C 2 A i
Instrumentation et régulation des fluides

Instrument for the analysis of the WBGT index

REF. HD32.2/A

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 thermom-eter 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 com-municate the sensor parameters and calibration data to the instrument.

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 **Tg**.
- Wet bulb temperature with natural ventilation **Tn.**
- 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 ven-tilation t_{nw} with the globe thermometer t_g and, in some situations, with the air tem-perature 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 regu-lations;
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 regula-tions:
- **ISO 7726**
- **ISO 7243**
- **ISO 8996**

Technical features

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

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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	Mains power supply (code SWD10) 12Vdc/1A
Batteries	4 batteries 1.5V type AA
Autonomy	200 hours with 1800mAh alkaline batteries
Power absorbed with instrument off	< 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:
========================
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NOTES

Reference standard

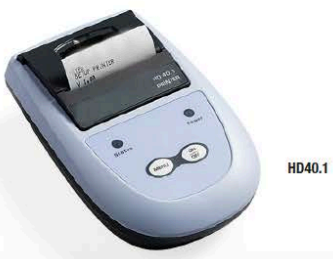
Instrument Model
Instrument firmware version
Instrument firmware date
Instrument Serial Number
Identification Code

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 Ø=50 mm (Ø=150mm TP3275)

Sensor type:	Pt100
Accuracy:	Class 1/3 DIN
Measurement range:	-10 ÷ 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:	Ø=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 ÷ 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:	Ø=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 insulated
Connection	M12-8 poles
Baud rate	460800 baud

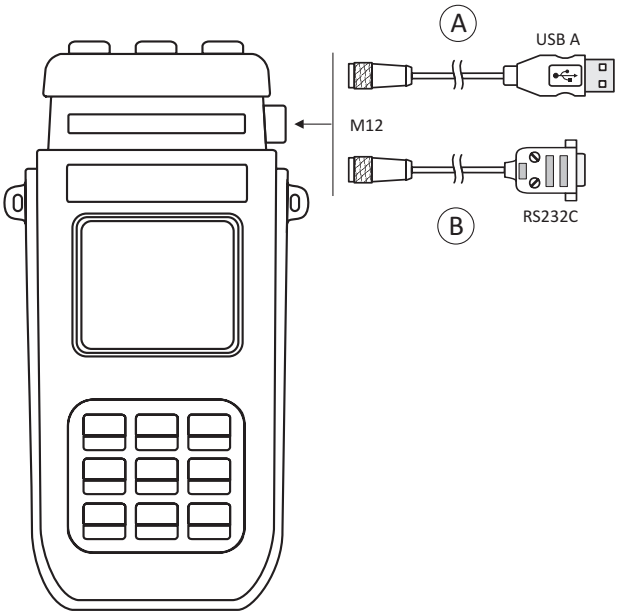
RS232 Serial Interface:

Pin:	M12-8 poles.
Type:	RS232C (EIA/TIA574) 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 divided in 64 blocks.
Storage capacity 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.

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 USB connection to PC using type A USB - M12 cable, code HD2110USB. **USB drivers are required**.
B RS232C connection to PC. 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 WBGT 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, WBGT, 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 WBGT.

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 **WBGT** 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.**

HD2110RS: Connection cable with M12 connector from the instrument side and with SubD female connector 9 poles for RS232C from PC side.

HD2110USB: Connection cable with M12 that attaches to instrument side and USB 2.0 on PC side.

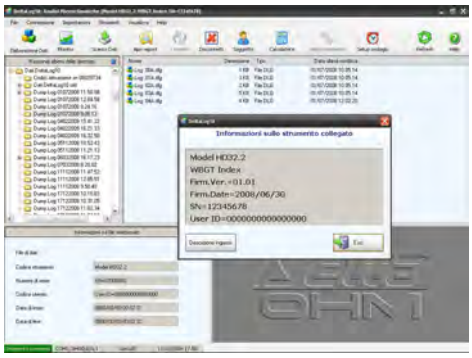
SWD10: 100-240Vac/12Vdc-1A mains voltage stabilized power supply.

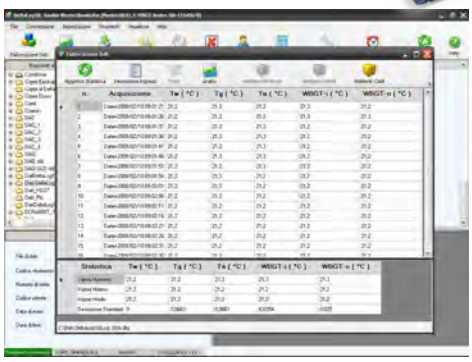
AQC: 200cc. of distilled water and n° 3 braids for HP3201 or HP3201.2 probes

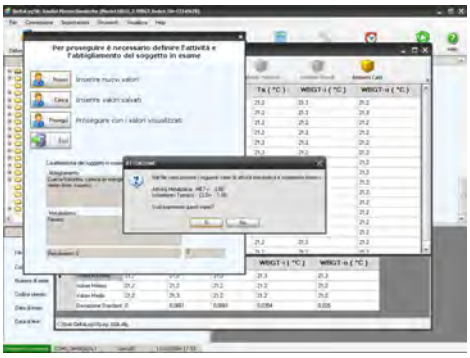
HD40.1: 24-column portable printer (uses cable HD2110RS).

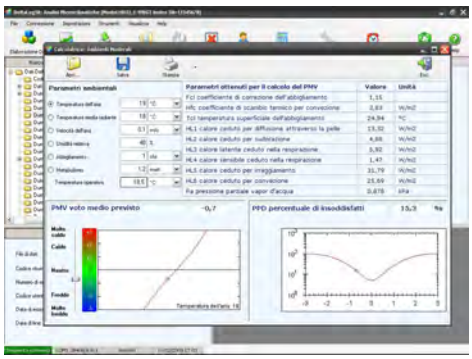
BAT.40: Spare battery pack for HD40.1 printer with built-in temperature sensor.

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









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