

Emissivity

What it is and why it matters

What is emissivity?

All surfaces emit infrared radiation. The amount of energy they emit depends on their temperature and emissivity.

To accurately measure the temperature of a surface, the infrared sensor needs to know how much of the energy it is “seeing” has been emitted from the surface as a result of the object’s temperature, and not reflected from the surface, or transmitted through it.

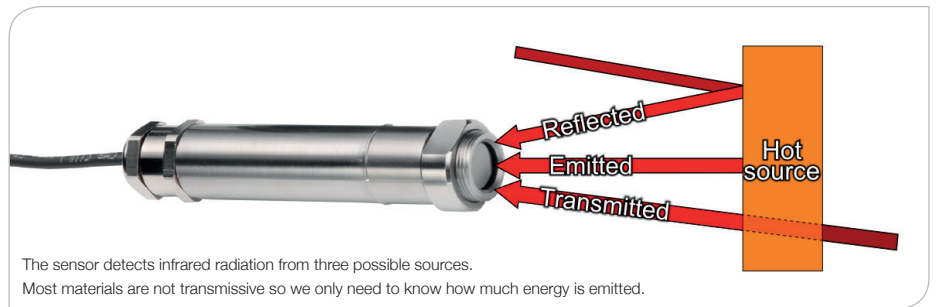
The emissivity of a surface is a measure of how effectively a surface emits infrared radiation.

The sensor’s emissivity setting should be set to match the emissivity of the target surface for maximum accuracy.

Transmissive materials

Most materials do not transmit any infrared radiation, so we can assume all the energy the sensor detects has been either emitted or reflected.

Transmissive materials are a special case. See below for more information.



How to adjust the emissivity setting

The emissivity setting can be adjusted in a different way for each type of sensor:

PyroMini and FibreMini

Via the touch screen, Modbus, or two rotary switches in the electronics module, depending on the model.

PyroEpsilon

Via the 4-20 mA input.

PyroUSB and PyroMiniUSB

Via USB using the included cable and software.

PyroBus and PyroMiniBus

Via the Modbus Master.

ExTemp

Via the optional USB adapter and software.

PyroPen L & U

Via push-buttons on the unit.

PyroCouple

The emissivity setting is fixed at 0.95 and cannot be adjusted.

PyroNFC

Via NFC using the smartphone app

High emissivity materials

e.g. painted or very dirty surfaces, food, rubber, thick plastics, paper, glue, asphalt

A surface with a high emissivity is easy to measure with a low-cost, general-purpose sensor. In this case, reflections are minimal.

Note: The colour of a surface does not usually affect the emissivity much.



Up to 1000°C: Low-cost 8 to 14 μm sensors such as the PyroCouple and PyroMini give good results.

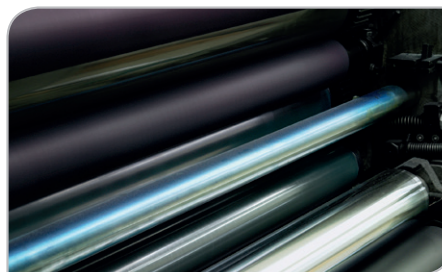
It is also possible to use a 2.2 μm sensor such as the PyroUSB 2.2 above 45°C.

Low emissivity materials

e.g. clean, bare, reflective metal surfaces including iron and steel

Reflective surfaces have a low emissivity and are more difficult to measure accurately.

If the emissivity is known, it is possible to achieve a good reading from a bare metal surface using a short-wavelength sensor.



If it is possible to paint the surface, you can use a low-cost 8 to 14 μm sensor such as the PyroCouple, PyroNFC or PyroMini.

Otherwise, try a short-wavelength sensor such as the PyroUSB 2.2 or PyroMini 2.2.

Some metals, most commonly aluminium and copper, are very difficult to measure. Contact Calex for advice.

Transmissive materials

e.g. thin film plastics, silicon

A small number of materials, such as thin film plastics and silicon, transmit most wavelengths of infrared energy. If the plastic film is thinner than about 1-2 mm, general-purpose IR sensors could “see” through it.



Transmissive materials are difficult to measure. A specialised sensor may be required to achieve a good reading.

Contact Calex for advice.

For more advice on emissivity, including how to measure the emissivity of a surface, see the Guide to Infrared Thermometry on our website, or contact us for help and guidance about a specific application.