Data Logger for WBGT, PMW, PPD Measurement
Brand: Delta OHM

Code: Heat stress meter HD32.3 + TP3207.2 + TP3276.2 + HP3201.2 + VTRAP30 + HD2110USB + SWD10 + HP3217.2 + AP3203.2

Thermal microclimate to measure the WBGT Index, PMV Index (Predicted Mean Vote) and PPD (Predicted Percentage of Dissatisfied). 3 inputs for probes with SICRAM module, graphic display. It includes DeltaLog 10 software (with analysis of WBGT, PMV and PPD indices).

Equipment that detects temperature in a workplace and classifies it in relation to humidity to determine the influence of temperature on a worker and thus determine the level of stress to which he is subjected.

HD32.3 – WBGT - PMV Index is an instrument made by Delta OHM for: Analysis of hot environments using WBGT index (Wet Bulb Glob Temperature: wet bulb temperature and Globe thermometer) in presence or absence of solar radiation. Analysis of the moderate warm environments using PMV index (Predicted Mean Vote) and PPD index (Predicted Percentage of Dissatisfied

Reference standards:

ISO 7243: Hot environments. Estimation of the heat stress on working man, based on WBGT index (wet bulb globe Thermometer).

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ISO 8996: Ergonomics of the thermal environment. Determination of metabolic rate.

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

ISO 7730: Moderate thermal environments. Determination of PMV and PPD index and specification of the condition for thermal comfort

PMV - PPD indexes

Human thermal comfort is defined by ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers INC) as the state of mind that expresses satisfaction with the surrounding living or working environment The evaluation of this subjective condition can be objectified and quantified using integrated index that considers the micro climatic environment parameters (Ta, Tr, Va, RH), and the work-related energy metabolic expenditure MET, and the typology of clothing (thermal insulation CLO) commonly used. Among these indexes, the most precise one reflecting the influence of the above mentioned physical and physiological variables on thermal comfort is PMV (Predicted Mean Vote) Synthetically, it comes from the equation of the thermal balance whose result is compared to a scale of psycho-physical health and expresses the average opinion (average foreseen vote) about the thermal sensations of a group of subjects From PMV is derived a second index called PPD (Predicted Percentage of Dissatisfied) that quantifies the percentage of subjects who will be dissatisfied with some micro climatic conditions. ISO 7730 regulations suggest PMV use in the presence of following variables that influence the thermal balance:

Metabolic expenditure = 1 ÷ 4 met

Thermal resistance of clothing = 0 ÷ 2 clo

Dry bulb temperature = 10 ÷ 30°C

Medium radiant temperature = 10 ÷ 40°C

Air speed = 0 ÷ 1 m/sec

Water vapor pressure = 0 ÷ 2.7 kPa

PMV is a particularly suitable index for the evaluation of work places with moderate microclimate such as houses, schools, offices, research laboratories, hospitals, and is useful to predict the number of people likely to feel uncomfortably warm or cool.

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According to ISO 7730 PMV values range between + 0.5 and - 0.5, provides comfort conditions corresponding to a percentage of dissatisfied (PPD) lower than 10%.

Starting from the measured values, HD32.3 can calculate and display, the following indexes:

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.

Starting from the measured values, the HD32.3 instrument can calculate and display.

Medium radiant temperature TMR.

PMV Index (Predicted Mean Vote).

PPD Index (Predicted Percentage of Dissatisfied).

WBGT index

WBGT (Wet Bulb Globe Temperature – wet bulb and globe temperature) 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 measurement of wet bulb temperature tnw with natural ventilation with the globe thermometer temperature tg and, in some situations, with the air temperature ta.

The calculation formula is the following: inside and outside the buildings in absence of solar radiation:

WBGT close environments = 0,7 tnw + 0,3 tg outside the buildings in presence of solar radiation:

WBGT outside environments= 0,7 tnw + 0,2 tg + 0,1 ta where: tnw = wet bulb temperature with natural ventilation;

tg = globe thermometer temperature;

ta = 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 bulb temperature, of 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

To calculate PMV and PPD indices, it's necessary to know: the working load (energy expenditure); the clothing thermal insulation.

Average radiant temperature Tr

The average radiant temperature is defined as the temperature of thermally uniform simulated environment that would exchange with a man the same thermal radiation power exchanged in the real environment. In order to evaluate the average radiant temperature, it is necessary to measure: the globe thermometer temperature, the air temperature, and the air speed measured close to the globe thermomet

Features:

The instrument is provided with three inputs for probes with SICRAM module: the SICRAM module is an interface between the instrument and connected sensor and communicates the sensor parameters and calibration data to the instrument. All SICRAM probes can be plugged into any of the inputs: they are automatically recognized upon turning on the instrument. Logging: data acquisition and logging in the internal instrument memory. Storage capacity: 64 different logging sections, sample interval, user selectable. Start and stop can be set automatically with the auto-start function, Selectable measurement unit of the temperature: °C, °F, K. The display of maximum, minimum, medium statistic parameters. The data transfer via RS232 or USB serial port.

Includes:

HD32.3 - Thermal microclimate data logger. It includes DeltaLog10

software (with analysis of WBGT, PMV and PPD indices) downloadable from Delta OHM website. The kit is composed of instrument, four AA 1.5 V batteries, instruction manual

The probes included for WBGT index measurement:

Dry bulb temperature probe.

Globe thermometer probe.

Natural wet bulb temperature probe with natural ventilation. For long lasting measurements:

The probes included for PMV/PPD indices measurement are

Combined T/RH probe.

Omni-directional hot wire air speed probe.

Globe thermometer probe.

ACCESSORIES

Small Tripod for measurements with probes with cable

Full Specifications

Power supply Mains power supply (cod. SWD10) 12 Vdc/1A

Batteries 4 batteries 1.5V type AA

Autonomy 200 hours with 1800mAh alkaline batteries

Power absorbed with instrument off < 45μA

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 or 2.0 no-

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 lenght max 15 m

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Memory divided in 64 blocks

Memory Capacity 67600 memorizations for each of 3 inputs

Memorization interval selectable between: 15, 30 s; 1, 2, 5, 10, 15,

20, 30 min and 1 hour

Safety of the stored: data Unlimited

Logging interval Configurable from 1 second to 1 hour

Storage capacity 8 GB

Instrument uncertainty ± 1 digit @ 20°C

Operating Conditions

Working temperature -5 ... 50 °C

Storage temperature -25 ... 65 °C

Working relative

humidity 0 ... 90% RH no condensation

Protection Degree IP64

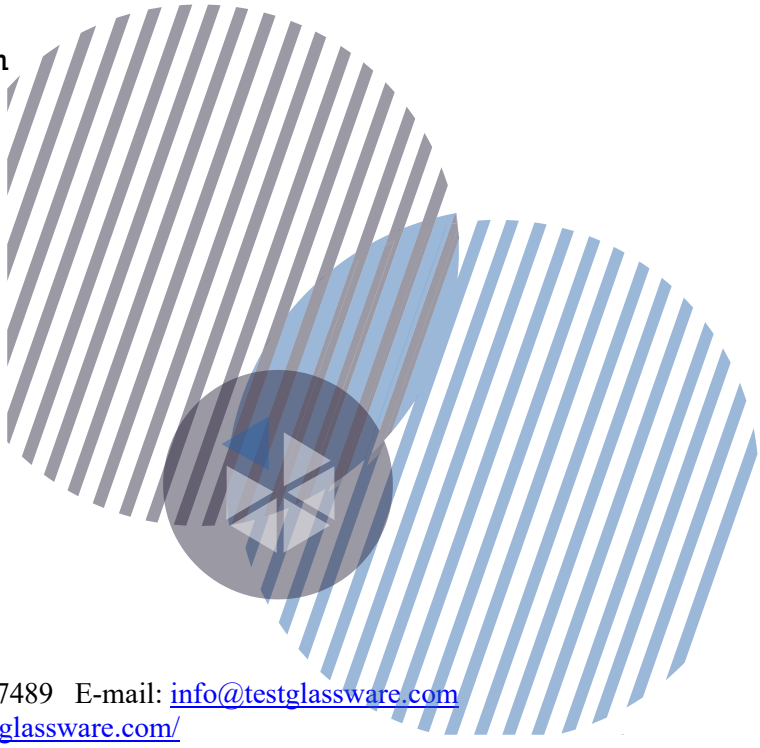
Dimensions (Length x Width x Height) 185 x 90 x 40 mm

Weight 470 g (batteries included)

Materials ABS, rubber

Display Back light, dot-matrix

160 x 160 points, visible area 52 x 42mm



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