Infrared Thermometers: Accurate Readings & Limitations

Date : 05/04/2018

Infrared thermometers are fantastic tools for quickly measuring surface temperatures. However they have their limitations, and knowing how to properly use an infrared thermometer is vital. Today we will be discussing emissivity and how this key factor will affect all infrared readings. Keep your eyes peeled for more blogs to come on subjects such as; cleaning and storing infrared thermometers, choosing the right infrared thermometer for you and infrared thermometer calibration.

Now, let's get technical…

Definition of Infrared

Infrared (IR) energy is the part of the Electromagnetic spectrum that people encounter most in everyday life, although much of it goes unnoticed. It is invisible to human eyes, but people can feel it as heat. IR radiation is one of the three ways heat is transferred from one place to another, the other two being convection and conduction. Everything around you emits IR radiation.

Infrared temperature measurement is affected by three main things; emissivity, distance and surroundings.

Definition of Emissivity

Depending on what you're pointing your infrared thermometer at you're going to get a variation in emitted infrared energy. Emissivity is a measure of a material's ability to emit infrared energy. It is measured on a scale from just about 0.00 to 1.00. Generally, the closer a material's emissivity rating is to 1.00, the more that material tends to absorb reflected or ambient infrared energy and emit only its own infrared radiation.

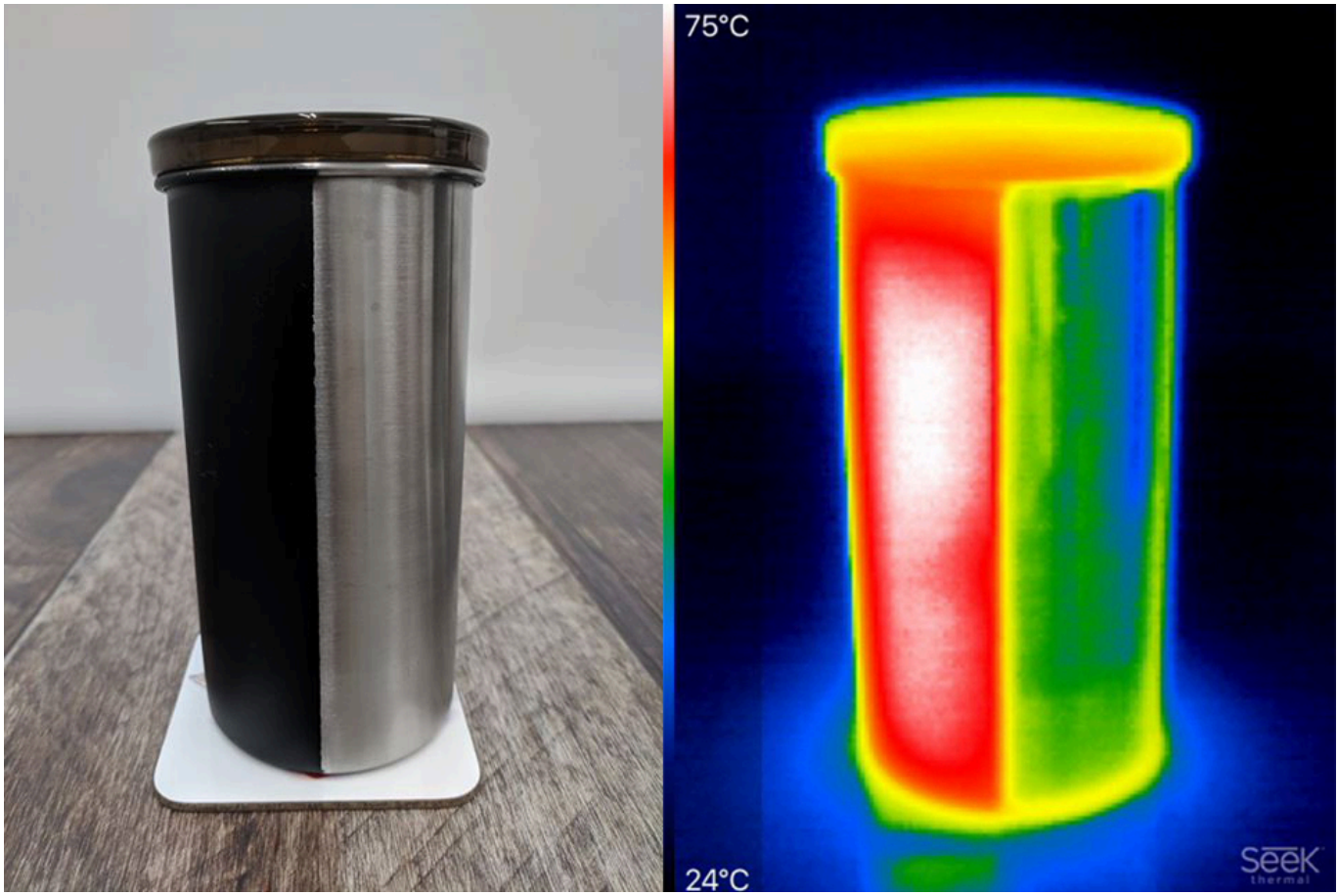
Emissivity

Every single object emits, transmits and reflects. The problem occurs when deciding where to measure the temperature, as everything around it will affect the reading. This means that if you do not know the correct emissivity of the object you wish to measure then you will not read an accurate temperature because the thermometer is set to the incorrect emissivity. This also becomes an issue when something is directly in front of the object you wish to measure, such as cellophane, cling film or a window. For example, if you decide to measure the temperature of

some sandwiches and you point your IR thermometer at the packaging – you will get an incorrect reading. The infrared will only ever measure surface temperature; therefore you would be measuring the cellophane window on the sandwich box. This will likely also be inaccurate as you would not have set your emissivity to the correct value for cellophane.

You can see our table of emissivity here:
http://thermometer.co.uk/img/documents/emissivity_table.pdf

You can see here how an insulated brushed steel mug is affected by painting one side of the mug in a matte black paint. This affects the emissivity value and will therefore give you very different temperature readings.



By simply adjusting the emissivity the temperature will vary, proving that as long as you know what surface you're measuring and what the emissivity of that surface is, you will get an accurate reading.

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Distance, Angle & Surroundings

The angle at which you point your infrared is a very important factor in ensuring you get an accurate reading. If you do not face the infrared straight on then you are at risk of taking

readings from the surroundings. If the object you are measuring is surrounded by something like stainless steel then the chance of you measuring the reflection of the surroundings is quite high.

Distance is also something to consider. Each infrared thermometer has a different distance to target ratio meaning it will take a reading from a certain size area of the object you are aiming it at. If the infrared thermometer you are using has a large target ratio size (indicated by a lower target ratio number i.e. below 5:1) and the object is small then you will end up getting an inaccurate reading as you'll pick up the surroundings.

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Infrared Thermometers may seem like they have many limitations however they really are very useful. Infrared thermometers are ideal for taking surface temperature measurements from a distance. They provide relatively accurate temperatures without ever having to touch the object you're measuring. This is can be useful when it's impractical to insert a probe into the item being measured, or if the surface is just out of reach and a surface probe will not do the job.

Keep an eye out for more blogs in the infrared series, coming soon.

In the meantime why not take a look at: What Is Salmonella and How Can We Prevent It?

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