FLUKE®

Infrared thermometers: electrical, industrial, and HVAC applications

Application Note

In general, there are three ways to use any kind of infrared, non-contact thermometer:

- **Measuring the temperature at a spot**
  This type of measurement is used to measure and track temperature at a single spot. It is useful for trending the temperature of an object or comparing a measurement to a specification. A thermometer with high repeatability helps ensure consistency for this kind of measurement.
- **Comparing the temperature of two spots**
  This type of measurement might be used to check the functioning of a steam trap by measuring the temperature of the inlet and outlet. No change indicates the trap has failed open. A very large change indicates the trap has failed closed.
- **Scanning an object and detecting changes within a continuous area on it**
  This capability allows the user to find hot or cold spots on housings, panels, and structures. For example, one can check the heat sink of air-cooled transformers for cool tubes that indicate a restricted flow or a lack of flow.

Applications for infrared thermometers

Infrared thermometry can be used for process monitoring, plant predictive and preventive maintenance, electrical applications, quality assurance, and other applications.

IR non-contact thermometers are ideal for moving targets and machinery, hazardous and inaccessible or distant targets, electrical components, "big picture" evaluations of machinery or surfaces, trending records, and even protection against litigation and insurance claims. In fact, insurance companies are encouraging their customers to implement preventive infrared scanning.

IR thermometers and imagers can save time and money for contractor and customer alike, as well as perform diagnostics that were previously impossible without shutting down systems.

Here are some suggestions for applications in which IR non-contact thermometers have proven useful:

Electrical maintenance
Check for heat buildup created by loose connectors. Troubleshoot problems in battery banks and power panel terminations, ballasts, switchgear and fuse connections. Identify hot spots in the output filters on DC battery connections.

They can be used to inspect supply power connections and circuit breakers (or fuses) for equal temperatures. They are effective in determining the source of the problem when a thermal overload protection device does not work and the motor shuts down.

Because electrical currents generate heat, temperature monitoring is an efficient way to predict potential equipment failure.

Equipment maintenance
Check moving parts and housings in motors and gear boxes for hot spots. Temperature change can indicate developing problems in many types of equipment, from ovens and boilers to freezers. Routine temperature audits of generators and their bearings can prevent expensive repairs. Scanning bearing temperatures with an infrared thermometer allows the maintenance engineer to detect hot spots and schedule repairs or replacements before the problem leads to an equipment failure.

Building controls
Monitor HVAC/R components for quick energy audits and room balancing in a short time. An IR thermometer with a 60:1 distance-to-spot ratio makes elevated vents and returns more accessible.

For example, if a thermometer has a 10:1 distance to spot ratio, one can stand 10 inches away from the target and measure the temperature of a one-inch circle. At 10 feet away from the target, the measurement spot will be a one-foot circle.

An IR thermometer can quickly survey compressor head temperatures, compressor oil sump temperatures, evaporator coil and suction line temperatures, discharge line temperatures, condenser coil and liquid line temperatures, and fan motor temperatures.

Insulation on all surfaces can be scanned for leakage and losses. Higher temperatures are indicated by a shift toward white. Lower temperatures are indicated by a shift toward black.

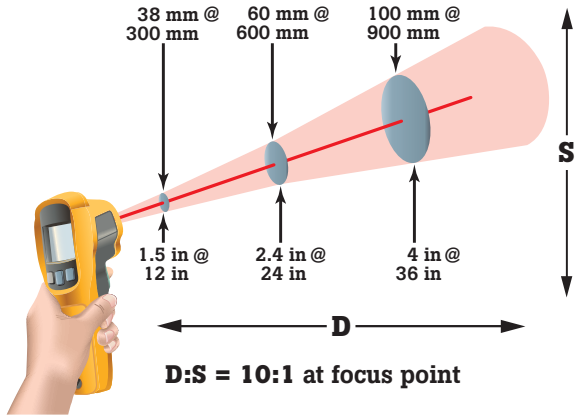
Process/product
Monitor process lines. Check the temperature of different products on production lines. These can vary from rubber tires to plastic, from concrete to chocolate bars.

Best practices for infrared temperature measurement

To get the best non-contact measurements, follow these guidelines:

- Get as close as is safely possible to your target.
- When measuring at a distance, understand the size of the measured target based on the distance-to-spot ratio.
- If you need to measure a reflective target often, mask the reflective surface with flat black paint or tape for best results. This also helps ensure the same spot is measured every time.
- Consider reflected infrared radiation. Items that have shiny, reflective surfaces will reflect infrared energy from other objects, including the sun. This can interfere with measurement of the target's radiated infrared energy
- Experiment with several angles to get the best measurement. A better angle can often mitigate reflected energy from other infrared energy sources.
- Make emissivity adjustments to minimize measurement errors.
- Consider using a contact thermometer or a contact thermometer probe that plugs into your infrared thermometer to verify readings you are unsure of.

The size of the temperature measurement area (the "spot") increases with distance. Infrared thermometers with a higher "distance-to-spot ratio" (D:S) can take accurate measurements at a greater distances.



Fluke. *Keeping your world up and running.*®

Fluke Corporation
PO Box 9090, Everett, WA 98206 U.S.A.

Fluke Europe B.V.
PO Box 1186, 5602 BD
Eindhoven, The Netherlands

For more information call:
In the U.S.A. (800) 443-5853 or
Fax (425) 446-5116
In Europe/M-East/Africa +31 (0) 40 2675 200 or
Fax +31 (0) 40 2675 222
In Canada (800)-36-FLUKE or
Fax (905) 890-6866
From other countries +1 (425) 446-5500 or
Fax +1 (425) 446-5116
Web access: http://www.fluke.com