

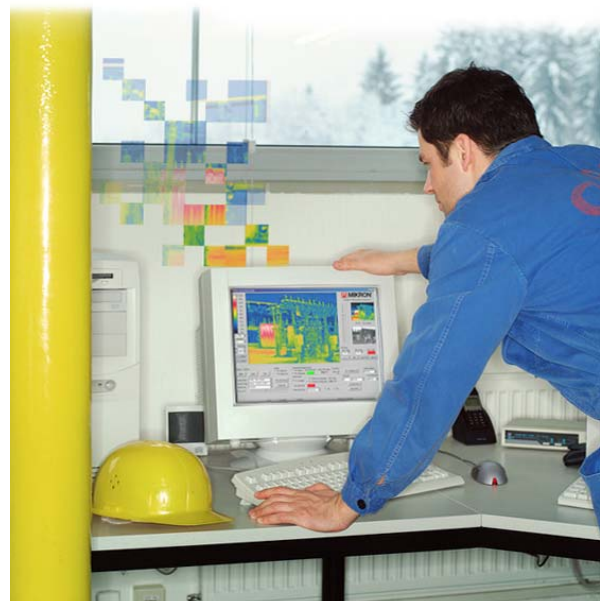


ThermalSpecion Systems

Total Solutions for Remote Monitoring and Process Control

Mikron presents visual and infrared cameras, and ultrasound capabilities in environment-appropriate enclosures.

Combined with Mikron's custom software, ThermalSpecion Systems produce powerful data in real-time.



Mikron Infrared, Inc.

Thermal Imaging Division

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ThermalSpection Systems

The Total IR Remote Monitoring Package—Whatever the Application



M7500 Multiple-Band Camera

Mikron's ThermalSpection Systems start with the unbeatable advantage of high-resolution (320x240)--four times the pixels of standard 160x120 detectors. The M7500's exclusive "spectral tuning" enables high-temperature capability (200-2000°C), allowing it to handle through-flame and furnace/kiln monitoring. The M7500 is designed with advanced maintenance-free electronics and offers unparalleled accuracy for demanding applications.

Detection Combinations

Visual and thermal camera combinations are available in the ThermalSpection package, blending images for added clarity in security and process control applications. Ultrasound arcing/corona detection can be added as well, for remote monitoring of electrical applications.

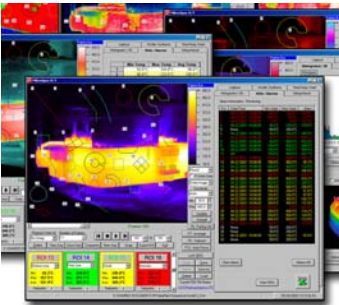
Adaptable Enclosures

Mikron's powder-coated NEMA-4 camera enclosures are built to last, and specifically, built to last in their intended environments. They include an IR transparent window, interface connections, power termination strip, vortex air cooler with thermostat, and mounts. Solid state air conditioner or heater with thermostat control is also available. The ThermalSpection 724HT enclosure offers continuous cooling. Positive pressure inside the enclosure prevents dirt or dust from entering, even in the harshest conditions.



Smart Software & Data Transfer

MikroSpec™ R/T Real-Time Thermal Data Acquisition and Analysis Software is a major feature of the ThermalSpection Systems. Mikron creates and updates its own software, customizing it to each customer's needs. Via Firewire™ or Ethernet, a user can control functionality remotely, selecting camera type, mode range, temperature scale and lens. Windows-based MikroSpec™ R/T allows the creation of up to 32 Regions of Interest (ROIs), allowing the user to retrieve temperature details within each ROI. The export to MS Excel™ feature allows analyzation of the real-time image temperature data in a numerical context.



Multiple Camera Systems Available

MikroSpec™ R/T Multiple Camera System, a thermal-imaging software add-on, allows data obtained from multiple cameras to be monitored simultaneously in real-time on a single computer.

System Commissioning

Support is the highlight of Mikron's total solution. Whether a single or multiple camera system, a Mikron technician travels to the customer site to install and configure the software for the application. The Mikron technician also trains the employees that will be using the system.

Continuing Support

Mikron's support continues after the sale and system commissioning. Software updates are free for 12 months, providing the latest advancements and improvements as soon as they are available.



ThermalSpection 724



Remote Thermal Monitoring System with Multiple Camera System Functionality

This system allows remote monitoring of temperatures in real-time through image data obtained from one or more cameras to a single PC. Designed with advanced maintenance-free electronics and industrial protective packaging, the ThermalSpection724 system offers unparalleled accuracy for demanding industrial and scientific applications. Each camera has an internet IP address, offering control from any computer using wired or wireless Ethernet. When used with MikroSpec™ R/T Thermal Data Acquisition and Analysis software, each camera is capable of monitoring up to 32 Regions of Interest.

TS724 DualVision



Remote Thermal Monitoring System with Visual Image Functionality

The ThermalSpection 724 DualVision system offers all the functions of the ThermalSpection 724, with the addition of a visual camera. Both visual and IR cameras have internet IP addresses. Mikron's software blends the visual and IR camera feeds into a single image with correct aspect ratio and spatial area. The resulting composite can be viewed in an infinitely blended percentage of visual/IR, simply by moving a slider bar within Mikron's software. With this system, visual surveillance enhanced with IR imaging makes it easy to spot intruders and monitor critical substation components 24/7, without supplementary lighting.

TS724 DualVision Ultra



Remote Thermal/Visual Monitoring System with Ultrasonic Detection

The ThermalSpection 724 DualVision Ultra system offers all the functions of the ThermalSpection 724 DualVision, with the addition of ultrasonic detection. With the addition of airborne ultrasound, certain conditions such as arcing, tracking, or corona can also be detected before they reach the critical stage.

ThermalSpection 724HT



Remote Thermal Monitoring System for Demanding High-Temperature Applications

The ThermalSpection 724HT system offers all the functions of the ThermalSpection 724, with special high-temperature camera range and flame-filtering capabilities. The 724HT enclosure is specifically designed for harsh high temperature environments. The enclosure features extra cooling and airflow to keep the viewing window clear. Low-emissivity silver paint coats the enclosure, to help keep the unit cooled. In addition, positive pressure inside the sealed enclosure prevents dirt or dust from entering.

ThermalSpection Systems



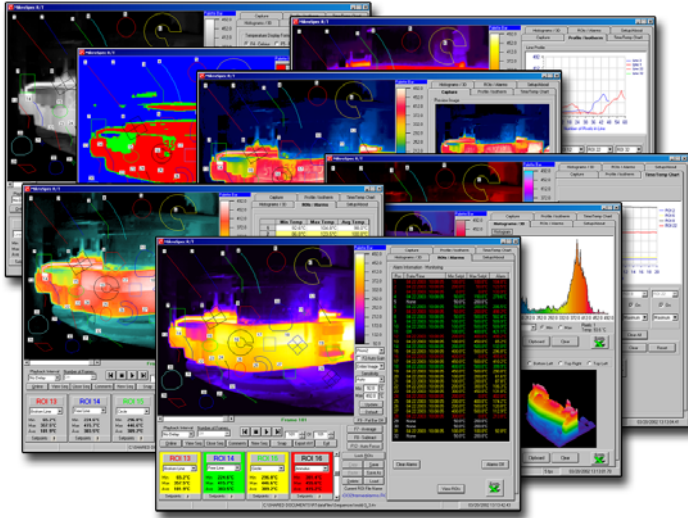
Technical Data	
More details available on individual system data sheets at mikroninfrared.com	
IR CAMERA—M7500	
Detector:	320 x 240 Uncooled Focal Plane Array (Microbolometer)
Measurement Accuracy:	±2% or 2°C of reading
Field of View:	27°(H) x 20.3°(V)
Focus Range:	30 cm to infinity
Spectral Band:	8.0 to 14.0 μm
Image Update Rate:	30 Frames/sec
Interfaces:	100 Base T Ethernet
HOUSING	
NEMA-4 Enclosure with Mounts	Includes IR Transparent Window, interface connections, power termination strip, vortex air cooler with thermostat control or optional solid state air conditioner or heater with thermostat control
ENVIRONMENTAL	
Operating Temperature:	-15°C to 50°C
ELECTRICAL	
Power Supply:	120 VAC 5 Amps Max Standard (10 Amps with Pan & Tilt)
PHYSICAL CHARACTERISTICS	
Dimensions:	8.5 (H) x 29 (L) x 10.625 (OD) (excluding projections)
Weight:	approximately 60-75 lbs, depending on model
ONLINE VISIBLE/THERMAL IMAGE PROCESSING SOFTWARE	
Feature Overview	Live thermal 256 color display, remote camera control functionality, real-time image and data acquisition, multiple Regions of Interest (ROIs), multiple color palettes, off-line analysis
Image Blending Feature	Blends the visual and IR camera feeds into a single DualVision image with correct aspect ratio and spatial area. Allows hot spots to be identified while viewing the scene as a visual image. The composite image can be adjusted to show any percentage of the IR and visual.
VISUAL CAMERA	
Sensor:	1/4 Interline Transfer CCD
Pixel Depth:	8 bit Digit B/W or 24 bit Digital Color
Resolution:	640x480 or 320x240
Shutter:	1/30s - 1/30,000s
Frame Rate:	Up to 30 Frames per Second
External Video:	CCTV Video Inputs/Outputs
ULTRASONIC DETECTION UNIT	
Frequency Range	36-44 kHz
Dynamic Input Range	100 dB
Field of View	10°
Outputs	4-20 mA DC Linear Output and 0 to 10 VDC; Proportional to the Received Ultrasound of 0 to 40 dB
Heterodyned (Audio) Output	90 dBA at Full Scale Output into 16 Ohms 0 to 6 kHz 3 dB Bandwidth
Alarm	Open collector rated at 24 VDC, 10 mA. threshold Level Adjustable Over the Output Range. Alarm Output Stops Conducting when the input level exceeds the threshold level set point.
TS724 HT IR CAMERA—M7500	
Detector:	320 x 240 Uncooled Focal Plane Array (Microbolometer)
Temperature and Spectral Range Configurations	Config. 1: 400° C to 1600°C with flame filter 3.9μm (standard) Config. 2: 400° C to 1600°C 4.8 to 5.2 μm (optional) Config. 3: 200° C to 2000°C 8.0 to 14.0 μm (optional)
Measurement Accuracy:	±2% or 2°C of reading
Field of View:	27°(H) x 20.3°(V)
Focus Range:	30 cm to infinity
Image Update Rate:	30 Frames/sec
Interfaces:	100 Base T Ethernet

Mikron reserves the right to change specifications to reflect the latest changes in technology and improvements at any time without notice. These changes will be reflected in subsequent editions of our literature when warranted.

More details on each system are available on individual system data sheets at mikroninfrared.com

MikroSpec™ R/T

Real-Time Thermal Data Acquisition and Analysis Software



- Monitor processes in real-time
- Reduce, even ELIMINATE downtime
- Lower production costs
- Save time
- Increase quality and safety

By using one or more MIKRON Infrared cameras connected to MikroSpec™ R/T software, processes can be measured accurately to ensure production quality where individual images are insufficient. The software allows you to view thermal images in real-time, as well as those that have been captured and stored to the computer's hard disk drive.

By creating up to 32 Regions of Interest (ROIs) in one of ten shapes, you can retrieve details as to the temperature range within the ROIs. The emissivity (key to accurate radiometric imaging) of each ROI can be set separately. Sophisticated graph tools allow you to create graphs of the real-time image temperature analysis, while the export to Excel™ feature allows you to analyze the real-time image temperature data in a numerical context.

MikroSpec™ R/T Features

Remote Camera Control Functionality via FireWire™ or Ethernet Interface allows you to select the camera type, mode, range, temperature scale and lens. It also allows you to perform non-uniformity correction (NUC) as well as make adjustments for focusing, emissivity, ambient calibration, and percentage of transmission loss.

Real-time Image Acquisition allows you to capture large amounts of data at a user-adjustable capture rate of up to 30 frames per second (FireWire) or one frame per second (Ethernet.) Live images can be captured with full temperature data and stored to a sequence file. Individual snap shot images can also be stored to files with full temperature data for later analysis.

Multiple Regions of Interest (ROIs) allow you to process and compute the Minimum, Maximum and Average Temperatures for up to 32 Regions of Interest (ROIs). The ROIs can be resized and moved on the live image display.

Each ROI has a minimum and a maximum alarm set point that can be configured to generate software and digital output alarms.

Off-line Analysis allows you to replay image sequence files that had been previously captured and saved to disk. Sequence files can be loaded into MikroSpec R/T and played back using all of the R/T tools.

Image Averaging and Subtraction allows you to compare the current input image with a snapped or loaded reference image.

Windows™ Compatibility ensures flawless operation in Windows 2000 or Windows XP .

Industry-Leading Documentation and Support ensures easy start-up and continued access to technical assistance and support.

Free Updates for 12 Months provides you access to the latest advancements and improvements as soon as they are available — at no charge.

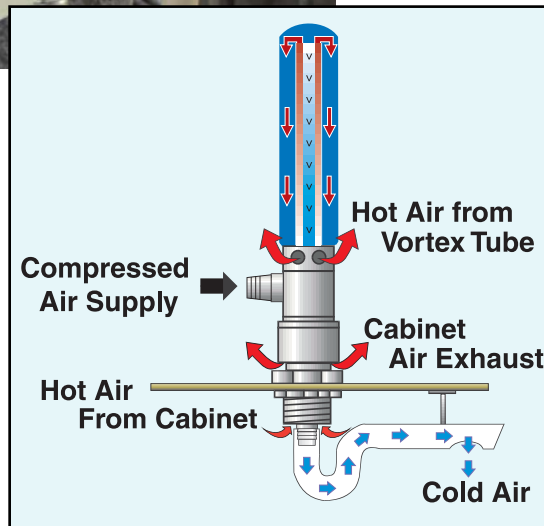
Standard Vortex Air Cooler

EXAIR® Economical, Reliable Cooler with No Moving Parts



Features

- Cools and purges
- Uses readily available compressed air
- No moving parts
- Wear-resistant stainless steel
- Adjustable thermostat
- NEMA 4X rating
- Eliminates need for fans/filters
- Compact unit
- Electronic Temperature Control standard



Compressed air enters the vortex tube powered Cabinet Cooler and is converted into two streams, one hot and one cold. Hot air from the vortex tube is muffled and exhausted through the vortex tube exhaust. The cold air is discharged into the control cabinet through the cold air distribution kit. The displaced hot air in the cabinet rises and exhausts to atmosphere through the cabinet air exhaust at a slight positive pressure. Thus the control cabinet air is both cooled and purged with cool, clean air. **Outside air is never allowed to enter the control panel.**

Source: www.exair.com

Specifications

Capacity:	1700 BTU/HR cooling 428 Kcal/HR
Rating:	NEMA 4
Construction:	Stainless steel
Size:	Outside cabinet: 7.25"H x 2.5"W x 2.5"D, Inside: 4.56" H
Weight:	6 lbs (unit alone)

ETC Details: The EXAIR ETC (Electronic Temperature Control) delivers precise temperature control for the ThermalSpecion enclosure. Temperature accuracy is $\pm 1^{\circ}\text{F}$ of the dial setting. The digital readout monitors the internal temperature of the enclosure, activating the solenoid valve only when the set temperature is exceeded. The ABS/PC plastic enclosure is suitable for NEMA 4X environments.

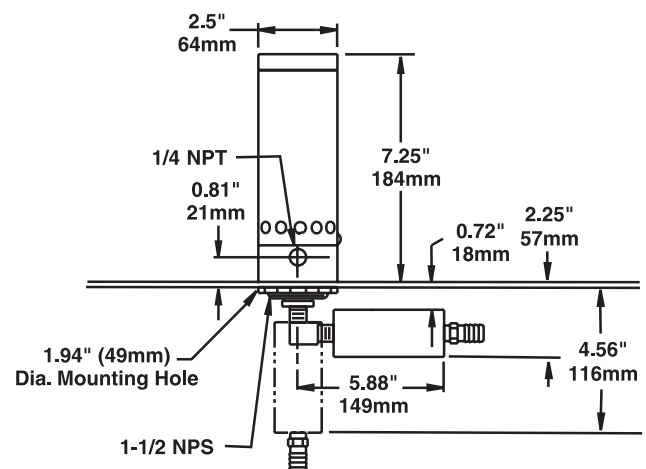


Diagram and specifications courtesy of www.exair.com

Optional HVAC Unit Heating/Cooling

Compact Heating/Cooling System for ThermalSpecion Enclosures



Outside half of HVAC Unit-- "hot side"



Inside half of HVAC Unit-- "cold side"

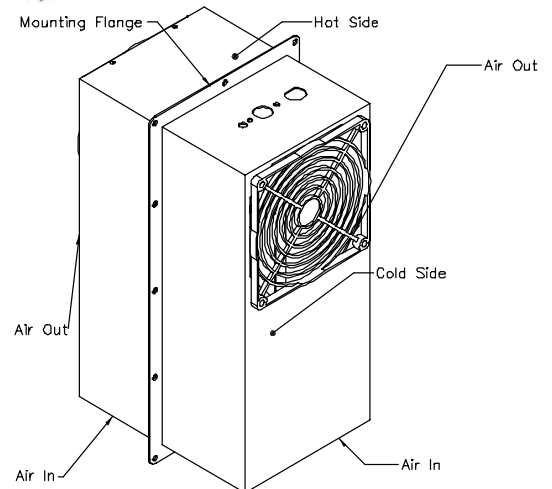
Features

- Unit provides heating and cooling
- Reliable Peltier cooling design
- Solid state operation
- No filters, compressors, or CFCs
- No exchange of ambient air
- No compressed air needed
- Corrosion-resistant stainless steel
- Capable of high-precision temperature control
- Adjustable thermostat
- NEMA 4X rating



Specifications

Capacity:	400 BTU/HR heating/cooling
Rating:	NEMA 4X - outdoor/wash down
Construction:	Stainless steel (covers and mounting flange)
Size:	11"H x 5"W x 3-1/2"D body, 12"H x 6"W flange
Operating Range:	Up to 140 degrees F
Temperature Control:	Adjustable thermostat (cooling) - Fixed point thermostat (heating)
Power:	120 VAC @ 2 AMPS
Frequency:	50/60 HZ
Weight:	16 lbs (unit alone)
Features:	Integral Power Supply



Product photos and specifications courtesy of www.eicsolutions.com

Optional Equipment

Multiply the power of the ThermalSpecction cameras by adding optional equipment

Computer Controlled Pan & Tilt Positioning System

This add-on offers ultra-smooth panning and tilting ability to the ThermalSpecction remote-monitoring cameras. The Pan & Tilt is controlled from a host computer via Ethernet, and includes test/operational software (requires Windows XP or 2000). The setup and access of the "tour" feature allows continuous cycling of up to 255 positions, or the virtual joystick allows precise control of movement and position. The system also includes an electronic limit of motion for both pan and tilt. The unit is suitable for indoor or outdoor applications.



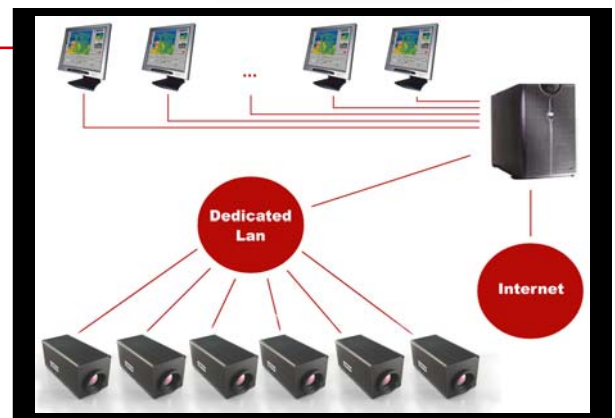
Lenses

The M7500 camera's standard lens offers a 21°(H) x 20.3°(V) field of view. Optional Telephoto and Wide Angle lenses are also available at an additional cost. Telephoto lens offers a 10.8°(H) x 8.1°(V) field of view, with focus range 78" to infinity. Wide Angle Lens offers a 52.6°(H) x 39.7°(V) field of view, with focus range 3" to infinity. Lenses shown at right are representative of M7500 Telephoto and Wide Angle Lenses.



Mikrospec™ R/T Multiple IR Camera System Package

Mikrospec™ R/T Multiple IR Camera System Package is the necessary software add-on needed to monitor data from multiple cameras simultaneously on a single computer. The system provides a high level of accuracy, reliability, and stability by utilizing customized Mikron Multi-Camera Controls and MikroSpec R/T software to monitor and analyze temperature and alarm data being received from all cameras.



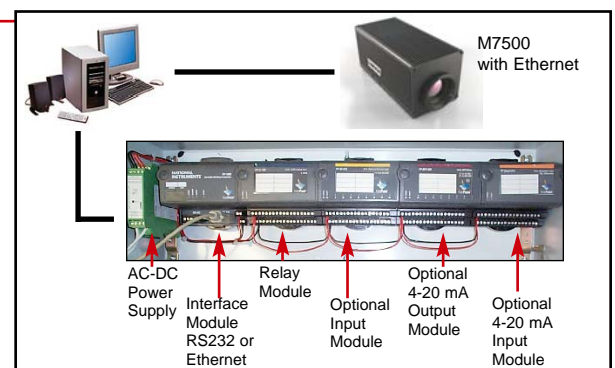
8-Channel Input/Output Modules

Relay Output (Alarms) Module offers 8 relay channels with each channel driving up to 240VAC at 3 Amps

Universal Input (Remote Triggering) Module offers 8 channels with each channel ranging from 5 VDC to 240 VAC

4-20 mA Output Module offers 8 channels allowing MikroSpec R/T software to send each Region of Interest temperature to a 4-20mA output.

4-20 mA Input Module offers 8 channels allowing the MikroSpec R/T software to store external signals with captured temperature data.



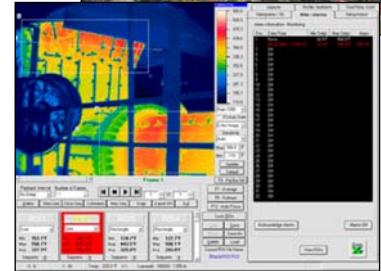
Sample Applications

Just a few of the ways ThermalSpection Systems are being used

Skin Temperature Monitoring of Critical Vessels

A 14-camera Mikron ThermalSpection System has been monitoring a Chevron-Texaco-designed gas separation system for a major specialty gas producer in Texas. The turnkey infrared system provides continuous real-time skin-temperature monitoring, with computer generated alarms for thermal excursions, while storing trend data for analysis and process improvement. This is the second system of its type in the Oil Patch, and the technology is applicable to any refractory-lined equipment, as well as reactors, regenerators, boilers and furnace tubes.

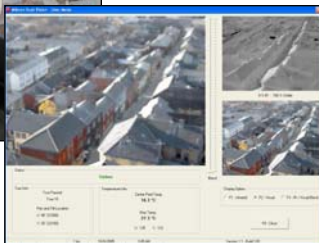
The new wireless visual system replaces a thermocouple-grid system, fixed directly to the shell's exterior. In the past, failures/problems with thermocouples or connecting cables left dangerous holes in the monitoring scheme until replacement or repair could be made--always difficult and risky. Thermocouples degraded with the vessel shell and only gave operators a general idea of where problems might be. Not only is the ThermalSpection multiple camera system simpler, easier and safer, now the plant operators are gaining an understanding of the "personality" (trending) of the gas separation system that was never gained through the thermocouple grid system.



Fire Detection and Security in Norway

Røros, Norway, a remote historic copper-mining center on UNESCO's list of priceless world historical sites, has implemented the use of Mikron's DualVision infrared and visual camera system for fire prevention. The camera, mounted on a pan-and-tilt head in the town's church steeple, monitors Røros's 17th century medieval layout. The densely packed, historic wooden town center would provide plenty of fire fuel and limited access for fire fighting brigades to respond quickly and effectively, should a fire occur.

The DualVision system is operated from a PC at the fire station, using Mikron's MikroSpec Real-Time Thermal Data Acquisition and Analysis software. By applying an isotherm color pallet to the IR image, hot spots are easily identified while still viewing the scene as a visual image. The composite thermal/visual image allows firefighters to quickly assess an alarm situation before sending equipment to a scene.

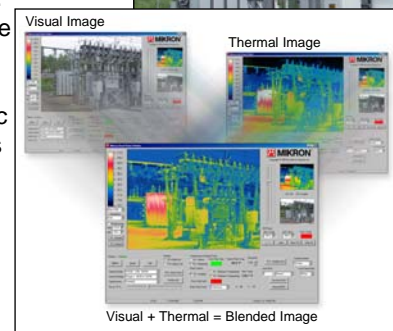


24/7 Maintenance/Security Monitoring of Substations

Although infrared technology has long been used in the utility industry, most utilities still use it only for periodic inspection of substations. Factors like aging equipment, homeland security concerns, and higher replacement costs clearly show a need for the real-time data analysis and cost-effective remote monitoring of Mikron's ThermalSpection Systems.

Mikron's TS724 DualVision Ultra, combining visual and IR cameras with airborne ultrasound detection, can be integrated with PLC and DCS control systems. Comparing load data with visual/thermal patterns provides a new tool for better understanding what constitutes a normal and safe state of the equipment. MikroSpec R/T software, with its many allowable Regions of Interest (32 per camera), multiplies the areas that even one camera is monitoring simultaneously.

In addition to the evident value of the thermal data, the visual surveillance capability of the system, enhanced with the IR data, makes it easy to spot intruders 24/7, without supplementary lighting.



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