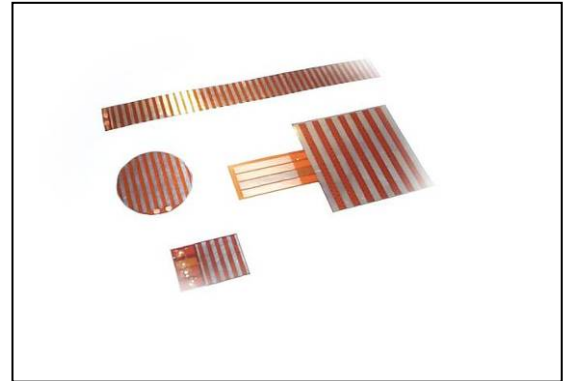


Radiant Flux Sensor

- High sensitivity
- Ultra thin (0,3mm)
- Short response time (30 ms)
- Low thermal and electrical resistance
- Built in T thermocouple
- All sizes and dimensions on request
- Custom made for various special applications
- Flat spectral response



ADVANTAGES

Easy to use: simply connect the terminals to a millivolt or microvolt meter.

Custom tailored for better fit: Size and shape possibilities are unlimited. CAPTEC builds sensors as large as 300*300mm, as small as 5*5mm. You can specify specific shapes to follow the curves of your hardware. Computed aided design produces uniform or profiled heat flux sensing elements to meet your precise needs.

Integral temperature sensor: CAPTEC can furnish heat flux sensors with integral thermocouple built in the sensing area ideal for heat transfer controllers.

Heat flux sensing assembly: As an added service CAPTEC can clamp heat flux sensors to mating metal parts. Our specialised equipment guarantees superior performance.

Ultra thin and low response time: the thinner the sensor is the shorter is the time required to reach its steady state sensor temperature.

Electric resistance: lower than 500 Ohm.

SPECIFICATIONS

Accuracy: Thickness of 0.3 mm

Sensing Area: Up to several square feet (precisely shaped and sized on request)

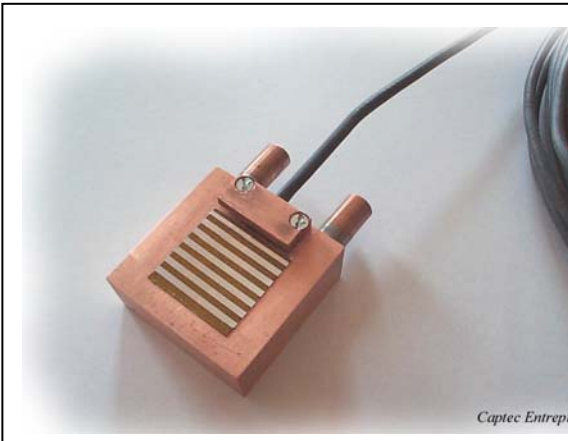
Operating temperature: from - 180°C to 200°C (-330F to 500F)

Input range: - 500 kW/ m2 to 500 kW/ m2

Electrical resistance: About 100 ohms for a sensing area of one dm2 (0.1 ft square)

Radiant Flux Sensor

UTILISATIONS



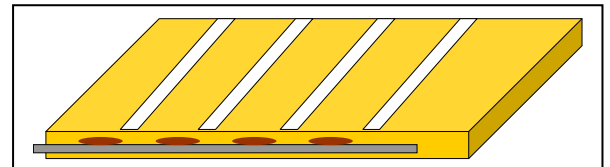
Although radiation is absorbed on the surface of the CAPTEC radiant sensors, radiant flux is measured without intermediary temperature measurement. These devices are based on sensing electrostatic charge distributed by outside radiant influences on the junctions of the planar detector incorporated in their sensing area.

These junctions are formed by the contact between highly conducting electrodes and their continuous metallic support of poor conductivity. They delimit on the continuous support of poor conductivity nearly isothermal and equipotential regions shielded from outside influences by electrostatic charge contained on their contour.

When radiant heat is prevented from reaching one portion of the junction area (by using metallic reflectors are deposited on the sensing area), heat flux lines will incline themselves on the junction area and so there must reside at the electrode ends just the proper distribution of electrostatic charges to be the source of net electric field parallel to the detector surface. Heat flux is converted into electric flux.

Shielding the junctions from outside radiant influences leads to detect radiant flux influencing the sensor area without intermediary transducing step.

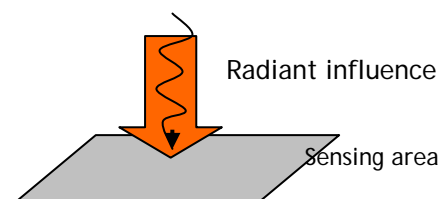
The delivered electric signal independent from the changes in the surface energy balance does not depend on the spectral content of absorbed radiation absorption



Since their introduction by CAPTEC over 10 years ago, radiant flux sensors are used as plane black body radiometers or to sense radiant flux between surfaces at different temperature. Total radiant flux sensors are capable of sensing IR fluxes and solar radiant fluxes with equal sensitivity.

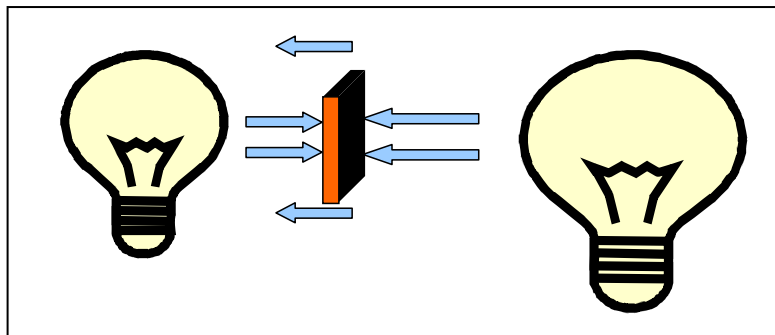
They have demonstrated significant advantage as compared with conventional heat sensors essentially because the interfering changes in the sensor temperature are not detected (the minimum detectable heat flux is very low).

- Standard radiant flux sensors are single sided stripped devices capable of comparing radiation emitted from their own sensing area to that of the sources contained in their 2π environment. They can be suspended in a gaseous medium or surface mounted on the surface of a solid medium.

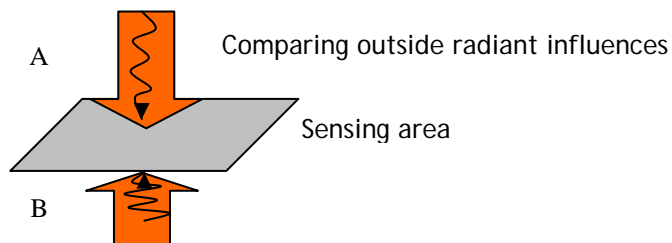


Radiant Flux Sensor

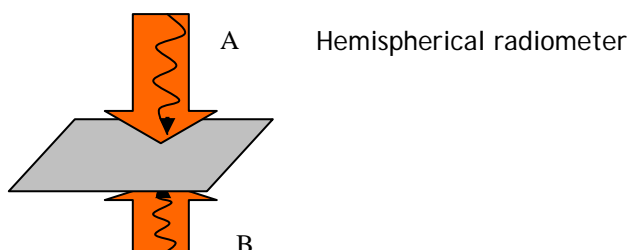
- 'Double sided' radiant flux sensors are based on comparing the W/m^2 produced by the radiant sources influencing the two sides of their sensing area (independently from radiation emitted by their sensing area). If suspended in the air between two lamps, the sensor 'of the type (A-B)' will deliver an 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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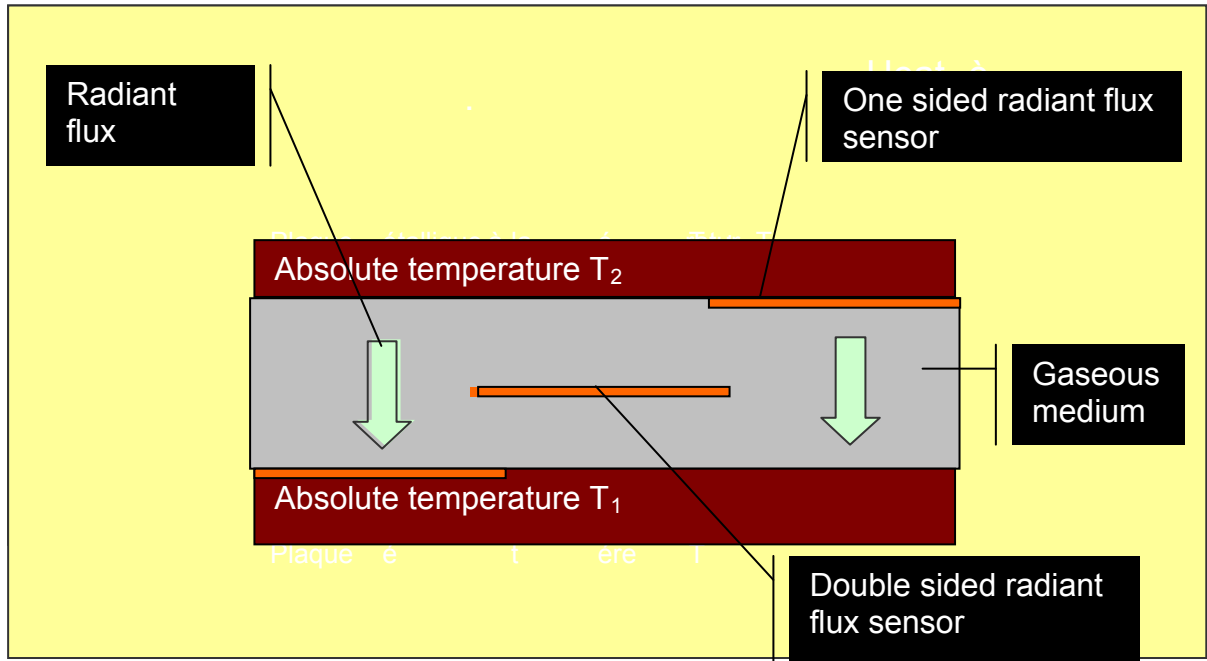


- Double sided devices 'of the type (A-B)' are stripped on their both sides and are capable of sensing radiant flux produced by the radiant sources contained in the 4π environment. These 4π hemispherical radiometer are based on comparing their own emission to the outside radiant influences in W/m^2 .



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 $\varphi = \sigma (T_2^4 - T_1^4)$ (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 $\varphi = \sigma (T_2^4 - T_1^4)$; the sensor pasted on the plate at higher temperature T_2 will sense the same radiant flux with a negative sign.

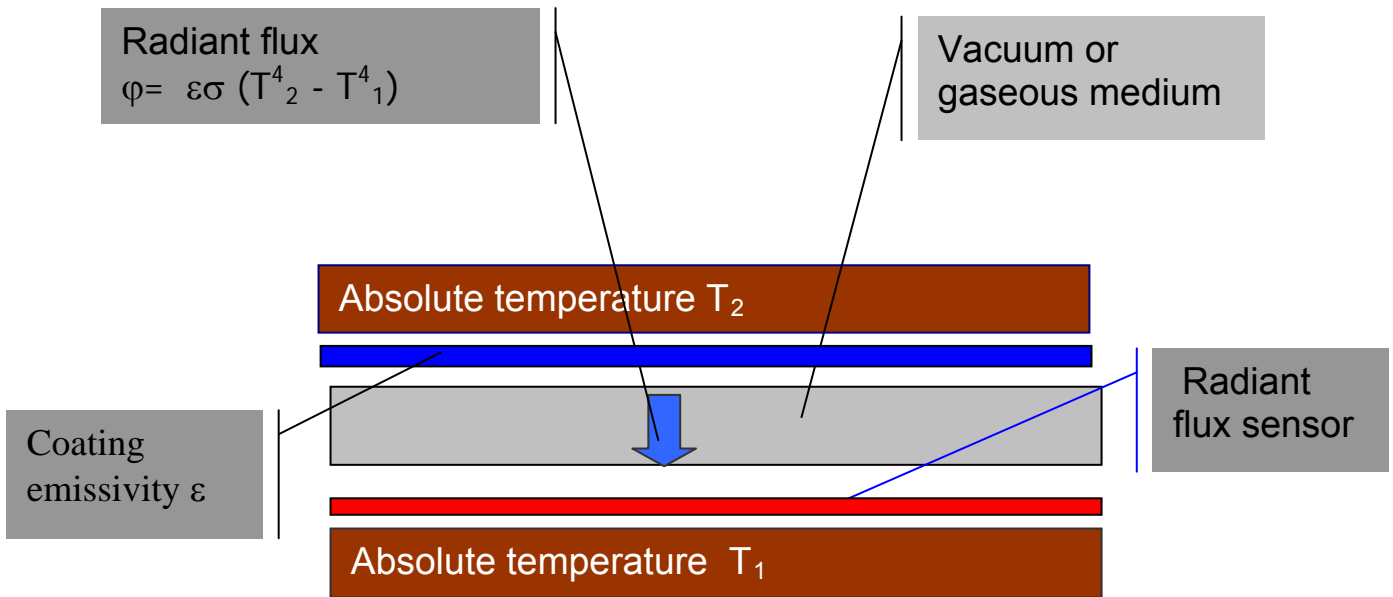
The double sided radiant flux sensor suspended in the space between the plates is capable to sense radiant flux independently from its temperature which can continuously changing.

Sensitivity to radiant flux can be determined in $\mu V/W/m^2$ by dividing the sensor reading in μV by radiant flux density $\varphi = \sigma (T_2^4 - T_1^4)$ 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 $\varphi = \varepsilon \sigma (T_2^4 - T_1^4)$ is proportional to the paint emissivity ε . The sensor pasted on the bottom plate kept at absolute temperature T_1 will detect radiant flux $\varphi = \varepsilon \sigma (T_2^4 - T_1^4)$ proportional to emissivity ε . If the difference between the fourth powers of the absolute temperature of the plates ($T_2^4 - T_1^4$) 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.

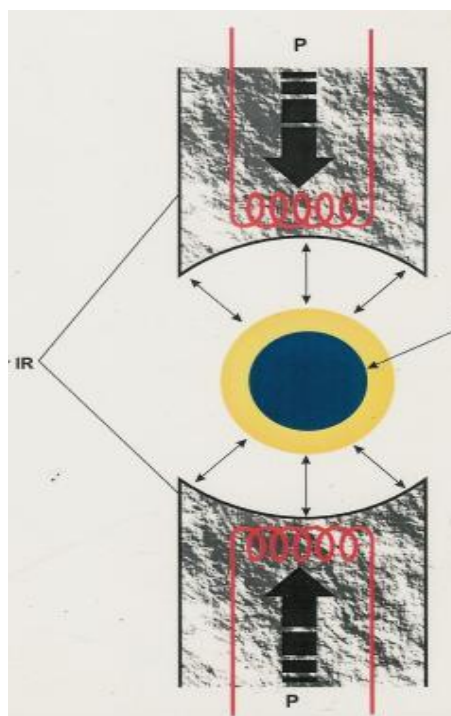
Radiant Flux Sensor



Measuring simultaneously radiant flux $\varphi = \varepsilon\sigma (T_2^4 - T_1^4)$ and the differences between the fourth power of the absolute temperatures leads to determine the emissivity of the emitting surface.

Application for controlling the emissivity of IR OVEN

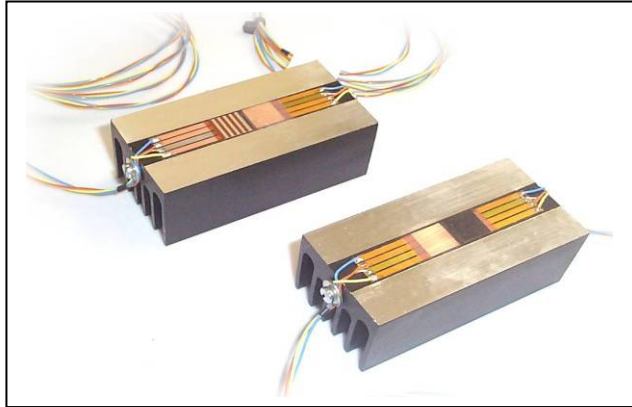
The radiant flux sensors in form of retractable sleeve on its metallic support in form of tube (whose temperature can be measured) is used to sense radiant flux emitted by the oven proportional to emissivity of the emitting surface when the dissipated electric power is kept constant.



Radiant Flux Sensor

Sensing high radiant flux

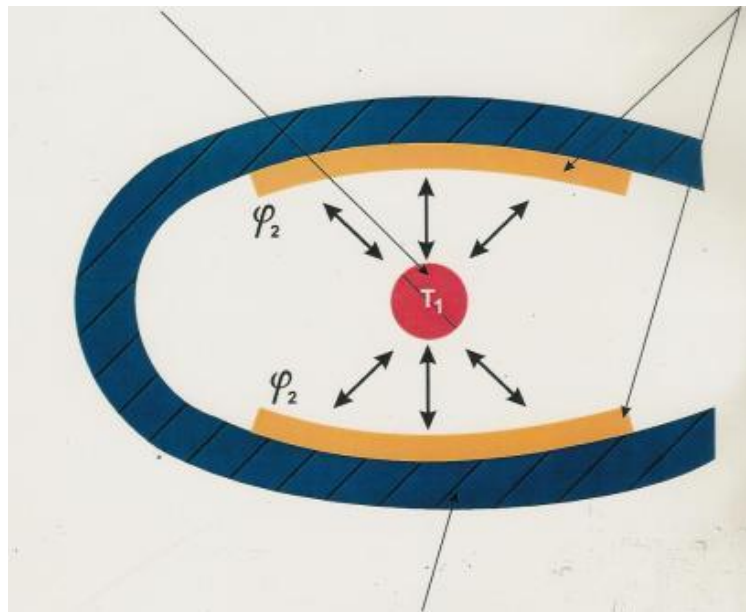
Because radiant flux is measured independently from the combined heat transfer by convection, the sensor response is linear up to several hundred of kW/m^2 , measuring radiant flux is very easy when the response to a unit radiant flux is known. Larger the sensing area, larger the sensitivity (nearly $0,5 \mu\text{V/W/m}^2$ for each additional square cm^2 of sensor area). The important problem encountered in practice is thus to determine how large must be the sensor area to accurately measure an expected radiant flux or a minimum detectable radiant flux. The market demand in devices capable of sensing radiant flux is growing more and



more for the development of energy related applications. CAPTEC radiant flux sensors are designed for that purpose and are capable of sensing radiant flux without glass windows on their sensing area.

When measuring radiant flux, the principle of superposition applies. If radiant flux to be measured is superposed to an original steady radiant flux, the origin value of the sensor reading is not zero and radiant flux to be measured only depends on the change in the sensor reading with respect to the origin value.

Controlling the polymerization of a textile wire in motion



Radiant Flux Sensor

Based on sensing radiant produced by the textile wire in motion on the and the radiant flux sensor bonded on the curved metallic support whose temperature is measured

Sensing radiant emission from a source at a distance

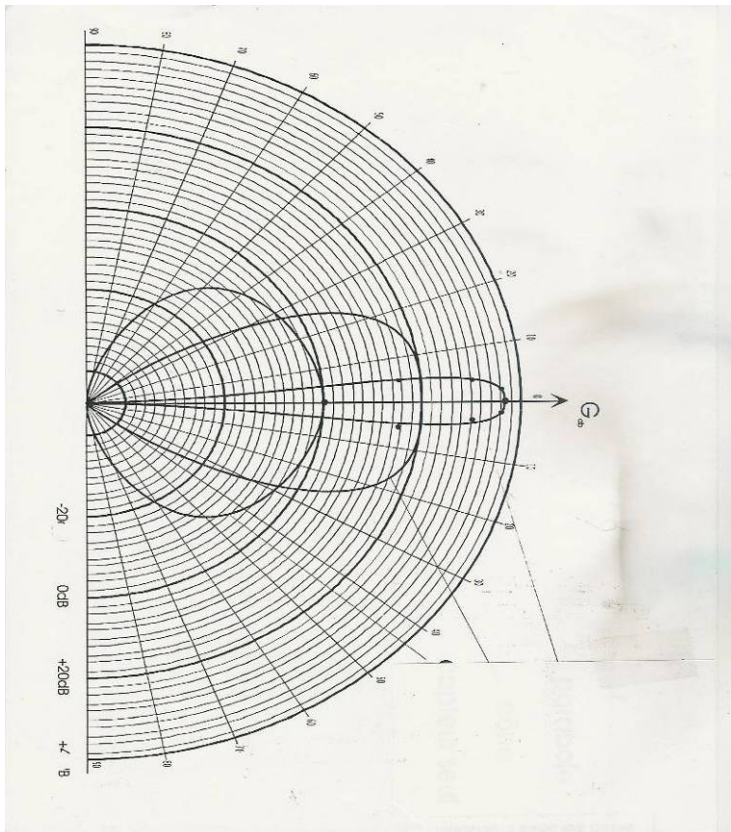
In numerous applications, the sensor mounted on a metallic support is associated to a parabolic reflector to detect at a distance radiant emission from a heated body.



The electric signal delivered by sensor (whose temperature can be measured at every time) depends on the differences between the fourth power of the absolute temperatures of the sensor support and that of the heated body.

Numerous applications (survey of fissile material, detection of motionless intruder) are based on sensing disturbances of the flux (seen by the parabolic reflector)

generated by the differences between the fourth power of the absolute temperatures of the sensor support and that of the heated body. Any disturbance is thus detected without delay even if there is no change in the sensor te



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