

Infrared Thermometer Accuracy & Calibration

By: Douglas Wright, President

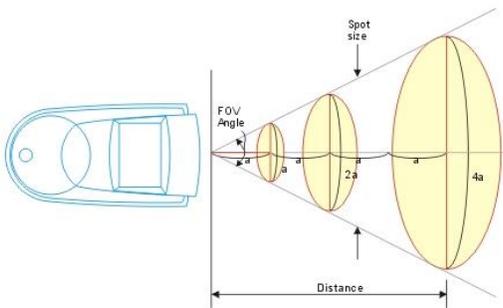
Unlike standard contact probe-type thermometers, [Infrared \(IR\) thermometers](#) do not directly measure the temperature but instead measure the reflected light at specific wave lengths. As the reflectance or emissivity of a surface can vary depending on the material, finish and even temperature this makes calibration of an IR thermometer a tricky proposition.



Why? It is actually quite simple—If a surface has an emissivity of 0.95 (typical of cardboard) and the unit is certified at 0.95 emissivity then that means it is accurate for surfaces of 0.95 emissivity but may be off significantly if the product measured has a different emissivity. So at 0.95 it may be good for cardboard boxes, but less than ideal on stainless steel, ice or fresh meat. This explains why cheap 0.95 units are prevalent in shipping areas but scorned in many production areas. In shipping it is a usually boxes being checked, whereas in production the products and materials to be measured vary significantly. [Scigiene Food Inspector \(FI series\) Infrared thermometers](#) actually use a fixed emissivity of 0.97 as this is better for most food products.



In IR thermometers the optics can change shape as the temperature changes causing errors. So if there is a large difference in temperatures condensation can form on the lenses also affecting the reading. Ideally the IR (or other electronics) used in production areas should be stored at those temperatures to help prevent rapid changes in the optics and electronics that create varying errors.

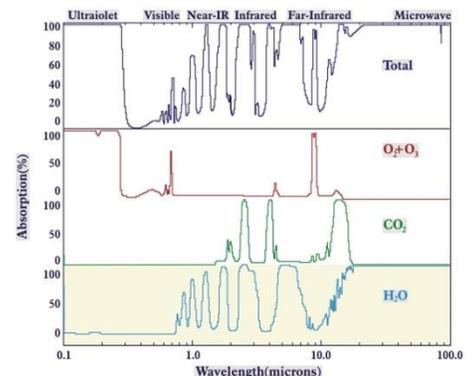
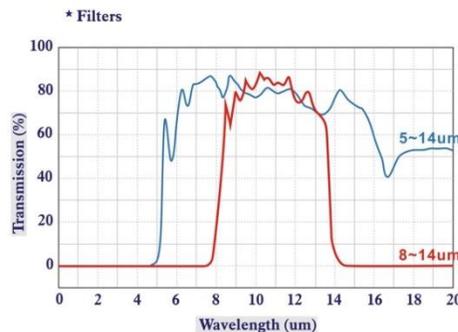


Another factor in the accuracy of an I.R. is the D:S or distance to spot ratio. If you are using a unit relatively close within a few cm this will not matter but as you get farther away the meter may be reading more than you expect? If the D: S is 1:1 then at 1m the area being measured is 1m in diameter. If D: S is 12:1 then from 12m away the area measured is 1m in diameter. Making sure meter users understand this will greatly improve the accuracy.

Our [FI Series](#) also differ from most Infrared Thermometers since they use a more expensive Thermopile using 8-14 um versus the cheaper units using 5-14 um.

Why is this important? Please look at the charts shown here. Here you will see that moisture/humidity will interfere mostly in the 5-8 um range. If you

Feature Why use " 8~14 " um thermopile sensor



can see your breath in the cooler, then 5-14 um I.R.'s should not be used. The more expensive thermopiles we use are also far more accurate. A standard 5-14 um model would give a reading of over 10C different at 290C.

Finally the range the unit is calibrated over is a major factor. All sensor types have a wider range of measurement but if only calibrated over a portion of that range then the accuracy can be greatly improved. Scigiene Food inspector thermometers are calibrated over a narrower range (-55 to 250°C) than most standard all-purpose I.R. units. This range is more than enough for most food processor uses and doubles the accuracy. Only Scigiene Food Inspector series I.R. thermometers go through this stringent process to improve your accuracy.

So if you wonder why most Infrared thermometers are off by up to 10C whereas others are slightly better and why Scigiene has the most accurate of all. You now know.

So how do you check /calibrate your IR thermometer?

Option A: Take the surface temperature of the object to be typically measured using a surface probe and ensure it is in a stable temperature environment. Once the thermometer reading has stabilized take a reading and then quickly point the IR thermometer at close range (a few cm away) at the same spot and take a reading. Adjust the emissivity until it reads correctly.



Option B For fixed emissivity units. With our dual IR/Thermocouple models [HACCP Auditor I.R.](#), [HACCP Auditor I.R. Plus](#) and [HACCP Thermometer with built-in K-type Thermocouple](#), we suggest that you check the unit with a surface probe and use this to validate any IR readings that prove to be suspect or out of range. This is simply due to the other factors that might affect the IR measurement (dirt, scratches, temperature, condensation etc.) that might affect any one surface of the same material.

OPTION C This is preferable. We recommend that you use our [IR Comparator](#) to validate the accuracy of all your IR thermometers. This can be used on a daily, weekly or monthly basis to determine if there are any underlying damages or inaccuracies to the infra-red thermometer itself. The IR Comparator provides a stable black body temperature and can be used at temperatures up 80C and within the ambient range of the instrument to be tested. A certified reference probe is inserted at the base of IR Comparator to allow for accurate comparison of the I.R. with an accurate certified thermometer.



Internal Temperature Readings

Can IR thermometers take internal readings? Not really. The IR is measuring reflected SURFACE light. In some controlled conditions an IR might be used to indicate that the internal temperature is incorrect. The principle here is that the entire product at a certain point in production has cooled or heated to a certain temperature. If the core temperature is incorrect then the surface temperature MAY be out as well. This is something that QA and engineering would need to work on, on a case by case basis. Again if variances are noted then steps should be taken to take true internal temperature readings. If done properly with the correct checks and balances, this can be a valuable option.

REV 12.2018 IR THERMOMETER ACCURACY & CALIBRATION

For More Information, Contact us at:



1295 Morningside Ave Units 16, 17, & 18
Toronto ON M1B 4Z4 Canada
Telephone: 416-261-4865 Fax: 416-261-7879
www.scigiene.com