THERMAL RADIATION STUDY GROUP

REFERENCE : ET1030

Non contractual photo

SERVICE :

WEIGHT : ~15 KG

The thermal exchange of a body with its environment also takes place through the emission and absorption of heat radiation. The radiation emitted by a body depends on its temperature and surface qualities, as can be seen with a Leslie cube.

Educational Objectives :

Using the radiation sensor and radiant cube:

- Heat radiation of a Leslie cube with a thermopile according to Moll
- Measure of the relative intensity of radiation emitted for the four surfaces of the cube as a function of temperature T
- Confirmation of correlation of T4 with radiation intensity

Using the radiation sensor and emission lamp:

- Confirm the dependence of radiation intensity on T4

It will be possible to practice:
. Measure the relative intensity of the radiation from a tungsten filament lamp with a thermopile according to Moll as a function of temperature.

. Measure the filament temperature-dependent resistance to determine the temperature.

. Represent the measurement values in a diagram ln (Uth) - ln (T) and determine the exponents from the slope of the line.

Technical specifications :

The intensity of radiation emitted by the body under study is designated by emissivity E. The absorption power A is the ratio between the intensity of absorbed radiation and that of incident radiation. The absorption coefficient is particularly high when emissivity is also high. More precisely, Kirchhoff's law says that for all bodies at a given temperature, the radiation emitted corresponds to the radiant energy which can be absorbed, and that it corresponds to the ESB emissivity of a black body at this temperature.

The experiment is carried out with a Leslie cube with four different radiant surfaces: white, black, matt aluminium and polished aluminium. The cube is heated to approximately 120°C and then measured with a Moll thermal probe. The measured values for the four surfaces of the cube are recorded during the entire cooling process up to room temperature.

The dependence of the radiation intensity of a black body on temperature is described by the Stefan-Boltzmann law. The intensity of a tungsten filament incandescent lamp has the same temperature dependence. In the experiment, it is determined with a thermopile according to Moll during a relative measurement. The filament

temperature can be determined from the temperature-dependent resistance, which is calculated with high precision during a four-conductor measurement.

OPTIONS :

Composition: Radiant cube (Leslie cube) with heating Radiation sensor: Thermopile from Moll Accessories