



HD 32.2, HD32.2A INSTRUMENT FOR THE ANALYSIS OF THE WBGT INDEX

HD32.2 – WBGT Index is an instrument made by Delta Ohm srl for the analysis of WBGT index (Wet Bulb Glob Temperature: wet bulb temperature and globe thermometer temperature) in presence or in absence of solar radiation.

Reference Regulations:

ISO 7243: Hot environments. Estimation of the heat stress on working man, based on WBGT index (wet bulb temperature and Globe thermometer).

ISO 8996: Ergonomics of the thermal environment – Determination of the energy metabolism.

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

The instrument is provided with three inputs for probes with SICRAM module: the SICRAM module interface between the instrument and sensor connected and communicate the sensor parameters and calibration data to the instrument.

The instrument is equipped with three inputs for probes with SICRAM module: the probes have an electronic circuit that communicates with the instrument and stores the sensor calibration data. All SICRAM probes can be connected to any of the instrument's inputs, they are automatically recognized upon turning the Instrument on. The **main features** of the instrument are:

- **Logging:** data acquisition and logging to the internal instrument memory. Storage capacity: **64 different logging sections**, sample interval, user selectable.
- You can set the automatic logging start with **auto-start** function (**Start/Stop time**).
- The **measurement unit** of the temperature: °C, °F, °K.
- The display of **maximum, minimum, medium** statistic parameters.
- The data transfer via the RS232 or USB serial ports.

HD32.2 instrument can detect simultaneously the following quantities:

- Globe thermometer temperature **T_g**.
- Wet bulb temperature with natural ventilation **T_n**.
- Environment temperature **T**.

Starting from the detected values, HD32.2 can calculate:

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

WBGT index

WBGT (Wet Bulb Globe Temperature – Wet bulb temperature and globe thermometer) is one of the indexes used to determinate the occupational heat exposure.

It represents the value, related to the metabolic expenditure linked to a specific work activity, that causes a thermal stress when exceeded.

WBGT index combines the temperature measurement of wet bulb with natural ventilation **t_{nw}** with the globe thermometer **t_g** and, in some situations, with the air temperature **t_a**.

The calculation formula is the following:

- inside and outside a buildings in absence of solar radiation:

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

- outside a building in presence of solar radiation:

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

where:

t_{nw} = natural wet bulb;

t_g = globe thermometer temperature;

t_a = air temperature.

The measured data should be compared with the limit values prescribed by the regulations;

when exceeded you have to:

- reduce directly the thermal stress on the examined work place;
- proceed to a detailed analysis of the thermal stress.

In order to measure the WBGT index, the following probes should be connected:

- **Natural wet bulb HP3201.2 (HP3201).**
- **TP3276.2 Globe thermometer probe (TP3276 or TP3275).**
- **TP3207.2 (TP3207) Dry bulb temperature, if the measurement is performed in presence of solar radiation.**

In order to measure the WBGT index, you should refer to the following regulations:

- **ISO 7726**
- **ISO 7243**
- **ISO 8996**

Technical features

Instrument

Dimensions	185x90x40 mm
(Length x Width x Height)	
Weight	470 g (batteries included)
Materials	ABS, rubber
Display	back light, with dot-matrix 160x160 points, visible area 52x42mm



Working conditions	
Working temperature	-5 ... 50°C
Storage temperature	-25 ... 65°C
Working relative humidity	0 ... 90% RH no condensation
Protection Degree	
	IP65
Instrument uncertainty	
	± 1 digit @ 20°C
Power supply	
Batteries	Mains power supply (code SWD10) 12Vdc/1A
Autonomy	4 batteries 1.5V type AA
Power absorbed with instrument off	200 hours with 1800mAh alkaline batteries
	< 45µA

Safety of the stored data unlimited

TP3207.2 (TP3207) Temperature probe

Sensor type:	Pt100 with thin-film
Accuracy:	Class 1/3 DIN
Measurement range:	-40 ÷ 100 °C
Resolution:	0.1°C
Temperature drift @20°C:	0.003%/°C
Drift after 1 year:	0.1°C/year
Connection:	4 wires plus SICRAM module
Connector:	8 female poles DIN45326
Dimensions:	Ø=14 mm L= 150 mm
Response time T ₉₅ :	15 minutes



Example of immediate data print, obtained with **HD40.1** printer.

=====	
ISO 7243 WBGT Index	
=====	
Model HD32.2 WBGT Index	
Firm.Ver.=01.00	
Firm.Date=2008/12/05	
SN=12345678	
ID=0000000000000000	
=====	
Probe ch.1 description	
Type: Pt100	
Data cal.:2008/10/01	
Serial N.:08109450	
=====	
Probe ch.2 description	
Type: Pt100 Tg 50	
Data cal.:2008/10/01	
Serial N.:08109452	
=====	
Probe ch.3 description	
Type: Pt100 Tw	
Data cal.:2008/10/01	
Serial N.:08109454	
=====	
Date=2008/11/21 15:00:00	
Tnw 21.2 °C	
Tg 24.9 °C	
Ta 31.3 °C	
WBGT (i) 22.3 °C	
WBGT (o) 23.0 °C	
=====	
Notes:	
=====	

NOTES	
Reference standard	
Instrument Model	
Instrument firmware version	
Instrument firmware date	
Instrument Serial Number	
Identification Code	
Description of the probe connected to input 1	
Description of the probe connected to input 2	
Description of the probe connected to input 3	
Date and time	
Natural wet bulb	
Globe thermometer ventilation	
Dry bulb temperature	
WBGT in absence of direct solar radiation	
WBGT in presence of direct solar radiation	



TP3276.2 Globe thermometer probe $\varnothing=50$ mm ($\varnothing=150$ mm TP3275)

Sensor type: Pt100
 Accuracy: Class 1/3 DIN
 Measurement range: $-10 \div 100$ °C
 Resolution: 0.1°C
 Temperature drift @20°C: 0.003%/°C
 Drift after 1 year: 0.1°C/year
 Connection: 4 wires plus SICRAM module
 Connector: 8 female poles DIN45326
 Stem dimensions: $\varnothing=8$ mm L= 170 mm
 Response time T_{95} : 15 minutes

HP3201.2 (HP3201) Natural ventilation wet bulb

Sensor type: Pt100
 Accuracy: Class A
 Measurement range: 4 °C \div 80 °C
 Resolution: 0.1°C
 Temperature drift @20°C: 0.003%/°C
 Drift after 1 year: 0.1°C/year
 Connection: 4 wires plus SICRAM module
 Connector: 8 female poles DIN45326
 Stem dimensions: $\varnothing=14$ mm L= 170 mm
 Braid length: 10 cm. at least
 Tank capacity: 15 cc.
 Tank autonomy: 96 hours with RH=50%, $t = 23$ °C
 Response time T_{95} : 15 minutes

Connections

Input for probes with SICRAM module 3
 Connectors 8 male poles DIN 45326

USB Interface

Type: USB 1.1 or 2.0 not isolated
 Connection: Mini-USB
 Baud rate: 460800

RS232 Serial Interface:

Pin: M12-8 poles.
 Type: RS232C (EIA/TIA574) not insulated
 Baud rate: from 1200 to 38400 baud.
 Data bit: 8
 Parity: None
 Stop bit: 1
 Flow control: Xon-Xoff
 Cable length: max 15m

Memory**Storage capacity**

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

Logging interval

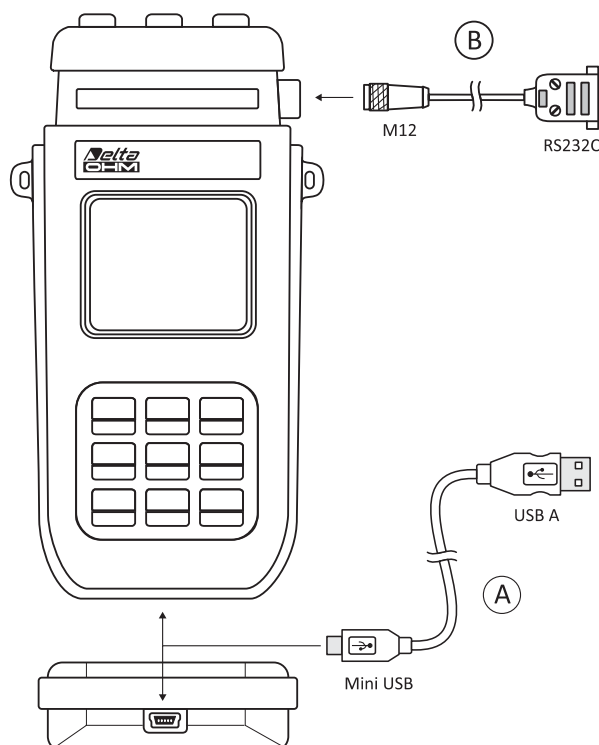
selectable among: 15, 30 seconds, 1, 2, 5, 10, 15, 20, 30 minutes and 1 hour.



AP3203.2 HP3217.2 TP3276.2

HP3201.2 TP3276.2 TP3207.2

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



A The HD32.2 uses a new MiniUSB serial port of HID type (Human Interface Device). To connect to the PC with the USB cable type A - MiniUSB type B, code CP23, it is **not required to install any USB drivers.**

B The port with M12 connector is a serial type RS232C port. It allows you to connect the RS232C serial port of a PC or the printer HD40.1 with the cable HD2110RS.

ORDERING CODES

HD32.2 consisting of:

- **HD32.2 WBGT Index instrument**, 4 alkaline batteries 1.5V AA type, instruction manual, case. **DeltaLog10 Software Warm environments: WBGT analysis. Probes and cables have to be ordered separately.**

Required probes for the measurement of WBGT:

- **TP3207.2** Probe of dry bulb temperature.
- **TP3276.2** Globe thermometer probe.
- **HP3201.2** Natural ventilation wet bulb

HD32.2A consisting of:

- **HD32.2 WBGT Index instrument**, 4 alkaline batteries 1.5V AA type, instruction manual, case. **DeltaLog10 Software Warm environments: WBGT analysis. Probes and cables have to be ordered separately.**

Required probes for the measurement of WBGT version A:

- **TP3207** Dry bulb temperature.
- **TP3275** Globe thermometer probe.
- **HP3201** Natural ventilation wet bulb.

Probes for HD32.2 WBG Index (without cable):

TP3207.2: Temperature probe with Pt100 sensor. Probe stem Ø 14mm, length 150 mm. Equipped with SICRAM module.

TP3276.2: Globe thermometer probe with Pt100 sensor, globe Ø 50 mm. Stem Ø 8 mm, length 170 mm. Equipped with SICRAM module.

HP3201.2: Natural wet bulb. Pt100 sensor. Probe stem Ø 14 mm, length 170 mm. Equipped with SICRAM module, spare parts of the braid and case of 50cc. distilled water.

Probes for HD32.2 version A (with cable):

TP3207: Temperature probe with Pt100 sensor. Probe stem Ø 14mm, length 140 mm. Cable length 2m. Equipped with SICRAM module. Used for the calculation of the indices: **IREQ, WCI, DLE, RT, PMV, PPD, WBG, SR**. Used for calculating Mean radiant temperature.

TP3275: Globe thermometer probe with Pt100 sensor, globe Ø 150 mm. Stem Ø 14 mm, length 110 mm. Cable length 2m. Equipped with SICRAM module. Used for calculating Mean radiant temperature and WBG.

HP3201: Natural ventilation wet bulb. Pt100 sensor. Probe stem Ø 14 mm, length 110 mm. Cable length 2m. Equipped with SICRAM module, spare braids and 50cc of distilled water. Used for the measurement for **WBG** calculation.

Accessories:

VTRAP30: Tripod to suit instrument with a maximum height of 280 mm

HD32.2.7: Probe holder, **to be fixed on standard tripod. For version HD32.2A.**

HD2110 RS: Connection cable with M12 connector from the instrument side and with SubD female connector 9 poles for RS232C from PC side.

CP23: Connection cable with MiniUSB type B that attaches to instrument side and USB 2.0 on PC side.

SWD10: 100-240Vac/12Vdc-1A mains voltage stabilized power supply.

AQC: 200cc. of distilled water and n° 3 braids for HP3201 or HP3201.2 probes

HD40.1: 24-column portable printer (uses cable HD2110RS).

BAT.40: Spare battery pack for HD40.1 printer with built-in temperature sensor.

RCT: The kit includes 4 thermal paper rolls, wide 57mm, diameter 32mm.

