indoor

General Catalog

Systems

Thermal Environment monitoring systems

LSI LASTEM

Milano
ITALY

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> thermal environments

Thermal Environment monitoring systems

Data logger, sensors and software for comfort, heat stress and cold environments evaluation.

Since the 1970s, LSI LASTEM designs and manufactures a class-leading range of monitoring system to evaluate thermal environmental quality and the comfort of its occupants. Our systems consist of specialized, high-end instruments to assess thermal environmental properties and a device for data acquisition/display and real-time calculation of the most relevant comfort indexes. The system is completed by a state-of-the-art software suite for the most comprehensive thermal analysis available on the market: complete ISO indexes determination and easy creation of complete thermal-comfort projects and reports.

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Applications

- Heat stress monitoring in workplaces (WBGT and PHS indexes), to evaluate operative thermal conditions and define working exposure/rest times.
- Thermal stress monitoring in cold environment for indoor and outdoor workplaces to adjust clothing level and exposure times.
- Comfort monitoring in workplaces to determine optimal thermal conditions.
- Monitoring of living environments (houses, buildings) to regulate and optimize the effectiveness of Heating/Cooling systems, resulting thermal comfort and energy saving.

LSI LASTEM

A **better thermal sensation** increases health, productivity and human performance

Portable equipment to monitor leaving and working thermal environments

Portable thermal environment monitoring systems

Highlights

- Comfort (PMV-PPD), Heat (PHS) and Cold (ITR) Stress indexes calculation with TEA software suite.
- Real-time calculation of the following indexes: WBGT, Operative Temperature, Heat index, Percentage of people dissatisfied by Draft, Floor temperature and Radiant asymmetry.
- Performs several measurements in different locations at the same time using radio technology.
- Compatible with a vast catalogue of indoor air quality, light sensors and outdoor meteorological sensors for the design of full, all-in-one environmental monitoring systems.
- Few minutes for system installation and set-up.

The system is composed of a specific set of sensors and a data logger mounted on tripod. The sensors selection is made according to the application: thermal comfort, heat stress or cold stress. Some indexes (including WBGT, Heat index, Operative Temperature and Percentage of people dissatisfied by Draft, Floor temperature and Radiant asymmetry) are calculated on-line by the data logger. More indexes, requiring complex calculations, are determined with TEA (Thermal Environments Application) software suite. For data logging, LSI LASTEM offers two different solutions. With the compact M-Log, all sensors are linked via cable; the flexible R-Log, supports both cable and radio connection. With R-Log, monitoring capabilities are virtually endless: managing a very high number of sensors and monitoring several locations at the same time becomes easy and time-effective.

Main Features

Multi-measurement system

LSI LASTEM monitoring systems support a vast catalogue of sensors, not only for thermal environment applications, but also for complete indoor environmental quality (IEQ) analysis – such as gas concentration, light and radiometric quantities.

Radio system

R-Log data loggers support both cable and radio connection, with virtually endless capability in terms of number of sensors managed. The distance between radio sensors and R-Log is up to 500 m (line-of-sight). With R-Log, managing a very high number of sensors and monitoring several locations at the same time becomes easy and time-effective.

Short- or long-term measurements

Schedule data acquisition according to your own needs: choose one long survey in a single location or many short surveys in different places. Our data loggers support a multi-survey logic and you can set specific markers on your data to facilitate post-processing.

TEA software suite

LSI LASTEM TEA (Thermal Environment Application) is a state-of-the-art software suite designed for the most comprehensive thermal analysis available on the market. With the 3 specific modules of TEA (Moderate/Hot/Cold environment) you can easily carry out ISO index calculations, generate thermal-comfort projects and reports, perform simulations and organize records and results in the database.

TEA calculator

The TEA software suite offers a quick index-calculator. With this tool, you can easily calculate different indexes using simulated quantities (instead of actual measurements) in order to verify how the results can change, editing values and perform sensing analysis.

PC Communication

At any time, after or during the survey, you can connect the system to a PC to download data and perform index calculation. You can directly download data via cable or connect the system to a remote host with a GSM modem. The latter case allows the user to design stand-alone systems and to access data without the need to be present in the remote measurement location.

KIT 1.0: Portable Thermal Environment system

Type of data logger: M-Log. This system, in combination with TEA software suite, calculates the following indexes: PHS (heat stress, ISO7933), PMV-PPD (comfort environments, ISO7730) and ITR (cold environments, ISO11079). To add WBGT index (ISO7243) calculation, just include a wet bulb temperature ESU121 sensor to your purchase (when using the system for WBGT calculation, the hot-wire anemometer has to be disconnected).

KIT 1.1: Radio Portable Thermal Environment system

Type of data logger: R-Log. This system has the same basic features of KIT 1.0, but Thermohygrometer, Black globe thermometer and wet bulb thermometer are connected via radio to the data logger. This leaves 3 more free inputs extra cabled sensors, such as hot wire anemometer (ESV106), needed to calculate Draft Rate index (ISO7730), Net radiometer, needed to calculate people dissatisfied by Radiant asymmetry index (ISO7730), or floor temperature sensor (EST130), needed to calculate people dissatisfied by Floor temperature index (ISO7730).

Code	Description	KIT 1.0	KIT 1.1
	Data logger		
ELO510M	R-Log data logger MASTER. 5 inputs Connection to sensor by radio and cable		●
ELO009	M-Log data logger. 5 input Connection to sensor by cable	●	
	Radiant temperature		
EST131	Black globe thermometer, by cable	●	
ELR205	Black globe thermometer, by radio		●
ELA130	Connection cable between ELR205 and ESU121 sensors		●
	Wet bulb temperature natural ventilated		
ESU121	Wet bulb thermometer	Note 1	●
	Air temperature		
EST003	Air thermometer		
	Air temperature and Relative Humidity		
ELR200	Thermohygrometer, by radio		Note 4
DYA235	Radiant screen with forced ventilation for ELR200 sensor		Note 5
ESU403.1	Thermohygrometer (capacitive hygrometer) by cable	●	●
ESU102	Thermohygrometer (psychrometer) by cable	Note 2	Note 2

continued

Code	Description	KIT 1.0	KIT 1.1
	Air speed		
ESV107	Hot wire anemometer, by cable	●	●
ESV106	Hot wire anemometer by cable. Turbulence measurement	Note 3	Note 3
ESV307	Hot wire anemometer, by cable. RS-232 output		
ESV306	Hot wire anemometer by cable. Turbulence measurement. RS-232 output		
	Local discomfort sensors	Note 8	Note 8
ESR231	Net radiometer. Permits calculation of the people dissatisfied by Radiant asymmetry index (ISO7730). Uses n.2 inputs		
EST130	Floor temperature sensor. Permits calculation of the People dissatisfied by Floor temperature index (ISO7730).		
	Accessory		
BSC015	220Vac-12Vdc power supply, battery charger	●	●
BSV304	Tripod	●	●
BVA305	Arms for sensors and data logger on tripod	●	●
BWA315	Carrying case	●	●
BWA316	Carrying case		●
BWA048	Soft bag for tripod and arms	●	●
	Modem GSM	Note 9	Note 9
DEA718	GSM modem		
BSZ313	GSM connection cable		
	PC programs		
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 6	Note 6
	Calibration certificates	Note 7	Note 7
DZC401S	Hot wire anemometer calibration certificate: ISO type		
CSIT.9	Hot wire anemometer calibration certificate: ACCREDIA type		
CSIT.T10	EST003 thermometer calibration certificate: ACCREDIA type		
CSIT.T15	ESU403.1 or ELR200 thermohygrometers calibration certificate: ACCREDIA type for temperature and ISO for Relative humidity		
CSIT.T20	EST131, EST205 thermometer calibration certificate: ACCREDIA type		
CSIT.T25	ESU102 thermohygrometer (psychrometer) calibration certificate: ACCREDIA type		

Note 1 Add it when WBGT (ISO7243) index calculation is required. When using the system for WBGT calculation, the hot-wire anemometer has to be disconnected..

Note 2 Alternative to ESU403.1 when it may be required the RH% measurement using psychrometric method

Note 3 Alternative to ESV107 when it may be required the air speed and Turbolence measurement to calculate Draft Rate (ISO7730) directly by the data logger

Note 4 Using ELR200 and ELR205 sensors by radio,) data logger has three free inputs for cabled probes. However, if you opted for a cabled thermohygrometer (ESU102 or ESU403.1), only one free input will be available.

Note 5 Accessory used with ELR200 sensor in applications with high radiant sources (such as direct exposure to sunlight).

Note 6 Add it when Cold Environments indexes are required. To calculate ITR index, make sure Black globe thermometer, Thermohygrometer and hot wire anemometer sensors are included in your kit.

Note 7 All sensors are supplied with a test report. Specific calibration certificates (ISO and ACCREDIA type) are available for every parameter.

Note 8 Questi sensori misurano indici di discomfort localizzato, verificare se il set di sensori scelti permette la misura in contemporanea della soluzione scelta e di uno o entrambi questi sensori, se non possibile queste misure dovranna essere eseguite in un momento diverso.

Note 9 Opzionale. E' possibile collegare il data logger M-Log e R-Log via modem al PC. Il programma (3DOM) incluso con l'apparecchio permette il collegamento e lo scaricamento dei dati anche via modem.

From the leading authority in Thermal Environment Analysis

HEAT SHIELD – THE LATEST IN HEAT STRESS PROTECTION

Fully adherence to **ISO7243** "Estimation of the Heat stress on working man based on WBGT index"

Heat Shield - Portable wireless WBGT meter

Heat Shield
Portable wireless WBGT meter

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).

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Some of the customers who choose our systems:

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