

Infrared Thermal Imaging for Your Electrical Systems

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Viewing Modes Expand

Admit it: Who did not grow up wanting to be a superhero with X-ray vision that sees through walls? Well, as infrared, thermal-imaging technology evolves, managers are getting closer to making this dream a reality.

Infrared cameras give front-line technicians in institutional and commercial buildings the power to see and inspect electrical systems – among many other components and systems – much more closely and effectively. The ability to detect and view excess heat where it should not be allows technicians to become superheroes of facilities by giving them the power to protect electrical equipment from the operational threats lurking in every corner.



Thermal imagers are compact and handheld with numerous capabilities for cost effective and efficient electrical component testing. *Printed with permission. Fluke Corporation*

New-generation Equipment

Unlike the fragile, bulky, and expensive imagers of the past, new-generation equipment is more compact and durable. With the price of many imagers coming down – many of today's units fall in the \$4,000-\$8,000 range – it is becoming much more viable

for managers to buy their own imaging equipment, instead of having to contract out scanning tasks. That said, managers at times might need to bring in outside experts to interpret certain images and determine appropriate action.

Of the latest advances in infrared thermal imagery, one manufacturer has developed technology that integrates infrared and visual – or visible light – images in full screen or picture-in-picture views. The technology helps users recognize image details and better identify problem areas by quickly scrolling through the different viewing modes. They include:

- full infrared – high-resolution, standard infrared images
- full visible light – a visible-light image similar to that of a digital camera
- picture-in-picture – an infrared-image portal surrounded by a visible-light frame for reference
- automatic blending – combines infrared and visible-light images blended at user-adjustable levels for maximum image clarity
- infrared/visible alarm – displays only the portions of the image that fall above, below, or between a user-specified temperature range as infrared, leaving the remainder of the image as full, visible light.

Thermal Imagers Play Role in Preventive Maintenance Programs

Increasingly, technicians are incorporating thermal-imaging cameras into preventive and predictive maintenance programs to help detect excess heat in electrical components, such as motors. This non-invasive technique can detect loose connections, corroded elements, short circuits, overloaded circuits, and other dangerous faults.

A huge advantage to this application of thermal-

imaging technology is technicians can perform testing while the system is under a full load with no impact on the facility or its operations. In the past, technicians had to schedule power-system shutdowns to physically check equipment connections for damage or wear.

Thermal-imaging technology now allows them to conduct inspections, such as busway-joint analysis, at a safe distance from the equipment. They also can analyze the gathered data in a facility's office or at a remote location, away from potentially dangerous situations. Since nearly every electrical component heats up before it fails, infrared inspection as a diagnostic method can provide a cost-effective means of identifying potential problems in electrical systems before damage occurs and safety hazards arise.

If technicians find potential problems early enough, they can take steps to resolve the problems during a scheduled outage, eliminating unplanned productivity downtime.



Technician conducting a thermal inspection using an IR Window.
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Safe Infrared Scanning Starts with Personal Protective Equipment

Front-line technicians can safely scan electrical equipment with a thermal imager in two ways: by leaving the panel closed and scanning through a specialized infrared window or by opening the electrical panel while wearing all of the required personal protective equipment (PPE).

Depending on the arc-flash rating of the equipment, PPE could include but is not limited to protective clothing, gloves, and a face shield. Most arc-flash events happen because of a change in state of the equipment, such as opening a piece of equipment to scan it.

By installing infrared windows, technicians can scan electrical equipment more frequently and safely, as well as without being forced to change the state of the equipment.

Whichever way managers choose, the maintenance staff must understand and adhere to requirements of National Fire Protection Association 70E, Electrical Safety in the Workplace.

Temperature Differentials Tell the Story

Thermal imagers display a color map that identifies temperature differentials of equipment invisible to the naked eye. The higher that temperature differential, the more likely it is a potential failure is looming. A slight temperature elevation either indicates an equipment-overload condition or the start of a loose connection. Technicians should review both of these conditions and correct them as soon as possible.

A high temperature differential or bright-red areas on the image indicate a more urgent condition. This situation most likely indicates an advanced problem technicians must review and correct immediately to prevent a catastrophic failure that could leave the facility without power or, worse, cause potential harm to people or property through an explosion or fire.

Infrared imagers might not allow managers or technicians to see through walls, but they can help them become quiet heroes in their facilities. Armed with this technology, they are poised and ready to save time and money, increase productivity and protect the lives of occupants by identifying potential problems in electrical systems early and making repairs before catastrophic events occur.

Beyond Electrical Systems

All objects emit infrared radiation, and the amount of radiation an object emits increases as its temperature rises. Thermographic cameras detect radiation in the infrared range of the electromagnetic spectrum, causing warm objects to stand out clearly against cooler backgrounds on the camera display.

More maintenance and engineering departments are using thermal imagers to diagnose small problems in electrical equipment before the problems grow into expensive emergencies. But the applications for these imagers go beyond electrical systems:

- Maintenance and engineering technicians are using the technology to scan the exteriors of commercial buildings for heat leaks. The

imagers allow them to see places heat is escaping through the shell, and they help managers build the case for spending money on insulation upgrades.

- Many international airports installed thermal-imaging cameras during the recent H1N1 flu outbreak to help identify travelers with elevated body temperatures as a first-level defense against the virus.
- Firefighters use the units to see through smoke and detect people, as well as to locate the base of a fire.
- Law-enforcement officials use them to track down suspects and find missing persons.
- Medical applications are expanding, since inflammation and the resulting increased temperatures accompany many diseases in the human body.



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Utility worker scans pole top transformers efficiently and from a safe distance. *Printed with permission. Fluke Corporation*

Infrared INSIGHTS: Benefits Abound

One major benefit of scanning electrical systems using infrared-imaging technology is the facility can remain energized and operational throughout the process.

Another benefit is many situations exist where technicians can scan electrical components, such as utility power poles, from a safe distance with no contact required and without the risk posed by exposing staff to unnecessary safety hazards.

If a thermal scan provides evidence of a loose connection or other irregularities, technicians can set up a scheduled procedure for shutting off power and repairing equipment at a designated time that does not disrupt facility operations.