

OPERATING MANUAL

HD32.2

WBGT index



EN

V2.0



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1 Introduction

HD32.2 is a portable instrument indicated for **WBGT** (Wet Bulb Globe Temperature) index analysis in presence or absence of solar radiation.

The instrument is equipped with three inputs for probes with SICRAM module, which keeps memory of the probe calibration data. The probes can be inserted in any of the inputs: they are automatically recognized when the instrument is turned on.

The instrument simultaneously measures:

- **T** dry bulb (ambient) temperature
- **T_n** natural ventilation wet bulb temperature
- **T_g** globe thermometer temperature

and calculates:

- **WBGT indoor** index, in absence of solar irradiation
- **WBGT outdoor** index, in presence of solar irradiation

Instrument main features:

- Data logging. Memory capacity 64 different logging sessions, with possibility to set the logging interval. Logging duration can be set and, with **auto-start** function, it is possible to set the logging starting and ending date/time.
- Real-time clock.
- Display of maximum, minimum and average statistical parameters.
- Data transfer via RS232 serial port or USB port.
- Configurable temperature unit of measurement: °C, °F, K.

Reference standards:

- **ISO 7726**: Ergonomics of the thermal environment - Instruments for measuring physical quantities.
- **ISO 7726**: Ergonomics of the thermal environment - Instruments for measuring physical quantities.

2 Description



1. Inputs for **SICRAM** probes.
2. External power supply input.
3. Backlit LCD display.
4. **ESC** key: exits the menu or, if in a submenu, returns to the upper level.
5. **▲** key: scrolls up the available options.
6. **◀ | FUNC** key: in measurement mode, displays the statistical data (min., max. and average); in menu, scrolls left.
7. **MEM** key: starts and stops logging.
8. **▼** key: scrolls down the available options.
9. **MENU** key: enters the menu (exists the menu if pressed inside the menu).
10. **▶ | UNIT** key: in measurement mode, selects the temperature unit of measurement; in menu, scrolls right.
11. **ENTER** key: in measurement mode, prints the data; in menu, confirms the selection.
12. **ON/OFF | AUTO/OFF** key: switches the instrument on and off; when pressed together with the ESC key, disables the auto-off.
13. RS232 /USB multistandard communication port.

3 WBGT index

WBGT (Wet Bulb Globe Temperature) is one of the indices used for determining the thermal stress to which is submitted an individual in a warm environment. It represents the value, with reference to the metabolic waste associated with a particular activity, beyond which the individual is in a thermal stress condition. WBGT index combines the natural ventilation wet bulb temperature measurement T_n with the Globe thermometer temperature T_g and, in some situations, with the air temperature T . The formula for the calculation is the following:

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

$$\text{WBGT}_{\text{indoor}} = 0.7 T_n + 0.3 T_g$$

- outside the building in **presence of solar irradiation**:

$$\text{WBGT}_{\text{outdoor}} = 0.7 T_n + 0.2 T_g + 0.1 T$$

where:

T_n = natural ventilation wet bulb temperature

T_g = globe thermometer temperature

T = air temperature

The detected data must be compared with the limit values established by the standard; if they are exceeded, it is necessary to:

- directly reduce the thermal stress in the workplace under consideration;
- proceed with a detailed analysis of the thermal stress.

Tab.3.1: limit values of the thermal stress WBGT indicated in the ISO 7243 standard

METABOLIC RATE CLASS	METABOLIC RATE, M		WBGT LIMIT VALUE			
	RELATIVE TO A UNIT AREA OF SKIN SURFACE (W/m ²)	TOTAL (FOR AN AVERAGE AREA OF SKIN SURFACE OF 1.8 m ²) (W)	INDIVIDUAL ACCLIMATED TO HEAT (°C)		INDIVIDUAL NON- ACCLIMATED TO HEAT (°C)	
0 (Resting)	$M \leq 65$	$M \leq 117$	33		32	
1	$65 < M \leq 130$	$117 < M \leq 234$	30		29	
2	$130 < M \leq 200$	$234 < M \leq 360$	28		26	
3	$200 < M \leq 260$	$360 < M \leq 468$	Stagnant air 25	Non-stagnant air 26	Stagnant air 22	Non-stagnant air 23
4	$M > 260$	$M > 468$	23	25	18	20

Note: the values have been established taking as a reference a maximum rectal temperature of 38 °C.

To calculate the WBGT index, the following probes must be connected:

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

Reference standards for WBGT index measurement are **ISO 7726** and **ISO 7243**.

4 Operation

Before switching the instrument on, connect the probes to the inputs.

Notes:

- **The SICRAM probes must be connected when the instrument is off. If a probe is connected when the instrument is already on, it is not recognized: it is necessary to switch the instrument off and on again.**
- If more probes of the same type are connected, it will be considered only the first recognized probe: the scan of the probes, for their recognition, starts from input 1.
- If a probe is disconnected while the instrument is on, an audible alert (one beep per second) sounds, and "LOST" appears on display in the corresponding quantity row.

To switch the instrument on and off, press the **ON/OFF** key.

When the instrument is switched on, the instrument model and the firmware revision will be displayed for some seconds, then the measurements are displayed.

	WBGT Index
2019/11/28 08:00:00	
Log 00	00:00:00
Tn	15.6 °C
Tg	20.2 °C
T	20.2 °C
WBGT (in)	17.0 °C
WBGT (out)	17.0 °C

- **Tn** = natural ventilation wet bulb temperature
- **Tg** = globe thermometer temperature
- **T** = dry bulb (ambient) temperature
- **WBGT (in)** = WBGT index calculated in absence of solar irradiation
- **WBGT (out)** = WBGT index calculated in presence of solar irradiation

The first row of the display shows the battery charge level, the second row shows the current date and time, and the third row shows the logging session number and the elapsed time since logging was started, if logging is in progress.

When powered by battery, the display backlight turns off after about 1 minute if no keys are pressed; to turn it back on, press any key. When powered by an external power source, the backlight remains always on.

The device turns off after about 8 minutes if no keys are pressed. The auto-off can be disabled by pressing the ESC and ON/OFF keys simultaneously when turning on the device.

4.1 Statistical values

Pressing the **◀ | FUNC** key, the maximum, minimum and average values of the detected measurements are displayed.

To reset the statistical values, press the **◀ | FUNC** key until the message "Clear Func? Yes No" appears. Select Yes with **▲ ▼** keys and confirm with **ENTER**.

Note: in the first five minutes, the average is calculated on the available samples; thereafter, the average is calculated on the samples of the last five minutes.

4.2 Printing the current measurements

The measurement values displayed can be printed by connecting the instrument communication port in one of the following ways:

- To the RS232 serial port of the **HD40.1** printer using the **HD2110RS** cable.
- To a PC RS232 serial port using the **HD2110RS** cable.
- To a PC USB port using the **HD2110USB** cable.

To receive measurements on the PC, use a standard serial communication program. In the program, set the COM port number to which the instrument is connected, the communication parameters to **8N1**, the flow control to **Xon/Xoff**, and the baud rate at which the instrument operates.

If the USB connection is used, the instrument operates with fixed **460800** baud rate, and the USB drivers included in DeltaLog10 software package must be installed on the PC.

If the RS232 connection is used, the instrument operates with the baud rate set in **Serial → Baudrate** menu (default 38400). If the HD40.1 printer is connected, make sure it is set to the same baud rate.

To start printing the measurements, press the **ENTER** key. Measurements are printed at regular intervals, according to the interval set in the **Serial → Print Interval** menu. If the interval is set to zero, only one printout is made. If the interval is greater than zero, printing can be stopped by pressing **ENTER** again.

Below is a sample printout:

Notes	
=====	
ISO 7243 WBGT Index	Reference standard
=====	
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 input 1
Type: Pt100	
Data cal.:2008/10/01	
Serial N.:08109450	
=====	
Probe ch.2 description	Description of the probe connected to input 2
Type: Pt100 Tg 50	
Data cal.:2008/10/01	
Serial N.:08109452	
=====	
Probe ch.3 description	Description of the probe connected to input 3
Type: Pt100 Tw	
Data cal.:2008/10/01	
Serial N.:08109454	
=====	
Date=2019/11/21 15:00:00	Date and hour
Tnw 21.2 °C	Natural ventilation wet bulb temperature
Tg 24.9 °C	Globe thermometer temperature
Ta 31.3 °C	Dry bulb temperature
WBGT (i) 22.3 °C	WBGT in absence of solar irradiation
WBGT (o) 23.0 °C	WBGT in presence of solar irradiation
=====	

4.3 Logging

The instrument can store up to 64 logging sessions, numbered sequentially from 00 to 63.

To start a logging session, press the **MEM** key, or schedule the automatic start in the **Logging → Start/stop time** menu.

The logging interval can be set in the **Logging → Log interval** menu.

When logging is running, the **LOG** indication and the number of the logging session appear on display; A beep sounds each time a value is saved.

If the Self Shut-off option between two recordings is enabled (see **Logging → Self shut-off mode** menu item) and if the logging interval is greater than or equal to 1 minute, the instrument shuts down after a data acquisition and turns back on 15 seconds before the next acquisition. If the logging interval is less than one minute, the instrument remains always on during logging.

To manually stop the logging session, press the **MEM** key again. A time can be set after which logging stops automatically (see **Logging → Log file manager → Log time** menu item). For scheduled logging, the stop date and time can be set.

The stored data can be transferred to a PC using the **DeltaLog10** application software, downloadable from the website. While data transfer is in progress, the display shows "DUMP"; to stop the transfer, press the ESC key. Transferring data does not erase the memory: the transfer procedure can be repeated multiple times.

To erase the stored data, use the **DeltaLog10** application software or the **Logging → Log file manager → Erase ALL logs** menu item.

Notes:

- The stored data remains in memory regardless of the battery charge level.
- During logging, some keys are disabled; only **MEM**, **MENU**, **ENTER** and **ESC** are active.
- Changing the logging settings has no effect if logging is already in progress.

5 Menu

Press the **MENU** key to enter the main menu:

```

■■■■ WBGT Index
2019/11/10 08:00:00
MAIN MENU
Info
Logging
Serial
Reset
Contrast

<ESC> exit/cancel

```

To select an item, use the ▲▼ arrow keys and press **ENTER**.

To go back to the previous menu level, press **ESC**.

To exit the menu directly from any level, press **MENU**.

If no key is pressed for 2 minutes, the instrument automatically exits the menu.

5.1 Info menu

The “Info” menu shows the instrument and connected probes general information. It also allows setting the date and time.

```

■■■■ WBGT Index
2019/11/10 08:00:00
INFO
Info Instrument
Info Probe
Time/Date

<UP> <DOWN> select
<ENTER> confirm
<ESC> exit/cancel

```

Instrument information: model, firmware version and date, serial number, calibration date and user code (ID).

```

■■■■ WBGT Index
2019/11/10 08:00:00
INFO INSTRUMENT
Model HD32.2
Firm.Ver.=01.00
Firm.Date=2008/06/30
Ser. Number=08010000
Calib: 2019/11/10

ID: 0000000000000000

```

To change the user code, press **ENTER**, select the digits to be changed one by one using the ◀▶ arrows, and change them using the ▲▼ arrows. When finished, press **ENTER** to confirm.

Probes information: number of the input to which the probe is connected, probe type, calibration date and serial number.

To set the date and time, select “Time/Date” and confirm with ENTER.

```

■■■■ WBGT Index
2019/11/10 08:00:00
enter date/time
<- arrows change ->
<ENTER> confirm
and set 00 seconds !
year/mm/dd hh:mm
2019/11/28 11:10:26

```

Select the parameters to be changed (year/month/day, hour:minutes) one by one with the ◀▶ arrows, and change them with the ▲▼ arrows; when finished, press ENTER to confirm.

The seconds cannot be set: they are automatically set to zero when ENTER is pressed.

5.2 Logging menu

The “Logging” menu allows setting the logging interval and duration. It also allows viewing the logging sessions stored in memory and erasing the memory.

```

■■■■ WBGT Index
2019/11/10 08:00:00
LOGGING MENU
Log interval
Self shut_off mode
Start/stop time
Cancel auto start
Log file manager
<ESC> exit/cancel

```

5.2.1 Log Interval

```

■■■■ WBGT Index
2019/11/10 08:00:00
LOGGING MENU
input LOG interval
as h:mm:ss (1h max)
arrows to correct
or <ESC> now set at:
0:00:15

```

Select the interval using the ▲▼ arrows and press ENTER to confirm. The available settings are 15/30 seconds, 1/2/5/10/15/20/30 minutes and 1 hour.

The following table shows approximately how long it takes for the memory to fill up, depending on the logging interval.

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

5.2.2 Self Shut-off mode (automatic shutdown during logging)

If the logging interval is greater than or equal to 1 minute, it is possible to choose whether the instrument should remain always on during logging or shut down between acquisitions, to extend the battery life.

```

■■■■ WBGT Index
2019/11/10 08:00:00
Log interval>=60 sec
During log session
the instrument
will SHUT OFF
between samples
  
```

Using the ▲▼ arrows, select "STAY ON" to keep the instrument always on during logging, or "SHUT OFF" to turn the instrument off between two consecutive acquisitions. Press ENTER to confirm.

If the logging interval is less than one minute, this parameter has no effect, and the instrument remains always on during logging.

5.2.3 Start/stop time (scheduled logging)

The logging automatic start and stop date/time can be set.

```

■■■■ WBGT Index
2019/11/10 08:00:00
enter start time
arrows to correct
<ENTER> confirm
default= 5m>RealTime

2019/11/28 10:29:00
  
```

The current time plus 5 minutes is proposed as the start time. It can be accepted by pressing ENTER, or a different time can be set by selecting the parameters to be changed (year/month/day, hour:minutes:seconds) one by one using the ◀▶ arrows, and changing them using the ▲▼ arrows; when finished, press ENTER to confirm.

After confirming the start date/time, the screen for setting the stop date/time (by default, the start time plus 10 minutes) will appear. Set the stop date/time using the same procedure as for the start date/time.

After confirming the stop date/time, a summary screen appears showing the logging start and stop date/time; press ENTER to confirm or ESC to exit without enabling the automatic start.

The scheduled logging starts even if the instrument is off; the instrument turns on automatically a few seconds before the start time, and remains on after logging is complete, turning off after the auto-off time has elapsed if it is battery-powered.

5.2.4 Cancel auto start

This submenu allows canceling any scheduled logging.

Selecting the item displays a screen showing the scheduled logging start and stop date/time. Press the **▲** key, the message “Self-timer not active” is displayed; press ENTER to confirm cancellation or ESC to exit without canceling the schedule.

5.2.5 Log file manager

This submenu allows printing the statistical values of the logging sessions in memory (Print selected log), erasing the whole memory (Erase ALL logs), and setting the duration of the logging sessions (Log time).

```

■■■■ WBGT Index
2019/11/10 08:00:00
LOG FILE MANAGER
Print selected log
Erase ALL logs
Log time
  
```

Selecting “Print selected log” displays the list of the sessions in memory:

```

LOG FILE          0/3
00 - 01 - 02 - 03
04 - 05 - 06 - 07
08 - 09 - 10 - 11
12 - 13 - 14 - 15
Date:
2019/11/28 08:59:40
rec: 000039
<MEM> to charge Page
  
```

The list of sessions is arranged in 4 rows and 4 columns. If there are more than 16 sessions, press the **MEM** key to move to the next screen. The current page and the total number of pages with stored data are displayed in the upper-right corner.

To select a session on the screen displayed, use the **▲▼◀▶** arrows. Below the list of sessions, the start date and time and the number of records of the selected session are shown. After confirming the selected session with the ENTER key, the statistical values for the data in that session are printed; during printing, a data transfer message appears on the display.

Note: a printout of a logging session contains only statistical data; to view all the acquired data, they must be downloaded using the DeltaLog10 software.

To delete all data in memory, select “Erase ALL logs” from the “Log file manager” submenu. It is not possible to delete individual sessions.

To set the duration of the logging sessions, select “Log time” from the “Log file manager” submenu.

```

■■■■ WBGT Index
2019/11/10 08:00:00
LOG TIME
as h:mm:ss (1h max)
arrows to correct
or <ESC> now set at:
00:00:00

```

Set the duration (hours:minutes:seconds) using the ▲▼◀▶ arrows and confirm with ENTER.

The maximum duration that can be set is 1 hour. If 00:00:00 is set, the function is disabled and the logging stops only when the MEM key is pressed or when the memory is full.

5.3 Serial menu

The “Serial” menu allows setting the RS232 serial communication baud rate and the measurements printing interval.

```

■■■■ WBGT Index
2019/11/10 08:00:00
SERIAL COM MENU
Baudrate
Print Interval

<UP> <DOWN> select
<ENTER> confirm
<ESC> exit/cancel

```

5.3.1 Baud rate

Set the value using the ▲▼ arrows and confirm with ENTER. The baud rate can be set to 1200, 2400, 4800, 9600, 19200 or 38400 (default).

```

■■■■ WBGT Index
2019/11/10 08:00:00

set Baudrate
arrows to correct
Or <ESC> now set at:
38.400

```

Note: for the USB connection, the baud rate cannot be set, but is fixed at 460800.

5.3.2 Print Interval

Set the value using the ▲▼ arrows and confirm with ENTER. The available settings are 0, 15/30 seconds, 1/2/5/10/15/20/30 minutes and 1 hour.

```
■■■■ WBGT Index
2019/11/10 08:00:00
SERIAL COM MENU
input PRINT interval
as h:mm:ss (1h max)
arrows to correct
or <ESC> now set at:
0:00:00
```

If zero is set (default), measurements are not printed automatically at regular intervals, but a single printout is generated when pressing the ENTER key.

5.4 Reset menu

The “Reset” menu allows resetting the instrument. After selecting “Reset” in the main menu, select “Reset” again using the ▲▼ arrows and confirm with ENTER.

```
■■■■ WBGT Index
2019/11/10 08:00:00

0)Reset

<Up-Down>: select
<Enter>: confirm
```

5.5 Contrast menu

The “Contrast” menu allows adjusting the display contrast. Use the ◀▶ arrows to decrease or increase the contrast, and confirm with ENTER.

```
■■■■ WBGT Index
2019/11/10 08:00:00
LCD CONTRAST
<- arrows change ->
<ESC> exit/cancel
Contrast Adjust: 012
```

6 Preparation and maintenance of the probes

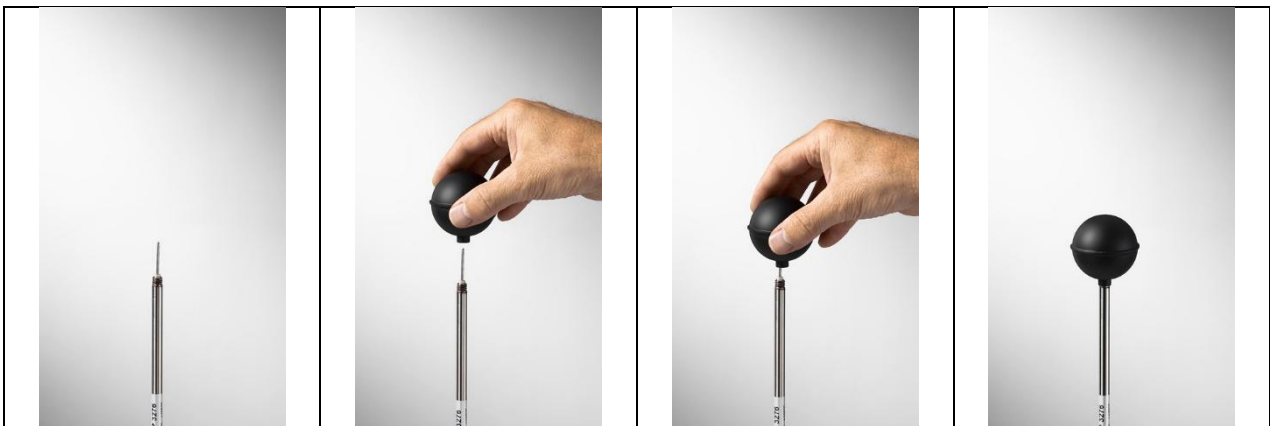
Probes necessary for **WBGT** index measurement:



The probes are already factory calibrated. The calibration data are stored in the SICRAM module memory.

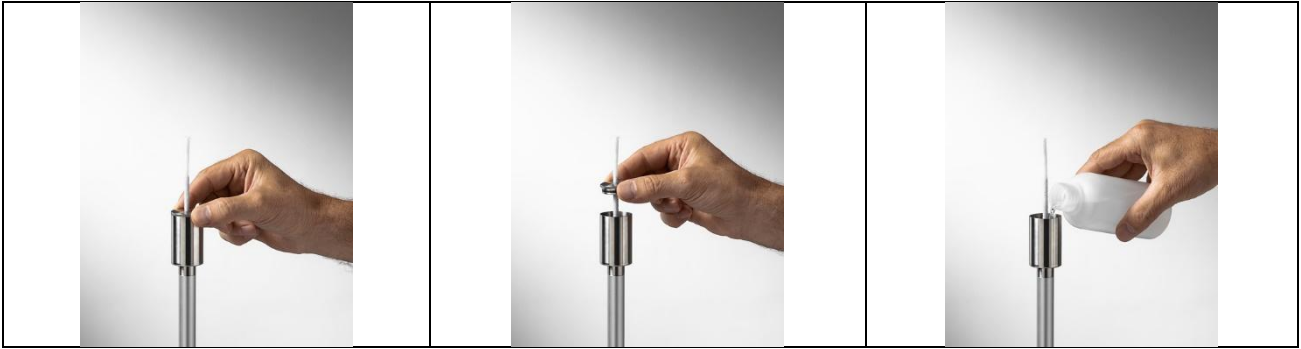
TP3575 and TP3276.2 globe thermometer probes:

Screw the globe to probe stem.



HP3201.2 and HP3201 natural ventilation wet bulb probes:

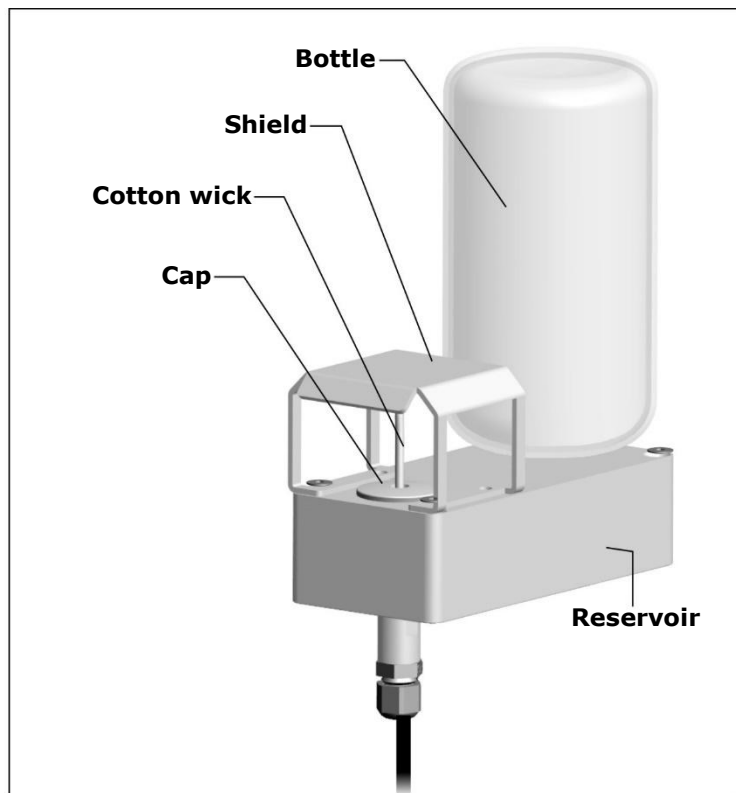
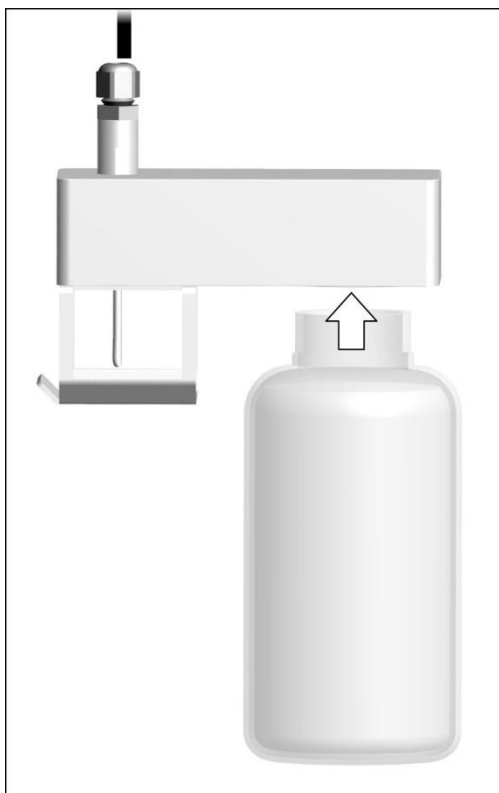
- Remove the sensor cap (the cap is not screwed).
- Insert the cotton wick, previously dipped with distilled water, into the temperature probe. The cotton wick must protrude from the probe for about 20 mm.
- Fill the reservoir up till $\frac{3}{4}$ with **distilled water**.
- Replace the cap.
- **Warning:** keep the probe vertical to prevent water from leaking.



Note: over time the cotton wick tends to calcify (harden): it must be replaced periodically.

TP3204S natural ventilation wet bulb probe:

- 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 **SP35TC** support.



For measurements in presence of solar irradiation, use the protection shield from solar radiations.

Note: over time the cotton wick tends to calcify (harden): it must be replaced periodically.

General warnings:**Danger!**

Some sensors are not isolated from the outer sheath; take great care not to come into contact with live parts (above 48 V): it could be dangerous for the instrument and for the operator who could be electrocuted.

**Caution!**

- Do not expose the probes to gas or liquids that could corrode the probe material. After the measurement, clean accurately the probes.
- Respect the correct probes polarity.
- When inserting the probes connector into the instrument, do not fold or force the contacts.
- Do not bend, deform or drop the probes: they can be irreparably damaged.
- Avoid measuring in presence of high-frequency sources, microwave or high magnetic fields, as they would be unreliable.

**Attention!**

- Use the probes suitable for the type of measurement to be performed.
- For a reliable measurement, avoid too rapid temperature variations.

7 RS232 and USB interface

The instrument is equipped with a galvanically isolated RS-232C serial interface and a USB 2.0 interface. The instrument can be connected:

- To the RS232 serial port of the **HD40.1** printer using the **HD2110RS** cable.
- To a PC RS232 serial port using the **HD2110RS** cable.
- To a PC USB port using the **HD2110USB** cable.

To interact with the instrument from a PC, use a standard serial communication program. In the program, set the COM port number to which the instrument is connected, the communication parameters to **8N1**, the flow control to **Xon/Xoff**, and the baud rate at which the instrument operates.

If the USB connection is used, the instrument operates with fixed **460800** baud rate, and the USB drivers included in DeltaLog10 software package must be installed on the PC.

If the RS232 connection is used, the instrument operates with the baud rate set in **Serial → Baudrate** menu (default 38400). If the HD40.1 printer is connected, make sure it is set to the same baud rate.

Serial commands:

The table below lists all the serial commands that can be sent to the instrument.

Command characters must be in uppercase only. Commands must end with a carriage return character (CR, ASCII 0D).

The instrument replies with "&" if the command is correct, or with "?" if the command is not recognized. The instrument reply strings are terminated with Carriage Return (CR, ASCII 0D) and Line Feed (LF, ASCII 0A) characters.

Before sending serial commands to the instrument, it is recommended to lock the keyboard using the P0 command to prevent operational conflicts. When finished, restore keyboard operation using the P1 command..

Command	Reply	Description
P0	&	Blocks the instrument keyboard for 70 seconds
P1	&	Unlocks the instrument keyboard
G0	Model HD32.2	Instrument model
G1	M=WBGT Index	Model description
G2	SN=12345678	Instrument serial number
G3	Firm.Ver.=xx.yy	Firmware version
G4	Firm.Date=yyyy/mm/dd	Firmware date
G5	cal yyyy/mm/dd hh:mm:ss	Calibration date and time
C1		Probe 1 type, serial number, calibration date
C2		Probe 2 type, serial number, calibration date
C3		Probe 3 type, serial number, calibration date
GC		Print instrument heading
GB	ID=0000000000000000	User code (set with T2xxxxxxxxxxxxxxxxxx)
H0	Tw= 19.5 °C	Prints wet bulb temperature
H1	Tg= 22.0 °C	Prints globe thermometer temperature
H2	Ta= 21.6 °C	Prints air temperature (dry bulb);

Command	Reply	Description
H7	WBGT(i)= 23.0 °C	Prints indoor WGBT
H8	WBGT(o)= 24.0 °C	Prints outdoor WGBT
LN	A00 - A01 - A02 - A03 .. - .. - .. -	Prints the memory map: if a session contains data, a number is displayed; if it is empty, 2 points (..) are displayed.
LFn	!Log n.= 0!started on:!2006/01/01 00:37:32	Prints start date and time of logging session n (hexadecimal number 0...F). If the session is empty, "-->No Log Data<--" is printed.
LDn		Prints data stored in logging session n (hexadecimal number 0...F). If the session is empty, "-->No Log Data<--" is printed.
LE	&	Erases stored data
K1	&	Prints measurements
K0	&	Stops printing measurements
K4	&	Starts logging
K5	&	Stops logging
KP	&	Enables auto-off
KQ	&	Disables auto-off
WC0	&	Disables self shut-off during logging
WC1	&	Enables self shut-off during logging
RA	Sample print = 0sec	Reads the set print interval
RL	Sample log = 30sec	Reads the set logging interval
WA#	&	Sets the print interval of index # (hexadecimal number 0...D representing the position of the interval in the list 0, 1, 5, 10, ..., 3600 seconds).
WL#	&	Sets the logging interval of index # (hexadecimal number 1...D representing the position of the interval in the list 15, ..., 3600 seconds).

8 Error indications

Displayed indication	Description
- - - -	Probe not connected or faulty.
OVFL	Overflow, the detected measurement value is greater than the upper limit of the measuring range.
UFL	Underflow, the detected measurement value is less than the lower limit of the measuring range.
WARNING: MEMORY FULL!!	Memory is full; no more data can be stored.

9 Power supply

The meter is supplied with 4 x 1.5 V AA size **alkaline** batteries.

The battery symbol on 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.

When the battery charge is too low to ensure accurate measurements, the instrument turns off. The data in memory are retained.

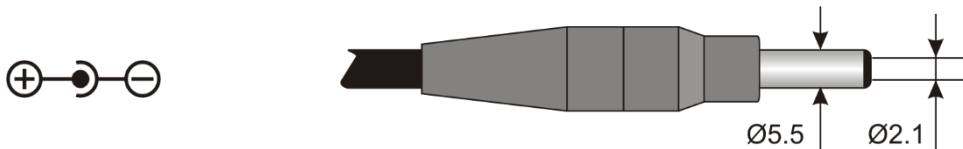
To replace the batteries, proceed as follows:

- 1) Switch the instrument off.
- 2) Disconnect the external power supply, if connected.
- 3) Unscrew the battery compartment cover screw counterclockwise and remove the batteries.
- 4) Insert the new batteries (4 x 1,5 V AA alkaline) making sure to observe the correct polarity indicated on the battery compartment.
- 5) Replace the cover by tightening the screw clockwise.

Note: the instrument may not restart properly after replacing the batteries. If this happens, remove the batteries and wait a few minutes to allow the circuit capacitors to discharge completely, then reinsert the batteries.

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

The power supply connector has the positive terminal in the center.



The battery symbol is replaced by [≈] when the external power supply is connected.

Warnings on battery usage:

- If the instrument is not used for a long period of time, remove the batteries.
- If the batteries are low, replace them as soon as possible.
- If the batteries leak, replace them immediately.
- Use high-quality, sealed alkaline batteries with sufficient capacity.

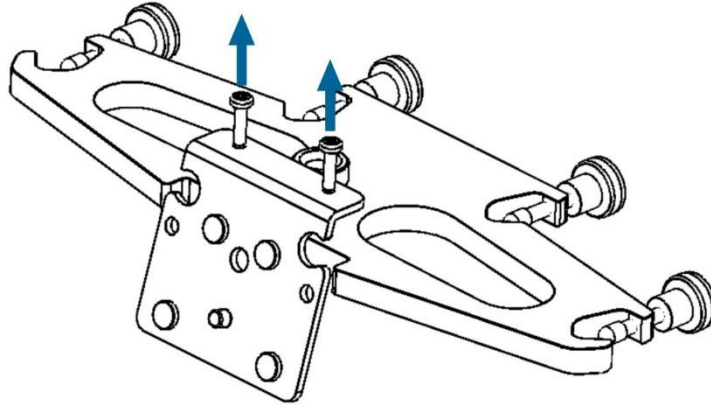
Batteries disposal:

- Dispose of dead batteries in the dedicated bins or deliver them to authorized collection centers. Follow the relevant regulation.
- Do not dispose as household waste.
- Do not throw batteries into fire.

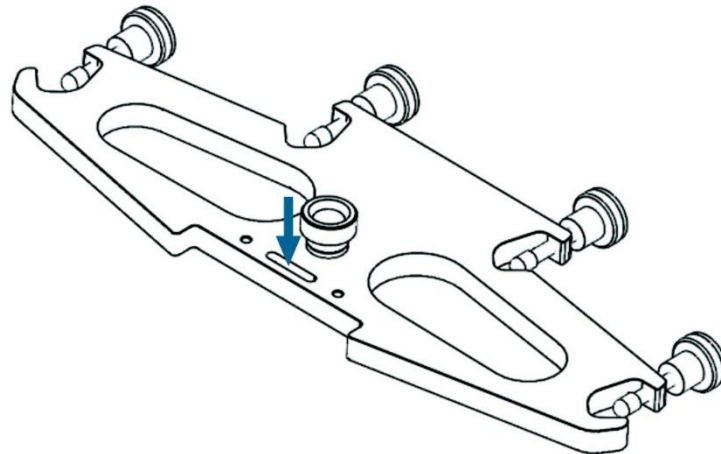
10 Fixing HD32.3A to the SP35TC holder

The mounting on the SP35TC holder can be done using the second battery cover supplied as an accessory with the HD32.2A version. Proceed as follows:

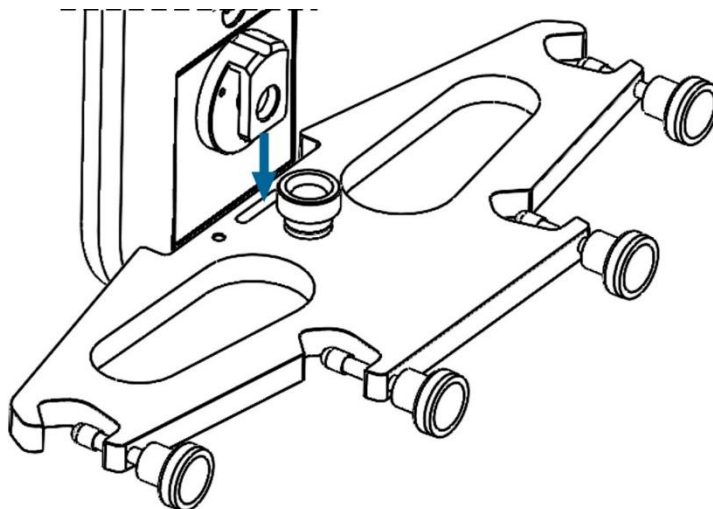
If present, remove the plate by loosening the two screws that secure it to the probes holder.



After removing the plate, a rectangular slot is visible.



In the instrument, replace the standard battery cover (with a threaded mount for direct attachment to a tripod) with the hook-type accessory cover, and insert the hook into the rectangular slot on the holder.



11 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.

12 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.

13 Technical specifications

Power supply	4 x 1.5 V AA size alkaline batteries 12 Vdc/1 A external power supply unit (SWD10)
Battery life	200 hours of continuous operation with 1800 mAh batteries Current consumption when the instrument is off <45 μ A
Logging interval	Configurable 15/30 seconds, 1/2/5/10/15/20/30 minutes, 1 hour
Storage capacity	67,600 entries for each of the 3 inputs The memory is divided in 64 blocks
Inputs	3 inputs with 8-pole DIN45326 connector for probes with SICRAM module
Display	Backlit dot matrix LCD Visible area 52x42 mm, 160x160 pixels
Connectivity	RS232C or USB 2.0, 8-pole M12 connector
Uncertainty	± 1 digit @ 20 °C (only the instrument)
Operating conditions	-5...50 °C, 0...90 %RH no condensation
Storage Temperature	-25...65 °C
Materials	ABS, rubber protection band
Dimensions	185x90x40 mm
Weight	470 g (with batteries)
Degree of protection	IP 64

TP3275 AND TP3276.2 TEMPERATURE PROBES

Sensor	Pt100
Measuring range:	-30...120 °C
Resolution:	0.1 °C
Accuracy:	1/3 DIN
Temperature drift @ 20 °C	0.003 %/°C
Long term stability	0.1 °C/year
Connection	8-pole female DIN45326 connector Cable L=2 m (only TP3275)
Globe dimensions	$\varnothing$ =150 mm (TP3275), $\varnothing$ =50 mm (TP3276.2)
Stem dimensions	$\varnothing$ =14 mm, L=110 mm (TP3275) $\varnothing$ =8 mm, L=170 mm (TP3276.2)
Response time T ₉₅ ⁽¹⁾	15 minutes

TP3207 AND TP3207.2 TEMPERATURE PROBES

Sensor	Pt100
Measuring range:	-40...100 °C
Resolution:	0.1 °C
Accuracy:	1/3 DIN
Temperature drift @ 20 °C	0.003 %/°C
Long term stability	0.1 °C/year
Connection	8-pole female DIN45326 connector Cable L=2 m (only TP3207)
Dimensions	Ø=14 mm, L=140 mm (TP3207), L= 150 mm (TP3207.2)
Response time T ₉₅ ⁽¹⁾	15 minutes

HP3201 AND HP3201.2 NATURAL VENTILATION WET BULB PROBES

Sensor	Pt100
Measuring range:	4...80 °C
Resolution:	0.1 °C
Accuracy:	Class A
Temperature drift @ 20 °C	0.003 %/°C
Long term stability	0.1 °C/year
Connection	8-pole female DIN45326 connector Cable L=2 m (only HP3201)
Dimensions	Shaft: Ø=14 mm, L=110 mm (HP3201) / 170 mm (HP3201.2) Reservoir: Ø=30 mm, L=35 mm
Cotton wick length	10 cm approx.
Reservoir capacity	15 cc, autonomy 96 hours @ RH=50% and t=23 °C
Response time T ₉₅ ⁽¹⁾	15 minutes

TP3204S NATURAL VENTILATION WET BULB PROBE

Sensor	Pt100
Measuring range:	4...80 °C
Resolution:	0.1 °C
Accuracy:	Class A
Temperature drift @ 20 °C	0.003 %/°C
Long term stability	0.1 °C/year
Connection	8-pole female DIN45326 connector, cable L=2 m
Dimensions	L x W x H = 140 x 65 x 178,5 mm (reservoir + bottle)
Cotton wick length	10 cm approx.
Reservoir capacity	500 cc, autonomy 15 days @ t=40 °C
Response time T ₉₅ ⁽¹⁾	15 minutes

⁽¹⁾ The response time T₉₅ is the time needed to reach 95% of the final value. The measurement of the response time is done with a negligible air speed (motionless air).

14 Probes and accessories ordering codes

The instrument is supplied with 4 x 1.5 V AA size alkaline batteries and carrying case. The HD32.2A version is supplied with an additional hook-type battery cover for mounting on the SP35TC holder.

DeltaLog10 software is downloadable from website.

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

Probes with SICRAM module

The probes necessary for **WBGT** index measurement are:

- Dry bulb temperature probe, one of the following:
 - **TP3207.2** Ø 14mm, L=150 mm.
 - **TP3207** Ø 14mm, L=140 mm. Cable 2 m.
- Globe thermometer probe, one of the following:
 - **TP3276.2** Globe Ø 50 mm. Stem Ø 8 mm, L=170 mm.
 - **TP3275** Globe Ø 150 mm. Stem Ø 14 mm, L=110 mm. Cable 2 m.
- Natural ventilation wet bulb temperature probe, one of the following:
 - **HP3201.2** Stem Ø 14 mm, L=170 mm.
 - **HP3201** Stem Ø 14 mm, L=110 mm. Cable 2 m.
 - **TP3204S** For long-lasting measurements. 500 cc distilled water capacity. Cable 2 m.

Accessories

VTRAP30	Tripod, height 157 mm.
VTRAP	Tripod, max. height 1310 mm (SP35TC support not included).
SP35TC	Holder for instrument and 4 probes with cable. It can be fixed to both VTRAP30 tripod and VTRAP tripod.
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.
SWD10	100-240 Vac/12 Vdc-1 A stabilized mains power supply.
HD40.1	Serial printer (HD2110RS cable is required).
AQC	200 cc of distilled water.

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.

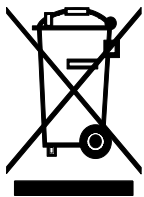
The manufacturer repairs the products that show defects of construction in accordance with the terms and conditions of warranty included in the manual of the product. For any dispute, the competent court is the Court of Padua. The Italian law and the "Convention on Contracts for the International Sales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



senseca.com



Senseca Italy S.r.l.
Via Marconi, 5
35030 Selvazzano Dentro (PD)
ITALY
info@senseca.com

