA. To change this quantity, select the item **1) Use** with the arrows ▼▲ and confirm with ENTER. The following screen will appear:



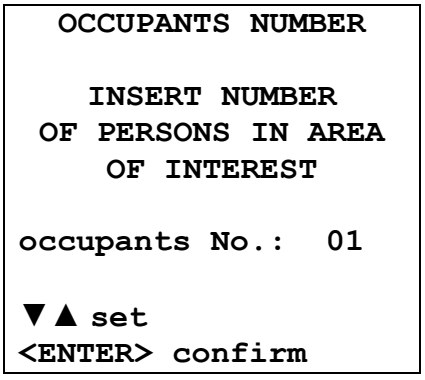
Using the ▲▼ arrows, select the desired item and confirm with ENTER.

2) N. occupants

The **2) N. occupants** menu item indicates the number of people in the environment. To enter this value, select **2) N. occupants** using the ▲▼ arrows, and confirm with ENTER:



The following screen will appear:



Use the arrows ▼▲ to change the number of occupants value and confirm using ENTER.

3) FVm (Flow Rate)

This item indicates the average value of the flow rate. To change this value, use the arrows ▲▼ to select the **3) FVm** menu item.

AIR FLOW	
Samples: 010	Number of air flow rate samples captured
FVm 0.50 L/s	Average air flow rate value as arithmetical average of the samples
Va 0.01 m/s	Current wind speed
FVa 0.50 L/s	Current flow rate
1) Samples capture	Capture the air flow samples
2) Samples reset	Reset the acquired samples

Description:

samples indicates the number of acquired samples.
FVm is the average of the air flow rate acquired samples.

$$FVm = \frac{\sum_{i=1}^{n} FVa_i}{n}$$

Va is the current air speed value
FVa is the current air flow rate value

To acquire the **FVm** samples select with the arrows ▼▲ the **Samples capture** menu item. Every time the **ENTER** key is pressed, a sample is acquired. The number of samples and the FVm value are increased on display.

To reset the FVm value and the number of samples, select with the arrows ▼▲ the **Samples reset** menu item and confirm with **ENTER.**

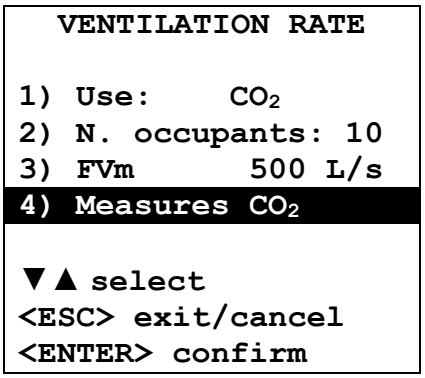
Example:

The number of acquired samples is 10.
The acquired flow rate values are:
sample n. 01: FVa = 0.2 L/s
sample n. 02: FVa = 0.5 L/s
sample n. 03: FVa = 0.3 L/s
sample n. 04: FVa = 0.1 L/s
sample n. 05: FVa = 0.6 L/s
sample n. 06: FVa = 0.5 L/s
sample n. 07: FVa = 0.4 L/s
sample n. 08: FVa = 0.5 L/s
sample n. 09: FVa = 0.2 L/s
sample n. 10: FVa = 0.2 L/s

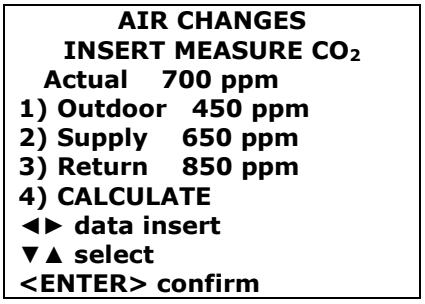
$$FVm = \frac{0.2+0.5+0.3+0.1+0.6+0.5+0.4+0.5+0.2+0.2}{10} = \frac{3.5}{10} = 0.35 \cdot L/s$$

4) Measures

This item indicates the value of the air flow circulating in the environment being examined. To change this value, use the arrows ▲▼ to select the **4) Measures** menu item.

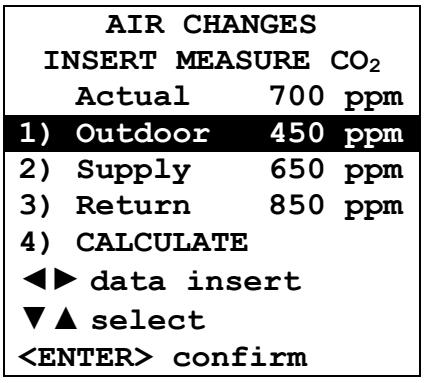


After confirming with ENTER, the following screen will appear:



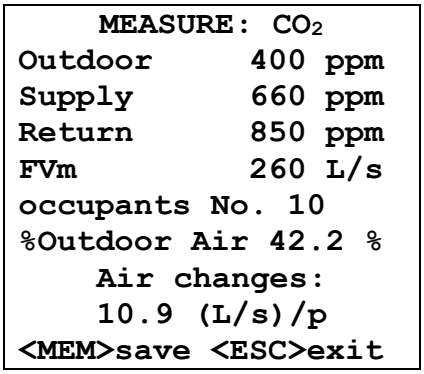
Current CO_2 value
CO_2 value in outdoor air
CO_2 value in inlet air
CO_2 value in return air

Use the arrows ▲▼ to select the corresponding value to be captured. If you want to capture the **CO_2 Outdoor** value, select the corresponding line:



Press ENTER to capture the CO_2 value. As an alternative, you can manually enter the CO_2 value using the arrows ◄►.

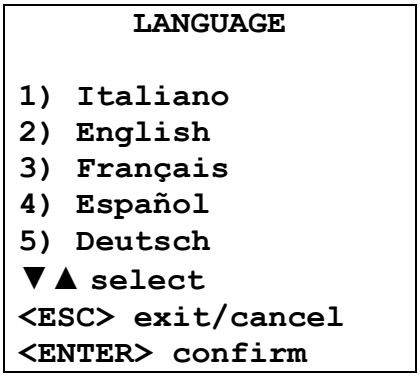
Repeat the operation to enter the inlet and return air CO_2 values. Select the **4) CALCULATE** item to compute the % OA value on the captured data, and press ENTER. The following screen will appear:



This page shows the **% Outside Air** result and the **Ventilation Rate** value.
The captured data can be saved in the memory by pressing MEM.

5.17 Language

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



6 Calibration

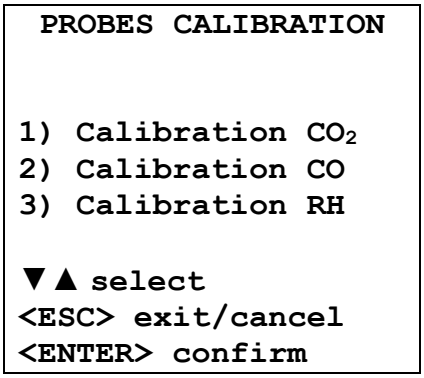
The instruments and probes are calibrated in the factory; no calibration is usually required by the user. However, you can perform a new calibration.

You can perform the calibration of the following connected probes:

- With the **P37AB147** SICRAM probe connected to input 1 Indoor Air Quality, you can perform the calibration of the RH (Relative Humidity), CO (Carbon Monoxide), and CO_2 (Carbon Dioxide) sensors.
- With the **temperature** and **humidity** combined SICRAM probes connected to input 1 Indoor Air Quality, you can perform the calibration of the RH (Relative Humidity) sensor.

No calibration is allowed for the Temperature sensor, and for the Hot-Wire and Vane sensors.

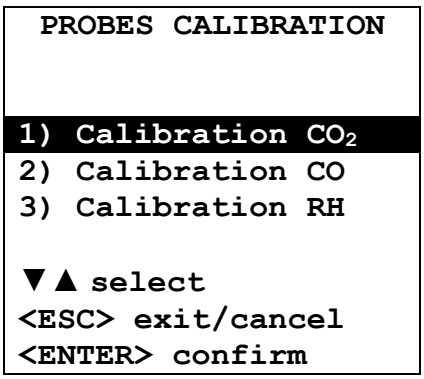
To calibrate the probes correctly, a knowledge of and abiding by the physical phenomena on which the measurement is based is fundamental: this is the reason why it is recommended to abide by what is reported below carefully and only to perform new calibrations if technically proficient.



6.1 CO_2 Calibration

Ensure the **P37AB147** SICRAM probe is connected to input 1, Indoor Air Quality.

Use the arrows ▲▼ to select the **1) Calibration CO_2** item:



Confirm with ENTER. The following screen will appear:

```
PROBE 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 400 ppm in clean air
- at 0 ppm with nitrogen bottles.

The instrument can automatically detect the calibration methods used: whether 400 ppm or 0 ppm. 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 on the back of the probe, on the aluminium black disc. In the place of the peg, screw the small metal tube at the end of the plastic tube connecting to the bottle for calibration.

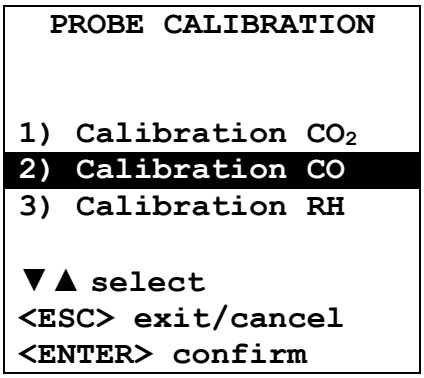
2. Let the inlet open if you want to perform a calibration at 400 ppm. **Ensure the probe is really in clean air**.
3. For the calibration at 0 ppm, after connecting the CO_2 input to the small tube from the nitrogen bottle, adjust the bottle flow meter to get a constant flow from 0.3 to 0.5 l/min.
4. Wait about 15 minutes before continuing.
5. Supply CO_2 for at least 2 minutes 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 probe and close the hole using the M6 hexagon slot peg.

6.2 CO Calibration

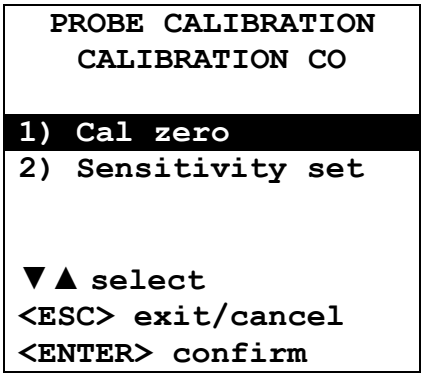
The CO sensor zero can be calibrated in clean air (the CO concentration is lower than 0.1 ppm outdoor) or using nitrogen bottles.

Ensure the **P37AB147** SICRAM probe is connected to input 1, Indoor Air Quality.

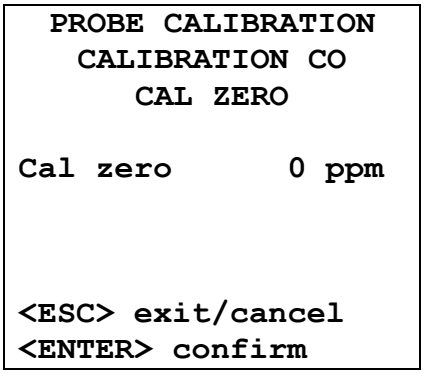
Use the arrows ▲▼ to select the **2) Calibration CO** item:



Confirm with ENTER. The following screen will appear:



Confirm with ENTER. The following screen will appear:



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 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:

Using a screwdriver, open the front small door of the probe and connect the tube from the nitrogen with the rubber cap on the CO sensor head.

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

```
  PROBE CALIBRATION


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

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

Confirm with ENTER. The following screen will appear:

```
  PROBE CALIBRATION
    CO CALIBRATION

1) Cal zero
2) Sensitivity set


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

Confirm with ENTER. The following screen will appear:

```
  PROBE CALIBRATION
    CO CALIBRATION
       CAL ZERO

Cal zero       0 ppm


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

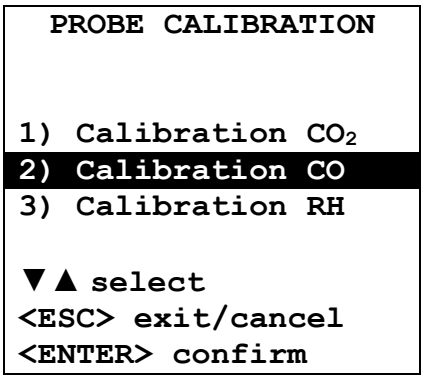
Proceed as follows:

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

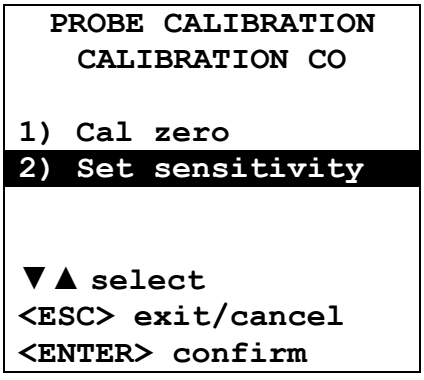
Replacement of the CO sensor:

In normal usage conditions, the CO sensor has an average life longer than 5 years.
To replace the CO sensor, follow this procedure:

1. Switch the instrument off.
2. On the probe, 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:



Confirm with ENTER. The following screen will appear:



Confirm with ENTER. The following screen will appear:

```
  PROBE 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.

6.3 RH Calibration

This procedure applies to **P37AB147** and to **Temperature** and **Humidity** combined SICRAM probes.

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:

```
  PROBE CALIBRATION


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

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

Confirm with ENTER. The following screen will appear:

```
  PROBE CALIBRATION
    CALIBRATION RH

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


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

Proceed as follows:

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

```
  PROBE 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 by the probe connected to the instrument.
10. Once measurements have been acquired, repeat the same operations backwards.
11. To check the second calibration point, repeat the operations from point 1 to 10.

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. 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 is as follows:
- First solution: 75% RH.
- Second solution: 33% RH.
- The checking order is not mandatory.

VII. If check, tuning or calibration, is performed at a temperature different 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 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	

7 Serial and USB interfaces

The **HD37AB1347** is fitted with an electrically isolated RS-232C serial interface, and an USB 2.0 interface. Optionally, you can receive on request:

- Serial connection cable (code **HD2110RS**) with M12 connector on instrument's side and Sub D 9-pole female connector on computer's side.
- Serial connection cable (code **HD2110USB**) with M12 connector on instrument's side and USB 2.0 connector on computer's side.

The USB connection requires the previous installation of the driver included in the DeltaLog10 software package (downloadable from the website). **Install the driver before connecting the USB cable to the PC**.

Standard parameters of the instrument RS232 serial transmission are:

- Baud rate 38400
- Parity None
- N. bit 8
- Stop bit 1
- Protocol Xon/Xoff

It is possible to change the RS232C serial port baud rate by setting the *"Selection of the serial transmission speed (Baud Rate)*" parameter in the menu (please see the menu on chapter *The Baud Rate*). The possible values are: 38400, 19200, 9600, 4800, 2400, 1200. The other transmission parameters are fixed.

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

The selection of the port is carried out directly by the instrument: if the USB port is connected to a PC, the RS232 serial port is automatically disabled, and vice versa.

The instrument is 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 HD21ABE17	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 T2xxxxxxxxxxxxxxx)
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
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.

7.1 Storing and Transferring Data to a PC

The **HD37AB1347** instrument can be connected to a PC via an RS232C serial port or USB port, and exchange data and information through the DeltaLog10 software running in a Windows operating environment. It is possible to print the measured values on the HD40.1 printer (*ENTER* key) or store them 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.

7.2 Logging Function

The *Logging* function allows recording of the measurements registered by the probe connected to the inputs. 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.

If the automatic turning off between two recordings (see par. *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. During data transfer the display shows the message DUMP; to stop the data transfer press ESC on the instrument or on the PC.

Notes:

- Data transfer does not cause the memory to be erased.
- The stored data remain in memory independently of the battery charge conditions.
- 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.

7.3 Print Function

Press **ENTER** to send the measured data directly to the RS232 or USB port, in real time. The printed data units of measurements are the same as those used on the display.

The time interval between two consecutive prints can be set from 15 second to 1 hour (please see the ***Print interval*** *menu* item). 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.

Notes:

- Check the printer speed when setting the baud rate.
- To print the data to a parallel interface printer, you must use a parallel-serial adaptor (not supplied).
- Connection to printer via USB is not possible.

7.4 Connection to the RS232C serial port

1. With the instrument off, connect it to a free serial port (COM) of the PC using the **HD2110RS** cable.
2. Turn on the instrument and set the baud rate to 38400 (MENU key >> "*Serial*" >> "*Baud Rate* >> select 38400 using the arrows >> confirm with ENTER). The parameter remains in memory.
3. Launch the DeltaLog10 software and press CONNECT. Wait for the connection to occur and follow the instructions on the screen. **For a description of the DeltaLog10 software**, **please refer to its On-line Help.**

8 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.

9 Power supply

The meter is provided with a pack of **4 x 1.2V-2200 mA/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.

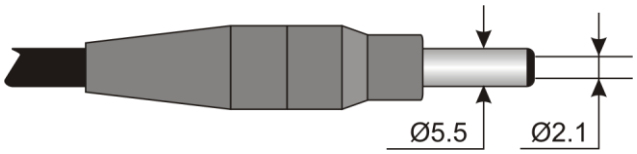
In this case, batteries should be replaced as soon as possible.

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 from mains by using an external power supply, for example the optional power supply **SWD10** (input 100…240 Vac, output 12 Vdc – 1A).

The power supply positive (pole) must be connected to the central pin.



Warning: the power supply has the dual function of **powering the meter and charging** the battery pack.

Charging the batteries:

To charge the batteries, connect the 12 Vdc external power supply.

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.

Notes on batteries usage:

- 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 charged and discharged hundreds 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 **BAT-40** battery pack and charge it using a battery charger 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.

Replacing 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.

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.

10 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.

11 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 instruments 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.

12 Technical specifications

Instrument	
Dimensions (Length x Width x Height)	185 x 90 x 40 mm
Weight	470 g (complete with batteries)
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
Protection degree	**IP66**
Instrument uncertainty	± 1 digit @ 20°C
Power Supply	
Mains adapter (SWD10)	12 Vdc/1A
Batteries	4 x 1.2V Ni-MH rechargeable batteries AA type
Autonomy	8 hours of continuous use in measure mode (with probe connected)
Power absorbed with instrument off	< 45 μA
Connections	
Input for probe with SICRAM module	2 x 8-pole male DIN45326 connectors
Indoor Air Quality input	**P37AB147** **Temperature** probes with SICRAM module **T and RH** combined probes with SICRAM module
Temperature – Air Velocity input	**Hot-Wire Sensor Wind Speed** probes with SICRAM module **Vane Wind Speed** probes with SICRAM module **Temperature** probes with SICRAM module
Serial interface	
Socket	8-pole-M12
Type	RS232C or USB 1.1 or 2.0 non insulated
Baud rate	Between 1200 and 38400 baud. With USB baud=460800
Data bits	8
Parity	None
Stop bits	1
Flow Control	Xon/Xoff
Cable length	RS232C: max. 15 m, USB: max. 5m

Memory	Divided in 64 blocks
Storage capacity	67600 recordings per each input
Logging interval	selectable among 15, 30 s; 1, 2, 5, 15, 20, 30, min 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		

P37AB147 probe:

CO_2 Carbon Dioxide

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

CO Carbon Monoxide

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

Relative Humidity RH

Type of sensor	Capacitive
Sensor protection	Stainless steel grid filter
Measurement range	0…100 %RH
Sensor working range	-20…+60 °C
Accuracy	±1,5 %RH (0…85 %RH) / ±2%RH (85…100 %RH) @ T=15…35 °C ±(2+1,5% measure) %RH @ T=-20…60 °C
Resolution	0.1 %RH
Temperature dependence	±2% on all temperature range
Hysteresis and repeatability	1 %RH
Response time (T_{90})	< 20 sec (wind speed = 2 m/s) without filter
Long-term stability	1%/year

Temperature T

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 = 2 m/s)
Long-term stability	0.1°C/year

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	2 hPa/year
Temperature drift	±3 hPa @ T= -20…+60 °C

Pt100 temperature probes with SICRAM module:

Model	Type	Application range	Accuracy
TP472I	Immersion	196 °C…+500 °C	±0.1°C (@ 0 °C) ±0.2°C (-50 °C ≤ t ≤ 250 °C) ±0.3°C (t < -50 °C; t > 250 °C)
TP472I.O	Immersion	-50 °C…+300 °C	
TP473P.I	Penetration	-50 °C…+400 °C	
TP473P.O	Penetration	-50 °C…+300 °C	
TP474C.O	Contact	-50 °C…+300 °C	
TP475A.O	Air	-50 °C…+250 °C	
TP472I.5	Penetration	-50 °C…+400 °C	
TP472I.10	Penetration	-50 °C…+400 °C	
TP49A.I	Immersion	-70 °C…+250 °C	
TP49AC.I	Contact	-70 °C…+250 °C	
TP49AP.I	Penetration	-70 °C…+250 °C	
TP875.I	Globe-thermometer Ø 150 mm	-30 °C…+120 °C	
TP876.I	Globe-thermometer Ø 50 mm	-30 °C…+120 °C	
TP87.O	Immersion	-50 °C…+200 °C	

Common characteristics

Resolution	**0.01°C in the range ±199.99°C, 0.1°C in the remaining field**
Temperature drift @ 20°C	0.003%/°C

Relative humidity and temperature combined probes with SICRAM module:

Model	Temp sensor	Application range		Accuracy	
		%RH	Temperature	%RH	Temp.
HP472ACR	Pt100	0…100% RH	-20 °C…+80 °C	±1.5% (0…85%RH) ±2.5% (85…100%RH) @ T=15…35 °C (2 + 1.5% measure)% @ T= remaining range	±0,3 °C
HP473ACR	Pt100	0…100% RH	-20 °C…+80 °C		±0,3 °C
HP474ACR	Pt100	0…100% RH	-40 °C…+150 °C		±0,3 °C
HP475ACR	Pt100	0…100% RH	-40 °C…+150 °C		±0,3 °C
HP475AC1R	Pt100	0…100% RH	-40 °C…+180 °C		±0,3 °C
HP477DCR	Pt100	0…100% RH	-40 °C…+100 °C		±0,3 °C
HP478ACR	Pt100	0…100% RH	-40 °C…+150 °C		±0,3 °C

Common characteristics

Relative humidity

Sensor	Capacitive
Resolution	0.1% RH
Temperature drift @ 20 °C	0.02 %RH/°C
Response time %RH @ constant temperature	10 s (10→80% RH; air speed = 2 m/s)

Temperature with Pt100 sensor

Resolution	0.01 °C
Temperature drift @ 20 °C	0.003%/°C

Hot-wire air speed probes with SICRAM module:

	AP471S1 - AP471S3	AP471S2	AP471S4
Types of measurements	Air speed, calculated flow rate, air temperature		
Type of sensor *Speed* *Temperature*	NTC Thermistor NTC Thermistor	Omni-directional NTC thermistor NTC thermistor	
Measuring range *Speed* *Temperature*	0.02…40 m/s -25…+80 °C	0.02…5 m/s -25…+80 °C	 0…80 °C
Air temperature compensation	0…80 °C		
Measurement resolution *Speed* *Temperature*	0.01 m/s - 0.1 km/h - 1 ft/min - 0.1 mph - 0.1 knot 0.1°C		
Measurement accuracy *Speed* *Temperature*	±0.2 m/s (0.10…0.99 m/s) ±0.4 m/s (1.00…9.99 m/s) ±0.8 m/s (10.00…40.00 m/s) ±0.8 °C (-10…+80°C)	±0.05 m/s (0.10…0.99 m/s) ±0.15 m/s (1.00…5.00 m/s) ±0.8 °C (-10…+80 °C)	
Minimum speed	0.02 m/s		
Cable length	~2 m		

Vane air speed probes with SICRAM module:

	AP472S1	AP472S2
Types of measurements	Air speed, calculated flow rate, air temperature	Air speed, calculated flow rate
Diameter	100 mm	60 mm
Type of measurement *Speed* *Temperature*	Propeller Tc K	Propeller ----
Measuring range *Speed* *Temperature*	0.6…25 m/s -25…+80 °C (*)	0.5…20 m/s -25…+80 °C (*)
Resolution *Speed* *Temperature*	0.01 m/s - 0.1 km/h - 1 ft/min - 0.1 mph - 0.1 knot 0.1 °C	 ----
Accuracy *Speed* *Temperature*	±(0.4 m/s + 1.5% f.s.) ±0.8 °C	±(0.4 m/s + 1.5% f.s.) ----
Minimum speed	0.6 m/s	0.5 m/s
Length del cable	~2 m	

(*) The indicated value refers to the vane's working range.

13 Probes and accessories ordering codes

The instrument is supplied with BAT-40 rechargeable NiMH battery pack and carrying case.

DeltaLog10 software is downloadable from website.

Probes, SWD10 external power supply and cables for connection to PC and printer must be ordered separately.

Air quality (IAQ) probe with SICRAM module

P37AB147 Temperature, relative humidity, atmospheric pressure, CO_2 (Carbon Dioxide) and CO (Carbon Monoxide) combined probe. Cable length 2 m.

Pt100 temperature probes with SICRAM module

TP472I Immersion probe, Pt100 sensor. Stem Ø3 mm, length 300 mm. Cable length 2 m.

TP472I.O Immersion probe, Pt100 sensor. Stem Ø3 mm, length 230 mm. Cable length 2 m.

TP473P.I Penetration probe, Pt100 sensor. Stem Ø4 mm, length 150 mm. Cable length 2 m.

TP473P.O Penetration probe, Pt100 sensor. Stem Ø4 mm, length 150 mm. Cable length 2 m.

TP474C.O Contact probe, Pt100 sensor. Stem Ø4 mm, length 230 mm, contact surface Ø 5 mm. Cable length 2 m.

TP475A.O Air probe, Pt100 sensor. Stem Ø4 mm, length 230 mm. Cable length 2 m.

TP472I.5 Penetration probe, Pt100 sensor. Stem Ø6 mm, length 500 mm. Cable length 2 m.

TP472I.10 Penetration probe, Pt100 sensor. Stem Ø6 mm, length 1000 mm. Cable length 2 m.

TP49A.I Immersion probe, Pt100 sensor. Stem Ø2.7 mm, length 150 mm. Cable length 1.5 m. Aluminum handle.

TP49AC.I Contact probe, Pt100 sensor. Stem Ø4 mm, length 150 mm. Cable length 1.5 m. Aluminum handle.

TP49AP.I Penetration probe, Pt100 sensor. Stem Ø2,7 mm, length 150 mm. Cable length 1.5 m. Aluminum handle.

TP875.I Globe thermometer Ø150 mm with handle. Cable length 2 m.

TP876.I Globe thermometer Ø50 mm with handle. Cable length 2 m.

TP87.O Immersion probe, Pt100 sensor. Stem Ø3 mm, length 70 mm. Cable length 2 m.

Relative humidity and temperature combined probes with SICRAM module

HP472ACR %RH and Temperature combined probe, dimensions Ø26x170 mm. Cable length 2 m.

HP473ACR %RH and Temperature combined probe. Handle size Ø26x130 mm, probe Ø14x120 mm. Cable length 2 m.

HP474ACR %RH and Temperature combined probe. Handle size Ø26x130 mm, probe Ø14x215 mm. Cable length 2 m.

HP475ACR %RH and Temperature combined probe. Cable length 2 m. Handle Ø26x110 mm. Stainless steel stem Ø12x560 mm. Tip Ø13,5x75 mm.

HP475AC1R %RH and Temperature combined probe. Cable length 2 m. Handle 80mm. Stainless steel stem Ø14x480 mm.

HP477DCR %RH and Temperature combined sword probe. Cable length 2 m. Handle Ø26x110 mm. Stem 18x4 mm, length 520 mm.

HP478ACR %RH and Temperature combined probe. Cable length 5 m. Stainless steel stem Ø14x130 mm.

HD75 Saturated solution for checking the Relative Humidity sensor at 75% RH, with screw adaptor for ∅14 probes, thread M12×1.

HD33 Saturated solution for checking the Relative Humidity sensor at 33% RH, with screw adaptor for ∅14 probes, thread M12×1.

HD11 Saturated solution for checking the Relative Humidity sensor at 11% RH, with screw adaptor for ∅14 probes, thread M12×1.

Hot-wire probes with SICRAM module for the measurement of air speed

AP471S1 Extensible hot-wire probe, measuring range: 0.02…40 m/s. Cable length 2 m.

AP471S2 Omnidirectional extensible hot-wire probe, measuring range: 0.02…5 m/s. Cable length 2 m.

AP471S3 Extensible hot-wire probe with shapeable end, measuring range: 0.02…40 m/s. Cable length 2 m.

AP471S4 Omnidirectional extensible hot-wire probe with base, measuring range: 0.02…5 m/s. Cable length 2 m.

Vane probes with SICRAM module for the measurement of air speed

AP472S1 Type K Thermocouple vane probe, Ø100 mm. Speed 0.6 to 25 m/s; temperature -25 to 80 °C. Cable length 2 m.

AP472S2 Vane probe, Ø60 mm. Measuring range: 0.5…20 m/s. Cable length 2 m.

AST.1 Extension rod (210 mm completely closed, 870 mm completely open) for AP472S1 and AP472S2 vanes.

AP471S1.23.6 Fixed extension element Ø16 x 300 mm, M10 male thread on one side, female on the other side. For AP472S1 and AP472S2 vanes.

AP471S1.23.7 Fixed extension element Ø16 x 300 mm, M10 female thread on one side only. For AP472S1 and AP472S2 vanes.

Accessories

SWD10	100-240 Vac/12 Vdc-1 A stabilized mains power supply.
HD2110RS	Cable for connection to PC or HD40.1 printer, with M12 connector (instrument side) and RD232C 9-pole Sub-D female connector.
HD2110USB	Cable for connection to PC, with M12 connector (instrument side) and USB type A connector.
HD40.1	Serial printer (HD2110RS cable is required).
VTRAP30	Tripod for P37AB147 probe, max height 157 mm.
HD37.36	Connection tube kit between P37AB147 probe and nitrogen cylinder for CO calibration.
HD37.37	Connection tube kit between P37AB147 probe and nitrogen cylinder for CO_2 calibration.

Spare parts

BAT-40	Spare NiMH battery pack with built-in temperature sensor.

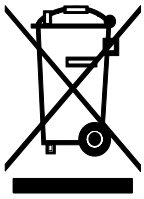
WARRANTY

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.

CE RoHS

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