

**WBGT (in/out door), TG Temp., Humidity/ Air Temp.
Dew point Temp. Wet bulb Temp.
SD Card, real time data logger, Patent**

HEAT INDEX WBGT METER

Model : WBGT-2010SD

ISO-9001, CE, IEC1010



B2		2009/12/28													
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
face	Date	Time	Value	Unit	Value	Unit	Value	Unit	Value	Unit	Value	Unit	Value	Unit	
1	2009/12/28	16:36:15	19.5	WBGT Temp C	46.9	%RH C	26.6	TA Temp C	21.3	TG Temp C	18.5	WET Temp C	14.3	DP Temp C	
2	2009/12/28	16:36:17	19.4	WBGT Temp C	47.2	%RH C	26.6	TA Temp C	21.3	TG Temp C	18.6	WET Temp C	14.4	DP Temp C	
3	2009/12/28	16:36:19	19.4	WBGT Temp C	47.2	%RH C	26.6	TA Temp C	21.2	TG Temp C	18.6	WET Temp C	14.4	DP Temp C	
4	2009/12/28	16:36:21	19.3	WBGT Temp C	47.2	%RH C	26.6	TA Temp C	21.3	TG Temp C	18.6	WET Temp C	14.4	DP Temp C	
5	2009/12/28	16:36:23	19.3	WBGT Temp C	47.5	%RH C	26.6	TA Temp C	21.3	TG Temp C	18.6	WET Temp C	14.5	DP Temp C	
6	2009/12/28	16:36:25	19.3	WBGT Temp C	47.5	%RH C	26.6	TA Temp C	21.4	TG Temp C	18.6	WET Temp C	14.5	DP Temp C	
7	2009/12/28	16:36:27	19.3	WBGT Temp C	47.7	%RH C	26.5	TA Temp C	21.3	TG Temp C	18.6	WET Temp C	14.5	DP Temp C	
8	2009/12/28	16:36:29	19.4	WBGT Temp C	47.5	%RH C	26.5	TA Temp C	21.2	TG Temp C	18.6	WET Temp C	14.4	DP Temp C	
9	2009/12/28	16:36:31	19.4	WBGT Temp C	47.6	%RH C	26.5	TA Temp C	21.2	TG Temp C	18.6	WET Temp C	14.4	DP Temp C	
10	2009/12/28	16:36:33	19.3	WBGT Temp C	48	%RH C	26.5	TA Temp C	21.3	TG Temp C	18.6	WET Temp C	14.5	DP Temp C	
11	2009/12/28	16:36:35	19.3	WBGT Temp C	48.4	%RH C	26.4	TA Temp C	21.2	TG Temp C	18.6	WET Temp C	14.6	DP Temp C	
12	2009/12/28	16:36:37	19.3	WBGT Temp C	48.8	%RH C	26.5	TA Temp C	21.2	TG Temp C	18.7	WET Temp C	14.7	DP Temp C	
13	2009/12/28	16:36:39	19.3	WBGT Temp C	49.9	%RH C	26.5	TA Temp C	21.2	TG Temp C	19	WET Temp C	15.2	DP Temp C	
14	2009/12/28	16:36:41	19.4	WBGT Temp C	49.9	%RH C	26.4	TA Temp C	21.1	TG Temp C	19	WET Temp C	15.2	DP Temp C	
15	2009/12/28	16:36:43	19.4	WBGT Temp C	49	%RH C	26.4	TA Temp C	21	TG Temp C	18.7	WET Temp C	14.8	DP Temp C	
16	2009/12/28	16:36:45	19.4	WBGT Temp C	48.6	%RH C	26.3	TA Temp C	21	TG Temp C	18.7	WET Temp C	14.6	DP Temp C	
17	2009/12/28	16:36:47	19.4	WBGT Temp C	48	%RH C	26.3	TA Temp C	20.9	TG Temp C	18.5	WET Temp C	14.4	DP Temp C	
18	2009/12/28	16:36:49	19.2	WBGT Temp C	47.8	%RH C	26.3	TA Temp C	20.9	TG Temp C	18.5	WET Temp C	14.3	DP Temp C	
19	2009/12/28	16:36:51	19.2	WBGT Temp C	47.7	%RH C	26.3	TA Temp C	20.8	TG Temp C	18.4	WET Temp C	14.3	DP Temp C	
20	2009/12/28	16:36:53	19.1	WBGT Temp C	47.8	%RH C	26.2	TA Temp C	20.9	TG Temp C	18.5	WET Temp C	14.3	DP Temp C	
21	2009/12/28	16:36:55	19.1	WBGT Temp C	48.5	%RH C	26.3	TA Temp C	20.9	TG Temp C	18.6	WET Temp C	14.5	DP Temp C	
22	2009/12/28	16:36:57	19.1	WBGT Temp C	48.7	%RH C	26.3	TA Temp C	21	TG Temp C	18.5	WET Temp C	14.5	DP Temp C	
23	2009/12/28	16:36:59	19.1	WBGT Temp C	49.2	%RH C	26.3	TA Temp C	20.9	TG Temp C	18.7	WET Temp C	14.7	DP Temp C	
24	2009/12/28	16:37:01	19.2	WBGT Temp C	49.1	%RH C	26.2	TA Temp C	20.9	TG Temp C	18.6	WET Temp C	14.6	DP Temp C	
25	2009/12/28	16:37:03	19.2	WBGT Temp C	48.9	%RH C	26.2	TA Temp C	20.7	TG Temp C	18.6	WET Temp C	14.6	DP Temp C	
26	2009/12/28	16:37:05	19.2	WBGT Temp C	48.6	%RH C	26.1	TA Temp C	20.7	TG Temp C	18.4	WET Temp C	14.4	DP Temp C	
27	2009/12/28	16:37:07	19.1	WBGT Temp C	48.2	%RH C	26.1	TA Temp C	20.8	TG Temp C	18.4	WET Temp C	14.2	DP Temp C	



Soft carrying case
CA-05B. included

LUTRON

LUTRON ELECTRONIC

The Art of Measurement

HEAT INDEX WBGT METER

Model : WBGT-2010SD

FEATURES

* Introduction :	WBGT (wet-bulb globe temperature) was developed as a monitoring basis at US military training camps and became widespread for the use in workplaces and sports situation It is suggested in the international standard ISO 7243, OSHA (US Occupation Safety), Japan Society for Occupational Health and the SMA (Sports Medicine Australia) in establishing the permissible heat exposure limits in health , sports or other physical activities.
* Measurement :	WBGT value (Indoor/Outdoor Wet bulb globe temperature), Black globe temperature, Humidity, Air temperature, Wet bulb temperature, Dew point Temp..
* Adjustable WBGT alarm setting, if the WBGT value over the alarm threshold, the buzzer will sound along with the flashing Display.	
* Using to control and monitor of physical activity in hot environment to limit the danger of heat related injuries.	
* Globe temperature measurement use the Pt sensor, high accuracy.	
* Fast humidity measuring response time.	
* Direct measurement of the radiation effect with a brass black ball in 75 mm dia.	
* Sensor protecting mechanism.	
* Real time SD memory card Datalogger, it Built-in Clock and Calendar, real time data recorder , sampling time set from 1 second to 3600 seconds.	
* Manual datalogger is available (set the sampling time to 0), during execute the manual datalogger function, it can set the different position (location) No. (position 1 to position 99).	
* Innovation and easy operation, computer is not need to setup extra software, after execute datalogger, just take away the SD card from the meter and plug in the SD card into the computer, it can down load the all the measured value with the time information (year/month/date/ hour/minute/second) to the Excel directly, then user can make the further data or graphic analysis by themselves.	
* SD card capacity : 1 GB to 16 GB.	
* LCD with green light backlight, easy reading.	
* Can default auto power off or manual power off.	
* Data hold, record max. and min. reading.	
* Microcomputer circuit, high accuracy.	
* Power by UM3/AA (1.5 V) x 6 batteries or DC 9V adapter.	
* RS232/USB PC COMPUTER interface.	

GENERAL SPECIFICATIONS

Circuit	Custom one-chip of microprocessor LSI circuit.
Display	LCD size : 52 mm x 38 mm LCD with green backlight (ON/OFF).
Measurement	* Wet bulb globe temperature (WBGT) @ Indoor/Outdoor * Black globe temperature (TG) * Air temperature (TA) * Wet bulb temperature (WB) * Humidity * Dew point temperature
WBGT formula	Indoor/Outdoor and no sun : $WBGT = (0.7 \times WB) + (0.3 \times TG)$ Outdoor and full sun : $WBGT = (0.7 \times WB) + (0.2 \times TG) + (0.1 \times TA)$
WBGT alarm setting	Adjustable WBGT alarm setting, if the WBGT value over the alarm threshold, the buzzer will sound along with the flashing Display.
Datalogger Sampling Time Setting range	Auto 1 second to 3600 seconds @ Sampling time can set to 1 second, but memory data may loss. Manual Push the data logger button once will save data one time. @ Set the sampling time to 0 second. @ Manual mode, can also select the 1 to 99 position (Location) no.

Data error no.	0.1% of total saved data max.
Memory Card	SD memory card. 1 GB to 16 GB
Advanced setting	* Set clock time (Year/Month/Date, Hour/Minute/ Second) * Set WBGT alarm value * Decimal point of SD card setting * Auto power OFF management * Set beep Sound ON/OFF * Select the temperature unit to °C or °F. * Set sampling time * SD memory card Format
Data Hold	Freeze the display reading.
Memory Recall	Maximum & Minimum value.
Sampling Time of Display	Approx. 1 second.
Data Output	RS 232/USB PC computer interface. * Connect the optional RS232 cable UPCB-02 will get the RS232 plug. * Connect the optional USB cable USB-01 will get the USB plug.
Operating Temperature	0 to 50 °C.
Operating Humidity	Less than 85% R.H.
Power Supply	* Alkaline or heavy duty DC 1.5 V battery (UM3, AA) x 6 PCs, or equivalent. * DC 9V adapter input. (AC/DC power adapter is optional).
Power Current	Normal operation (w/o SD card save data and LCD Backlight is OFF) : Approx. DC 5 mA. When SD card save the data but and LCD Backlight is OFF) : Approx. DC 25 mA. * If LCD backlight on, the power consumption will increase approx. 11 mA.
Weight	489 g/1.08 LB.
Dimension	Meter 177 x 68 x 45 mm Black brass ball (7.0 x 2.7x 1.9 inch) Round, 75 mm dia
Standard Accessories Included	* Instruction manual.....1 PC * Black brass ball (with sensor)..... 1 PC * Soft carrying case, CA-05B.....1 PC
Optional Accessories	* SD Card (2 GB) * AC to DC 9V adapter. * USB cable, USB-01. * RS232 cable, UPCB-02. * Data Acquisition software, SW-U801-WIN. * Hard carrying case, CA-08, Size : 370 x 310 x 115 mm.

ELECTRICAL SPECIFICATIONS (23±5 °C)

Wet bulb globe temperature (WBGT)				
Range	°C	Indoor	0 °C to 59 °C	
		Outdoor	0 °C to 56 °C	
	°F	Indoor	32 to 138 °F	
Accuracy		Outdoor	32 to 132 °F	
	°C	* Indoor	± 1 °C (15 to 59 °C) ± 1.5 °C (Others)	
	°F		± 1.8 °F (59 to 138 °F) ± 2.7 °F (Others)	
Accuracy	°C	* Outdoor	± 1.5 °C (15 to 56 °C) ± 2 °C (Others)	
	°F		± 2.7 °F (59 to 132 °F) ± 3.6 °F (Others)	

WBGT Formula :

Indoor (Outdoor and no sun)	WBGT = 0.7WB + 0.3TG
Outdoor (Outdoor and full sun)	WBGT = 0.7WB + 0.2TG + 0.1TA

Air temperature (TA)

Range	°C	0 to 50 °C
	°F	32 to 122 °F.
Resolution	°C	0.1 °C
	°F	0.1 °F
Accuracy	°C	± 0.8 °C
	°F	± 1.5 °F

Black globe temperature (TG)		
Range	°C	0 to 80 °C
	°F	32 to 176 °F.
Resolution	°C	0.1 °C
	°F	0.1 °F
Accuracy	°C	± 0.6 °C
	°F	± 1.1 °F

Humidity

Range	5 % to 95 % R.H.
Resolution	0.1 % R.H.
Accuracy	≥ 70% RH : ± (3% reading + 1% RH). < 70% RH : ± 3% RH.

Dew Point Temp.

°C	Range	-25.3 °C to 48.9 °C
	Resolution	0.1 °C
°F	Range	-13.5 °F to 120.1 °F.
	Resolution	0.1 °F.
Remark : * Dew Point Temp. value is calculated from the Humidity/Air Temp. measurement automatically. * The Dew Point Temp. accuracy is sum accuracy value of Humidity & Air Temperature measurement..		

Wet bulb Temp.

°C	Range	-21.6 °C to 50.0 °C
	Resolution	0.1 °C
°F	Range	-6.9 °F to 122.0 °F.
	Resolution	0.1 °F.
Remark : * Wet bulb display value is calculated from the Humidity/Air Temp. measurement automatically. * The Dew Point accuracy is sum accuracy value of Humidity & Air temperature measurement..		

Recommendations to heat exposure level for working and physical activity.

(Permissible heat exposure threshold limit)

Work/rest regimen (Each hour)	Light	Moderate	Heavy
Continuous work	30 °C (86 °F)	26.7 °C (80 °F)	25 °C (77 °F)
75% work, 25% rest	30.6 °C (87 °F)	28 °C (82 °F)	25.9 °C (78 °F)
50% work, 50% rest	31.4 °C (89 °F)	29.4 °C (85 °F)	27.9 °C (82 °F)
25% work, 75% rest	32.2 °C (90 °F)	31.1 °C (88 °F)	30 °C (86 °F)

Source : AGGIH 1992 (The American Conference of Governmental Industrial Hygienists)

WBGT INDEX and PHYSICAL EXERCISE

WBGT	Flag	Activity Intensity
< 26.7 °C (< 80 °F)	White	Normal activity. Caution should be taken.
26.7 to 29.4 °C (80 to 84.9 °F)	Green	Descretion is required in planning intense physical activity.
29.5 to 31 °C (85 to 87.9 °F)	Yellow	Intense activity for new and unacclimatized persons should be curtailed.
31.1 to 32.2 °C (88 to 89.9 °F)	Red	Intense exercise must be curtailed for those with less than 12 weeks training in hot weather. Be on high alert
≥ 32.2 °C (≥ 90 °F)	Black	Cancel all outdoor exercise.