



> welcome..

LSI LASTEM

Heat Shield – Heat Stress Meter

New Firmware update (June 2022)

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Data Loggers



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PRESENTATION

continued



Introduction



ISO 7243 2017-08 edition describes the methodology to produce WBGT heat index calculations and to assess limits defined on the basis of the activity level and clothing of the subject under evaluation.

Most of the WBGT meters on the markets are made to produce WBGT values (with and without solar load calculations), but probably no one (apart from the LSI LASTEM Heat Shield monitor latest version) produces in real time mode the WBGT Eff (which take in consideration the CAV Clothing Adjustment Value) and, online, produces and display the WBGT-Ref Delta (Delta To The Limit) value which corresponds to the distance between the WBGT Eff and its limit value (named WBGT Ref) given by the ISO 7243 standard for boths Acclimatized and Not Acclimatized subjects in function of their activity level.



Introduction



- ▶ *ISO 7243 2017-08* edition describes how to assess the heat stress using the **WBGT** (Wet Bulb Globe Temperature) index calculation. This assessment is made starting from the measurement of some physical parameters and calculation of the WBGT index using two formulas: with and without solar load.
- ▶ When the WBGT calculation has been produced, ISO 7243 asks to produce the **WBGT Eff** which is the WBGT value adjusted for the effect of clothing coverage using the Clothing Adjustment Value (**CAV**).
- ▶ When the WBGT Eff calculation has been produced, ISO 7243 asks to produce the **WBGT Ref** which is the limit for two types of Subjects (Acclimatized and Not Acclimatized) according to their **Metabolic rate** categories of work.

- ▶ ISO 7243 says that if WBGT Eff values are greater, than WBGT Ref reference value, then further action is required

- ▶ ACGIH renames the two WBGT Ref limits as TLV-Time Limit Value (limit for acclimatized subject) and AL-Action Limit (limit for non acclimatized subject). ACGIH suggests their own CAV values. Other ACGIH criterias remain the same as ISO 7243



Heat Shield - New Firmware update (V.1.08.00) in complete accordance with ISO 7243 (2017 – 08) Standard



Direct measurements by Heat Shield unit:

- ▶ Air Temperature (T_a)
- ▶ Black globe Temperature (T_g)
- ▶ Wet Temperature (T_{wv})
- ▶ Relative Humidity (RH)
- ▶ Air Speed (option for PMV-PPD calculation)



Manual Inputs in the Heat Shield unit:

- ▶ Without solar load **OR** with solar load WBGT formula selection
- ▶ Subject type: Acclimatized to heat **OR** not accimatized to heat subject selection
- ▶ Metabolic rate (W) selection (**from table or by manual choice**)
- ▶ Clothing Adjustment Value (CAV) selection (**from table or by manual choice**)



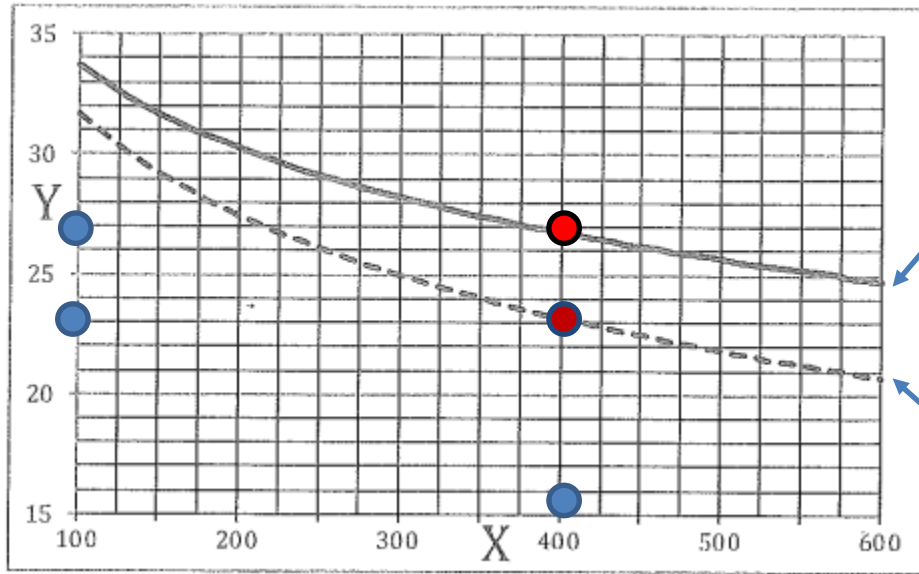



Direct Calculations by Heat Shield unit:

- ▶ **WBGT** index without solar load version **OR** WBGT index with solar load version - According to the selected formula
- ▶ **WBGT Eff** –According to selected with solar Load or without solar load WBGT formula and selected Clothing Adjustent Value (CAV)
- ▶ **WBGT Ref** for NOT Acclimatized subject (**Action Limit by ACGIH**) **OR** Acclimatized subject (**TLV Time Limit Value by ACGIH**) – According to selected Metabolism value and Subject type
- ▶ **Delta** - Distance To The Limit (difference between WBGT Eff and WBGT Ref)

- ▶ Heat Index
- ▶ Humidex Index
- ▶ PMV-PPD comfort index (needs Air speed value)





WBGT Ref for 
 Acclimatized subject
 TLV (Time Limit Value
 ACGIH) curve

WBGT Ref for NOT
 Acclimatized subjects
 AL (Action Limit
 ACGIH) curve

Metabolism (W)

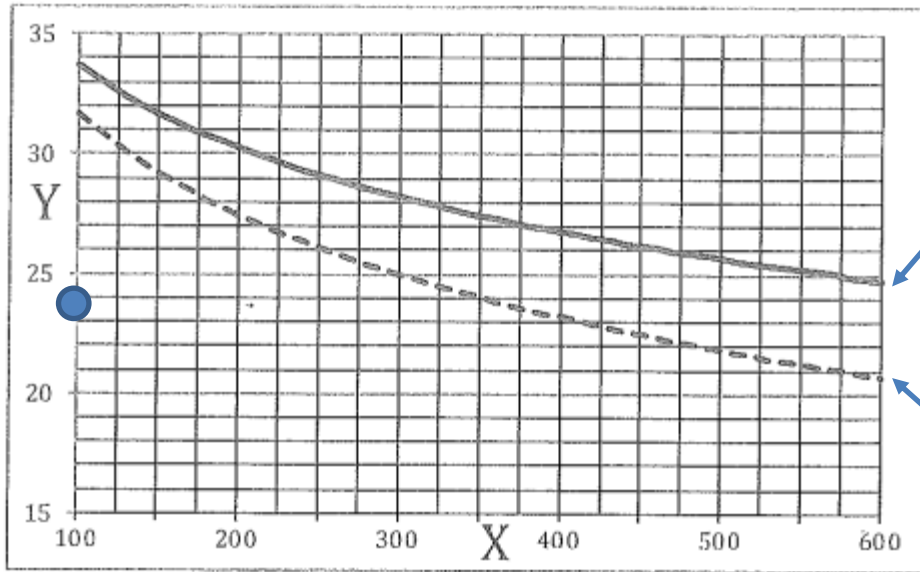
1. According to Metabolism value and subject acclimatate (YES/NOT), Heat Shield produces WBGT Ref for Acclimatized (ACGIH-TLV) OR WBGT Ref for NOT acclimatized (ACGIH-AL) value

Example:

WBGT Ref / ACGIH TLV: limit for Acclimatized subjects at 400 W Metabolic rate = 27°

WBGT Ref / ACGIH AL: limit for NOT Acclimatized subjects at 400 W Metabolic rate = 23°

WBGT Eff



Metabolism (W)

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WBGT Ref for
Acclimatized subject
TLV (Time Limit Value
ACGIH)

WBGT Ref for NOT
Acclimatized subjects
AL (Action Limit
ACGIH)

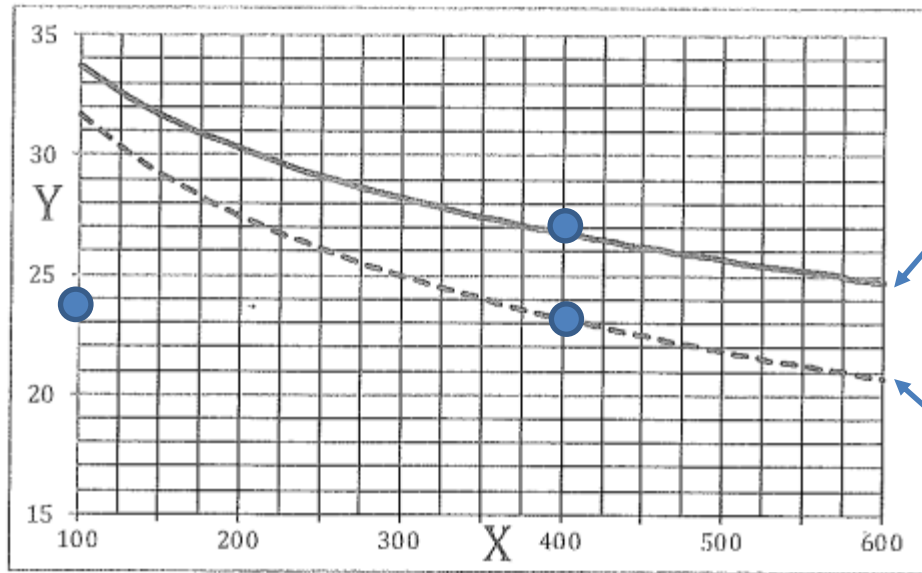
2. According to WBGT with/without solar load selection and Clothing value (CAV) the Heat Shield produces WBGT Eff (WBGT+CAV)

Example:

Calculated WBGT (without solar load) = 23°

Selected CAV value = +1

Calculated WBGT Eff = 24°



WBGT Eff

Metabolism (W)

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WBGT Ref for
Acclimatized subject
TLV (Time Limit Value
ACGIH)

WBGT Ref for NOT
Acclimatized subjects
AL (Action Limit
ACGIH)

3. According to WBGT Eff and WBGT Ref, Heat Shield produces DTTL (Distance To The Limit) – Limit exceeded/NOT exceeded (WBGT Eff – WBGT Ref)

Examples:

WBGT Eff= 24°

WBGT Ref NOT acclimatized (AL ACGIH)= 23°

DTTL = 24-23= +1° (**Limit Exceeded**)

WBGT Eff= 24°

WBGT Ref acclimatized (TLV ACGIH)= 27°

DTTL = 24-27= -3° (**Limit NOT Exceeded**)



Conclusions



Starting from **Version 1.08.00 Heat Shield** is producing the following **NEW** parameters for **one** Subject selection:

- ▶ **WBGT Eff**
- ▶ **DTTL**
- ▶ **New HS Manager (2.1.5.0) PC program version will produce the same for several Subjects selection (starting from WBGT index calculation).**
- ▶ **Choice of the With or Without solar load WBGT formula is made by menù selection**
- ▶ **Choice of the Acclimatized or Not Acclimatized subject is made by menù selection**
- ▶ **CAV values are selectable from a list by the ACGHI standard and editable**
- ▶ **Metabolic rates are selectable from a list by ACGHI/ISO7243 and editable**

The following parameters are already inside the Heat Shield previous versions:

- ▶ **WBGT index with and without solar load**
- ▶ **Heat Index**
- ▶ **Humidex Index**
- ▶ **PMV-PPD comfort index (needs Air speed value)**

and maintained even in the newer version





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**Thanks for your
attention**