

# Pyrometer

Pyrometers are **non-contact thermometers** that determine the temperature of the measured body from thermal radiation. They mainly measure temperatures in the range of  $-50\text{ °C}$  to  $+3500\text{ °C}$ .

## Principle

The pyrometer **captures and evaluates the electromagnetic radiation** emitted by the measured object. The cause of this radiation is the **internal mechanical movement of molecules**, the intensity of which depends precisely on the temperature of the object. The theoretical basis on which pyrometers work is the **Stefan-Boltzmann law**.

- The black body radiation intensity  $M_e$  is directly proportional to the fourth power of the thermodynamic temperature  $T$  of the black body, i.e.  $M_e = \sigma T^4$ , where the Stefan-Boltzmann constant  $\sigma$  takes on the value  $\sigma = 5.67 \times 10^{-8} \text{ Wm}^{-2} \text{ K}^{-4}$ .

For non-contact temperature measurement, it is necessary to know the emissivity of the object. The emissivity  $\epsilon$  is equal to the ratio of the radiation intensities of a real surface and an absolute black body. It can take values from 0 to 1.0. A shiny mirror would have a value of 0, for example, and a completely black body would have a value of 1.0.



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## Advantages and disadvantages of pyrometers

### Benefits include:

- measurement speed
- the possibility of measuring even moving objects
- easy temperature measurement in hard-to-reach places
- trouble-free measurement of very high temperatures
- the measured object is not affected
- the measurement takes place without the risk of contamination and mechanical effects on the surface of the object being measured

### Disadvantages include:

- the measured object must be optically visible to the thermometer
- solid obstacles only allow surface measurement (not internal temperature)
- the need to protect the sensor from dust and condensing liquids
- only the surface temperature of the materials is measured and their emissivity must be taken into account

## Links

### Related articles

- Temperature measurement
- Temperature measurement/Catalog of methods in biophysics
- Measurement and assessment of body temperature

### Source

<https://cs.wikipedia.org/wiki/Pyrometr>

[http://www.allforpower.cz/UserFiles/file/termokamery\\_1.pdf](http://www.allforpower.cz/UserFiles/file/termokamery_1.pdf)