VÓRTEX

Raytek Infrared Thermometers: Monitoring Electrical Systems

Saving man-hours and preventing down-time has never been easier, faster, or safer. Raytek® has a complete line of reliable and accurate thermometers designed with your specific needs in mind.

Raytek Infrared Noncontact Thermometers are the professional's choice for:

- Finding Hotspots
- Preventing Arcing and Insulation Damage
- Locating Grounds in Circuits
- Pinpointing Sources of Nuisance Tripping
- Spotting Energy Loss Sources
- Protecting Electric Motors
- Checking Transformers

Infrared Thermometers are proven money-saving tools for diagnostic and predictive inspection of electrical systems and equipment. Used in electrical maintenance for over 30 years, infrared noncontact thermometers allow you to quickly gather important temperature information.

Because electrical currents generate heat, temperature monitoring has become an efficient way to predict potential equipment failure. In one survey of electrical service and maintenance personnel, 100% of those using infrared thermometers reported preventing thousands of dollars of downtime and repair expenses through detection of hotspots. In fact, insurance companies are encouraging their customers to implement preventive infrared scanning.

Raytek's full line of infrared thermometers provide precise readings with 1–4% accuracy, and from as far away as 180 feet depending on the model used. They require no set-up and demonstrate a response time of less than a second. These instruments are lightweight, rugged, and easy to use.

VÓRTEX
EQUIPAMENTOS

Measuring Electrical Components

Small Circuits
Isolate short circuits and bad connections.

Circuit Breakers
Check for hotspots before they trip.

Motor Bearings
Check for worn bearings before they fail.

Noncontact infrared thermometers measure the surface temperature of an object from a safe distance, which makes them an indispensable tool in any electrical maintenance operation.

Since an infrared thermometer measures surface temperature, accurate results are obtained only when the target is visible. Remove covers and enclosures to expose the object to be measured. Motors and oil-filled transformers and circuit-breakers can be measured directly because the surface temperatures of their enclosures generally correlate to the internal temperature.

Make the following applications part of your comprehensive preventative maintenance program to prevent equipment failures and unscheduled down time.

Connectors

Normal on/off current loading and environmental temperature changes result in repeated heating (expansion) and cooling (contraction) of connections. Over time this can gradually loosen the connector. Because a loosened connector has higher resistance to current flow, it dissipates power and, as a result, generates heat. Similarly, dirt, carbon deposits, and corrosion in connections also cause higher resistance.

When evaluating connections, it is important to know the temperature differential between the connector and the ambient temperature. If ambient temperature is unknown, it can be quickly determined with the noncontact thermometer. Increases of 10°C (18°F) from ambient temperature indicate a poor connection, ground in circuit, or unbalanced load. Most experts agree that a temperature reading of 30°C (54°F) or more above ambient indicates a serious problem.

Electric Motors

Industrial plants often have hundreds of polyphase motors in operation. To ensure a motor's life span, temperatures must be monitored to verify balanced phase-to-phase power distribution and proper operating temperatures. NEMA, the National Electrical Manufacturers Association, recommends a ±1% power balance to prevent damage or motor burn-out, and IR thermometers can be used to inspect supply power connections and circuit breakers (or fuses) for equal temperatures.

Motor Bearings. Heat is generated when bearings break down, causing the motor to vibrate and become off-centered. 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.

Motor Winding Insulation. The life of motor winding insulation is drastically shortened if operating temperatures exceed rated maximums. The life of normal winding insulation is about 10 years. The following illustrates how operating temperatures effect winding insulation life:

Max Temp Rating	Insulation Life
exceeds 10°C (18°F)	1/2 of normal
exceeds 20°C (36°F)	1/4 of normal
exceeds 30°C (54°F)	1/8 of normal

Studies by electrical maintenance professionals have shown that winding surface temperatures are typically 10°C (18°F) cooler than internal (motor surface) temperatures. Certain standard test procedures, such as the IEEE "Meg-Ohm" test for motors 50 horsepower and above, require knowledge of the motor's temperature to obtain accurate results; in such cases, an IR thermometer with a digital, absolute temperature output is invaluable.

IR thermometers are also effective in determining the source of the problem when a thermal overload protection device does not work and the motor shuts down.

Phase-to-Phase Measurement

High-voltage, three-phase power circuits are common in industrial electrical systems. This is of importance to induction motors, large computers, and other equipment, which require balanced phase-to-phase power. If the power balance is not maintained due to an overload or ground in the circuit, damage and downtime can result. Checking cables and connectors with noncontact thermometer for equal phase-to-phase temperatures will quickly show if there's a difference of 5°C (9°F) or more, indicating a problem.

Transformers

Maximum permissible operating temperatures are usually listed on the transformer. The windings of air-cooled units can be measured directly with an infrared thermometer to verify overall temperature. Any hotspots indicate winding flaws.

Wires and Cables

Wires and cables can be monitored with a noncontact thermometer to identify heat caused by cracks, corrosion, or deterioration. When comparing two cables, the one with the higher temperature is carrying the larger current.

Uninterruptible Power Supplies

DC battery connections are susceptible to loosening and corrosion, which can create excess heat. Hot localized connections in the UPS output filters can be identified with an infrared thermometer. A cold spot may indicate an open DC filter circuit.

Back-up Batteries

Low-voltage batteries should be checked with a noncontact thermometer to ensure proper connections. Poorly attached cell strap connections in a battery string may heat up enough to burn the posts.

Ballasts

Aging electrical components cause lighting fixtures to overheat. Using an infrared thermometer can detect an overheated ballast before it begins to smoke.

Utilities

Within the plant, infrared readings can quickly and cost-effectively identify hot spots in connections, cable splices, transformers, and other equipment. Routine temperature audits will help prevent the enormous costs that result from equipment failures and system shutdowns.

In the field, conducting electrical utility inspections means taking regular temperature readings of transformers, wires, and other components located high above the ground and in other difficult-to-access locations. Several Raytek models feature optical ranges of 60:1 or greater, bringing almost any target easily within reach.

Interpreting Results

Once you have made a temperature reading, how do you know when a true problem exists? The answer lies in a combination of the service or maintenance technician's own experience with the equipment and the ratings provided by the manufacturer of the electrical components being monitored. Electrical equipment manufacturers usually list on the rating plate the maximum allowable temperatures.

The following organizations have set forth guidelines for operating temperatures, test methods, and frequencies of inspection for various equipment.

Factory Mutual

IEEE (Institute of Electrical & Electronic Engineers)

NFPA (National Fire Protection Association)

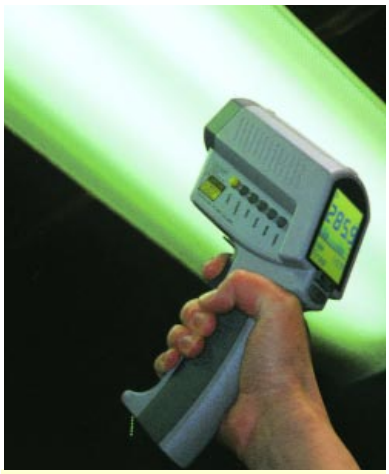
NETA (National Electrical Testing Association)

ASTM (American Society of Test Methods)

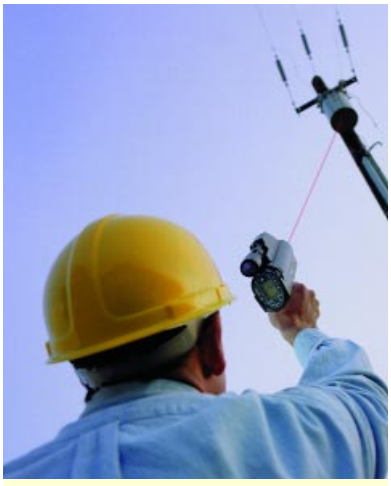
ANSI (American National Standards Institute)

The National Electrical Code (NEC) also gives information on acceptable equipment temperature as well as operating temperatures for specific electrical components and equipment.

Transformers
Detect flawed windings and terminals.



Ballasts
Inspect for overheating components.



Utilities
Monitor hard to reach equipment.

MiniTemp™ • At Home, At Work, Anywhere

If you're looking for a basic noncontact thermometer for a variety of applications, MiniTemp is the tool for you. It's priced to fit any toolbox and is small enough to fit in your pocket. Choose between MiniTemp MT2, without laser sighting, or MiniTemp MT4 with laser sighting.


MT

- Temp Range -18 to 260°C (0 to 500°F)
- Response at 95% 500 mSec
- Accuracy ±2% of reading or ±2°C (±3°F) whichever is greater
- D:S 6:1

Raynger® IP™ • Compact Close-Focus Plug-in

Measure temperatures of small targets—as small as 2.5 mm (0.1 in). Ideal for measuring extremely small targets. The IP is designed to plug into your thermocouple meter and offers a choice of J or K output.


IP

- Temp Range -18 to 260°C (0 to 500°F)
- Response at 95% 1 Second
- Accuracy ±2% of reading or ±2°C (±3°F) whichever is greater
- D:S 4:1

Raynger® ST Pro & ProPlus™ • The Professional's Choice

The Raynger ST is the most popular noncontact thermometer in the world. It offers an ideal combination of precision and value for the technical professional. Available in four models—ST20, ST30, ST60, or ST80. Most models feature circular laser sighting. The ST is accurate, compact, reliable, and easy to use—just what a professional needs.


ST20
ST30
ST60
ST80

- Temp Range
  - ST20 Pro -32 to 400°C (-25 to 750°F)
  - ST30 Pro -32 to 545°C (-25 to 950°F)
  - ST60 ProPlus -32 to 600°C (-25 to 1100°F)
  - ST80 ProPlus -32 to 760°C (-25 to 1400°F)
- Response at 95% 500 mSec
- Accuracy ±1% of reading or ±1°C (±2°F) whichever is greater
- D:S ST20 Pro, ST30 Pro = 12:1, ST60 ProPlus = 30:1; ST80 ProPlus = 50:1

Raynger® MX™ • For Those Who Demand Maximum Performance

The Raynger MX features an optically matched coaxial laser sighting system, which precisely and accurately outlines the target measurement area. With its unique combination of features and DataTemp™ software, the MX can adapt to any work environment. Choose from three models—MX2, MX4, and MX4+. Also available is the **MX Close Focus (MXCF)** special purpose model which will measure very small targets. (D:S 50:1, 6 mm target @ 30 cm,.25 in. target @ 12 in.).


MX

- Temp Range -30 to 900°C (-25 to 1600°F)
- Response at 95% 250 mSec
- Accuracy 0.5% of reading ±1°C (±2°F) whichever is greater
- D:S 60:1

Raynger® 3i™ • Superior Performance in Specialized Applications

The Raynger 3i is practically made-to-order for your speciality applications. Choose the temperature range, laser sighting, D:S, and scope option that work for you. The scope and scope-with-laser models are ideal for applications requiring long range temperature measurement, or for use in bright light. The 3i offers the only scope and laser combination on the market today.


3i

- Temp Range -30 to 3000°C (-25 to 5400°F)
- Response at 95% 550 mSec
- Accuracy ±1% of reading or ±1°C (±1.5°F) whichever is greater
- D:S 25:1 to 180:1

ISO 9001 Certified CE

Raytek®

Vórtex Equipamentos Ltda
Rua São Miguel 1183 - Sala 101 Bairro Itapoã
Belo Horizonte - MG CEP: 31710-350
Tel.: (31) 3427-7700 Fax.: (31) 3427-7792

e-mail: vortex@vortex.com.br
www.vortex.com.br

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