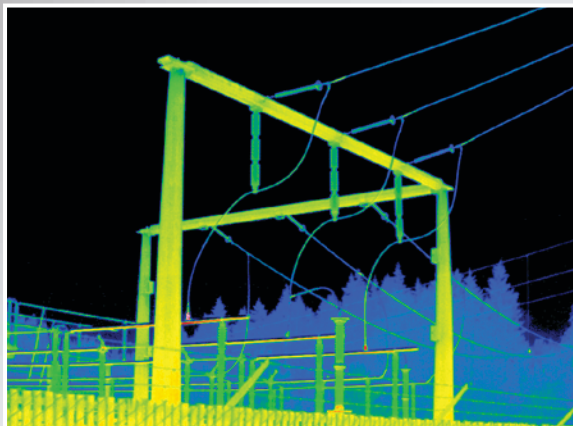
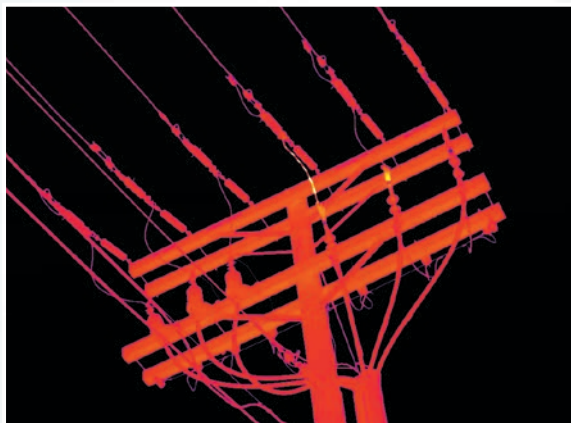
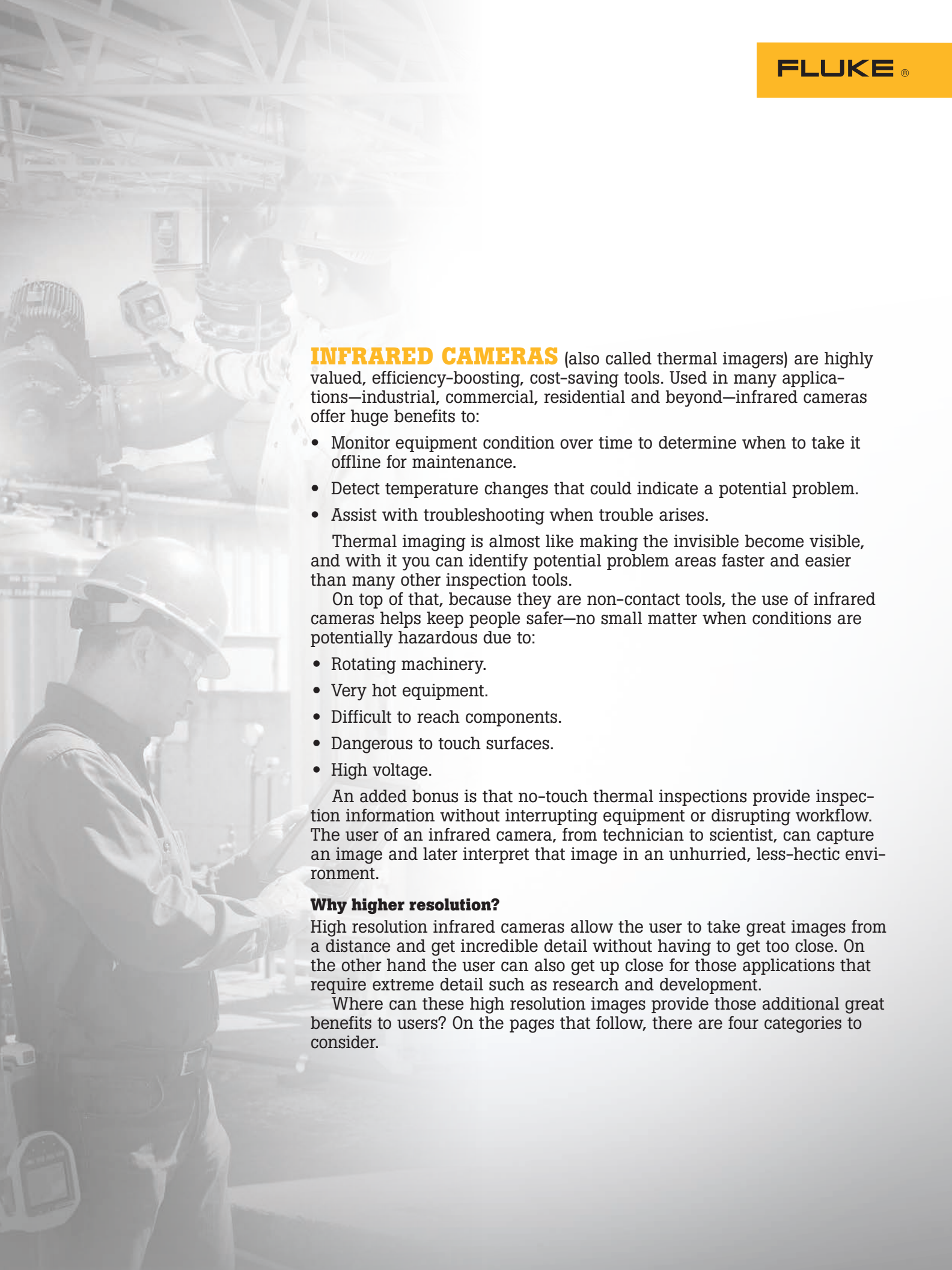


FLUKE®



A guide to high resolution thermography applications





INFRARED CAMERAS (also called thermal imagers) are highly valued, efficiency-boosting, cost-saving tools. Used in many applications—industrial, commercial, residential and beyond—infrared cameras offer huge benefits to:

- Monitor equipment condition over time to determine when to take it offline for maintenance.
- Detect temperature changes that could indicate a potential problem.
- Assist with troubleshooting when trouble arises.

Thermal imaging is almost like making the invisible become visible, and with it you can identify potential problem areas faster and easier than many other inspection tools.

On top of that, because they are non-contact tools, the use of infrared cameras helps keep people safer—no small matter when conditions are potentially hazardous due to:

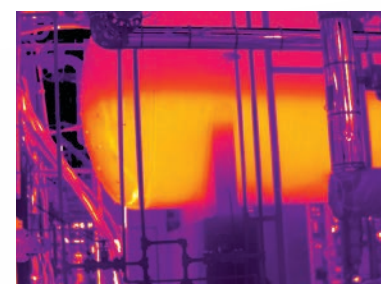
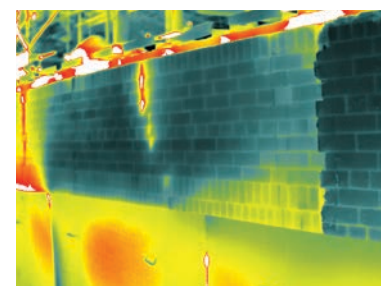
- Rotating machinery.
- Very hot equipment.
- Difficult to reach components.
- Dangerous to touch surfaces.
- High voltage.

An added bonus is that no-touch thermal inspections provide inspection information without interrupting equipment or disrupting workflow. The user of an infrared camera, from technician to scientist, can capture an image and later interpret that image in an unhurried, less-hectic environment.

Why higher resolution?

High resolution infrared cameras allow the user to take great images from a distance and get incredible detail without having to get too close. On the other hand the user can also get up close for those applications that require extreme detail such as research and development.

Where can these high resolution images provide those additional great benefits to users? On the pages that follow, there are four categories to consider.



Predictive maintenance

Predictive maintenance (PdM) involves measuring key indicators on critical equipment at regular intervals, documenting those measurements, trending those results over time, and looking for changes—particularly those that cross a threshold known to damage equipment. This approach is designed to help predict a failure before it occurs.

High resolution infrared cameras enhance results in many industry sectors, including:

- Utilities (electrical, gas, water)
- Chemical and petrochemical processing
- Nuclear power
- Data centers
- Discrete manufacturing

Capturing images. Higher quality images deliver important details that you might miss with a lesser camera. The high resolution can make the difference between catching a potential problem early, and finding it when it's already caused damage or outages.

For predictive maintenance inspection applications in critical and/or potentially hazardous situations, you need as much diagnostic information as you can get to identify subtle changes. That means you need a high resolution infrared camera designed to provide a high level of detail as quickly and easily as possible. Ideal features include premium resolution ability, large articulating display, versatile focus options and of course the most data and analysis options possible.

High resolution cameras in action

Applications such petroleum, chemical, electrical, nuclear power, cement and steel manufacturing that involve extreme temperatures and potentially hazardous conditions can all benefit from the level of detail provided by high resolution infrared images. Some specific examples include:

- Monitor and better predict when repairs are needed by inspection of refractory structures from a distance

- Monitoring and measuring bearing temperatures and condition in large motors or other rotating equipment
- Identifying leaks and determining fluid levels in sealed vessels and tanks
- Monitoring insulation performance in process pipes or other insulated processes
- Finding faulty connections in high power electrical circuits and equipment
- Locating overloaded circuit breakers in a power panels
- Identifying fuses that are at or near their current rating capacity or that are improperly installed
- Identifying problems in electrical switch gear
- Trending process temperatures
- Monitoring overall performance of specialized production equipment and systems

All without putting yourself at risk by getting too close to unsafe conditions and still get the spectacular images you need.

Download the complete application note at
fluke.com/Ti-pdm



Utility inspection

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.

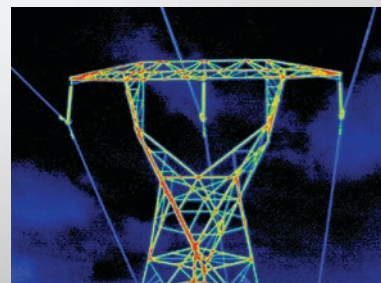
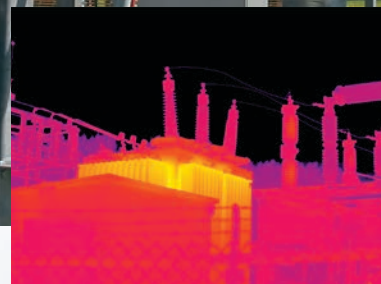
High resolution infrared cameras meet most of these challenging maintenance objectives. The top applications in utilities include:

- Transmission line inspections
- Substation or switchyard inspection
- Vault inspection and troubleshooting
- Solar panel inspection
- Coal handling and storage
- Steam heat coils and boilers, and furnace exteriors
- Electrical generator and turbine inspection

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.

The newest high resolution infrared cameras from Fluke, such as the Fluke TiX1000, TiX660 and TiX640, allow you to work from a safe distance and 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 away or close-up and several user-friendly features.

Download the complete application note at fluke.com/TI-utilities



Oil and gas

Oil and gas inspections are often challenging and users can really benefit from high resolution infrared. Some examples are:

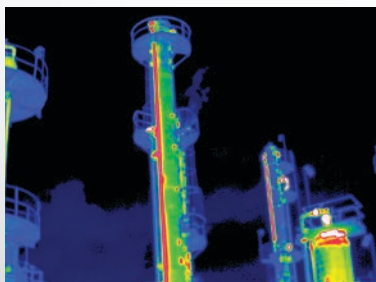
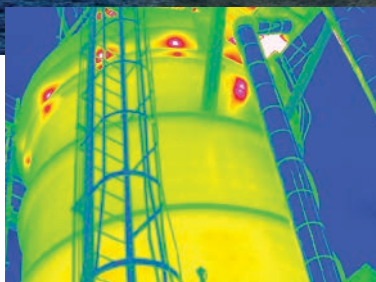
- Remote sites/compressor stations
- Towers, stacks, and air scrubbers
- Steam traps, leaks, cat cracker degradation
- Horizontal flares on offshore rigs
- Top drives
- Tank level
- Electrical systems
- Equipment monitoring
- Motors and drives
- Bearings

In addition to long distance exterior inspections, you can use high resolution infrared cameras to troubleshoot the standard equipment in a refinery from a safe distance so you may not have to secure a hot work permit or get closer to high voltage.

Unscheduled downtime can cost millions and professionals who work in the oil and gas industry know it is critical to maintain stable, continuous operations without sacrificing safety. They also know that regular maintenance, quick diagnosis of potential problems, and clear documentation are key to keeping production going smoothly and meeting regulatory requirements.

High resolution infrared cameras offer the versatility, accuracy, and usability to address a wide variety of inspection and troubleshooting activities. Whether used onshore or offshore, upstream or downstream, infrared cameras allow you to capture an infrared image of surface temperatures of a wide variety of equipment and processes. You can collect heat signatures for process equipment, as well as for leaks in pipes and tanks, without touching surfaces and without interfering with the process. The images and measurements from that inspection help you identify potential problems at an early stage.

Download the complete application note at fluke.com/TI-OandG



Research and Development

High resolution infrared cameras are ideal tools for scientific research, including early- and late-stage development troubleshooting and analysis. A key reason: They collect highly detailed thermal data without physically contacting the target and without interfering with the process.

Top R&D application areas for high resolution thermal imagers include:

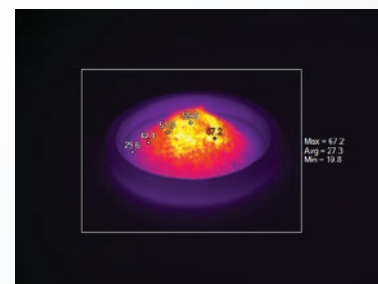
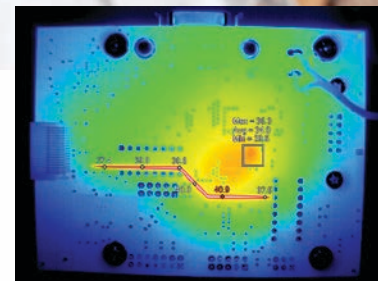
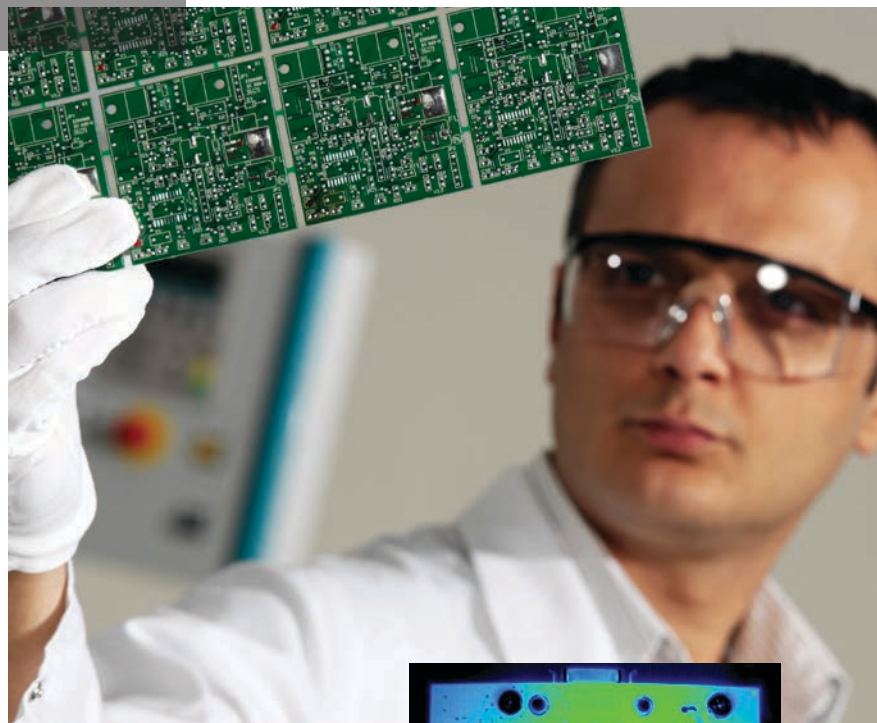
- Electronics research and development
- Materials engineering
- Chemistry and biological sciences
- Product design and validation
- Geothermal, geological and earth sciences
- Aerodynamics and aeronautics

While the specifics of those applications vary tremendously, all benefit from infrared cameras with high resolution. These new cameras also have a high degree of accuracy, excellent spatial and measurement resolution, high thermal sensitivity, and responsive performance.

The Fluke TiX1000, TiX660, and TiX640 infrared cameras, part of the Expert Series, provide all of those capabilities with a set of features that are indispensable for many types of R&D applications. High resolution (from 307,000 to 786,000 actual pixels of data with up to 3.1 million effective pixels on the TiX1000 in SmartView® software with SuperResolution mode) coupled with optional macro lenses can provide up-close imaging capabilities that produce highly detailed and informative images, with radiometric temperature measurements for each pixel. Individual images can provide a wealth of data on their own.

Capture multiple images, or streaming video with radiometric data, and the mountain of data increases exponentially. All who take on the task of research and development will appreciate useable, accurate, and analyzable data. With the Fluke Expert Series, users can easily access this data from the included SmartView® software and then often export it and apply their own analysis and algorithms.

Download the complete application note at fluke.com/TI-RandD





Fluke Expert Series

Not all thermal imagers are created equal. The new Fluke TiX1000, TiX660 and TiX640 infrared cameras, part of the Fluke Expert Series line, are ideal for challenging 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 deliver ultra-high resolution and temperature accuracy from far away and close-up.

Gain inspection accuracy, versatility, and speed with the New Fluke Expert Series Infrared Cameras.

- **More diagnostic information.** The more detail you can see in an infrared image, the more information you have to work with. These Fluke Expert Series infrared cameras give you both detail and information
- **Super high resolution images.** Get enhanced image quality and temperature measurement accuracy with up to four times the standard mode resolution and pixels (up to 3.1 million pixels on the TiX1000 and up to 1.2 million pixels with the TiX660) with SuperResolution mode 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
- **A tiltable LCoS color viewfinder display for outdoor use**—even in bright sunlight—provides excellent contrast, color reproduction and better high resolution images with 800 x 600 pixel resolution visibility
- **Advanced focus systems** offer a choice of LaserSharp® Auto Focus, Auto Focus, manual focus, and EverSharp multifocal recording features, for quick, accurate, in-focus image capture
- **Maximum lens flexibility** with field replaceable optional lenses (2x and 4x telephoto lenses and two wide-angle lenses) gives you the ability to capture high-resolution images close up or from a distance
- **12 palette selections to get the best results**—no need to default to grayscale any longer
- **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 quick team collaboration
- **Handheld versatility** gives you the choice of carrying the camera or mounting it on a tripod

The ability to get sharp, accurate images quickly from more than 100 feet away makes the Fluke Expert Series infrared cameras well suited to the challenges of all kinds applications.

The SuperResolution mode gives you up to four times the standard mode resolution for crisp images that deliver maximum detail when viewed in SmartView® software.



Multiply your resources with Fluke Connect™ wireless capabilities

Download the Fluke Connect mobile app to transmit images and measurements from Fluke Expert Series infrared cameras immediately to other team members' or customers' smart phones. Now sharing results is easier with ShareLive™ video call—see the same images and measurements remotely that you're seeing on site. That can help you get questions answered or get work order approvals on the spot and expedite repairs without leaving the field.

Fluke Connect™ is not available in all countries.
*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 the flexibility to get high resolution images in areas that may be hard to reach.

Those are the very capabilities that set these Fluke Expert Series TiX infrared cameras apart. To find out more about how these versatile, high resolution, high accuracy cameras can help keep the power up and running smoothly, consult your Fluke sales representative or visit www.fluke.com/ExpertSeries for more information.

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

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Printed in U.S.A. 1/2015 6004420b-en