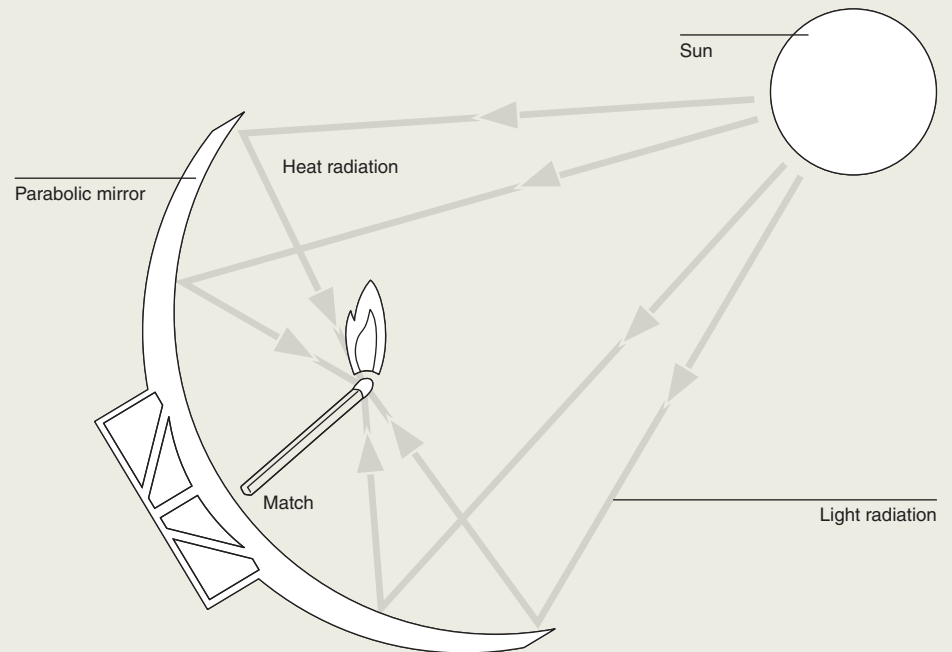


What is heat radiation?

Principles

It is a well-known fact in daily life that all bodies emit electromagnetic waves, or radiation, depending on their temperature. During dispersion of the radiation, energy is transported, a fact which means that radiation can be used to measure body temperature without contact. The radiated energy and its characteristic wavelengths are primarily dependent on the temperature of the radiating body. If, for example, you point a parabolic mirror with a match directly towards the sun, then it will ignite after a short period of time. This is because of the heat radiation from the sun, which is concentrated by the parabolic mirror onto a point.

Example of heat radiation



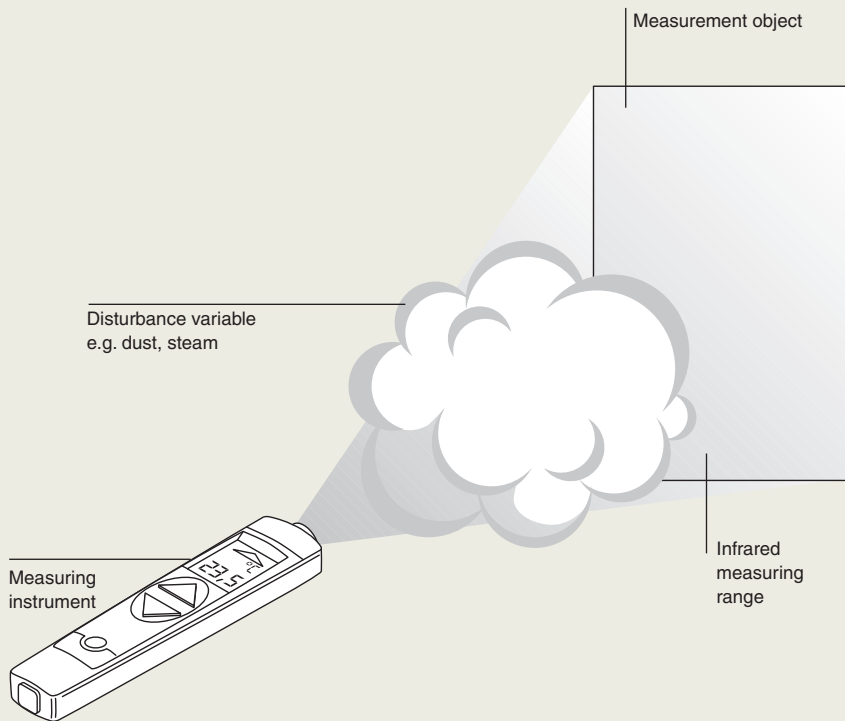
Advantages of IR measuring technology

- > Infrared measuring technology enables simple temperature recording of fast, dynamic processes. This is assisted by the short reaction time of sensors and systems.
- > No influence on the object being measured means that measurements can be performed on sensitive surfaces and sterile products, just as well as measurements on hazardous points or points that are difficult to access.

Infrared thermometers are particularly suitable for:

- > Poor heat conductors, such as ceramics, rubber, plastics etc. A probe for contact measurement can only display the correct temperature if it can take on the temperature of the measured body. In the case of poor heat conductors, this is not usually the case and/or the response times are very long.
- > Determining the surface temperature of gears, housings and bearings in large and small motors.
- > Moving parts, e.g. running paper webs, running sheet metal tracks etc.
- > Parts which cannot be touched, e.g. freshly painted parts, sterile parts or for corrosive substances.
- > Measuring very small and very large areas.
- > Live parts, e.g. electrical components, conductor rails, transformers etc.
- > Small and low-mass parts from which a contact probe would remove too much heat thus resulting in incorrect readings.

Applications and practical tips



Emissivity table of important materials

Material	Temperature	E
Aluminium, bright-rolled	170 °C	0.04
Cotton	20 °C	0.77
Concrete	25 °C	0.93
Ice, smooth	0 °C	0.97
Iron, polished	20 °C	0.24
Iron with cast skin	100 °C	0.80
Iron with rolled skin	20 °C	0.77
Gypsum	20 °C	0.90
Glass	90 °C	0.94
Rubber, hard	23 °C	0.94
Rubber, soft grey	23 °C	0.89
Wood	70 °C	0.94
Cork	20 °C	0.70
Heat sink, black anodised	50 °C	0.98
Copper, lightly tarnished	20 °C	0.04
Copper, oxidised	130 °C	0.76
Plastics (PE, PP, PVC)	20 °C	0.94
Brass, oxidised	200 °C	0.61
Paper	20 °C	0.97
Porcelain	20 °C	0.92
Black paint (matt)	80 °C	0.97
Steel (heat-treated surface)	200 °C	0.52
Steel, oxidised	200 °C	0.79
Clay, fired	70 °C	0.91
Transformer paint	70 °C	0.94
Brick, mortar, plaster	20 °C	0.93

Error sources with infrared measurement

In the case of non-contact temperature measurement, the composition of the transmission path between the instrument and the object being measured can also have an effect on the measured result.

Disturbance variables include, e.g.

Dust and dirt particles
Moisture (rain), steam, gases

> Only measure if there are no disturbing variables

Incorrectly set emissivities can lead to significant errors.

> Set emissivity using emissivity table or check via contact probe. A coating e.g. paint, oil or emission adhesive tape with a defined emissivity must be applied to the object being measured in the case of non-contact measurement on objects with low emissivity.

The temperature differential between the thermometer and ambient air can lead to significant errors

> If possible, store the instrument in the place where the measurement is to be performed. This will avoid the problem of adjustment time (but observe instrument operating temperature).

IR measurement is a purely optical measurement:

> Clean lens is essential for accurate measurement.
> Do not measure with fogged-up lens, e.g. due to steam

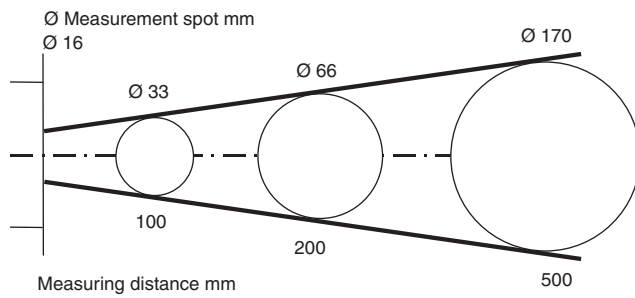
IR measurement is surface measurement

> Always make sure that the surface is clean. If there is dirt, dust, grime etc. on the surface, only the top layer will be measured.
> Do not measure at occlusions (e.g. in packaging)

Distance between IR measuring instrument and object being measured too far - measuring spot is bigger than object.

> Keep distance between instrument and object being measured as small as possible.

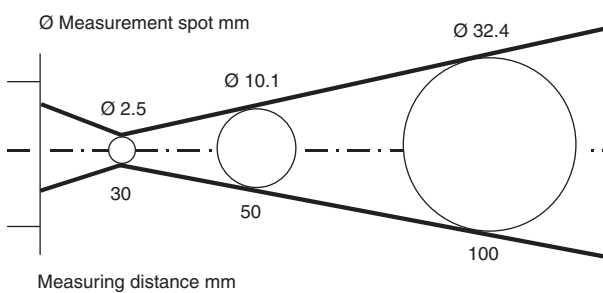
Measurement spot and distance from object being measured



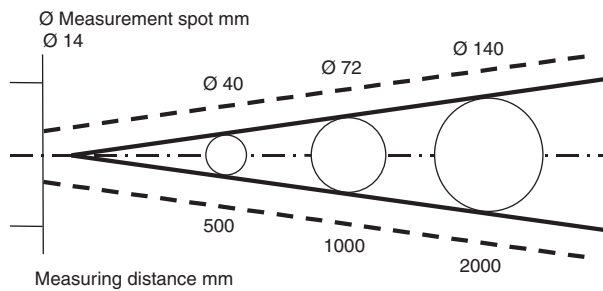
testo 825-T1 / -T2 / -T3 / -T4

testo 826-T1 / -T2 / -T3 / -T4

Ratio of measuring distance to measurement spot 3:1

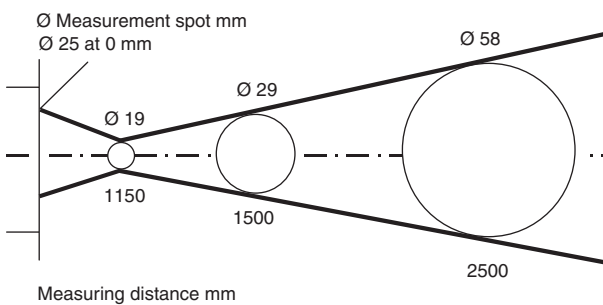


testo 850-1



testo 850-2

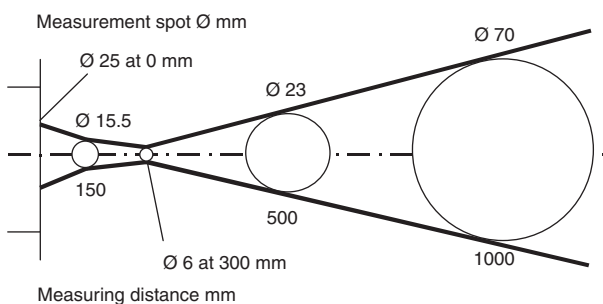
Ratio of measuring distance to measurement spot 12:1



testo 860-T1 / -T2

Near field 60:1

Far field 35:1



testo 860-T3

Near field 50:1

Far field 12:1