Heat Shield
Portable wireless WBGT meter

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Highlights

- Quick, real-time, reliable and accurate assessment of indoor and outdoor WBGT index
- Real-time assessment of the PMV-PPD index (ISO7730)
- Verification probe for assessment of the system calibration
- Built-in radio technology for simultaneous, wireless monitoring in different locations/heights
- Rated IP54 to withstand harsh environmental conditions
- 8MB memory for extended data logging
- Battery Life: 200h (with radio on 20h)
- Automatic start/stop of measurements
- Probe design and performances according to ISO7726
- GIDAS TEA The most advanced software available on the market for Thermal Environment Analysis
- Support for ISO7730 thermal comfort analysis with PMV and PPD indexes, heat and cold stress Predicted Heat Strain (PHS), Insulation Required (IREQ)

Heat Shield includes globe temperature, wet bulb temperature the, dry bulb temperature and relative humidity and displays on-line WBGT indoor& outdoor index, Heat Index and Humidex. Furthermore, if one anemometer is connected, Heat Shield can calculate directly the PMV-PPD comfort index (ISO7730). Thanks to its built-in radio technology, Heat Shield can support up to two satellite units to calculate WBGT at different levels (As per the recommendations outlined in ISO 7243: 1989) or in different locations. When equipped with the anemometer, the unit can be also used for accurate thermal environments analysis thanks to the most advanced software available on the market for this purpose, GIDAS TEA. Using software, the user can calculate additional ISO indexes for thermal comfort – Predicted Mean Vote (PMV), Predicted Percent of Dissatisfied (PPD) – or heat and cold stress - Predicted Heat Strain (PHS), Insulation Required (IREQ), Duration Limit of the exposition (Dlim). The software will also allow in-depth analysis of WBGT, PMV and PPD and creation of reports.
For more information about Heat Shield, see LSI LASTEM catalogue MW9002-ENG.

Main Features

Measurements

Heat Shield is equipped with built-in sensors to measure globe temperature (tg), wet bulb temperature (tnw), dry bulb temperature (ta) and relative humidity (rh). All sensors are designed in compliance with ISO7726. Heat Shield supports both 15 cm (6”) and 5 cm (2”) black globes thermometers as well as external anemometers for air speed (va) measurement.

Tg sensor, 5 cm (2”) diameter

Tg sensor, 15 cm (6”) diameter

Ta&RH% sensor

Tnw sensor

ESV125 Va sensor (hot wire)

DNA205 Va sensor (cups)

continued

Hot wire technology offers optimal performances indoors and in low air speed conditions, while a cup anemometer is ideal for outdoor use.

Calculations

Heat Shield calculates on-line and displays the following indexes:

- WBGT indoor&outdoor index (ISO7243). For up to 3 locations simultaneously it requires Satellite units.
- Head-Torso-Ankle Weighted Average WBGT (ISO7243) (requires Satellite units)
- Heat index According to 1990 National Weather Service (NWS) Technical Attachment (SR 90-23)
- Humidex According to J.M. Masterton and F.A. Richardson of Canada's Atmospheric Environment Service equation (1979)
- PMV-PPD (ISO7730) comfort index. Only whenever one anemometer sensor is connected. Metabolism (Met), Cloth (Clo) and Mechanical ratio (ETA) values are required for the subject under evaluation.

Heat Shield has 8 Mb memory to store measurements and calculations performed during every survey. Once data are downloaded to a PC, LSI Lastem suggests two software applications: Using GIDAS TEA will be possible perform easy and quick creation of reports based on any available ISO index:

- PMV-PPD index, TO Operative Temperature index (ISO7730) (requires BSZ313 PC module)
- PHS Predicted Heat Strain (ISO7933) (requires BSZ317 PC module)
- IREQ Insulation Required, Duration Limit of the exposition (ISO11079) (requires BSZ313 PC module)

Using HS Manager will be possible to perform analysis of the results of Heat Shield and to evaluate working limits. HS Manager always comes together with Heat Shield units. GIDAS TEA is an optional program.
Read more about it in the LSI-LASTEM's Software catalogue (MW9006).

Three levels WBGT on the same vertical

WBGT in three positions of the same environment

Verification probe

Using the high accuracy temperature probe connected to Heat Shield, it is possible to assess the measurement differences between this reference sensor and the three temperature sensors (Ta, Tg, Tnw) values. This operation can be done before each measurement. The three-integrated sensors of Heat Shield are easily replaceable by the operator using spare sensors.

Easy to operate
Heat Shield is very stable when placed on any horizontal surface but it can be also hand able or mounted on standard photographic tripod. With its on-and-play philosophy, measurements can be displayed in just a few instants from power on. No configuration is required by PC. Rechargeable batteries assure up to 200 hrs of measurement (20 hrs when using wireless Satellites).

Three WBGT with wireless satellite modules
Heat Shield can be supplied as a single base unit or with two additional wireless satellite modules. The satellite units are used to measure environmental conditions at three levels and calculate Head-Torso-Ankle Weighted Average WBGT as required by the ISO 7243. Alternatively, the satellite modules can be used in different locations, performing three simultaneous measurements saving the user precious working time. Heat Shield radio can cover up to 300 m (line-of-sight; actual range in indoors conditions may vary).

Rugged and reliable
Heat Shield is extremely compact and robust. It has been designed to withstand the harsh working environments where heat stress condition normally arise both in indoor and outdoor conditions. Due to its metal case, it is very well protected against mechanical shocks, dust and dew. IP54 protection guarantees performance in outdoors or in dusty and humid conditions.

Sales Kit
Heat Shield - Portable wireless WBGT meter

KIT 1.0: Base WBGT kit

Includes:
- Heat Shield base module, complete with 110-220 Vac power charger, PC serial cable, USB adapter, HS Manager software and carrying case

KIT 1.1: WBGT + Thermal comfort kit

Includes:
- Heat Shield base module, complete with 110-220 Vac power charger, PC serial cable, USB adapter, HS Manager software, supports and carrying case
- Hot wire anemometer

KIT 1.2: Full three levels WBGT kit

Includes:
- Heat Shield base module, complete with 110-220 Vac power charger, PC serial cable, USB adapter, HS Manager software and carrying cases
- N.2 wireless satellite modules.
- Tripod
- Pole for fixing the system to three levels
- Carrying bag for tripod and pole

Code	Description	KIT 1.0	KIT 1.1	KIT 1.2
	Heat Shield modules			
ELR610M	Heat Shield base module. Includes 110-220 Vac power charger, PC serial cable, USB adapter and HS Manager software. Small black globe sphere (5 cm diameter)	●	●	●
ELR615M	Heat Shield base module. Includes 110-220 Vac power charger, PC serial cable, USB adapter and HS Manager software. Large black globe sphere (15 cm diameter)	Note 1	Note 1	Note 1
ELR610S	N.2 Heat Shield satellite modules Small black globe sphere (5 cm diameter)			●
ELR615S	N.2 Heat Shield satellite modules Large black globe sphere (15 cm diameter)	Note 1	Note 1	Note 1
	Tripod			
BVA304	Tripod	Opt.	Opt.	●
BWA048	Soft bag for tripod and supports	Opt.	Opt.	●
BVA325	Support for Heat Shield and ESV125 anemometer on tripods or surfaces	Opt.	●	●
BVA326	Tripod extension for 3-level measurements and/or BVA308 mounting		Note 2	●
BVA308	H.80 cm pole for DNA205 anemometer on tripod	Note 3	Note 3	Note 3
	Anemometers	Note 4	Note 4	Note 4
ESV125	Hot wire anemometer	Opt.	●	Opt.
DNA205	Cup anemometer	Opt.	Note 4	Opt.
	Verification probe	Note 5	Note 5	Note 5
EST100	Temperature sensor for the assessment of the measurement differences between the three temperature sensors (Ta, Tg, Tnw) values coming from Heat Shield modules and the reference sensor measurement. Complete with ACCREDIA certificate of calibration.	Opt.	Opt.	Opt.
	GIDAS TEA modules	Note 5	Note 5	Note 5
BSZ317	TEA module for hot environments. PHS index calculation. Calculator			
BSZ313	TEA module for comfort environments. PMV-PPD index calculation. Calculator			
BSZ315	TEA module for cold environments. ITR index calculation. Calculator			

Note 1 Check your country policy and legislation to select the appropriate globe diameter.

Note 2 Normally tripod can use useful for three levels WBGT measurement. In that case, BVA326 pole is also needed to fix one of the two satellites to the correct highness. Second satellite module is placed on the floor to obtain the measurement at 10 cm highness as required by the ISO7243 standard. Heat Shield base module is fixed to the tripod together with the ESV125 anemometer using the BVA325 arm.

Note 3 Wind measurement using DNA205 cup anemometer is required to evaluate the heat stress in outdoor conditions. In that case, DNA205 is mountable on a BVA304 tripod using BVA308 pole. While the Heat Shield base module is fixed to the tripod using the BVA325 arm.

Note 4 Anemometer is required for calculation of PMV-PPD, PHS and IREQ. Hot wire technology (ESV125) offers optimal performances indoors and in low air speed conditions, while a cup anemometer (DNA205) is ideal for outdoor use.

Note 5 GIDAS TEA modules performs in-depth index calculation, data analysis and reporting. Each module includes also a unique “Calculator” feature, to perform sensitivity analysis simulating thermal environments conditions using real measurements or virtual data. See technical specification in the last pages of this document. Read more about it in the LSI-LASTEM’s Software catalogue (MW9006).

Heat Shield - WBGT meter

Technical features - MODELS

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Heat Shield base module

Heat Shield includes globe temperature, wet bulb temperature the, dry bulb temperature and relative humidity and displays on-line WBGT indoor& outdoor index, Heat Index and Humidex. Two models are available, one (ELR610M) with 2" (5 cm) sphere globe temperature sensor the other (ELR615M) with 6" (15 cm) sphere.

ELR610M (1) – ELR615M (2)	*Type*	*Element*	*Range*	*Accuracy (0÷60°C)*
	Natural Wet Bulb Thermometer (Cotton wick immersed into a built-in reservoir with detachable cover)	1/3 DIN-A Pt100	-20÷60°C	± 0.3°C
	Globe Thermometer **ELR610M**: 2" sphere **ELR615M**: 6" sphere	1/3 DIN-A Pt100	-20÷120°C	± 0.3°C
	Dry Bulb Thermometer (Equipped with radiant screen)	1/2 Pt100	-20÷60°C	± 0.8°C ±0.4 °C (10-40°C)
	Relative Humidity Sensor	Capacitive sensing element	0÷100%	1.8 %RH (10-90%)
	ESV125 Air Flow (optional)*	Hot wire (Tungsten wire diam. 9,45 µm)	0.01÷20 m/s	±10 cm/s (0,5÷1,5 m/s) 4% (>1,5 m/s)
	DNA205 Anemometer (optional)* *not supported on satellite units	Cup anemometer for outdoor use	0÷75 m/s	2,5%\

Common features

Calculated parameters	*WBGT (indoor) index* *WBGT (outdoor) index*	According to ISO7243 For up to 3 locations simultaneously (Requires Satellite units)
	Head-Torso-Ankle Weighted Average WBGT	According to ISO7243 (Requires Satellite units)
	Heat index	According to 1990 National Weather Service (NWS) Technical Attachment (SR 90-23)
	Humidex	According to J.M. Masterton and F.A. Richardson of Canada's Atmospheric Environment Service equation (1979)
	PMV-PPD	According to ISO7730
	*Predicted Heat Strain (PHS)***	According to ISO7933
	*Insulation Required (IREQ), Duration Limit of the exposition (Dlim)***	According to ISO11079
	***Requires Air Flow measurement*	** via post-processing Software
Data management	*Data logging*	10" sec÷12hrs; va=1"
	Memory	8MB of flash data memory
	Survey identification	Time and date stamping with clock and calendar
	Software compatibility	HS Manager (included), Gidas TEA (optional)
	Languages	English, Spanish, Portuguese, Italian

continued

Power supply	*Power supply*	8 ÷ 14 Vdc
	Power consumption (Radio ON)	TX ON: 180 mA, RX ON: 30 mA8 ÷ 14 Vdc
	Power consumption (Stand-by)	0.2 mA
Battery	*Type*	2 A (4.2 V) Lithium rechargeable
	Recharging time	~ 8 hrs
	Battery life	Standby: 9 months Radio OFF (without satellites): 400 hrs Radio ON (without satellites): 20 hrs
Other features	*Internal clock*	Accuracy: 30 sec/month (T=25°C)
	Display	LCD 4 x 20 car
	Keyboard	N.8 keys
	Processor	1 RISC 8 bit, clock 16 MHz
	ADC resolution	16 bit
	Sampling time	80 ms (rejection 50 Hz)
	Environmental limits	-20 ÷ 60 °C
	Protection	IP 54
	Standards / Approvals	CE Mark
	Weight	1,4 Kg
	Dimensions	185x220x55 mm
	Mounting	Threaded bushing allows mounting to standard photographic tripods

Interfaces	*On instrument*	*External*
RS232 PC Interface (Base unit only)	Waterproof jack	Supplied with USB converter for PC connection
12VDC power jack	Waterproof jack	AC adapter wall power cube (90÷230VAC – 50÷60Hz)
Anemometer	Waterproof jack	Compatible with ESV125 Hot wire and DNA205 Cup anemometer
Verification probe	Waterproof jack	Common connector with RS232 port

Heat Shield satellite module

Additional satellite module for ELR610M or ELR615M base modules. Each base module can manage up to two satellites. Two satellite models are available, one (ELR610S) with 2" (5 cm) sphere globe temperature sensor the other (ELR615S) with 6" (15 cm) sphere.

ELR610S (1) – ELR615S (2)	*Type*	*Element*	*Range*	*Accuracy (0÷60°C)*
	Natural Wet Bulb Thermometer (Cotton wick immersed into a built-in reservoir with detachable cover)	1/3 DIN-A Pt100	-20÷60°C	± 0.3°C
	Globe Thermometer **ELR610S**: 2" sphere **ELR615S**: 6" sphere	1/3 DIN-A Pt100	-20÷120°C	± 0.3°C
	Dry Bulb Thermometer (Equipped with radiant screen)	1/2 Pt100	-20÷60°C	± 0.8°C ±0.4 °C (10-40°C)
	Relative Humidity Sensor	Capacitive sensing element	0÷100%	1.8 %RH (10-90%)

Common features

Power supply	*Power supply*	8÷14 Vdc
	Power consumption (Radio ON)	TX ON: 180 mA, RX ON: 30 mA
Battery	*Type*	2 A (4.2 V) Lithium rechargeable
	Recharging time	~ 8 hrs
	Battery life	20 hrs
Radio	*Type*	ZigBee
	Frequency	ISM 2.4 GHz direct sequence channels
	Power	10 mW (+10 dBm)
Other features	*Internal clock*	Accuracy: 30 sec/month (T=25°C)
	Keyboard	N.4 keys
	Processor	1 RISC 8 bit, clock 16 MHz
	ADC resolution	16 bit
	Sampling time	80 ms (rejection 50 Hz)
	Environmental limits	-20 ÷ 60 °C
	Protection	IP 54
	Standards / Approvals	CE Mark
	Weight	1,05 Kg
	Dimensions	185x150x55 mm
	Mounting	Threaded bushing allows mounting to standard photographic tripods

Interfaces	*On instrument*	*External*
12VDC power jack	Waterproof jack	AC adapter wall power cube (90÷230 VAC – 50÷60Hz)

Hot wire anemometer

Compliance to ISO7726 standard (STRESS class) excluding omni-directional feature (300° arc) and the accuracy in the range 0-1 m/s. Air speed is measured every 100 ms, output of the sensor is the average air speed (va) every one second.

Order numb.	**ESV125**	
Air speed	*Principle*	Hot wire
	Range	0.01÷20 m/s
	Accuracy *Calibration >0,5 m/s* *(10÷30 °C), (1013 hPa)*	0÷0.5 m/s = na 0,5÷1.5 m/s = 10 cm >1.5 m/s= 4%
	Output	Average over 1 sec measurements
	Resolution	0,01 m/s
	Response time	10 Hz

Cup anemometer

For wind speed measurement in outdoor applications.

Order numb.	**ESV125**	
Wind speed	*Principle*	Relay Reed
	Range	0÷75 m/s
	Accuracy	2,5%
	Threshold	0,5 m/s

Verification probe

Connection to the RS232 port of the Heat Shield base module. It verifies if the measurements coming from the Heat Shield sensors are within the accuracy requirements of the ISO7043 standard. This procedure assesses the whole measurement chain from Heat Shield electronic part, to the sensitive elements (Ta, Tg, Tnw) response.

Order numb.	**EST100**	
Temperature	*Principle*	Pt100
	Range	0+50°C
	Accuracy	0,01 °C
	Calibration certificate (included)	ACCREDIA (ISO17025)