

MEASURING OBJECTS SMALLER THAN THE FIELD-OF-VIEW

For some non-contact temperature monitoring tasks, the object to be measured is too small to adequately fill the field-of-view of one of the IRt/c models. The monitoring can still be successfully performed if two conditions are met:

- The object size and distance from the IRt/c are constant.
- The area surrounding the object within the field-of-view of the IRt/c has a repeatable temperature.

The signal produced by the IRt/c represents the average temperature within its view. Accordingly, the signal can be represented by the equation:

$$T = (T_t A_t / A) + (T_s A_s / A)$$

where T is the output signal, T_t the target object temperature, A_t the target object area, T_s the surroundings temperature, A_s the surroundings area as seen by the IRt/c, and A the total area seen by the IRt/c.

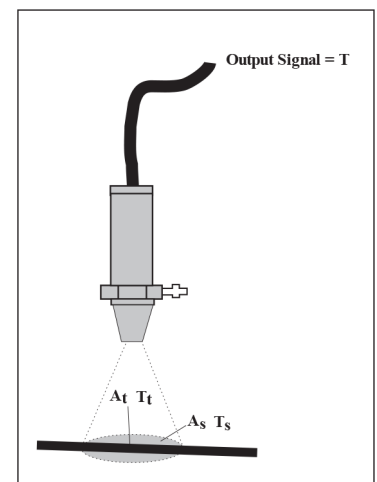
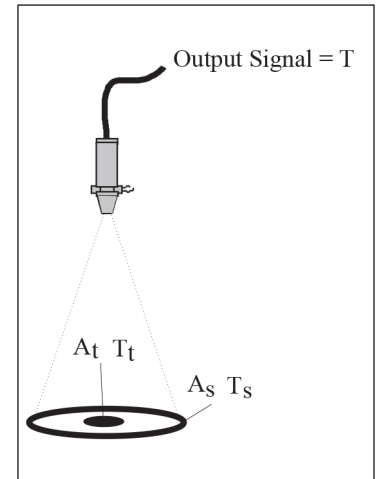
For example, to measure the temperature of a thin rubber strip 0.1" (2.5 mm) wide moving continuously 1" (25 mm) away from an IRt/c.2, at a temperature expected to be about 200°F (93°C), and a surrounding temperature at 80°F (27°C). At 1" (25 mm) distance, the IRt/c.2 spot size will be approximately 0.5" (13 mm).

Computing the results for the equation gives:

$$T = (200)(.5)(.1) / [\pi(.25)^2] + (80)[\pi(.25)^2 - (.5)(.1)] / [\pi(.25)^2]$$

This result shows that the average signal will be 31°F (17°C) above the surroundings temperature, compared to an actual object temperature of 120°F (67°C) above surroundings, or approximately one-fourth, which is the ratio of object area to surroundings area measured. Therefore, if the surroundings are expected to be repeatable to 1°F (.6°C), the IRt/c signal will be repeatable to 4°F (2°C). For the final display on a controller, or other read-out device, calibrate in standard fashion by using the available offset adjustment. If the object is to be controlled over a wide range of temperatures, calibrating with a span adjustment will yield greater accuracy.

If the target temperature falls within the range of one of the LoE models, the LoE model should be used, even if the target is not metallic. Since a small target results in the same radiation mathematics as low emissivity, a LoE model will reduce errors due to size change and positioning by a factor of approximately 4. See Tech Note 59.



Exergen Global offices:

The Netherlands
Pastoor Clercxstraat 26
5465 RH Veghel
Tel: +31(0) 413 37 65 99
Fax: +31(0) 413 37 93 10

USA
400 Pleasant Street
Watertown, MA 02472
Tel: +1 617 649 6322
Fax: +1 617 923 9911

office@exergenglobal.com
www.exergenglobal.com