PART TWO
of a predictive
maintenance series

CHAPTER 2.3

The Fluke 62 Mini Infrared Thermometer

For quick, basic temperature checks

Application Note

Increases in temperature are often the first sign of trouble for mechanical equipment, electrical circuits and building systems such as heating, ventilation and air conditioning (HVAC). A quick temperature check of key components and equipment can detect potential problems and prevent catastrophic failures. Regular contact measurement with a thermometer and probe takes time and can require getting close to dangerous or inaccessible operational equipment or shutting equipment down. Non-contact infrared (IR) thermometers take quick, safe measurements from a distance while equipment is operational.

Advances in technology have made the smallest infrared thermometers, such as the Fluke 62 Mini, especially practical. They're convenient to carry and affordable enough for everyone on an entire crew to own one, so that infrared temperature measurement isn't limited to specialists. And the latest models are more accurate and measure greater temperature ranges than earlier "mini" generations.

Point, shoot and read

To use the Fluke 62 Mini Infrared Thermometer, use the laser sighting to pinpoint the target, and pull the trigger to see the temperature on the built-in display.


Check motor temperatures quickly, without contact.

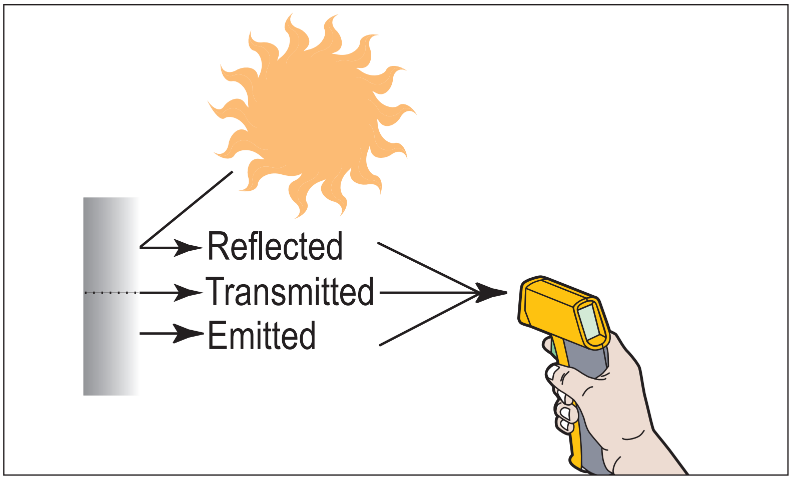
The thermometer works by measuring the infrared energy emitted from surfaces and converting the information into a temperature reading. It measures temperatures from -30 °C to +500 °C (-20 °F to +932 °F), is accurate to ± 1 % of reading and can capture the maximum reading among a range of readings.

While there are endless ways to use an infrared thermometer, here are the three primary ones:

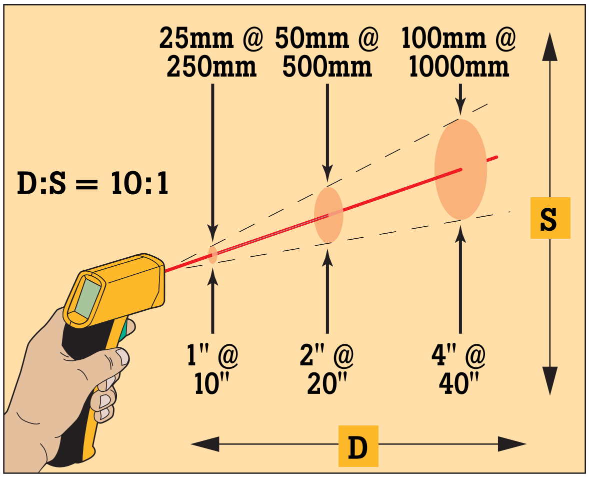
1) **Measure the absolute temperature at a spot.** This is useful for trending the temperature of an object such as a bearing housing over time. With a repeatability of ± 0.5 %, the new thermometers make this practice quite accurate.
2) **Compare the temperature differential of two spots.** For example to compare the running temperatures of two like objects to determine if one is overheating.
3) **Scan an object** and detect changes within a continuous area on it, to find hot or cold spots on housings, panels and structures.

Securing accurate measurements

The uses for handheld infrared thermometers are limited only by the nature of infrared technology. The key restriction is the surface of the target object. Simply stated, these instruments cannot accurately measure shiny surfaces. The issue is emitted versus reflected energy.



Non-contact thermometers are adjusted to consider only emitted energy.



Use D:S ratio for accurate measurements.

Emissivity

Of the kinds of energy—reflected, transmitted and emitted—emanating from an object, only emitted infrared energy indicates the object's surface temperature. Transmitted and reflected energy do not. When IR thermometers measure surface temperatures, they sense all three kinds of energy. Therefore, they have to be adjusted to read emitted energy only. The Fluke 62 Mini Infrared Thermometer has a fixed, pre-set emissivity of 0.95, which is the emissivity value for most organic materials as well as painted or oxidized surfaces.

To accurately measure the surface temperature of a shiny object, cover the target surface with masking tape or flat black paint and allow enough time for the tape or paint to reach the temperature of the material underneath.

Distance-to-spot ratio

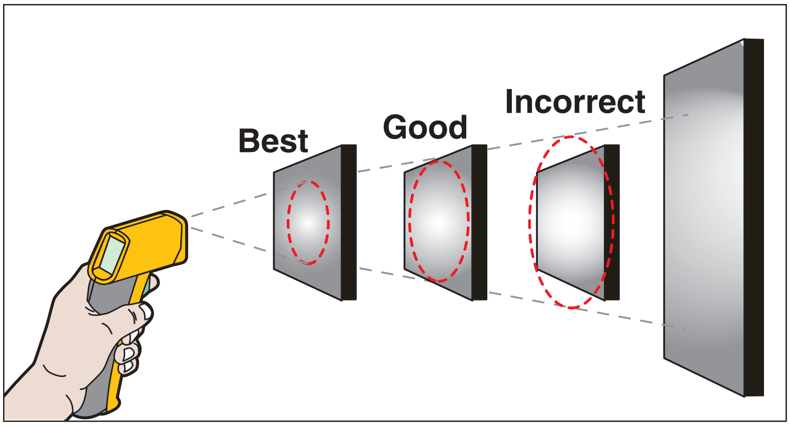
The optical system of an infrared thermometer collects the infrared energy from a circular area or spot and focuses it on the detector. The farther a target is from the instrument the larger the spot created on the target will be. Optical resolution is defined by the ratio of the distance from the instrument to the object compared to the size of the spot ("distance-to-spot" or D:S ratio). For the Fluke 62 Mini the distance-to-spot ratio is 10:1. This means that at a distance of 10 inches the spot is about one inch in diameter. The larger its ratio number the better is the instrument's resolution.

Resolution is important because it relates directly to getting good readings by ensuring that the target is larger than the spot size. The smaller the target, the closer one must be to it. When accuracy is critical, the target should be at least twice as large as the spot.

Other factors to consider

These instruments measure only surface temperatures, not internal temperatures. Furthermore, they cannot take readings through glass and, as noted, will be inaccurate if used to measure shiny or polished metal surfaces (stainless steel, aluminum, etc.).

Users of IR thermometers also must be alert to environmental conditions. Steam, dust and smoke, for example, can prevent accurate temperature readings by obstructing a unit's optics. A dirty lens can also affect readings. Lenses should be cleaned with dry, clean plant air or a fluid made specifically for cleaning lenses. Also, changes in ambient temperature can influence a thermometer's performance. If an IR unit is exposed to abrupt temperature changes of 11 °C (20 °F) or more, the user should allow at least 20 minutes for the unit to adjust to the new ambient temperature.



For the best readings, the measured target should be at least twice as large as the spot.

Popular applications

Even considering the limitations of infrared temperature monitoring, there are still so many possible uses for this technology that trying to list them all would be fruitless. Here are some of the most common and particularly successful applications.

Predictive maintenance

Regular maintenance in industrial and institutional locations keeps motors, pumps and gearboxes from experiencing catastrophic failures that can halt production or pose safety problems. In an infrared maintenance program, technicians set up an inspection route and measurement parameters for each piece of key equipment and/or component. Then, they take an infrared temperature measurement on a regular basis, record the measurement, and compare against previous readings for any changes.

As an example, a technician can use a Fluke 62 Mini to check the operation of an induction motor on a critical piece of equipment. She or he would start by reading the unit's specifications on the plate attached to it. The plate will reveal either a Temperature Rise Rating or a Motor Class Rating for the motor. The rise rating gives the maximum allowable operating temperature above ambient. The motor class rating, e.g. "Class A," will reveal an absolute maximum operating temperature. Both pertain to internal-winding temperatures. Of course, a contact thermometer cannot measure these temperatures while the motor is running. However, an operator or technician can use a non-contact IR thermometer to measure the temperature of the motor case. She or he should add 10 °C (18 °F) to surface scans to determine the internal operating temperature. For each 10 °C (18 °F) above the maximum operating temperature, the life of the motor is likely to decrease by 50 %. If the motor is extremely hot it could be a fire hazard.

Measure moving targets easily.

Using infrared thermometry for plant maintenance reduces repair costs and avoids equipment stoppages. Industrial maintenance personnel, building managers, HVAC technicians and even homeowners can reduce costs by repairing only what needs to be fixed. They can avoid unplanned equipment stoppages by making specific, necessary repairs before equipment fails. Then, after repairs, they can perform new temperature measurements on the same equipment to determine whether the repairs were successful.

Electrical inspections

Electrical systems supply essential power to every industrial, commercial and residential setting. With degradation over time and the general vulnerability of electrical connections, it's important to monitor electrical systems for loose, dirty or corroded connections, flaws in transformer windings, hot spots in panel boxes and other telltale signs of trouble.

The Fluke 62 Mini can be invaluable for finding developing hotspots in electrical equipment that may indicate a short circuit, a fused switch or an overload. In general, higher operating temperatures reduce the life of electrical components by damaging insulation and raising the resistance of conductor materials. Pinpointed by a non-contact IR thermometer, these situations signal that action is required.

Use unit in close range for near-distance targets.

Use non-contact temperature measurements for inaccessible targets.

HVAC inspections

Heating and cooling systems, whether for maintaining production parameters or human comfort, are easily monitored with the Fluke 62 Mini Infrared Thermometer. Check air stratification, supply and return registers, furnace performance and steam distribution systems and conduct energy audits to pinpoint system upgrade opportunities.

For example, IR non-contact thermometers can be used to troubleshoot steam traps, which are designed to remove water (condensate) that has condensed from the steam as it travels in transfer pipes. If a steam trap fails while open, it will leak steam, causing an energy loss. If it fails while closed, it won't remove condensate from the steam line, making it useless. A faulty steam trap can cost a plant $500 USD or more per year, and in any given year, 10 % of all industrial steam traps fail. Since many plants have as many as 1,000 traps, they can quickly become high-value maintenance targets.

To verify whether a steam trap is working properly, use a non-contact thermometer like the 62 Mini to measure from input to output. On a properly operating trap, the temperature should drop significantly. If the temperature doesn't drop, the steam trap has failed open and is passing superheated steam into the condensate line. If the temperature drop is overly large, the trap may be stuck closed and is not ejecting heated condensate. Condensate in steam lines reduces the effective energy of the steam and can cause difficulties in steam driven processes.

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