

Emissivity Blackbodies

Emissivity is a term used to quantify the energy emitting characteristics of different materials: it is a function of wavelength, temperature and angle view. Emissivity is defined as the ratio of the energy radiated by an object at a given temperature to the energy emitted by a perfect radiator, or blackbody, at the same temperature. A blackbody neither reflects nor transmits energy and has an emissivity of 1.0.

Blackbodies absorb and re-emit all energy incident upon them and are an ideal surface for infrared temperature measurement. By examining the chart below that illustrates blackbody curves at different temperatures, we notice several things. The curve for a given temperature never crosses the curve of any other temperature, which allows us to calibrate an instrument to measure temperature at any point in the electromagnetic spectrum. As temperature increase, the total amount of energy emitted increases and the peak of the curve shifts to the left of the graph, or the shorter wavelengths. In fact, very hot bodies emit energy in the visible spectrum. Although only 25% of the energy is emitted on the shorter wavelength side of the peak, the slope of the curve on that side is considerably steeper, with more energy difference per degree difference in temperature than on the longer wavelength side. The blackbody concept is important, not only because it is the most efficient radiator, but also because it shows that radiant power depends upon temperature.

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BLACK BODY

Do you need to calibrate your IR thermometer?

If you use it just as a diagnostic or troubleshooting tool, probably not. On the other hand, if you are using a fixed sensor for process control, or making critical measurements, you probably should calibrate your thermometer. IR thermometers are calibrated using a black body calibration source. A blackbody calibrator is a calibrated precision temperature source with perfect emissivity. Calibration is performed by pointing the thermometer at the calibrator target, and comparing or adjusting the output or display. Blackbody sources can cost from a few hundred to more than \$20,000 depending on the temperature range. IRtek provide calibration / verification facility using certified blackbody 400.

Specifications	Range	50 ~ 400°C (122 ~ 752°F)	
	Accuracy	±0.8°C at T ≤ 100°C (±1.44°F at T ≤ 212°F)	
		±1.6°C at 100 < T ≤ 200°C (±2.88°F at 212 < T ≤ 392°F)	
		±2.8°C at 200 < T ≤ 400°C (±5.04°F at 392 < T ≤ 752°F)	
	Stability	±0.1°C at T ≤ 100°C (±0.18°F at T ≤ 212°F)	
		±0.2°C at 100 < T ≤ 200°C (±0.36°F at 212 < T ≤ 392°F)	
		±0.4°C at 200 < T ≤ 400°C (±0.72°F at 392 < T ≤ 752°F)	
	Target emissivity	0.95	
	Resolution	0.1°C (0.18°F)	
	Heating time	30 minutes to max	
	Cooling time	30 minutes to 100°C (212°F)	
	Aperture diameter	58mm	
	Power	220VAC(±10%), 1.25A or 110VAC(±10%), 2.5A	
	Size	180 x 114 x 233mm	
	Weight	3kg	

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