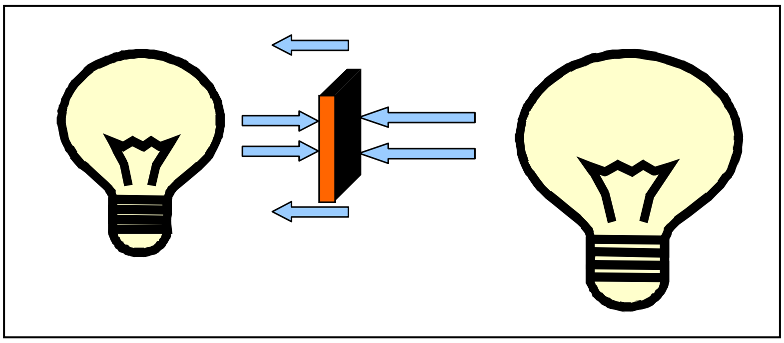
Radiant Flux Sensor

- 'Double sided' radiant flux sensors are based on **c**omparing the W/m^2 produced by the radiant sources influencing the two sides of their sensing area (independently from radiation emitted by their sensing area). If suspended in the air between two lamps, the sensor 'of the type (A-B)' will deliver an electric signal proportional to the difference between the fourth power of their absolute temperature (Stefan Boltzman law $\varphi = \sigma\ (T^4_2 - T^4_1)$ in W/m^2) even if its temperature is continuously changing under the influence of radiation absorption or of energy loss in the air.



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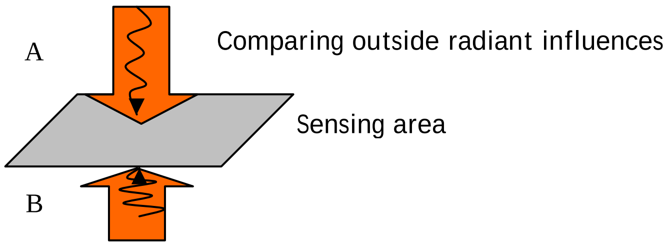
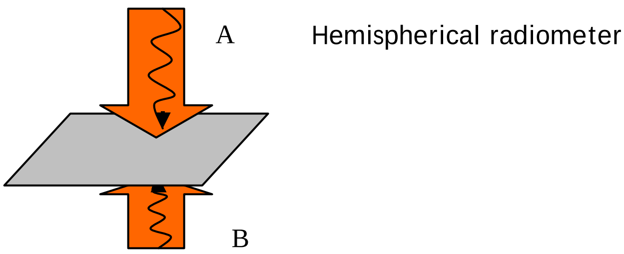


- Double sided devices 'of the type (A-B)' are stripped on their both sides and are capable of sensing radiant flux produced by the radiant sources contained in the 4π environment. These 4π hemispherical radiometer are based on comparing their own emission to the outside radiant influences in W/m^2.



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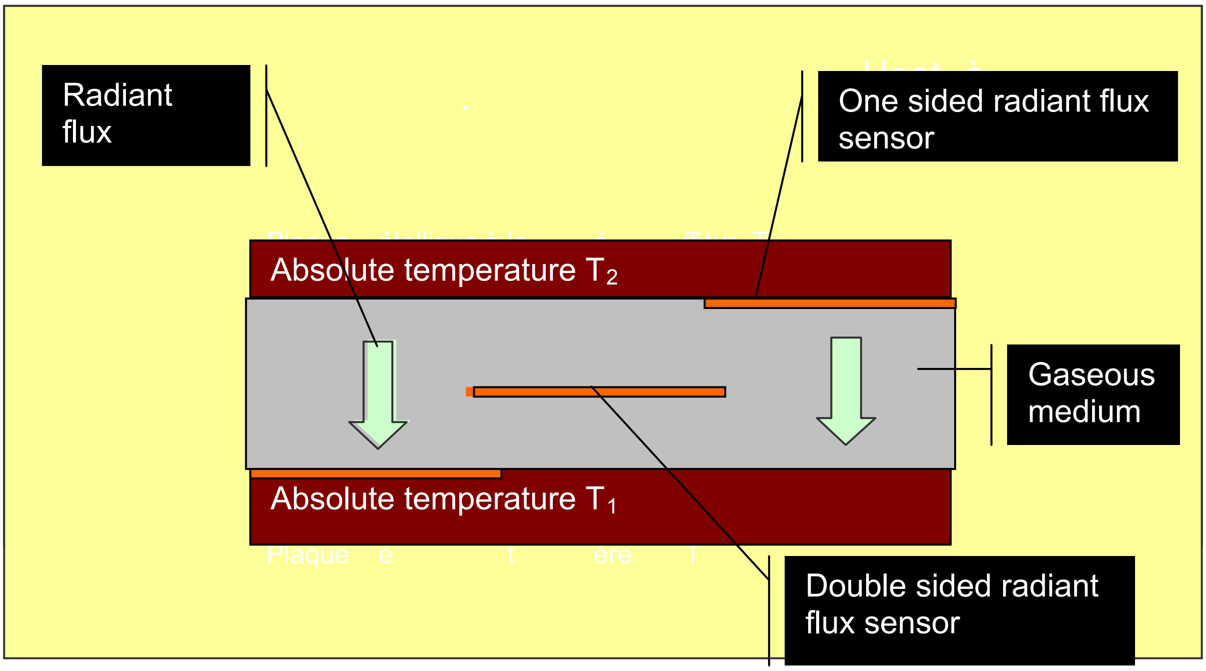
Radiant Flux Sensor

Sensing radiant flux between black surfaces



Radiant flux in the space between the plates, black painted and kept at constant temperature T_2 and T_1, is given by the Stefan Boltzman law $\varphi = \sigma (T^4_2 - T^4_1)$ (if the angle factor is nearly equal to 1). The sensor pasted on the bottom plate kept at the absolute temperature T_1 is capable of comparing the emission of its own sensing area to that of the plate at T_2 and thus to sense radiant flux $\varphi = \sigma (T^4_2 - T^4_1)$; the sensor pasted on the plate at higher temperature T_2 will sense the same radiant flux with a negative sign.

The double sided radiant flux sensor suspended in the space between the plates is capable to sense radiant flux independently from its temperature which can continuously changing.

Sensitivity to radiant flux can be determined in µV/W/m^2 by dividing the sensor reading in µV by radiant flux density $\varphi = \sigma (T^4_2 - T^4_1)$ in W/m^2.

Emissivity comparison

In the case where one of the plate is covered with a paint of emissivity ε, radiant flux in the space between the plates $\varphi = \varepsilon\sigma (T^4_2 - T^4_1)$ is proportional to the paint emissivity ε. The sensor pasted on the bottom plate kept at absolute temperature T_1 will detect radiant flux $\varphi = \varepsilon\sigma (T^4_2 - T^4_1)$ proportional to emissivity ε. If the difference between the fourth powers of the absolute temperature of the plates $(T^4_2 - T^4_1)$ is kept to a constant value, changing the paint emissivity automatically leads to a proportional change in the delivered electric signal. The device can be used as emissivity tester.

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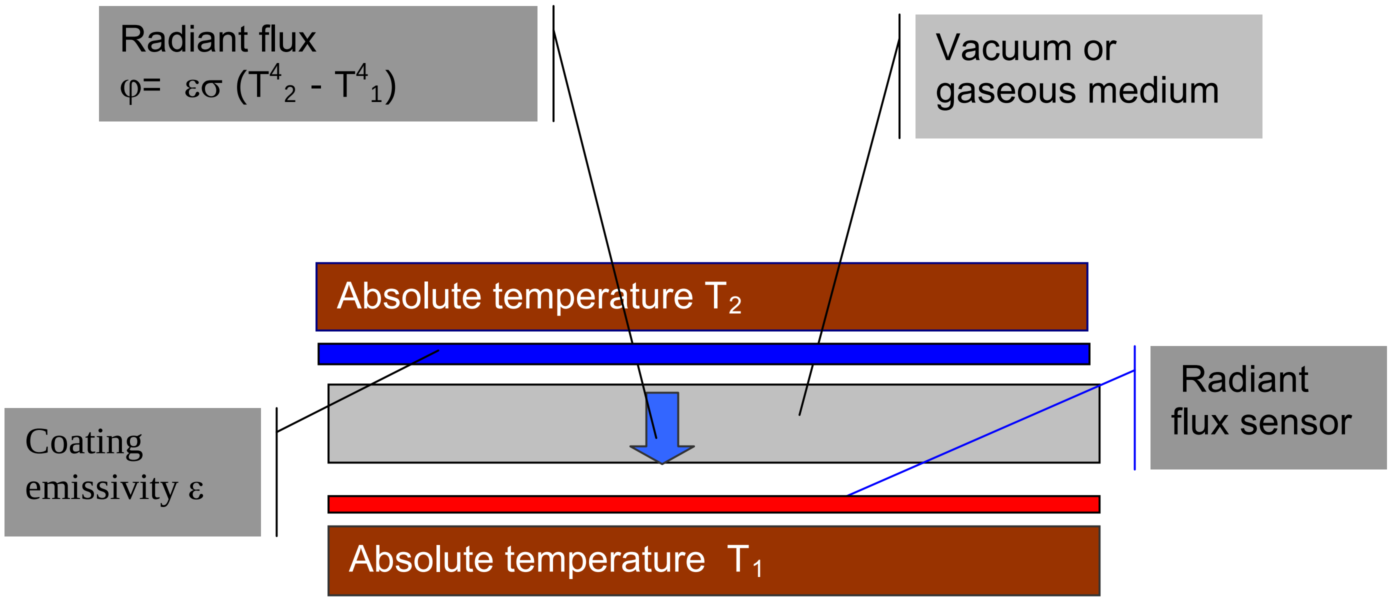
Radiant Flux Sensor



Measuring simultaneously radiant flux $\varphi = \varepsilon\sigma (T^4{}_2 - T^4{}_1)$ and the differences between the fourth power of the absolute temperatures leads to determine o emissivivity of the emitting surface.

Application for controlling the emissivity of IR OVEN

The radiant flux sensors in form of retractable sleeve on its metallic support in form of tube (whose temperature can be measured) is used to sense radiant flux emitted by the oven proportional to emissivity of the emitting surface when the dissipated electric power is kept constant.