

APPLICATION NOTE

High resolution infrared inspection power transmission and distribution applications

Today's public and private utilities in the developed world face a number of challenges. The components of the power grid are getting older and need regular predictive maintenance (PdM) to keep them running efficiently and to avoid costly and dangerous failures. Utilities are running with leaner crews so staff technicians are stretched to their breaking points. A steady stream of widespread weather-related outages, take their toll on the aging power network and are challenging utility crews to keep up with repairs.

As a result, the need for PdM is growing and the resources to perform it are decreasing. Still, it is necessary to conduct regular inspections of all aspects of the power network quickly and accurately so that potential problems can be addressed before they become actual problems. At the same time, utilities need to meet increasingly rigorous safety standards for inspecting all phases of the power system. The tools they use for those jobs need to support the safety standards and be intuitive and versatile to keep training costs down and maximize the value of each tool added to their toolbox.

One tool for many utility applications

One tool that can help utilities meet all those objectives is a handheld infrared camera (also called a thermal imager). Infrared cameras allow you to capture two-dimensional representations of the apparent surface temperatures of electrical components and other objects without touching those surfaces and without interfering with target systems. The images and measurements from that testing can help you identify problems before they do a lot of damage.



However, not all thermal imagers are created equal. The Fluke TiX580, TiX560 and Ti480 infrared cameras are ideal for utility applications because they allow you to work from a safe distance to inspect areas that you could not get close enough to inspect any other way. They go wherever you go—from inspecting transmission lines from a helicopter or truck, to scanning live substations on foot, or climbing down into a cramped transformer vault. They deliver ultra-high resolution and temperature accuracy from far a way or close-up, along with quick response, and several user-friendly features.

Top THREE

Utility inspection applications

1. Transmission line inspections
2. Substation or switchyard inspection
3. Vault inspection and troubleshooting

Expedite PdM and troubleshooting

These Fluke infrared cameras with their high resolution images, long distance accuracy, thermal sensitivity, advanced focus systems, flexible viewing options, and other innovative features are particularly suited to the challenges of transmission and distribution applications, including:

Transmission line inspections

Loose contacts, corrosion, or internal defects in fittings and weakened or failing cable splices often cause hot spots that pose serious hazards to the integrity of a power transmission system. In areas subject to high winds and frequent wildfires this can have catastrophic consequences.

That's why utility companies are vigilant about inspecting

their transmission assets to find hot spots before they can cause disasters. In the past, surveying miles of transmission lines through remote and difficult terrain required hiring a helicopter with a fixed mount infrared camera to survey the area. These cameras often only identified anomalies and provided no radiometric data. Getting the data to diagnose the problem often required a second trip or carrying a second, more sophisticated infrared camera.

Another challenge, if there were only a few towers to be inspected, was that the lineman typically had to climb into a bucket and be raised up to inspect connection fittings or contacts. This was time consuming and brought workers closer to dangerous high voltage.

These Fluke infrared cameras help to overcome both of those



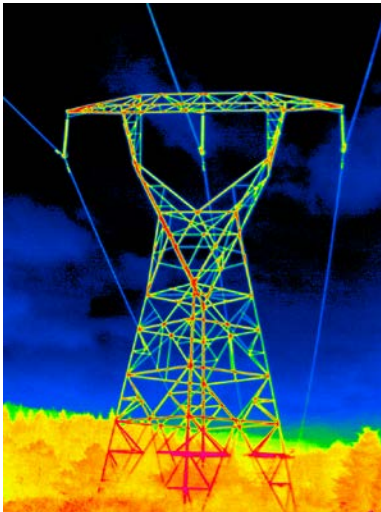
challenges. They deliver high resolution images and radiometric information at a safe distance with less hassle. You can inspect fittings and splices from the ground, with a telephoto lens to scan up to 30 meters (100 ft) away.



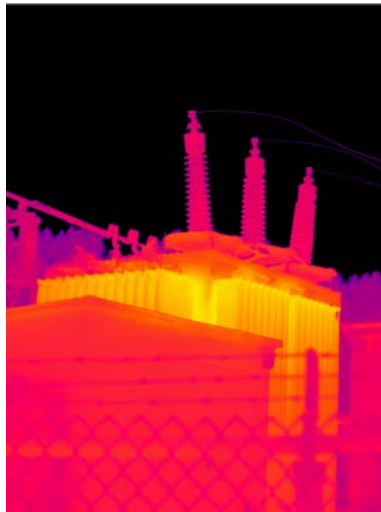
- **More diagnostic information.** The more detail you can see in an infrared image, the more information you have to work with. These Fluke high resolution infrared cameras give you both detail and information.
- **Super high resolution images.** Get up to 640 x 480 resolution and then four times the standard resolution with SuperResolution—up to 1280 x 960 for crisp images that deliver maximum detail.
- **Large 5.6 inch rotatable LCD display** lets you more easily inspect over, under, and around difficult-to-navigate equipment.
- **Rotating screens get better images.** Capture images in awkward or hard-to-reach areas with the versatility of rotating screens.
- **Advanced focus systems** offer a choice of manual, auto focus and LaserSharp® Auto Focus and MultiSharp™ focus for quick, accurate, in-focus image capture.
- **Maximum lens flexibility** with field replaceable optional lenses* (2x and 4x telephoto lenses and a wide-angle lens) you get the ability to capture high-resolution images close up or from a distance.
- **Gray scale and full color imaging** serve a variety of applications.
- **Video capture with voice and text annotations** makes it easier to document trouble points.
- **Fluke Connect® wireless compatibility** allows inspectors to send images and measurements to smartphones and iPads with the Fluke Connect mobile app for team collaboration**.
- **Handheld versatility** gives you the choice of carrying the camera in a helicopter, truck, or on foot, or mounting it on a tripod.

*Not all optional lenses work with all models, check with your Fluke representative for additional information.

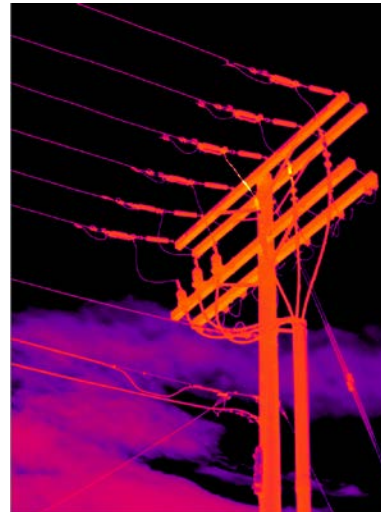
**Within providers wireless service area.



Electrical utilities transmission tower.



Electrical utilities substation transformer bushings.



Electrical utilities broken strand and high resistance.

For aerial inspections you can carry these Fluke infrared cameras on a helicopter and quickly scan miles of transmission lines, using gray scale to locate hot spots, and zooming in on suspect locations to collect high resolution infrared images with radiometric data. The built-in laser distance meter ensures that you are focusing where you intend to.

You can combine a digital visible light image an infrared image through Fluke IR-Fusion® technology to provide visual context for locating suspect components. You can also make text or voice annotations to add more details or location information. The removable SD card stores thousands of images which you can forward on to the supervisor back in the office for further analysis and reporting. Using the included Fluke Connect SmartView® software you can adjust the emissivity, reflective temperature compensation, transmissivity, level and span, and palette of the image downloaded from the thermal imager or zoom into a particular area of interest and include the enhanced images in a report or work order.

Substation or switchyard inspection

Substations and switchyards have many complex electrical systems and equipment that handle very high voltage. Keeping this equipment running safely and efficiently is critical because a failure can lead to lost production revenue for end users and lost sales revenue and liability issues for a utility.

Keeping substations and switchyards online requires regular PdM to isolate conditions that indicate impending failure. Infrared cameras combined with the skills of an experienced inspector provide the predictive capabilities to fill this role well because overheating or abnormally cool operating temperatures may signal degradation of an electrical component. A substation transformer can cost hundreds of thousands of dollars so keeping just one from being destroyed could more than pay for the infrared camera.

Here again, these Fluke infrared cameras provide an extra measure of accuracy and safety. You can perform the initial scan of the exterior of the substation from a distance of over 30 meters (100 feet). You can move quickly through the components, scanning the transmission line

feeding the station, the circuit from the transmission line, high side insulators (arrestors) and bushings on the transformer, and the regulators. Moving inside the perimeter you can inspect the bus work and its bypass switches for hot spots.

MutiSharp focus captures multiple images from varying distances and combines them into a single image that's in focus throughout the entire field of view.

If you find temperature anomalies at any point, you can zoom in on those areas and assign a level of criticality using either spot markers or other annotations. Then you can use the images and measurement data collected to create a professional report to document your findings.

Vault inspection and troubleshooting

Transformer vaults are typically crammed full of equipment and located below ground level, which makes them difficult to access and even more challenging to safely troubleshoot and maintain. However, PdM is absolutely necessary because failure within a vault can be costly, dangerous and a very visible mark against a utility's reputation.

Infrared images are for illustrative purposes and may not have been taken by these camera models.

In addition to LaserSharp auto focus capabilities provided by these Fluke infrared cameras, there are some added features that make them very handy for cramped transformer vault applications. Wide angle lenses allow for the quick scan of large areas—ideal for tight spaces.

The large displays on the TiX5XX series rotate to see much of the vault from above ground. If there are areas you can't reach from that spot, then you can easily carry the camera down the ladder, using the included neck strap, to scan the remaining connections and switches.



Preventative maintenance simplified. Rework eliminated.

Save time and improve the reliability of your maintenance data by wirelessly syncing measurements using the Fluke Connect® system.

- Eliminate data-entry errors by saving measurements directly from the tool and associating them with the work order, report or asset record.
- Maximize uptime and make confident maintenance decisions with data you can trust and trace.
- Access baseline, historical and current measurements by asset.
- Move away from clipboards, notebooks and multiple spreadsheets with a wireless one-step measurement transfer.
- Share your measurement data from your phone right from the inspection site
- Fluke infrared cameras are part of a growing system of connected test tools and equipment maintenance software. Visit your local fluke website to learn more.



You can also use Fluke Connect® SmartView® software included with all Fluke infrared cameras to document your findings in a report that includes thermal images, visible light images, and blended images to communicate problems you find and to suggest repairs.

Fluke Connect® SmartView® analysis and reporting software is available in all countries but Fluke Connect system is not. Please check availability with your authorized Fluke distributor. *Within providers wireless service area.

See what you're missing

The common requirements for all of these applications are clear image resolution, temperature accuracy, speed, and flexibility to get high resolution images in areas that may be hard to reach. Those are the very capabilities that set these Fluke infrared cameras apart.

To find out more about how these versatile, high resolution, high accuracy cameras can help utility companies keep the power up and running smoothly, contact your Fluke sales representative.

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)40 267 5100 or
Fax +31 (0)40 267 5222
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>

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