

Three new infrared instruments from Fluke

Application Note

With night vision equipment being used in Iraq and shown regularly on the evening news, nearly everyone is aware of what makes this life-saving technology possible: infrared (IR) emissions from warm bodies and equipment. That's the same kind of energy that makes equipment-saving strategies possible wherever sound maintenance procedures are required.

There are two useful IR technologies available for maintenance: IR thermometry and thermal imaging, also known as IR thermography. The former measures the average temperature of an area on an object's surface. The latter uses infrared emissions to make a two-dimensional, *quantitative* image of the temperatures at points on an object's surface. By contrast, the night vision equipment used by US troops in Iraq provides *qualitative* images that allow the viewer only to identify objects and features.

IR thermometers and thermal imagers are essential tools in any comprehensive predictive maintenance (PdM) program. They prevent failures by identifying conditions that indicate impending failure and providing data that helps technicians determine whether remedial action is warranted. If it is, maintenance personnel can repair the equipment before it fails and during a scheduled shutdown. The benefits: no unplanned downtime and maximized uptime using less labor and fewer replacement parts. Only equipment that needs repairing gets repaired.

Since increases in temperature are associated with nearly all mechanical and electrical failures, thermal imaging and IR thermometry have broad application in PdM programs. Three new products from Fluke take advantage of that fact.

The Fluke Ti30™ Thermal Imager

Until recently thermography was so complex and expensive that only certified specialists used the technology. Now, the Fluke Ti30 Thermal Imager is changing all of that.

The Ti30 is an affordable, compact, handheld, ergonomically designed device. It literally puts thermal imaging into the hands of the people most familiar with a facility and its equipment: in-house maintenance technicians and equipment operators.



The technology behind the Ti30 is as powerful as the instruments used by specialists, but it makes thermal imaging a point-and-shoot process. It has ample on-board computer power to collect data for a PdM program, and it interfaces with software on a host computer or network, so that maintenance managers can track temperature measurements and compare thermal images over time.

Since consistency is key to effective periodic PdM inspections, the Ti30 system software allows the supervisor to build and edit a route on the PC and then upload it into the imager. The imager's user interface then describes the location of each stop and the images needed, leading the technician through the route. This ensures that the correct equipment gets inspected and the correct images recorded.

The Ti30 has a sighting window that displays the thermal image along with readouts of status and mode. At a route stop, the technician simply uses the sighting window to frame the required thermal images, clicks the trigger and presses the save button (up arrow) for each one. Also available to the tech are features for managing the temperature level and span, switching the display from color to black and white and turning on a built-in sighting laser.

Finally, the Fluke Ti30 thermal imager comes standard with powerful InsideIR™ PC software for data analysis and report writing, for a complete thermal PdM program. Included with purchase and with no licensing restrictions and free periodic upgrades available via the web, the software is the most affordable on the market today. Also included is two days of professional thermography training*. By focusing on applications and infrared technology basics, this program ensures a fast return on investment.

*Two-day training package available in North America only. Other training programs vary by region.



The 570 Series IR Thermometer

Infrared thermometers in the Fluke 570 Series – the 572, 574 and 576 – are among the most advanced available. They all feature accuracies of $\pm 0.75\%$ of reading and high resolution represented by distance-to-spot ratios of 60:1. This ratio means, for example, that at a distance of 60 inches from an object these thermometers will measure the temperature of a spot about one inch in diameter. In other words, they can measure the temperature of small objects at a relatively long distance and very small objects close up. In fact, the Fluke 572, 574 and 576 models are available with a close focus option featuring a 50:1 distance to spot ratio and a minimum measurement spot to be as small as 6 mm (.24 in).

Many models of IR thermometers have a laser beam for sighting a target, but a single beam in the middle of a spot only tells the user where the center of the spot is. All Fluke 570 Series units have a three-dot sighting system that reveals not only where the center of the spot is but also where its edge is. The Fluke 570 Series laser sighting also features a special laser that appears twice as bright to the human eye (while maintaining

the same safety rating as less bright lasers). This feature makes accurate sighting easier in a variety of lighting conditions and at varying distances.

All thermometers in the Fluke 570 Series record temperatures from $-30\text{ }^{\circ}\text{C}$ to $+900\text{ }^{\circ}\text{C}$ ($-25\text{ }^{\circ}\text{F}$ to $+1600\text{ }^{\circ}\text{F}$), a sizable range. Such a wide temperature range extends the applications for 570 Series thermometers. It means that maintenance personnel and even production personnel can measure the temperatures of equipment or products-in-process that are very cold or very hot and everything in-between.

Non-contact thermometers use the amount of energy emitted by an object and the efficiency with which the object's material emits infrared energy (its "emissivity") to calculate the object's surface temperature. While some instruments have their emissivity preset close to the emissivity of most organic materials and painted or oxidized surfaces, all the thermometers in the Fluke 570 Series allow their emissivity settings to be adjusted to match the surface characteristics of specific targets. The 574 and 576 models also have easily accessible preset emissivity settings for common materials. Using this feature saves the user time in not having to look up the proper emissivity setting before taking a

reading. Of course, when a thermometer's emissivity setting matches the emissivity of the target, the reading is more accurate.

All thermometers in the Fluke 570 Series have a very fast 250 mSec response time. This high speed means that one of these thermometers can record accurate readings even in situations where target temperatures are changing rapidly. It also means that serious problems can be diagnosed immediately with no need to shut down equipment to take a reading.

Other features of the Fluke 570 Series include backlit liquid crystal displays for viewing in poorly lit areas and the capability to store the last 10 readings and then display them as a bar graph for easy comparison. Each also has a high alarm warning that is both audible and visible.

A Fluke 572 thermometer has all of the aforementioned capabilities. Moving up to the Fluke 574 and 576 add the power of 100-point data logging. This feature, along with software for logging, graphing and analyzing temperature data on a PC and an RS-232 (574) or USB (576) connection to move the data from the thermometer to the PC, minimizes the time once used to transcribe data and streamlines analysis. Reports get written faster and more accurately, and needed repairs are more likely to happen before equipment fails.

Along with their inherent data logging capability, the 574 and 576 models have customizable features such as log names, high and low alarms, emissivity values for special conditions, etc. A technician can customize an instrument to conform to his or her inspection route. In addition, a version of the 574 has been tested by Factory Mutual, a US organization, and has received a nonincendive (Class I, Division 2) approval. The nonincendive model is not available with the close-focus option.

To all of this, the Fluke 576 adds digital photography. When a temperature reading is recorded, the instrument records the temperature on the photo of the



target along with the date and time of the measurement. Having a photographic record of measurements is a powerful documentation and reporting tool.

At the end of an inspection route, a technician using a Fluke 574 or 576 IR Thermometer uploads the collected data and, if using the 576 model, images. At this point, she or he has several options. The data can be compared to data recorded earlier. Questions can be asked and answered: Was the inspection done properly? Was this measurement consistent with earlier ones in terms of location and temperature recorded? Is any equipment's temperature trending upward or downward?

The technician can record the equipment data in tabular view; tailor high or low alarms to specific locations; view minimum, maximum and average temperatures for specific locations; graph the data to reveal trends and much more. If warranted, a report on the status of any piece of equipment can be created. Then, the report may be distributed electronically or printed for physical distribution or even posted on a company's intranet.

If the technician had used the Fluke 576, photos for added impact or to help guide repair personnel to a location could accompany any of the documentation and reporting just mentioned.

The Fluke 62 Mini IR Thermometer

For technicians just getting started with IR thermometry, there is the Fluke 62 Mini IR thermometer. Like other IR thermometers, it serves to measure increases in temperature that often indicate potential problems with mechanical equipment, electrical circuits and building systems.

The Fluke 62 Mini is faster, more accurate, and measures a greater range of temperatures than earlier generations of so-called "mini" IR thermometers. It has single-point laser sighting and can capture, along with the current reading, the maximum reading among a range of readings. It measures temperatures from -30 °C to +500 °C (-20 °F to +932 °F), making applications for it quite extensive. In addition, it is accurate to ± 1 % of reading.

The 62 Mini has a fixed, preset emissivity of 0.95, which is the emissivity value for most organic materials as well as painted or oxidized surfaces. So, it can't accurately measure the temperature of objects with shiny surfaces unless steps are taken to eliminate the reflected energy. Typical moves are to compensate by covering the surface with masking tape or flat black paint.

Of course, it is necessary to allow enough time for the tape or paint to reach the temperature of the material underneath.

The distance-to-spot ratio of Fluke 62 Mini Thermometer is 10:1, making it best for applications where users can safely stand close to targets. However, despite this relatively low resolution (compared to the 570 Series) and its fixed emissivity settings, it can be quite useful to homeowners, auto mechanics and heating, ventilation and air-conditioning technicians, working fairly close-up and not needing the extraordinary temperature range of the 570 Series.

New Fluke infrared tools and applications

	62 Mini Infrared Thermometer	57X Series Infrared Thermometer	Ti30 Thermal Imager
Recommended Uses	Basic electrical, light industrial maintenance checks	Predictive and preventive maintenance, electrical, process monitoring, heavy equipment, quality assurance programs	All types of maintenance that require a fast overview of existing temperature distribution
Temperature Range	-18 to 275 °C	-30 V to 900 °C (Standard) -50 to 500 °C (SubZero option)	-10 to 250 °C
Typical Distance to Target (spot)	Up to 1 m	Up to 10.5 m	Between 60 cm and 15 m
Optical Resolution (D:S)	8:1	60:1 (Standard focus) 50:1 (Close focus)	90:1 for temperature measurement
Accuracy	+/- 2 %	+/- .75 %	+/- 2 %
Sighting	Laser point	High precision coaxial laser sighting	Single-point laser
Emissivity	Pre-set to 0.95	Adjustable	Adjustable
Data Logging	N/A	574, 576: 100 data points	Up to 100 images with temperature data
Data Output	N/A	574: RS-232 or 1 mV per degree 576: USB 1:1	USB 1:1

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