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English

Operating manual

WBGT index

HD32.2

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1. GENERAL FEATURES

HD32.2 is designed for **WBGT** (Wet Bulb Globe thermometer temperature) index analysis in presence or absence of solar radiation. The instrument is provided with three inputs for probes with SICRAM module: the probes have an electric circuit that communicates with the instrument; the sensor calibration data are saved in its permanent memory.

All the SICRAM probes can be inserted in one of the inputs: they are automatically recognized when you switch the instrument on.

The **main features of** the instrument are:

- **Logging:** acquisition and memorization of data inside the instrument. Memory capacity: **64** different **logging sections,** with the possibility to set the acquisition interval of the samples. You can set the **duration of the memorization** and, with **auto-start** function; it's possible to set the starting and finishing date and the hour of data memorization.
- The **measurement unit** of the temperature visualized sizes: °C, °F, °K.
- The system **date** and **hour**.
- The visualization of the **maximum, minimum and medium** statistic parameters and their cancellation.
- The transfer speed of the data through the serial port RS232.

NOTE: The set acquisition interval is the same for all the probes connected to the instrument.

HD32.2 instrument can contemporarily detect the following sizes:

- Globe thermometer temperature **Tg**.
- Wet bulb with natural ventilation temperature **Tn**.
- Ambient temperature T.

On the basis of the detected measurements, HD32.2 can calculate:

- **WBGT(in)** index (Wet Bulb Glob Temperature: wet bulb and globe thermometer temperature) in presence or absence of solar irradiation.
- **WBGT(out)** index (Wet Bulb Glob Temperature: wet bulb and globe thermometer temperature) in presence of solar irradiation.

WBGT
Wet Bulb Globe Temperature Meter
HD32.2

1. Inlets for **SICRAM** probes.
2. Inlet for power supply.
3. Back - enlightened graphic display.
4. Navigation key ▲: it allows the navigation through the menus. During the normal working it selects the reset of statistic data.
5. **ESC** key: it allows exiting from the menu or, in case of a submenu, exiting from the current level display.
6. Navigation key ◄: it allows the navigation through the menus. During a normal visualization, it allows to visualize the statistic data: maximum, minimum and medium.
7. **MEM** key: it starts and ends the recording of the data (logging).
8. Navigation key ▼: it allows the navigation through the menus. During the normal working it cancels the reset choice of statistic data.
9. **MENU** key: It allows entering or exiting from the instrument working parameters setting menu.
10. Navigation key ►: it allows the navigation through the menus.
11. **ENTER** key: it confirms the inserted data inside the menu. During the normal visualization, it allows resetting the statistic data and immediately printing the data on HD40.1 printer.
12. **ON/OFF** key**:** it switches the instrument on and off.
13. **RS232** and **USB** serial ports**.**

2. WORKING PRINCIPLE

Microclimate term means the environmental parameters that influence the thermal exchanges between the being and the environments inside limited places and that determinate the so-called "thermal well-being".

The micro-environmental weather factors together with your own job influence a series of your biologic responses connected to well-being situations (Comfort) or thermal uneasiness (Discomfort).

In fact, the human body tries to keep the thermal balance in equilibrium conditions in order to keep the body temperature on optimal values.

HD32.2 detects the following sizes:

- t_{nw}**:** wet bulb with natural ventilation temperature probe
- t_g**:** globe thermometer temperature
- t_a**:** ambient temperature

It realizes direct measurements with the probes connected to the instrument and it also calculates and directly visualizes **WBGT index**.

WBGT (Wet Bulb Globe Temperature) - wet bulb and globe thermometer temperature - is one of the indexes used for determining the thermal stress to which is submitted a being in a warm environment. It represents the value, with reference to the metabolic waste connected to a special job, over which the being is in a thermal stress condition. WBGT index combines the temperature measurement of natural ventilation wet bulb $\mathbf{t_{nw}}$ with the Glob thermometer $\mathbf{t_g}$ and, in some situations, with the air temperature $\mathbf{t_a}$**.** The formula for the calculation is the following one:

- inside and outside the buildings in absence of solar irradiation:

$$WBGT_{close\ environments} = 0{,}7\ t_{nw} + 0{,}3\ t_g$$

- outside the building in presence of solar irradiation:

$$WBGT_{external\ environments} = 0{,}7\ t_{nw} + 0{,}2\ t_g + 0{,}1\ t_a$$

where:

t_{nw} = natural ventilation wet bulb temperature
t_g = globe thermometer temperature;
t_a = air temperature.

The detected data must be compared with the limit values established by the regulation; if they are over passed, it's necessary to:

- directly decrease the thermal stress in the considered working place;
- go on with a detailed analysis of the thermal stress.

In the following table are indicated the limit values of the WBGT thermal stress index taken from ISO 7243 regulation:

LEVEL CLASS METABOLIC	METABOLIC LEVEL, M		WBGT LIMIT VALUE			
	RELATIVE TO A SINGLE SKIN SURFACE W/m^2	TOTAL (FOR A MEDIUM AREA OF 1,8 m^2 SKIN SURFACE) W	ACCLIMATIZED BEING TO HEAT °C		NON- ACCLIMATIZED BEING TO HEAT °C	
0 (RESTING)	M ≤ 65	M ≤ 117	33		32	
1	65 < M ≤ 130	117 < M ≤ 234	30		29	
2	130 < M ≤ 200	234 < M ≤ 360	28		26	
3	200 < M ≤ 260	360 < M ≤ 468	STAGNANT AIR 25	NO STAGNANT AIR 26	STAGNANT AIR 22	NO STAGNANT AIR 23
4	M > 260	M > 468	23	25	18	20
NOTE: THE VALUES ARE STABILIZED, CONSIDERING A MAXIMUM RECTAL TEMPERATURE OF 38° C FOR THE CONSIDERED BEINGS.						

To calculate WBGT index, it's necessary that to the instrument are connected:

- **HP3201.2, HP3201 or TP3204S temperature probe with natural ventilation wet bulb.**
- **TP3276.2 or TP3275 globe thermometer.**
- **TP3207.2 or TP3207 wet bulb temperature probe if the detection is made in presence of solar irradiation.**

To measure WBGT index consider the following regulations:

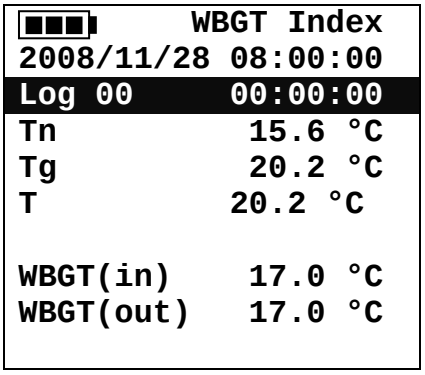
- **ISO 7726**
- **ISO 7243**

3. USER INTERFACES

The user interface is composed of an **LCD graphic back - enlighten display** and start and set keys of the instrument. With a battery power supplying without pressing any key, the back- lighting switches off after 1 minute. To activate it again, press one key. With external power supply, the back-lighting is always activated.

To switch the instrument on and off, press **ON/OFF** key. When you switch it on, the logo and the model of the instrument will be visualize, for some seconds, then you can go to the main visualization.

3.1 THE DISPLAY



The first line visualizes the **charge condition of the battery**, the **second line indicates the current date and the current hour**. If logging function is activated, the third line indicates the current logging number and the spent time from the logging start.
The **detected sizes** are:

Tn: wet bulb with natural ventilation temperature
Tg: globe thermometer temperature
T: ambient temperature
WBGT (in): WBGT index in absence of direct solar irradiation
WBGT (out): WBGT index in presence of direct solar irradiation

3.2 THE KEYBOARD

The instrument keys have the following functions:

ON-OFF / AUTO-OFF key

ON-OFF: It allows switching the instrument on and off.
When you switch the instrument on, the first screen will be visualized and, after some seconds, the detected measurements will be visualized.
AUTO-OFF: The instrument switches off after 8 minutes from the switching on. When you switch the instrument on, the AUTO-OFF function can be disabled pressing together ESC and ON/OFF keys.

MENU key

It allows entering and exiting from the setting menu of the instrument working parameters.

ENTER key

Inside the menu for confirming the inserted data.
During a normal working:

- it confirms the choice to reset the statistic data.
- it prints the immediate data on HD40.1 printer.

ESC key

You exit from the menu or, if there is a submenu, you exit from the current level visualization.

MEM key

It allows starting and stopping a “logging” section (data memorization); the interval for sending data must be set from the menu.

◀/FUNC key

◀ It allows the navigation through the menus.
FUNC: during a normal visualization, it allows to select some statistic data: maximum, minimum and medium.

▲key

It allows the navigation through the menus. During a normal working, it selects the reset of statistic data.

▼key

It allows the navigation through the menus. During a normal working, it cancels the choice to reset the statistic data.

►/UNIT key

► It allows the navigation through the menus.

UNIT: it allows selecting the temperature measurement unit: °C, °F, °K.

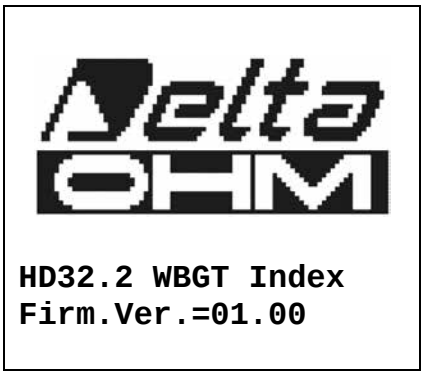
4. WORKING

Before switching the instrument on, connect the SICRAM probes to the inlets: 8 pin male connector DIN 45326 that is on the bottom of the instrument.

NOTE: The probes must be connected to the instrument off. If you connect a new probe to the instrument already switched on, it isn't recognized, so it's necessary to switch the instrument off and switch it on again.

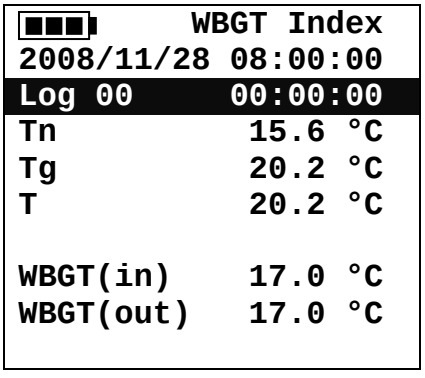
If you connect a probe with the instrument switched on, you have an acoustic alarm (a beep per second) and you can visualize it on the display in correspondence of a disconnected physical size, the "LOST" message will be visualized.
If you insert more probes of the same type, it will be only consider the first recognized probe: the scansion of the probes, for their recognition, happens from the inlet 1 up the inlet 3.

When you switch the instrument on, on the display appears the following writing for at least 10 seconds:



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

After connecting the probes, switch the instrument on: the display, after 10 seconds, will appear in the measurement visualization mode:



Tn: wet bulb temperature with natural ventilation
Tg: globe thermometer temperature, detected by the globe thermometer probe
T: ambient temperature, detected by Pt100 probe
WBGT (in): WBGT index calculated in absence of solar irradiation
WBGT (out): WBGT index calculated in presence of solar irradiation

4.1.1 The measurement "Unit"

Pressing ►/ **UNIT** key, it's possible to visualize the temperature in degrees °C (Celsius), °F (Fahrenheit) or °K (Kelvin).

4.1.2 The immediate printing of the data

Pressing **Enter** key, it's possible to print the immediate data on **HD40.1** printer.

*Example of immediate printing of the data, obtained using **HD40.1** printer.*

	NOTES
==========	
ISO 7243 WBGT Index	Reference regulation
==========	
Model HD32.2 WBGT Index	Instrument model
Firm.Ver.=01.00	Instrument firmware version
Firm.Date=2008/12/05	Instrument firmware date
SN=12345678	Instrument serial number
ID=0000000000000000	Identification code

Probe ch.1 description	Description of the probe connected to the inlet 1
Type: Pt100	
Data cal.:2008/10/01	
Serial N.:08109450	

Probe ch.2 description	Description of the probe connected to the inlet 2
Type: Pt100 Tg 50	
Cal. date.:2008/10/01	
Serial N.:08109452	

Probe ch.3 description	Description of the probe connected to the inlet 3
Type: Pt100 Tw	
Cal. date.:2008/10/01	
Serial N.:08109454	
==========	
Date=2008/11/21 15:00:00	Date and hour
Tnw 21.2 °C	Wet bulb temperature with natural ventilation
	Globe thermometer temperature
Tg 24.9 °C	Wet bulb temperature
Ta 31.3 °C	WBGT in absence of direct solar irradiation
WBGT (i) 22.3 °C	WBGT in presence of direct solar irradiation
WBGT (o) 23.0 °C	
==========	
Notes:	
==========	

4.1.3 The maximum, minimum and medium values of the detected sizes

Pressing ◄/**FUNC** key, it's possible to visualize the maximum, minimum and medium value of the detected sizes.
To reset the statistic data, press ◄/**FUNC** key till "Clear Func? Yes No" writing doesn't appear.
Select Yes with ▲▼ keys and confirm with ENTER key.

NOTE: Once selected, for example, ***max***, all the visualized sizes indicate the maximum value. **The average is calculated on the number of samples belonging to the first five minutes and then, considering the current average.**

4.1.4 Instrument setting

To set the instrument up, you enter to the main menu, pressing **MENU** key. For more details, see the chapter 5.

4.1.5 Start a memorization section (Logging)

To start a **Logging** section, press **MEM** key: the key starts and stops the memorization (Logging) of a data block that will be kept into the instrument internal memory. The frequency with which the data are memorized is set with "**Log interval"** menu parameter. The memorized data between a start and a following stop represent a measurement block.

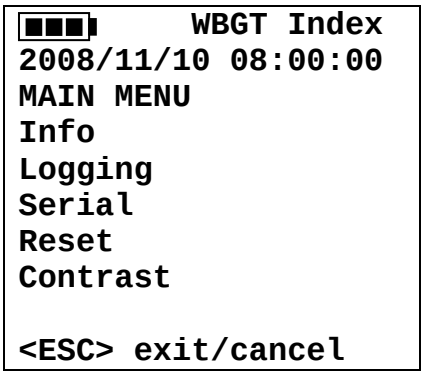
With the memorization function on, ***LOG and number of logging section*** appears on the display; a beep is given out during each memorization.

To finish the logging, press **MEM** key again.

The instrument can switch off during the logging between an acquisition and the following one: the function is controlled by ***Auto_shut_off_Mode*** parameter. With a memorization interval less than one minute, the instrument remains always on during the logging; with an interval of at least one minute, it switches off between an acquisition and the following one.

5. THE MAIN MENU

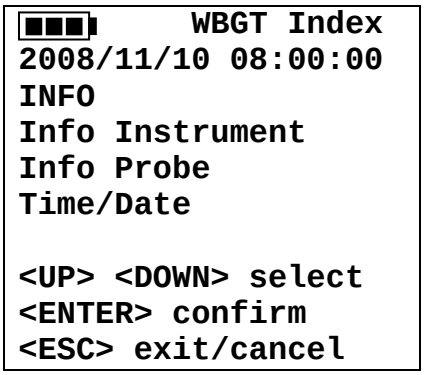
To visualize the programming menu, press **MENU** key:



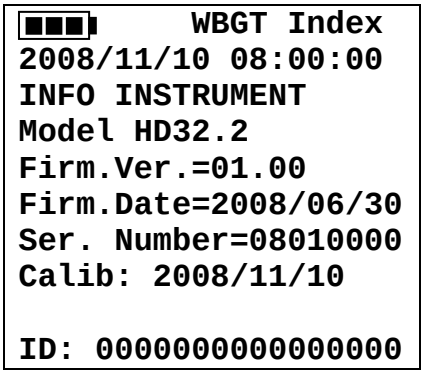
If you don't press any key for at least 2 minutes, the instrument will be back to the main visualization.
To select a heading, use ▲▼ arrow keys and press **ENTER**.
To exit from the selected heading and be back to the previous menu level, press **ESC**.
To exit directly from the main menu, press **MENU** again.

5.1 INFO ABOUT MENU

Pressing **MENU** key, you enter into the main menu. To enter to Info menu, select **Info** heading with ▲▼ keys and press **ENTER**.

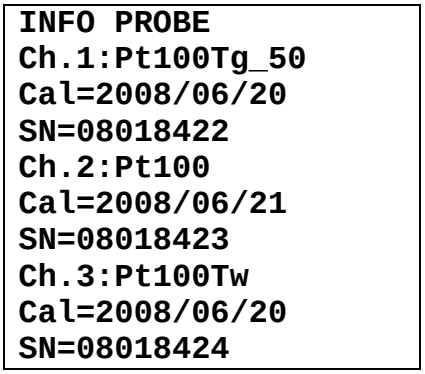


Selecting **Info Instrument**, you can visualize the information involving the instrument: instrument code and operative programm, firmware version anda date, serial number, instrument calibration date and identification code.



To modify the **ID**, press ENTER. Select the heading that you want to change with ◄► arrows and modify it with ▲▼ arrows. Go on with the other headings and, at the end, confirm with **ENTER** key.

Selecting **Info Probe** you can visualize the information involving the probes connected to the inlets:



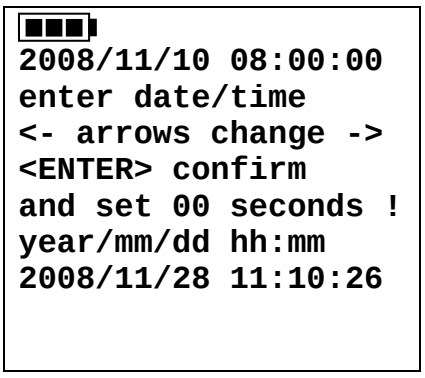
INFO ABOUT PROBE:
Description of the probe connected to the inlet 1.
Calibration data of the probe connected to the inlet 1.
Serial number of the probe connected to the inlet 1.

Description of the probe connected to the inlet 2.
Calibration data of the probe connected to the inlet 2.
Serial number of the probe connected to the inlet 2.

Description of the probe connected to the inlet 3.
Calibration data of the probe connected to the inlet 3.
Serial number of the probe connected to the inlet 3.

To go back to the main menu, press **ESC**. To exit from the menu, press **MENU**.

Time/Date allows to set the date and the hour that will appear on the upper part of the display.
To enter into ***Time/date***, go on as indicated below:
1. using ▼▲ arrow keys, select ***Time/date*** heading
2. press **ENTER**
3. the messagge will be visualized



4. use ◄► arrows to select the data to set (year/month/day – hour : minutes)
5. once selected, the data will start flashing;
6. using ▼▲ arrows, insert the right value;

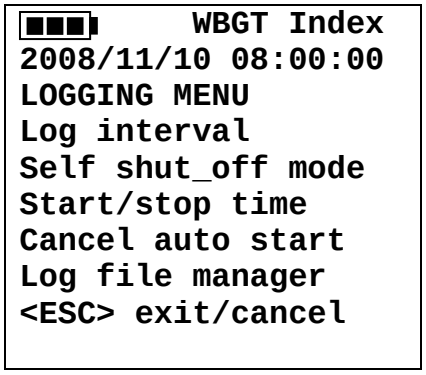
7. press **ENTER** to confirm and go back to the main menu;
8. or press **ESC** to go back to the menu, without modifying anything;
9. press **MENU** to exit directly from the main menu.

NOTE: With reference to the time, you can set hour and minuted, the seconds are always set at 00 (set 00 seconds!).

5.2 LOGGING MENU

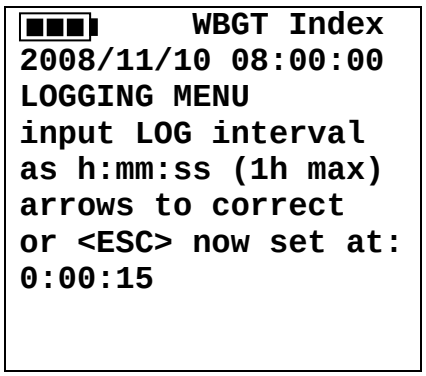
Press **MENU** key to enter into the main menu;

- Select **Logging** heading using ▲ ▼ keys;
- press **ENTER**: the submenu for the parameters setting involving the Logging section (to aquired) is visualized.



5.2.1 Log Interval

Through this heading, it's possible to set the LOG interval (interval between two acquisition following samples): to set, go on as indicated below:
enter into ***LOGGING*** submenu (previus paragraph), select ***Log Interval*** heading using ▲ ▼ arrow keys:



1. Using ▲ ▼ arrow keys select the interval duration that is between a minimum of 15 seconds and a maximum of one hour.
2. Press **ENTER** to confirm and go back to Logging menu.
3. To go back to **Logging** menu without modifying anything, press **ESC**.
4. To go back to the main menu, press **ESC** again.
5. To exit directly from the menu, press **MENU**.

The values that youc an set are the following ones: 15 seconds - 30 seconds - 1 minute - 2 minutes - 5 minutes- 10 minutes - 15 minutes -20 minutes - 30 minutes – 1 hour

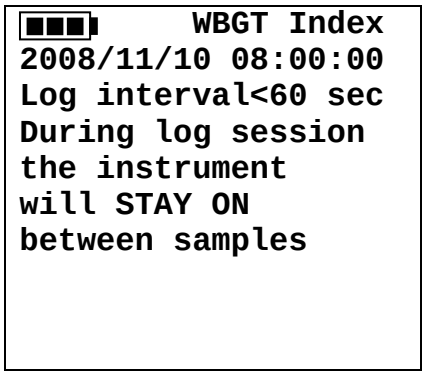
Memorization interval	Memory capacity	Memorization interval	Memory capacity
15 seconds	About 11 days and 17 hours	10 minutes	About 1 year and 104 days
30 seconds	About 23 days and 11 hours	15 minutes	About 1 year and 339 days
1 minute	About 46 days and 22 hours	20 minutes	About 2 years and 208 days
2 minutes	About 93 days and 21 hours	30 minutes	About 3 years and 313 days
5 minutes	About 234 days and 17 hours	1 hour	About 7 years and 261 days

5.2.2 Self Shut-off mode – The automatic switching off

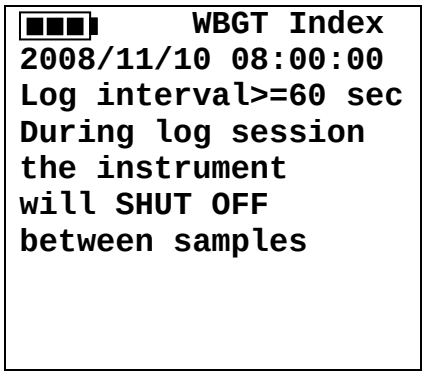
Self shut-off mode heading controls the instrument automatic switching off mode during the logging between the acquisition of a sample and the following one. **With an interval less than 60 seconds, the instrument will always remain on.** With intervals upper or equal to 60 seconds, it's possible to choose switching the instrument off between the memorizations: it will switch on in correspondence of the sampling time and it will switch off after some seconds, so extending the life of the batteries.

Once you entered into ***LOGGING*** sub menu (previous paragraph), select ***Self shut_off mode*** heading using ▲ ▼ arrow keys:

- If the set ***Log Interval*** (see the previous paragraph) is less than 60 seconds, there will be visualized:



- If the set ***Log Interval*** (see the previous paragraph) is upper or equal to 60 seconds, there will be visualixed:



1. Pressing ▲ ▼arrows, you can select:

   STAY ON (the inswtrument remains on)
   SHUT OFF (the instrument remains off)

2. To go back to ***Logging*** menu, press **ESC**.
3. To go back to the main menu, press **ESC** again**.**
4. To exit directly from the menu press **MENU**.

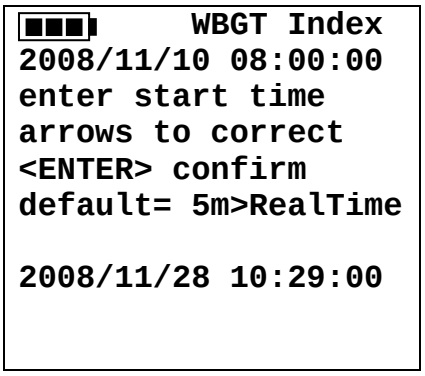
5.2.3 Start/stop time – The automatic start

The start and the end of the memorization can be programmed inserting the date and the hour.
The function offers, as start hour, the current hour will increase of 5 minutes: to confirm, press <ENTER>, vice versa set the date and the hour using the arrows. So it's requested to set the data for ending the memorization: in a default mode, the instrument offers the start hour increased of 10 minutes. The values offered in default mode are such to allow the user arranging the instrument for the measurement.

<u>NOTE</u>: in a default mode, the set time is more than 5 minutes with reference to the current hour.

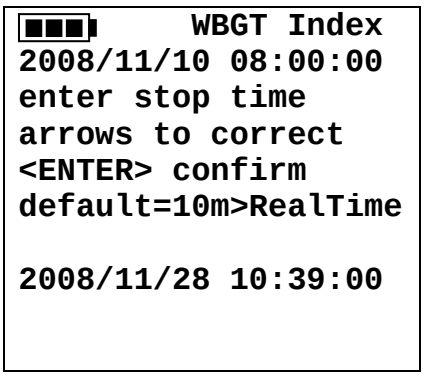
For the setting, go on as indicated below.

Once entered into ***LOGGING*** submenu, select ***Start/Stop time heading using*** ▲ ▼ arrow keys: "Enter start time" messagge will be visualized as indicated below:



1. using ◄ ► arrow key select the data to modify (year/month/day and hour/minutes/seconds);
2. once selected, the data will start flashing;
3. change the valued with ▼▲ keys;
4. confirm pressing **ENTER**;
5. to be back to ***Logging*** menu without modifying anything, press **ESC**;
6. to be back to the main menu, press **ESC** again;
7. to exit directly from the main menu, press **MENU**.

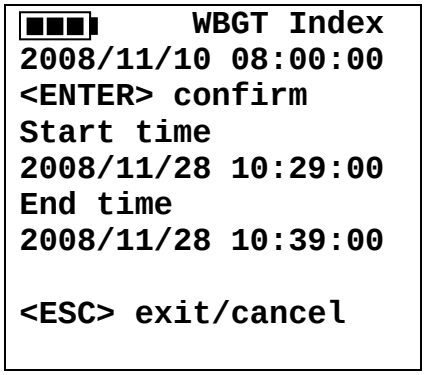
After setting the time of the memorization start, there will be visualized the request screen for inserting the end memorization time (enter stop time):



1. using ◄ ► arrow key select the data to modify (year/month/day and hour/minutes/seconds);
2. once selected, the data will start flashing;
3. change the valued with ▼▲ keys;
4. confirm pressing **ENTER**;
5. to be back to ***Logging*** menu without modifying anything, press **ESC**;
6. to be back to the main menu, press **ESC** again;
7. to exit directly from the main menu, press **MENU**.

NOTE: in a default mode, the set end acquisition time is more than 10 minutes with reference to the start time of Logging section..

1. Once set both the values, the summary of the times will be visualized: date and hour of start and end of LOG section.



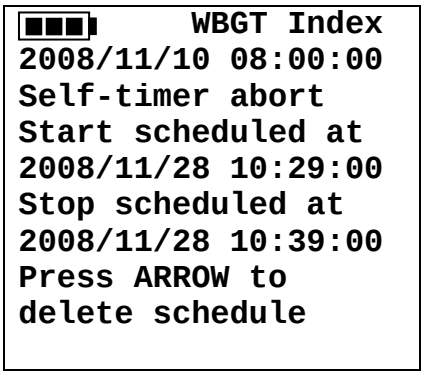
2. Press **ENTER** to confirm or **ESC** to exit without activating the automatic start: in both the cases, you go back to **LOGGING** menu.
3. Press MENU to exit directly from the main menu.

When the instrument starts a LOG section in an automatic mode, a beep is given out for each acquisition and, in the upper part of the display, **LOG** flashing heading will appear.
To stop the section befor the set stop time, press **MEM** key.
To cancel the settingf of the automatic start, use **Cancel auto start function, described in the previous paragraph.**

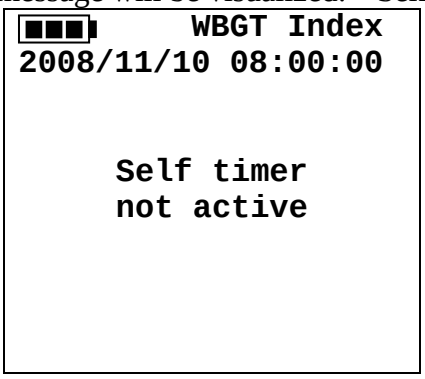
NOTE: the automatic logging section starts also if the instrument is off. If, during the start of automatic logging section, the instrument is off, it switches on some minutes before the start time and, at the end of the logging, it remains on. If it's supplyed by a battery, it switches off after some minutes spent in no working conditions at the end of the logging section.
To set the auto-switching, see the paragraph 5.2.2.

5.2.4 Cancel auto start

Once set the start and end times of LOG section, you can avoit the auto start of the section through ***Cancel auto start*** heading.
Once entered into ***LOGGING*** submenu:
1. select, using ▲ ▼ arrow keys, ***Cancel auto start*** heading
2. a message containing the start and end time of LOG section will be visualized:



3. pressing ▲ key the following message will be visualized: ”Self timer not active”;



4. press **ENTER** to cancel the auto start;
5. press **ESC** to exit without cancelling the auto start;
6. press **ESC** again to go out from the different submenus;
7. or press **MENU** to exit directly from the main menu.

After cancelling the austo start time, to set a new one, see the previous paragraph.

5.2.5 Log File Manager

Through this heading, it's possible to manage the acquired log sections: the instrument allows printing the acquired data files (***Print selected log***) and cancelling the whole memory (***Erase ALL logs***).
The instrument can memorize up to 64 sections of LOG numbered progressively from 00 to 63: the list of the sections is placed on 4 lines and 4 columns. If there are more than 16 sections, using **MEM** key you can visualize the following screen. Downwards, at the right, is indicated the current page (0, 1, 2 or 3) and the total number of pages with the memorized data: in the example, "0/3" means that you must print the page 0 on the three pages with memorized data.

```
LOG FILE          0/3
00 - 01 - 02 - 03
04 - 05 - 06 - 07
08 - 09 - 10 - 11
12 - 13 - 14 - 15
Date:
2008/11/28 08:59:40
rec: 000039

<MEM> to charge Page
```

Once you enter into the submenu ***LOGGING***:

1. select **Log File manager** heading through ▲▼ arrow keys: the following submenu will be visualized:

```
     WBGT Index
2008/11/10 08:00:00
LOG FILE MANAGER
Print selected log
Erase ALL logs
Log time
```

HD40.1

2. to select a menu heading, use ▲ ▼ arriw keys;
3. press **ENTER** to confirm;
4. press **ESC** to go back to the menu;
5. press **MENU** to exit immediately from the main menu.

NOTE: you can connect a PC to the serial port RS232C of the instrument or the **HD40.1 printer**. Before starting to print through the port RS232C, you must set the baud rate. To do this, select ***Baud Rate*** heading from ***Serial*** menu (see the paragraph 5.3.1 The Baud Rate) and select the maximum value equal to **38400 baud**. For the connection to a printer, use the maximum value tolerated by the printer.

The communication between the instrument and the PC or between the instrument and the printer works only if the baud rate of the instrument and the one belonging to the connected device (computer or printer) are the same.

*Example of printing of a logging section, obtained with **HD40.1** printer*

	NOTES
Log number: 1	Number of logging sections
==========	
ISO 7243 WBGT Index	Reference rules
==========	
Model HD32.2 WBGT Index	Instrument model
Firm.Ver.=01.00	Version of the instrument firmware
Firm.Date=2008/12/05	Date of the instrument firmware
SN=12345678	Instrument serial number
ID=0000000000000000	Identification code

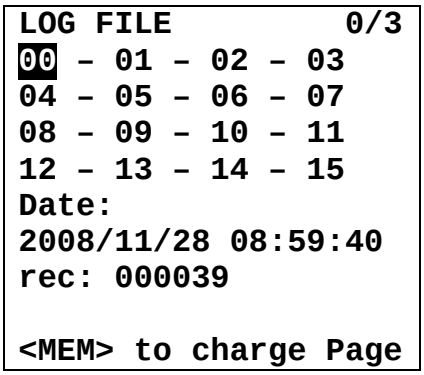
Probe ch.1 description	Description of the probe connected to the inlet 1
Type: Pt100	
Data cal.:2008/10/01	
Serial N.:08109450	

Probe ch.2 description	Description of the probe connected to the inlet 2
Type: Pt100 Tg 50	
Data cal.:2008/10/01	
Serial N.:08109452	

Probe ch.3 description	Description of the probe connected to the inlet 3
Type: Pt100 Tw	
Data cal.:2008/10/01	
Serial N.:08109454	
==========	
From=2008/11/21 15:00:00	Logging start day and hour
To =2008/11/21 16:30:00	Logging end day and hour
Tot. rec.= 000360	Number of samples acquired by the instrument
** max value **	Maximum value of the acquired data
Tnw 21.2 °C	Maximum temperature of wet bulb with natural ventilation
	Maximum temperature of globe thermometer
Tg 24.9 °C	Maximum temperature of wet bulb
Ta 31.3 °C	Maximum WBGT in absence of direct solar irradiation
WBGT (i) 22.3 °C	Maximum WBGT in presence of direct solar irradiation
WBGT (o) 23.0 °C	
** min value **	Minimum value of the acquired data
Tnw 21.0 °C	Minimum temperature of wet bulb with natural ventilation
Tg 24.9 °C	Minimum temperature of globe thermometer
Ta 23.5 °C	Minimum temperature of wet bulb
WBGT (i) 22.2 °C	Minimum WBGT in absence of direct solar irradiation
WBGT (o) 22.6 °C	Minimum WBGT in presence of direct solar irradiation
** avg value **	Medium value of the acquired data
Tnw 21.1 °C	Medium temperature of wet bulb with natural ventilation
Tg 24.9 °C	Medium temperature of globe thermometer
Ta 30.3 °C	Medium temperature of wet bulb
WBGT (i) 22.3 °C	Medium WBGT in absence of direct solar irradiation
WBGT (o) 22.8 °C	Medium WBGT in presence of direct solar irradiation
==========	
Notes:	
==========	

NOTE: The printing of a logging section on HD40.1 printer contains only the statistic data. To visualize all the acquired data, it's necessary to download the data using DeltaLog10 software.

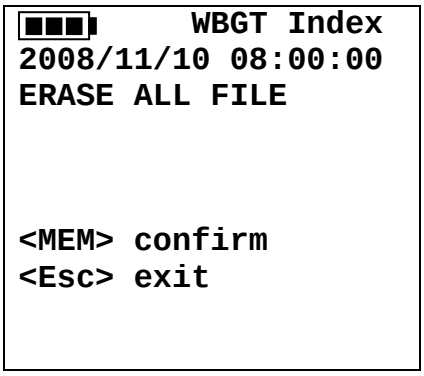
Print selected log
Selecting this heading you can visualize the logging sections that are into the instrument:



1. select the log to print, using ▲▼◄►arrows and **MEM** key to go to the following page.
2. once selected a file, in the lower part of the display, are indicated the date and the hour of acquisition start and the number of samples contained into the file (Rec). **The files are memorized in a growing order.** Each file is only identified by the date and the hour **indicated on the display.** In the example above, the file 00 is selected: the memorization started at 08:50:40 on 11/28/2008. The file contains 39 samples.
3. the data transfer message is visualized for some seconds, then the instrument go back to **Print selected log** screen to select another log to print.
4. repeat the process to print the sections you are interested in or press **ESC** to exit from this menu level.
5. press **MENU** to exit immediately from the main menu.

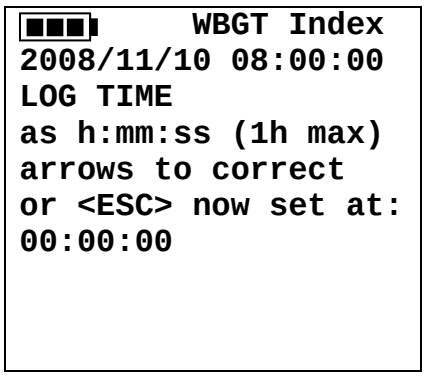
Erase all memory

Selecting this heading, **"ERASE ALL FILES"** messagge will be visualized:



1. press **MEM** to erase all the files;
2. press **ESC** to erase the operation and go back to the upper menu level;
3. press **MENU** to exit immediately from the main menu.

Log time (Set time for the memorization)
It represents the duration of the memorization: after the set time, the memorization stops. The memorization can be finished before the expiration of the set time, pressing **MEM** key.
To disable the function, set the time at 0:00:00. In this case, the memorization stops pressing MEM key or when the memory is full.



With the arrows modify the set time, the maximum value admitted is 1 hour.
Confirm with **ENTER** key.
Press **ESC** to exit from this menu level without modifying anything.
Press **MENU** to exit immediately from the main menu.

5.3 SERIAL MENU (SERIAL COMMUNICATION)

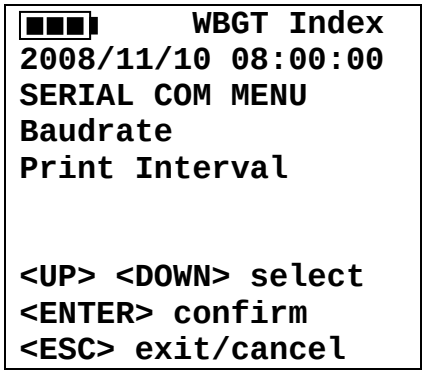
Serial sub menu allows setting the data transfer speed by serial means (***Baud rate***) and the record printing interval (***Print Interval***).

LOG sections can be downloaded to a PC by **RS232** serial connection or **USB** connection.
In case of serial connection, the transmission speed is set by the user (see the following paragraphs) and, however, can't be more than 38400 bps.
In case of USB connection, the transmission speed is fixed at 460800 bps.

After downloading the data on your PC, by the relative software, the data are elaborated by the software for the graphical visualization and for the calculation of the comfort/stress indexes.

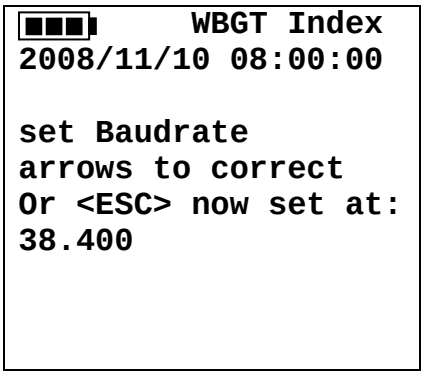
The instrument can be directly connected to **HD40.1 printer.**

To enter into ***Serial*** submenu, go on as indicated below:
1. Press **MENU** key of the instrument;
2. Select, using ▼▲ arrow keys, ***Serial*** heading;
3. press **ENTER;**
4. ***Serial*** submenu will be visualized.



5.3.1 Baud Rate

Baud Rate represents the speed used for the serial communication with the PC.
To set ***Baud rate***, go on as indicated below:
1. select the heading with ▼▲ arrow keys;
2. press **ENTER**: the following message will be visualized:



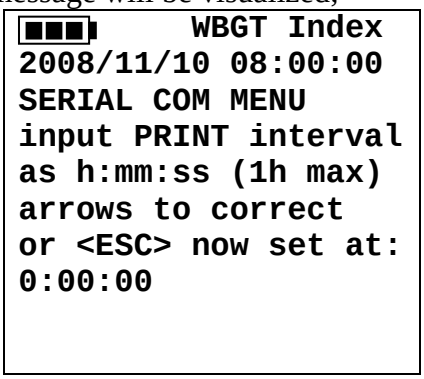
3. set the value through ▼▲ arrow keys;
4. press **ENTER** to confirm and go back to the previous screen or press **ESC** not to modify the value and exit for the menu heading;
5. press **ESC** over and over to exit from the menu different levels;
6. press **MENU** to exit immediately from the main menu.

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

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

5.3.2 Print Interval

To set ***Print Interval***, go on as indicated below:
1. use ▲▼ arrow keys to select the heading;
2. press **ENTER**: the following message will be visualized;

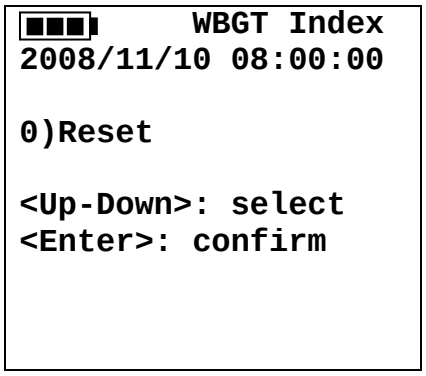


3. using ▼▲ arrow keys, set the value;
4. press **ENTER** to confirm and go back to the previous screen or press **ESC** not to modify the value and exit from the menu heading;
5. press **ESC** over and over to exit from menu different levels;
6. press **MENU** to exit immediately from the main menu.

The print interval can be set from 0 seconds to one hour:
0 s - 15 s - 30 s - 1 min. - 2 min. - 5 min. - 10 min. - 15 min. - 20 min. - 30 min. - 1 hour.

5.4 RESET

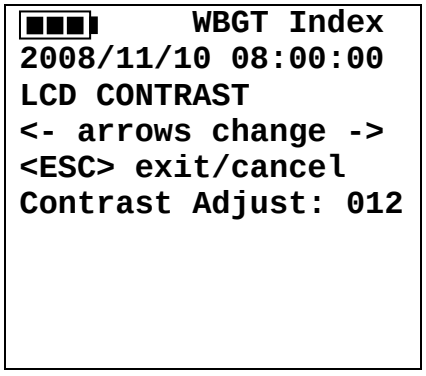
To enter into ***Reset*** submenu in order to carry out a complete reset of the instrument, go on as indicated below:
1. press **MENU** key of the instrument;
2. select ***Reset*** heading, using ▼▲ arrow keys;
3. press **ENTER**: the messagge will be visualized:



4. press ▼▲ arrow key to select ***Reset*** heading;
5. press **ENTER** to confirm or press **ESC** over and over to exit from the menu different levels;
6. press **MENU** to exit immediately from the main menu.

5.5 CONTRAST

This menu heading allows increasing or decreasing the contrast on the display:
To enter into ***Contrast*** submenu, go on as indicated below:
1. Press **MENU** key of the instrument;
2. Use ▲▼ arrow keys to select ***Contrast.;***
3. Press **ENTER**;
4. The following message will be visualized.



5. use ◄►arrow key to decrease or increase the contrast;
6. press **ENTER** or **ESC** to go back to the main menu;
7. press **MENU** to exit immediately from the main menu.

6. PROBES AND MEASUREMENTS

Necessary probes for **WBGT** measurement:

TP3276.2 or **TP3275**

HP3201.2, **HP3201** or **TP3204S**

TP3207.2 or **TP3207**

TP3207.2, TP3207

Temperature probe

	Sensor type:	Thin film Pt100
(*)	Accuracy:	Class 1/3 DIN
	Measurement range:	-40 ÷ 100 °C
	Connection:	4 wires plus SICRAM module
	Connector:	8-pole female DIN45326
	Cable:	Only TP3207 (2m)
	Dimensions:	Ø=14 mm L= 150 mm (TP3207.2), L= 140 mm (TP3207)
(**)	Response time T_{95}	15 minutes

(*) The probe is calibrated, the calibration data are kept into the SICRAM module memory.

(**) T_{95} response time is the time spent to reach the 95% of the final value. The measurement of the response time is done with a negligible air speed (motionless air).

TP3276.2, TP3275

Globe thermometer probe Ø=50 mm (TP3276.2), Ø=150 mm (TP3275)

	Sensor type:	Pt100
(*)	Accuracy:	Class 1/3 DIN
	Measurement range	-30 ÷ 120 °C
	Connection:	4 wires plus SICRAM module
	Connector:	8-pole female DIN45326
	Cable:	Only TP3275 (2m)
	Stem dimension:	Ø=8 mm L= 170 mm (TP3276.2), Ø=14 mm L= 110 mm (TP3275)
(**)	Response time T_{95}	15 minutes

(*) The probe is calibrated, the calibration data are kept into the SICRAM module memory.

(**) T_{95} response time is the time spent to reach the 95% of the final value. The measurement of the response time is done with a negligible air speed (motionless air).

HP3201.2, HP3201

Wet bulb probe with natural ventilation

	Sensor type:	Pt100
(*)	Accuracy:	Class A
	Measurement range:	4 °C ÷ 80 °C
	Connection:	4 wires plus SICRAM module
	Connector:	8-pole female DIN45326
	Cable:	Only HP3201 (2m)
	Stem dimension:	Ø=14 mm L= 170 mm (HP3201.2), L= 110 mm (HP3201)
	Cotton wick length:	about 10 cm
	Tank capacity:	15 cc
	Tank autonomy:	96 hours con RH=50%, t = 23°C
(**)	Response time T_{95}	15 minutes

HP3201.2, HP3201 wet bulb probe with natural ventilation

For the start up go on as indicated below:

- Remove the cover, **the cover isn't screwed**.
- Insert the cotton wick into the temperature probe, the cotton wick was previously dipped with distilled water.
- Fill the case up till ¾ with **distilled water**.
- Close the case cover.
- **Warning**: don't turn the probe in the vertical direction because the distilled water can exit.
- The cotton wick must project from the temperature probe for about 20mm.
- During the time, the cotton wick is going to calcify (to become hard) and so it's necessary to replace periodically it.

(*) The probe is calibrated, the calibration data are kept into the SICRAM module memory.

(**) T_{95} response time is the time spent to reach the 95% of the final value. The measurement of the response time is done with a negligible air speed (motionless air).

TP3204S

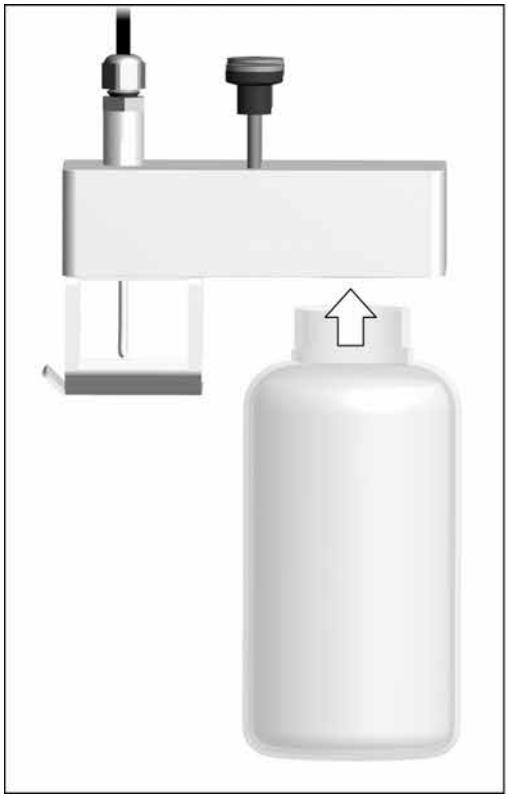
Natural ventilation wet bulb probe for long-lasting measurements

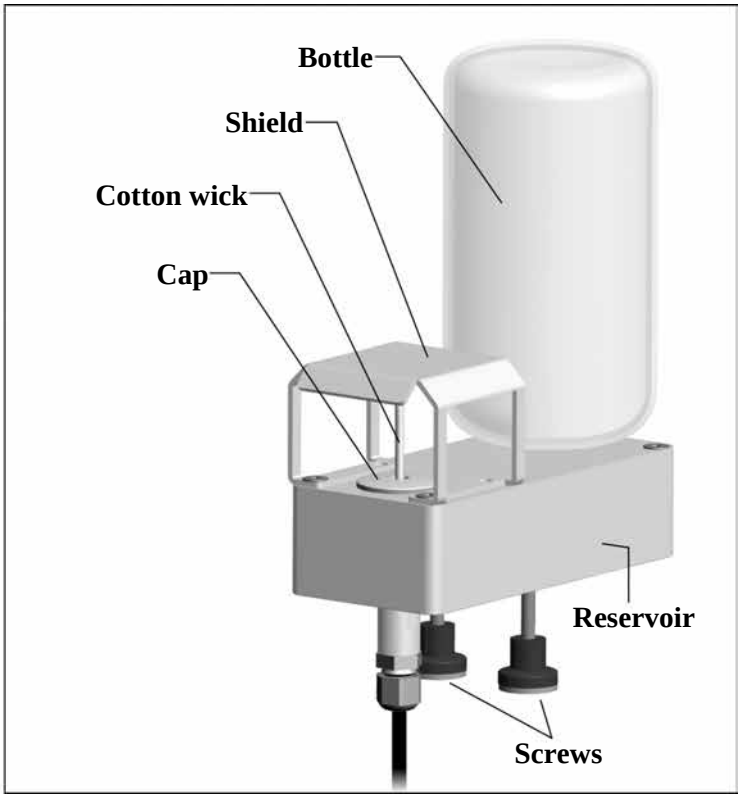
	Sensor type:	Pt100
(*)	Accuracy:	Class A
	Measurement range:	4 °C ÷ 80 °C
	Connection:	4 wires plus SICRAM module
	Connector:	8-pole female DIN45326
	Cable:	2 m
	Dimensions:	L x W x H=140 x 65 x 178.5 mm (reservoir + bottle)
	Cotton wick length:	about 10 cm
	Tank capacity:	500 cc
	Tank autonomy:	15 days @ t = 40 °C
(**)	Response time T_{95}	15 minutes

TP3204S wet bulb probe with natural ventilation

For the start up go on as indicated below:

- Remove the sensor cap (**the cap is not screwed**).
- Insert the cotton wick, previously dipped with distilled water, into the temperature probe. The cotton wick must protrude from the probe for about 20 mm.
- Replace the cap.
- Fill the bottle with 500 cc of **distilled water**.
- Turn the probe over and firmly screw the bottle to the probe reservoir.
- Turn the probe quickly (to avoid water spillage).
- Secure the probe to the **HD32.2.7.1** support by using the two screws at the bottom of the probe.





For measurements in presence of solar irradiation, use the protection shield from solar radiations.
The cotton wick calcifies (becomes hard) with time: replace it periodically.

(*) The probe is calibrated, the calibration data are kept into the SICRAM module memory.

(**) T_{95} response time is the time spent to reach the 95% of the final value. The measurement of the response time is done with a negligible air speed (motionless air).

Measurement

In the place where you want to measure, you must assembly the tripod and the probes necessary for the measurement. You set the instrument up and then you start measuring. If the measurement has to be done in other places, you have to move all the equipment in the new measurement position.

At the end of the measurement or after some times, the acquired data are transferred to the PC for the elaboration and to allow writing the measurement report/s.

6.1 Instruction, accuracy and maintenance of the probes

- Don’t expose the probe to gas or liquids that could corrode the probe material. After the measurement clean accurately the probes.
- Don’t fold the connector, using force upwards or downwards.
- Respect the correct probe polarity.
- During the insertion of the probe’s connector into the instrument, don’t fold or use force against the contacts.
- Don’t fold the probes and don’t distort them or let them fall: they can damage in an irreparable manner.
- Use a probe suitable to the measurement type that you want to realize.
- For a reliable measurement, avoid too speed temperature variations.

- Some sensors aren’t isolated with referent to the external sheathing, pay attention not to be in contact with items under tension (up to 48V): it could be dangerous for the instrument and for the operator who can be electrocute.

- Avoid measuring in presence of high-frequency sources, microwave or great magnetic fields, because they will be not so reliable.
- The instrument is water-proof, you don't dip it into the water. If it falls into the water, check that there isn't any infiltration.

7. SERIAL AND USB INTERFACES

HD32.2 has a RS-232C serial interface, galvanically isolated and it has a USB 2.0 interface. As an optional, we can supply, under request:

- RS-232C serial connection cable (code **HD2110/RS**) with M12 connector from instrument side and 9-pole female connector sub D from the PC side.
- USB 2.0 connection cable (code **HD2110/USB**) with M12 connector from instrument side and USB 2.0 connector from the PC side.

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

The instrument standard RS232 serial transmission parameters are:

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

It's possible to change the speed of RS232C serial data transmission acting on "*Selection of serial transfer speed (Baud Rate)*" inside the menu (see the menu of the chapter **5.3.1 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 (Baud rate = 460800 fixed).

The port selection is directly done by the instrument: if USB port is connected to a PC, RS232 serial port is automatically excluded and vice versa.

The instruments are provided with a complete set of commands and data request to send by PC.

All the commands transmitted to the instrument must have the following structure:
XXCR where: **XX is the command code and CR is the** Carriage Return (ASCII 0D).
The command characters XX are only capital, the instrument responses with "&" if the command is correct, with "?" for each characters combination that is wrong.
The response string of the instrument is finished, entering CR (Carriage Return) and LF (Line Feed) commands.
Before entering the commands to the instrument through the serial port, we suggest you to block the keyboard to avoid working conflicts: use P0 command. At the end of the process, restore the keyboard use with P1 command.

Command	Response	Description
P0	&	Ping (locks the instrument keyboard for 70 seconds)
P1	&	Unlocks the instrument keyboard
S0		
G0	Model HD32.2	Instrument model
G1	M=WBGT Index	Model description
G2	SN=12345678	Instrument serial number
G3	Firm.Ver.=01.00	Firmware version
G4	Firm.Date=2008/10/12	Firmware date
G5	cal 2008/11/10 10:30:00	Calibration date and time
C1		Probe 1 type, serial number, calibration date
C2		Probe 2 type, serial number, calibration date

Command	Response	Description
C3		Probe 3 type, serial number, calibration date
GC		Print instrument's heading
GB	ID=0000000000000000	User code (set with T2xxxxxxxxxxxxxxx)
H0	Tw= 19.5 øC	Print wet bulb temperature
H1	Tg= 22.0 øC	Print globe thermometer temperature
H2	Ta= 21.6 øC	Print air temperature (dry bulb);
H7	WBGT(i)= 23.0 øC	Print indoor WGBT (without solar radiation)
H8	WBGT(o)= 24.0 øC	Print outdoor WGBT (with solar radiation)
LN	A00 -A01 -A02 -A03 - .. - .. - .. - .. - .. - .. - .. - .. - .. - .. - .. - .. -	Print instrument memory map: if a section is allocated a number is displayed, if it is free 2 points (..) are displayed.
LFn	!Log n.= 0!started on:!2006/01/01 00:37:32	Print memory n section status. The number, the storage start date and time are displayed. (n= hexadecimal number 0-F). If the section is empty:"-->No Log Data<--"
LDn		Print data stored in section n. If the section is empty: "-->No Log Data<--"
LE	&	Cancel stored data
K1	&	Immediate data printing
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
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 THE DATA MEMORIZATION AND THE DATA TRANSFER TO A PC

HD32.2 can be connected to RS232C serial port or USB port of a PC and can exchange data and information through DeltaLog10 software that works with Windows. The values measured can be printed (ENTER key) or stored in the memory of the instrument by using the *Logging* function (MEM key). The memorized data can be transferred to the PC in a second time.

7.1.1 Logging function

Logging function allows memorizing the measurements detected by the probes connected to the inlets. The interval between two following measurements can be set between 15 seconds and 1 hour. The memorization start is obtained pressing **MEM** key; the stop is obtained pressing the same key: so, the memorized data are a continuous block of data.
See the menu headings description in the chapter 5. MEIN MENU".
If the *Self Shut-off* option is activated between two memorizations (see the paragraph 5.22 *Self Shut-off mode*), pressing **MEM** key, the instrument memorizes the first data and the switches off, 15 seconds before the following memorization istant, the instrument switches on to acquired the new sample and then it switches off.
The memorized data can be transferred to the PC (see the paragraph 5.22 Log File Manager). During the data transfer, the display visualizes DUMP writing; to stop the data transfer, press ESC key on the instrument or on the PC.

7.1.2 Erase function: cancellation of the memorized data

To cancel the content of the memory, you must use Erase Log function (see the paragraph 5.2.5 Log file Manager). The instrument cancels the internal memory and, at the end of the operation, goes back to the normal visualization.

NOTES:

- The data transfer doesn't involve the memory cancellation: it's possible to repeat over and over the transfer process.
- The memorized data independently remain in memory from the batteries charge condition.
- To print the data using a printer provided with a parallel interface, it's necessary to use a serial- parallel converter (usually, not supplied).
- **The direct connection between the instrument and the printer with USB connection doesn't work.**
- During *logging*, some keys are disabled, **MEM**, **MENU**, **ENTER** and ESC are enabled.
- Pressing **MEM** and **MENU** keys, doesn't involve the memorized data if these keys are pressed **after** starting the memorization, vice versa it's valid what indicated below.

7.1.3 Print function

Pressing **ENTER** key, in real time, you can immediately send the detected data by the instrument to RS232C or USB ports. The measurement units of the printed data are the ones visualized on the display. The function starts, pressing **ENTER** key. The interval between the two following printings can be set between 15 seconds and 1 hour (see **Print interval** menu heading at the paragraph 5.3.2. Print Interval). If the printing interval is equal to 0, pressing **ENTER**, key you send only a data to the device. If the printing interval is more than 0, the data sending goes on till the operator doesn't stop it, pressing **ENTER** key again.

NOTE: During baud-rate setting, check the printing speed capacity of the used printer.

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.
WARNING: MEMORY FULL!!	The instrument cannot store further data, the memory space is full.
LOG	Blinking message. It appears on the first line of the display and indicates a logging session.

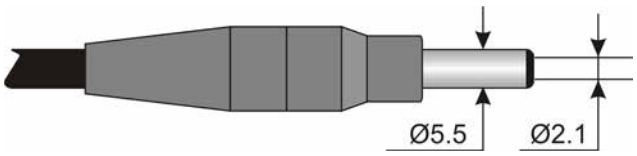
9. BATTERY SYMBOL AND BATTERY REPLACEMENT – MAIN POWER SUPPLY

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.

To replace the batteries, go on as indicated below:
1. switch the instrument off;
2. disconnect the external power supply, if connected;
3. unscrew the battery cover counter clockwise and take out the battery holder.
4. replace the batteries (4 1.5V alkaline batteries – 1.5 V AA type). Check that the battery polarity matches the indication on the battery holder;
5. Replace the battery holder and screw the cover on clockwise.

The instrument can be powered by the main using, for example, the stabilized power supply SWD10 input 100÷240Vac output 12Vdc – 1000mA. The positive connector is in the middle.



The external diameter of power supply connector is 5.5mm, the internal diameter is 2.1mm.
Warning: The power supply cannot be used as battery charger. If the instrument is connected to the external power supply, the [≈] symbol is displayed instead the battery symbol.

Malfunctioning upon turning on after battery replacement
After replacing the batteries, the instrument may not restart correctly; in this case, repeat the operation.
After disconnecting the batteries, wait a few minutes in order to allow circuit condensers to discharge completely; then reinsert the batteries.

9.1 WARNING ABOUT THE BATTERIES USE

- Batteries should be removed when the instrument is not used for an extended time.
- Flat batteries must be replaced immediately.
- Avoid loss of liquid from batteries.
- Use waterproof and good-quality batteries, if possible alkaline. Sometimes on the market, it is possible to find new batteries with an insufficient charge capacity.

10. 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 solvent for cleaning.

11. PRINTING OF THE MEASUREMENT REPORT

Evaluation Report

Hot Environments: Determination of WBGT heat stress index

Norm ISO 7243

Delta OHM
Via Marconi, 5
35030 Caselle di Selvazzano
Padova
Italy

INTRODUCTION

The WBGT (*Wet Bulb Globe Temperature*) (UNI, 1996) is an empirical temperature index used to evaluate very hot thermal environments, from the experimental correlations between microclimatic parameters and physiologic reactions of a large sample of subjects.
In order to determine the conditions of thermal stress within an environment, you should know the air temperature, wind speed, and air humidity, as well as the average radiation temperature. The WBGT index uses some derived quantities to characterise the environment under consideration from a thermal point of view.

PURPOSE AND APPLICATION SCOPE

The purpose of this survey is the WBGT index evaluation in a hot environment.

REFERENCE STANDARDS

Norm ISO 7243

NOTES

Space for notes

	Evaluation Report Hot Environments: Determination of WBGT heat stress index Norm ISO 7243	Mod. 002 rev.0 Page 2 of 6

Measurement date:

Start date:	2006/10/05	**Start time:**	10:30:00
End date:	2006/10/05	**End time:**	10:38:00

Location of the survey:

Company:	Delta OHM
Address:	Via Marconi, 5
City:	35030 Caselle di Selvazzano
Prov.:	Padova
Country:	Italy
Contact person:	Paolo Bianchi
Telephone/fax:	0039-0498977150 - Fax 0039-049635596
E-mail:	deltaohm@tin.it

Report Author:

Author:	Mario Rossi
Address:	Via Marconi, 5
City:	35030 - Caselle di Selvazzano
Prov.:	Padova
Country:	Italy
Contact person:	Mario Rossi
Telephone/fax:	0039-0498977150 - Fax 0039-049635596
E-mail:	deltaohm@tin.it

Written		Checked and Approved	
Date	**Signature**	**Date**	**Signature**

Delta OHM	**Evaluation Report** Hot Environments: Determination of WBGT heat stress index Norm ISO 7243	Mod. 001 rev.0 Page 3 of 6

Instrumentation used:

Instrument Code:	Model HD32.
Firmware Version:	Firm.Ver.=01.00
Firmware Date (yyyy/mm/dd):	Firm.Date=2005/10/12
Instrument Serial Number:	SN=12345678
User Code:	User ID=0000000000000000

Probes used:

Input description Ch.1

Type of probe:	Pt100
Cal. Date:	2004/09/13
Y/N:	87654321

Input description Ch.2

Type of probe:	Pt100 Tg 50
Cal. Date:	2005/06/27
Y/N:	05013380

Input description Ch.3

Type of probe:	Pt100 Tw
Cal. Date:	2002/01/02
Y/N:	04006422

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Description of the observation location:

Very Hot Environment
Indoor, without solar radiation
Person acclimatized to heat
The worker being observed has an average size body

Description of clothing:

Daily Clothing:
Intimate underwear and lingerie, short-sleeved vest/top, blouse, trousers, jacket, ankle socks, shoes — 1.5 clo

Description of activity:

Type of Job: Sedentary activity (office, home, school, laboratory) — 70 W/m2

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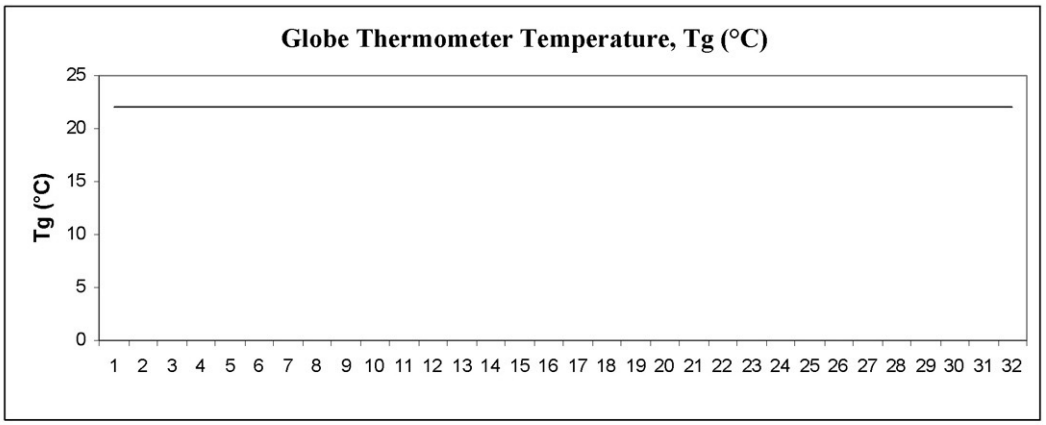
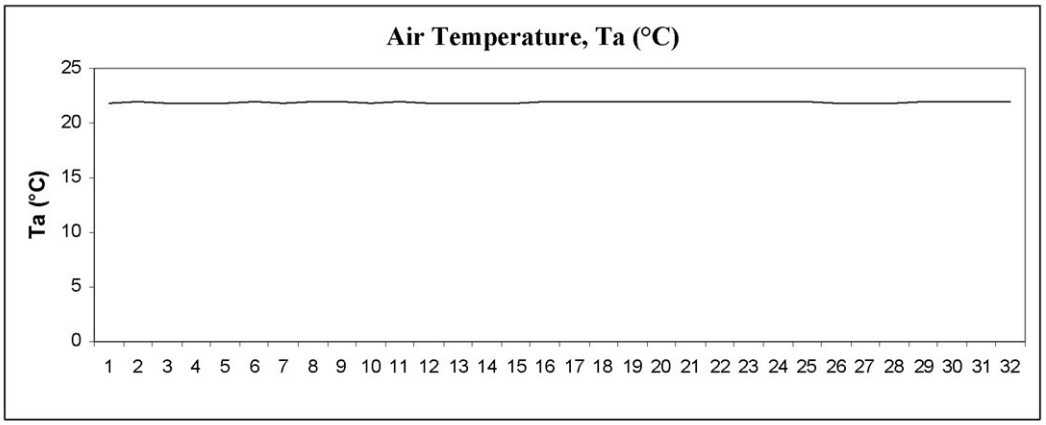
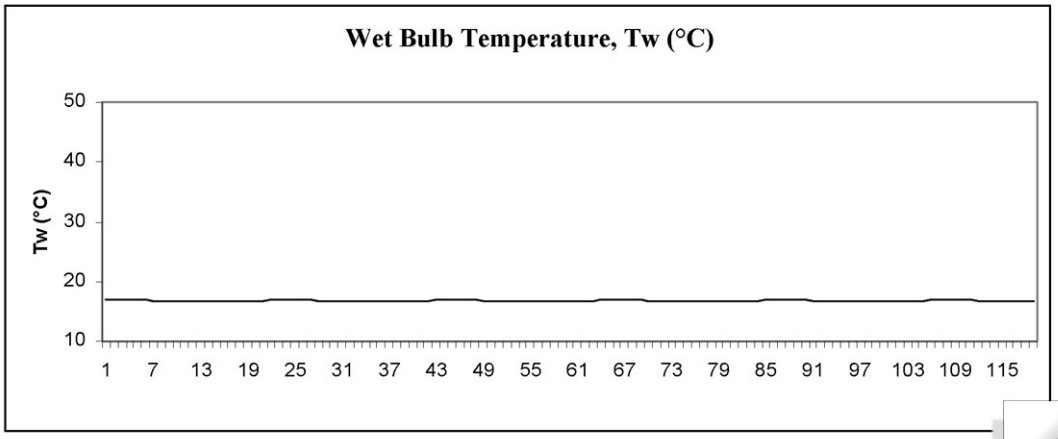
Graph Trend:

Start date:	2006/10/05	**Start time:**	10:30:00
End date:	2006/10/05	**End time:**	10:38:00

Acquisition frequency: 15 sec







Delta OHM	**Evaluation Report** Hot Environments: Determination of WBGT heat stress index Norm ISO 7243	Mod. 001 rev.0 Page 6 of 6

Measurements:

Globe Thermometer Temperature, Tg (°C)	22.7
Wet Bulb Temperature, Tw (°C)	16.8
Air Temperature, Ta (°C)	22.7

Overall result:

WBGT heat stress index (°C)	18.6
WBGT value limit (°C)	28.0

12. NOTES ON WORKING AND OPERATING SAFETY

Authorized use

Comply with the technical specifications outlined in the chapter “TECHNICAL CHARACTERISTICS”. Its use is authorized only in conformity with the instructions written in this manual. Any different use is considered improper.

General instructions on security

This instrument has been manufactured and tested according to safety regulation EN 61010-1:2010 concerning electronic measurement instruments and was delivered ex factory in perfect security conditions.
Its regular functioning and operating security can be ensured only if all the normal safety measures as well as the specifications described in this manual are complied with.
Its regular functioning and operating security can be ensured only within the climatic conditions specified in the chapter “TECHNICAL CHARACTERISTICS”.

Do not use or store the instrument in ways and/or places in which there are:

- Quick environment temperature changes that could cause condensation.
- Corrosive or inflammable gases.
- Direct vibrations or shocks against the instrument.
- High intensity electromagnetic fields, static electricity.

If the instrument is moved from a cold to a hot environment, the condensation can disturb its functioning. In this case, you need to wait for the instrument to reach the environment temperature before using it.

User obligations

The user of the instrument must ensure that the following regulations and directives concerning the handling of hazardous materials are complied with:

- CEE directives on job safety
- National laws on job safety
- Accident prevention regulations

13. TECHNICAL CHARACTERISTICS

Instrument

Dimensions (Length x Width x Height)	185x90x40 mm
Weight	470 g (complete of batteries)
Materials	ABS, rubber
Display	Dot matrix with backlight 160x160 points, visible area 52x42mm

Working conditions

Operative temperature	-5 … 50°C
Storage temperature	-25 … 65°C
Humidity relative to work	0 … 90% HR no condensation
Protection degree	**IP64**

Instrument uncertainty	± 1 digit @ 20°C

Power supply

Net power supply (code SWD10)	12Vdc/1A
Batteries	4 batteries 1.5V AA type
Autonomy	200 hours with 1800mAh alkaline batteries
Absorbed current with switched instrument off	< 45μA

Safety of the memorized data	unlimited

TP3207.2, TP3207 *temperature probe*

Sensor type:	Thin film Pt100
Accuracy:	Class 1/3 DIN
Measurement range:	-40 ÷ 100 °C
Resolution:	0.1°C
Drifting in temperature @20°C:	0.003%/°C
Drifting after 1 year:	0.1°C/year
Connection:	4 wires plus SICRAM module
Connector:	8 – poles female DIN45326
Cable:	Only TP3207 (2m)
Dimensions:	Ø=14 mm L= 150 mm (TP3207.2), L= 140 mm (TP3207)
Response time T_{95}:	15 minutes

Globe thermometer probe Ø=50 mm ***TP3276.2,*** *Ø=150 mm* ***TP3275***

Sensor type:	Pt100
Accuracy:	Class 1/3 DIN
Measurement range:	-30 ÷ 120 °C
Resolution:	0.1°C
Drifting in temperature @20°C:	0.003%/°C
Drifting after 1 year:	0.1°C/year
Connection:	4 wires plus SICRAM module
Connector:	8 – poles female DIN45326
Cable:	Only TP3275 (2m)
Stem dimensions:	Ø=8 mm L= 170 mm (TP3276.2), Ø=14 mm L= 110 mm (TP3275)
Response time T_{95}:	15 minutes

HP3201.2, HP3201 *Natural ventilation wet bulb probe*

Sensor type:	Pt100
Accuracy:	Class A
Measurement range:	4 °C ÷ 80 °C
Resolution:	0.1°C
Drifting in temperature @20°C:	0.003%/°C
Drifting after 1 year:	0.1°C/year
Connection:	4 wires plus SICRAM module
Connector:	8 – poles female DIN45326
Cable:	Only HP3201 (2m)
Stem dimensions:	Ø=14 mm L= 170 mm (HP3201.2), L= 110 mm (HP3201)
Cotton wick length:	about 10 cm.
Tank capacity:	15 cc.
Tank autonomy:	96 hours with RH=50%, t = 23°C
Response time T_{95}:	15 minutes

TP3204S *Natural ventilation wet bulb probe*

Sensor type:	Pt100
Accuracy:	Class A
Measurement range:	4 °C ÷ 80 °C
Resolution:	0.1°C
Drifting in temperature @20°C:	0.003%/°C
Drifting after 1 year:	0.1°C/year
Connection:	4 wires plus SICRAM module
Connector:	8 – poles female DIN45326
Cable:	2 m
Dimensions:	L x W x H=140 x 65 x 178.5 mm (reservoir + bottle)
Scotch length:	about 10 cm
Tank capacity:	500 cc
Tank autonomy:	15 days @ t = 40 °C
Response time T_{95}:	15 minutes

Connections

Inputs for probes with SICRAM module	3 male 8-pole DIN 45326 connectors

Serial interface:

Pin:	M12-8 poles.
Type:	RS232C (EIA/TIA574) or USB 1.1 o 2.0 not isolated
Baud rate:	from 1200 to 38400 baud. with USB baud=460800
Data Bit:	8
Parity:	None
Stop bit:	1
Flow control:	Xon-Xoff
Cable length:	max 15m

Memory	divided in 64 blocks.
Memory capacity	67600 memorizations for each of 3 inputs

Memorization interval	selectable between: 15, 30 seconds, 1, 2, 5, 10, 15, 20, 30 minutes and 1 hour

14. ORDERING CODES

HD32.2 Kit consists of:

- **HD32.2 WBGT Index instrument**, 4 alkaline batteries 1.5V AA type, instruction manual, case. **The probes and the cables are not included.**
- **DeltaLog10 Software for warm environments: WBGT analysis.**
  The DeltaLog10 software is downloadable from Delta OHM website.

Necessary probes for **WBGT** measurement:

- **TP3207.2** Dry bulb temperature probe**.**
- **TP3276.2** Globe thermometer probe.
- **HP3201.2** Wet bulb temperature probe with natural ventilation.

Necessary probes for **WBGT version A** measurement:

- **TP3207** Dry bulb temperature probe**.**
- **TP3275** Globe thermometer probe.
- **HP3201** or **TP3204S** Wet bulb temperature probe with natural ventilation.

14.1 PROBES FOR HD32.2 WBGT INDEX

TP3207.2	Temperature probe for Pt100 sensor. Shank probe Ø 14mm, length 150mm. Complete with SICRAM module.
TP3276.2	Globe thermometer probe for Pt100 sensor, globe Ø 50 mm. Shank Ø 8 mm, length 170 mm. Complete with SICRAM module.
HP3201.2	Wet bulb probe with natural ventilation. Pt100 sensor. Shank probe Ø 14 mm, length 170 mm complete with SICRAM module, spare parts of the cotton wick and case of 50cc. distilled water.
TP3207	Temperature probe for Pt100 sensor. Shank probe Ø 14mm, length 140mm. Cable length 2 m. Complete with SICRAM module.
TP3275	Globe thermometer probe for Pt100 sensor, globe Ø 150 mm. Shank Ø 14 mm, length 110 mm. Cable length 2 m. Complete with SICRAM module.
HP3201	Natural ventilation wet bulb probe. Pt100 sensor. Probe stem Ø 14 mm, length 110 mm. Cable length 2 m. Complete with SICRAM module, spare parts of the cotton wick and and case of 50 cc of distilled water.
TP3204S	Natural ventilation wet bulb probe for long-lasting measurements. Capacity: 500 cc of distilled water. Pt100 sensor. Cable length 2 m. Complete with SICRAM module, 500 cc bottle and two spare cotton wicks.

Accessories:

VTRAP30	Tripod to be fixed to the instrument with a maximum height of 280 mm
VTRAP32.2A.3A	Tripod for HD32.2A
HD32.2.7.1	Support for probes, to be fixed on standard tripod for version **HD32.2A**
HD2110/RS	Connection cable with M12 connector on the instrument side and with

	9-pole SubD female connector for RS232C on PC side.
HD2110/USB	Connection cable with M12 connector on the instrument, USB 2.0 connector on PC side.
SWD10	Stabilized power supply with 100-240Vac/12Vdc-1A main tension
AQC	200cc of distilled water
HD40.1	Printer (it uses **HD2110/RS** cable)

DELTA OHM metrology laboratories LAT N° 124 are ISO/IEC 17025 accredited by ACCREDIA for Temperature, Humidity, Pressure, Photometry / Radiometry, Acoustics and Air Velocity. They can supply calibration certificates for the accredited quantities.

NOTES

NOTES

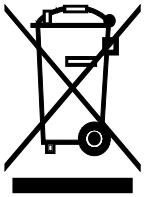
WARRANTY

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

TECHNICAL INFORMATION

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

senseca

Please note our new name:
Senseca Italy Srl
Via Marconi 5, 35030 Padua, Italy
Documents are in the process of being changed.