

The Temperature Tool

What's essential to the restaurant experience, right now? The food? Yes. The staff? Yes. How about the contactless thermometer found at the entrance? Also, yes. Thermometers are a hallmark of an illness check. Running over 99 degrees Fahrenheit is an indication of breaking into a fever. On the other hand, below 95 degrees Fahrenheit, and hypothermia can occur.

Thermometers give quick measurements, the analog versions of these medical instruments are most often found in the mouth of patients and a variety of other orifices. However, as implied in the name, contactless thermometers don't require contact with the object to measure its temperature.

While the use of contactless thermometers isn't a new idea, with the first patent for the measurement tool dating back to 1899, known as the disappearing-filament optical pyrometer, the public and widespread use of it by public facilities shines a light on its existence. For instance, a restaurant would station a contactless thermometer at the front entrance, barring entrance from customers who have too high a temperature, to prevent the potential spread of illness.

The "contactless thermometer" is a moniker for infrared thermometers, which gives more insight into how the technology works. Infrared is a form of electromagnetic radiation, which means the radiation contains a wave with electricity. Infrared can be felt as heat, but can't be seen, putting it on the invisible spectrum.

Infrared in Contactless Thermometers

Every object that contains a temperature above zero has molecules that are constantly moving around inside of them. The hotter the object, the faster these molecules are moving, and as they move from position to position, they are emitting infrared radiation. This emission is referred to as an object's black body radiation, a black body meaning an opaque, non-reflective body.

As an object becomes warmer, they begin to emit visible light, changing colors as the amount of infrared radiation increases. Contactless thermometers would then detect and measure this radiation. Although infrared is on the invisible spectrum, the radiation is made up of waves, and this means it can be focused on, reflected, and absorbed.

Breaking Down the Contactless Thermometers

The contactless thermometers contain a lens that focuses the infrared it's detecting onto a detector, called the thermopile. The thermopile is a device that converts thermal energy, the infrared, into electrical energy through its thermocouples, which are sensors that measure temperature through the amount of electricity they are receiving, also known as the voltage. Essentially, the thermopile is a "pile" of thermocouples.

The thermopile, now absorbing the infrared radiation, continues to transform the heat into electricity, the amount of electricity is proportional to the heat. The electricity is then sent to another detector, which determines the temperature to be displayed. Thus, the more electricity, the more heat.

Using the Contactless Thermometer

Contactless thermometers are used in a variety of ways: measuring a person's temperature while reducing the risk of spreading illness, measuring a fire or oven's temperature to get the right pre-heat, a firefighter finding a "hot spot" where a fire is burning, or in factory manufacturing to ensure machinery isn't overheating or components aren't damaged.

Contactless thermometers' accuracy is dependent on the distance-to-spot ratio, however, where the surface area being measured determines the distance the thermometer must be from the object as a whole. To measure at a farther distance, the surface area must increase as well. Even with this in mind, the time it takes for the contactless thermometer to process the temperature measurements is done within seconds, meaning the temperature of an object can be recorded at any given time.

Sources

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