

Globothermometer: sensor for analysing thermal environments

 The LSI LASTEM technical pills



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The key role of the globethermometer

The **globethermometer** is a fundamental sensor for **measuring the temperature of the black globe**, a necessary parameter for estimating the mean radiant temperature (T_{mrt}). Average Radiant Temperature is the net amount of radiant heat lost or received by the human body that corresponds to the algebraic sum of all radiant fluxes exchanged by its exposed parts with the various surrounding heat sources. The latter therefore represents a measure of primary importance in the control of the human energy balance. The Globethermometer, compliant with the ISO7726:2002 standard, is composed of a copper sphere painted with a special black paint with an emissivity of approximately 0.95, therefore with high absorption, with a diameter of 150 mm and a thickness of 0.4 mm, inside which it houses a centrally positioned thermometer.

Specific models for different applications

LSI LASTEM, a leading company in the environmental monitoring sector, offers **two** distinct **models** of Globethermometer: one designed for **outdoor use** and the other dedicated to **indoor applications**. The difference in use reflects the versatility of this instrument in meeting specific needs in different environments.

Calculation of the average radiant temperature and microclimate indices

The **mean radiant temperature** (T_{mrt}), a key parameter for numerous microclimatic indices, is determined through two distinct formulas (in relation to the air speed). These formulas consider the difference between the temperature of the black globe and that of the air, also taking into account the speed of the air (if greater than 0.1 m/s). The formula necessary to calculate this essential parameter is integrated into the LSI LASTEM data loggers.

All **microclimate indices**, based on the heat balance equation between the individual and the environment, both in moderate and severe contexts, include the **thermal power exchanged by radiation** (R). The human body, in fact, absorbs and emits thermal radiation in the form of electromagnetic waves. Heat transfer through radiation depends on the surface area of the human body, its emissivity and the difference between the individual's skin temperature and the average radiant temperature. In the **heat balance between the individual and the environment**, the following environmental **variables are relevant: temperature, humidity, air speed and average radiant temperature**.

Using the LSI LASTEM data loggers it is possible to calculate the following indices using the globe temperature parameter:

- Average radiant temperature with natural/forced ventilation (ISO7726);
- Operating Temperature (ISO7726);
- WBGT index with and without solar load (ISO7243);
- Universal Thermal Climate Index (UTCI).

EST131 and DMA131 to evaluate the indoor and outdoor microclimate

Thanks to the **EST131** (for **indoor** environments) and **DMA131** (for **outdoor** environments) **sensors**, it is possible to calculate different microclimate indices. These instruments are essential for indoor microclimatic applications, for example to evaluate **comfort** and **heat stress** in **enclosed workplaces**. In **outdoor applications**, on the other hand, black globe temperature measurement finds its most common use in **monitoring hot heat stress** in public places such as parks, stadiums and sports facilities or outdoor work situations. This is to warn users of potential health risk situations or for research purposes.

In conclusion, the **Globethermometer** represents an **essential** tool **for monitoring thermal environments**, offering tailor-made solutions for indoor and outdoor applications. LSI LASTEM, with its range of specialised sensors, confirms itself as a reliable partner for the optimal management of environmental comfort and in particular of thermal environments.