

INFRARED THERMOMETER:

OVERVIEW:

All objects with a surface temperature above absolute zero (-273 °C/-460 °F) emit thermal radiation. This is also known as long wave radiation or infrared radiation. The warmer an object is—the greater amount of energy emitted. In fact, a very hot object emits not only infrared radiation, but also visible radiation known as short wave radiation or light.

You can observe this phenomenon when a blacksmith places a piece of steel in a fire. If the steel is in the fire for a relatively short time, the steel is hot and you can feel the heat (this is thermal or long wave radiation that our body senses). If the blacksmith places the steel in the fire for a longer time, the steel starts to glow red hot. You can still feel the heat, but you can also see the effects of heating the steel to a higher temperature. If the blacksmith places the steel in the fire for an even longer time, the metal glows white hot. You can still feel the heat, and in addition, you can see a brilliant white-hot color.

As you heat up the surface of an object, radiation is primarily emitted as long wave radiation that we sense as heat – this is the case for most objects in our immediate environment. The trees, the soil, the grass, the sidewalk, the beach, the water, etc. all exist at relative low temperatures and their surfaces emit infrared radiation not light.

INSTRUMENTATION:

The typical infrared thermometer consists of a lens that collects and projects the infrared radiation emitted by the object of interest onto a sensor. The sensor converts the signal into an electrical signal that is then transformed into temperature units (°C and/or °F). Our units have a laser beam that allows one to direct the sensor onto the surface of interest (a leaf, a section of soil in the sun or a section of soil in the shade, etc. However, you must realize that the amount of area that the sensor sees influences the accuracy of the measured temperature. In other words, you must be careful in not placing the sensor too far from the object of interest. Since the infrared device determines the average temperature of all surfaces within the field of view, if the background temperature is different from the object temperature, a measurement error can occur.

In order to determine the correct distance to place the front face of the thermometer, **remember that the distance to measurement must not be any greater than 8 times the size of the object being measured.** Thus, if you are measuring the temperature of a leaf that is 2 inches in diameter, the thermometer cannot be any further than 16 inches from the leaf surface. If the thermometer is greater than 16 inches from the leaf, the instrument will see background beyond the edges of the leaf. If the background is colder than the leaf, the thermometer will give you an inaccurate reading that will be lower than the actual “real” leaf temperature.

INSTRUCTIONS:

To use the thermometer:

1. Point the unit at the object of interest making sure that the distance from the object is no greater than 8 times the diameter of the object.
2. Press the ON button-the laser should be visible. If not visible-press the red laser button (do this while you continue to press the ON button). **DO NOT RELEASE THE ON BUTTON UNTIL YOU HAVE OBTAINED A TEMPERATURE READING OF THE OBJECT BEING MEASURED.** If released, the temperature displayed will freeze. The screen will display the temperature in °C or °F (press the C/F button to change units) and a sun symbol will be seen in the upper right corner, indicating that the laser is on. The bottom of the screen should not have any symbols-if symbols are observed, press the MODE button until a blank field is observed at the bottom of the screen.
3. If you wish to determine the maximum (MAX), minimum (MIN), difference between maximum and minimum temperatures (ΔT) and average temperature (AVG) of an area (a room, a field, a forest, etc.) press the ON button (hold and do not release) and sweep slowly across the area of interest. Then release the ON button. Now press the MODE button and you will see the MAX temperature; press the MODE button again and you will observe the MIN temperature; press the MODE button again and you will see the difference in temperature between the MAX and MIN, and press the MODE button again to see the AVG temperature.
4. **IMPORTANT—PRESS MODE BUTTON AGAIN TO CLEAR THE BOTTOM FIELD OF THE SCREEN.**
5. **NOTE: Yellow button turns on a screen light to allow use of thermometer under low light conditions. PRESS YELLOW BUTTON AGAIN TO TURN OFF LIGHT.**

