



# AUTOMATION

## Industrial Safety Cameras

Condition Monitoring | Early Fire Detection | Process Control



# WHEN PRECISION AND CONTROL ARE MISSION CRITICAL

There is a wide range of automation and industrial safety applications for FLIR high-performance thermal imaging solutions. New applications emerge every year as more industries identify a need for thermal imaging to:

- Find temperature problems before they lead to failures
- Prevent costly production stops
- Spot process anomalies that can flag dangerous situations early, improving safety in the workplace

Automated FLIR applications are most prolific in condition monitoring, early fire detection, and process control monitoring. We created this primer to illustrate thermal imaging value in specific industry applications. If it's been done before, then you have a template for implementation. If yours is a new application, then perhaps one of these examples will give you an idea of what's possible. Either way, if the value of thermal imaging intrigues you, then we want to help you determine if it's the right fit.

If you're new to thermal imaging technology, then download the IR Automation Handbook from [flir.com/automation-handbook](http://flir.com/automation-handbook). This guide provided details on the science, technology, and capabilities of thermal imaging. If you're more comfortable learning directly from one of our thermal experts, call us with your questions at 1-866-477-3687.

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# CONDITION MONITORING

Condition monitoring identifies problems before failures occur in order to prevent costly production stops. Typical equipment that is monitored includes high- and low-voltage installations, turbines, compressors, and other electrical and mechanical equipment. Sometimes processes need to be monitored because an anomaly can cause dangerous situations. For example, flares that have a flame invisible to the naked eye need to be monitored to see if they are effectively burning gas exhaust.

## FLARE STACKS

### Thermal Imaging Value

Flare stacks are used in many industries to burn off unwanted waste gas byproducts, or flammable gases released by pressure relief valves during unplanned over-pressuring of plant equipment. Thermal imaging cameras are ideal monitoring tools because they allow full-time automated remote monitoring in virtually any weather. In addition, thermal imaging cameras avoid many of the technical and cost-related problems associated with other technologies such as ultraviolet (UV) flame detectors, flame ionization spectrometers, thermocouples, and pyrometers.

### Application Story

Customers use FLIR thermal imaging cameras such as the FLIR A310 to not only monitor flare stack flames, but also to actively regulate assist gas control programs. If a flame is not burning within preset parameters, the FLIR A310-based automated system will alarm, prompting immediate adjustments to air or steam volume to maintain proper combustion. As a bonus, automated assist gas injection control can help prevent excessive steam consumption and provide significant cost savings.

### THE FLIR SOLUTION



FLIR A310





## ELECTRIC SUBSTATIONS

### Thermal Imaging Value

Electric power utilities today are faced with an aging infrastructure, increasing risk of blackouts and brownouts as well as security threats. Unplanned maintenance can be expensive in the best-case scenarios and catastrophic in the worst. With FLIR thermal imaging cameras and condition monitoring software, impending equipment failures and security breaches can be detected anytime, day or night, from a remote monitoring location.

### Application Story

Sensei Solutions LLC, a North Carolina-based provider of smart grid solutions, uses thermal imaging technology to improve stability and security of electric substations. According to Robin Thompson, Sensei Solutions founder and CTO, "Continuous automated radiometry has many benefits. This method is non-invasive, it eliminates human errors and mitigates the risk of greater failures." Their customers use automated thermal imaging for temperature measurement of bushings, breakers, and capacitor banks, as well as to detect the heat signatures of intruders.

### THE FLIR SOLUTION



FLIR A310 f



## STEEL MILL LADLES

### Thermal Imaging Value

Steel mill ladles have limited lives. As their refractory linings wear or break due to shock, the outer part of a ladle can be exposed to excessive temperatures. If not caught in time, the result can be ladle disintegration and a molten metal breakout, threatening the lives of workers and destroying equipment. FLIR thermal imaging camera systems monitor ladles in real time and warn of a breakout before it happens.

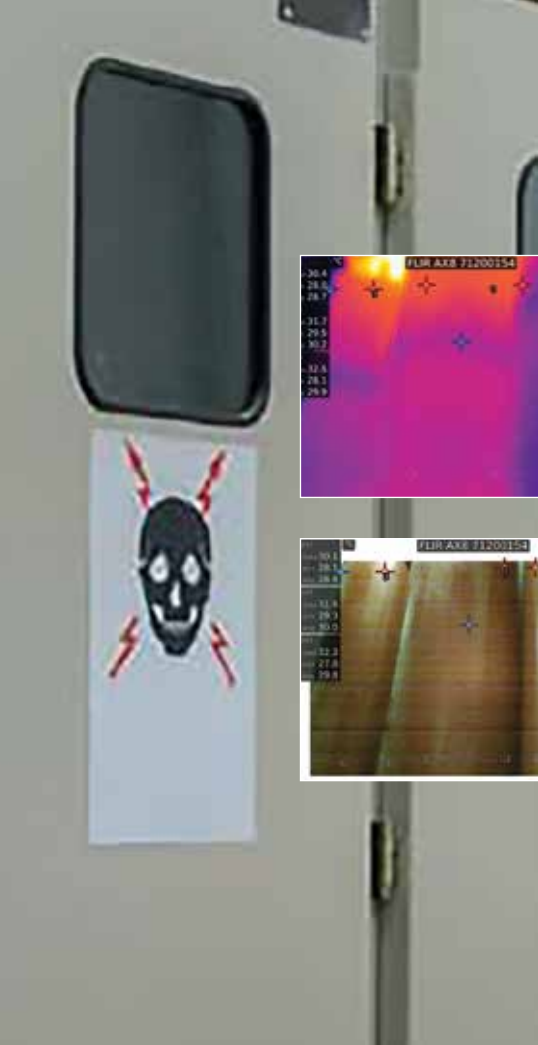
### Application Story

Customers place the FLIR A310 thermal imaging cameras in robust housings, located in fixed positions where they have a clear view of a filled ladle as it passes by on a gantry crane. Those cameras capture video images of the ladle in real time and calculate temperatures over the ladle's surface. A few cameras can cover the entire surface of the ladle, but typically a few regions of interest are predefined for closer scrutiny and analysis. If a temperature exceeds the ladle's predefined parameters, an alarm is triggered. The exact temperature parameters for alarms can be adjusted easily, based on mill experience.

### THE FLIR SOLUTION



FLIR A310



## ELECTRICAL & MECHANICAL INSTALLATIONS

### Thermal Imaging Value

Some critical electrical and mechanical installations in manufacturing companies and utilities are monitored 24/7 with a thermal imaging camera. Heat buildup indicates poor equipment health and possible impending failure. A fixed-mounted thermal imaging camera gives you the advantage, so you don't need to rely on periodic inspections. Alarms can be set to go off once a temperature threshold is exceeded.

### Application Story

ADE Technology Inc., in Taiwan developed an affordable condition monitoring solution for electrical and mechanical installations that is compact enough to fit inside of a cabinet with the installation. Called T-Guard, ADE's solution can manage up to nine FLIR AX8 cameras to monitor enterprise-wide electricity management, solar PV management, Environment Control Systems (ECS), and more. According to Jeffrey Chow, ADE's general manager, "The AX8 is a definitely a game changer for traditional condition monitoring."

#### THE FLIR SOLUTION



## LIVESTOCK HEALTH

### Thermal Imaging Value

Modern farms increasingly resemble factories in their makeup as they become more and more industrialized. The present-day farmer spends less time performing menial tasks and more time behind the computer. In these circumstances good automatic monitoring systems are a must to ensure quality and continuity. Thermal imaging cameras make sense in an automated system anywhere you need to monitor temperature change on the farm, including: livestock health, herd management, irrigation control, and commodity storage and handling.

### Application Story

Agricam uses a FLIR A310 thermal imaging camera in its automated inflammation detection tool to diagnose mastitis. Mastitis is the inflammation of a dairy cow's udders caused by a bacterial infection. If it's caught early enough, then a cow can be treated non-medically. Early detection gets cows back to producing viable milk faster to minimize the bacteria's financial impact to farmers, which can add up to tens of thousands of dollars each year. "With a thermal sensitivity of 50 mK, the FLIR A310 thermal imaging cameras provide exactly the kind of detailed images and thermal data that we need for this application," said Stefan Sjökvist, CEO of FLIR distributor, Termisk Systemteknik.

#### THE FLIR SOLUTION





# EARLY FIRE DETECTION

Fire can destroy multiple buildings or installations within an extremely short time frame. The value of the goods destroyed during a fire can be tremendous, and the cost of a life that is lost during a fire is impossible to calculate. With their non-contact method of measuring temperatures, thermal imaging cameras can help prevent fires by detecting hot spots before they ignite.



## FUEL STORAGE

### Thermal Imaging Value

Fuel storage is notoriously hazardous because the commodity itself is so flammable. Corrosion, leaks, and human error can lead to explosive, sometimes catastrophic, consequences. Autonomous monitoring of temperature changes in fuel storage depots with thermal imaging cameras can avert disaster, satisfy insurer oversight and improve safety for workers and the public.

### Application Story

On the French-Belgian border, in the town of Wattrelos, a Transpole bus depot stores all of the natural gas for its bus fleet. Natural gas is stored under high pressure and is highly flammable. An explosion would endanger employees as well as citizens in nearby towns. French FLIR products integrator ALOATEC developed a fuel storage monitoring system comprised of 10 FLIR A310 thermal imaging cameras. "Not only do thermal imaging cameras function regardless of the light conditions, they also help to spot a rise in temperature even before fire breaks out," said Philippe Bourrier, director of ALOATEC

### THE FLIR SOLUTION



FLIR A310 f



FLIR A310 ex



FLIR FC-SERIES R



## WAREHOUSES

### Thermal Imaging Value

Even though warehouses are equipped with fire alarms and firefighting systems, once a fire starts, asset damage is almost certain. FLIR thermal imaging cameras can identify hot spots before they ignite and provide an early warning response to avoid full-on conflagration before assets are harmed or safety is compromised.

### Application Story

An enclosed chemical waste storage facility used stand-alone thermal imaging cameras to detect temperature changes among its stockpiles. Waste exposed to air or water could become unstable and possibly explosive. So, the company brought in FLIR thermal imaging cameras to monitor the entire storage warehouse, 24/7. Now, these cameras broadcast images on a control room monitor that can direct personnel to the exact location of a hot spot. Preconfigured temperature alarms can be adjusted to compensate for temporary changes such as the presence of a forklift or worker. Thermal imaging cameras can also integrate with automated fire alarms and extinguishing systems to minimize the footprint of fire damage if it ignites before preventative measures can be imposed.

### THE FLIR SOLUTION



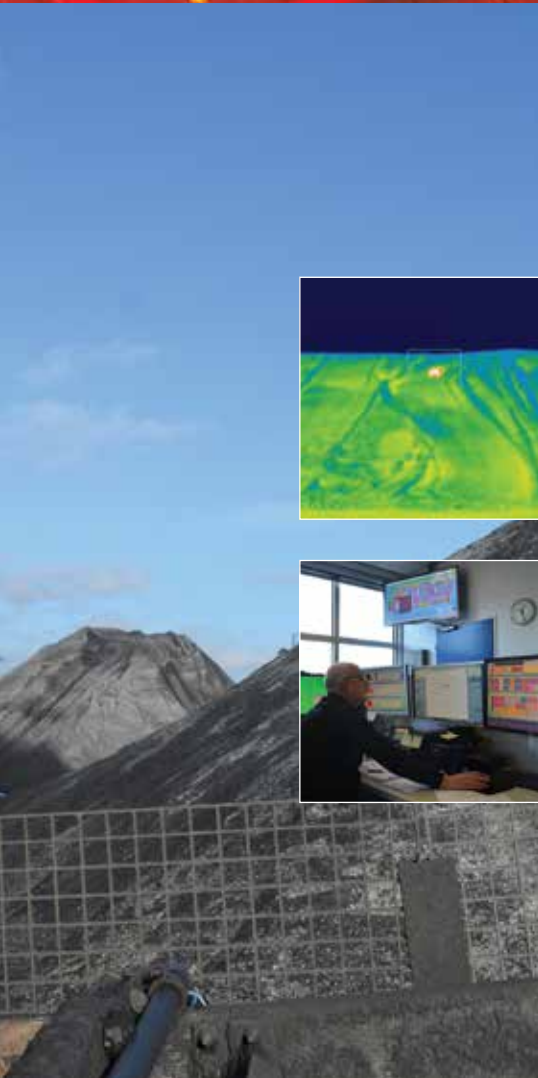
FLIR AX8



FLIR A310



FLIR FC-SERIES R



## COMBUSTIBLE PILES

### Thermal Imaging Value

Storage of some material invites the risk of spontaneous combustion. As always, prevention is better than a cure. A thermal imaging camera can help to ensure safety and detect spontaneous combustion. It provides continuous, remote monitoring of temperatures in piles of coal, wood chips, fertilizers, and more.

### Application Story

When coal is exposed to oxygen, it can react and heat up. This is more likely to happen when there is insufficient ventilation for cooling, such as in the massive coal piles at OBA Bulk Terminal Amsterdam. OBA uses three rugged FLIR A310 f thermal imaging cameras to monitor coal while it is in piles and as it moves on conveyor belts. "We used to engage external measurement professionals for this, which was an extra cost for the end customer. Now we can do the measurement ourselves, not only at one moment in time, but continuously on a 24/7 basis," said Dick Meijer, OBA planner.

### THE FLIR SOLUTION



FLIR A310 f



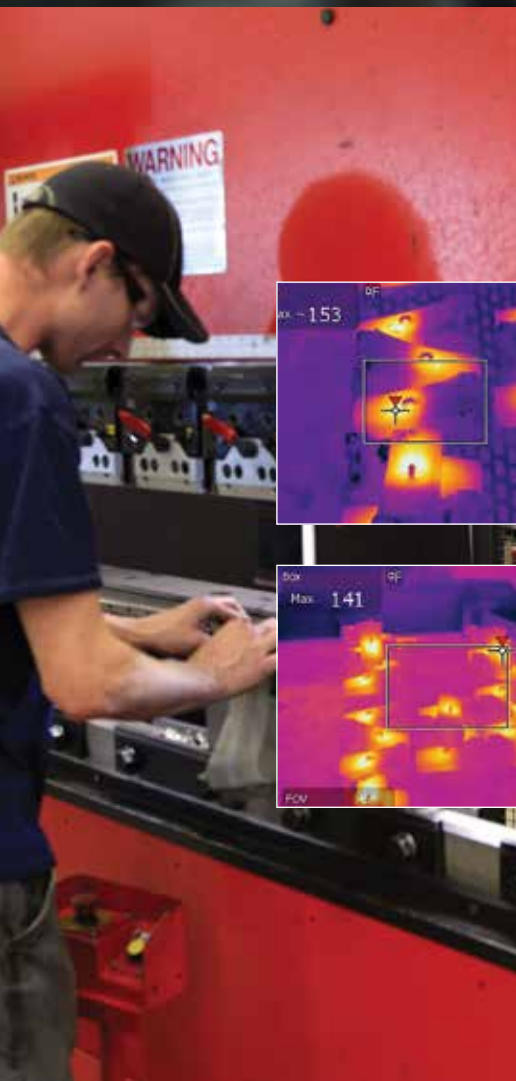
FLIR FC-SERIES R



FLIR A310 ex

# PROCESS CONTROL

Process control monitoring is all about measuring the temperature and/or determining the shape of certain products on a production line. The acquired thermal imaging data is used to control and improve the process so that the resulting products will meet specifications.



## METAL MANUFACTURING

### Thermal Imaging Value

Heat treatment is used in metal manufacturing to alter the chemical and physical properties of the resulting metal parts. Careful application of a specific sequence of heating and cooling cycles for predetermined intervals enables metallurgists to control the parts' hardness or softness. Thermal imaging can be used to monitor the temperature of metal parts after leaving a cooling bath, or "quench pit."

### Application Story

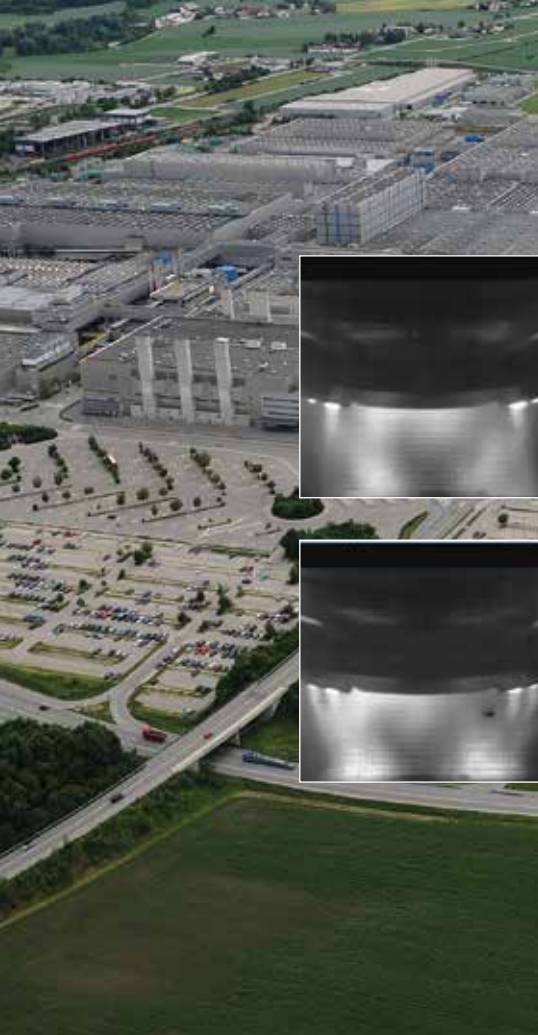
Thermography specialist MoviTHERM developed a dedicated thermal inspection system with cameras from FLIR Systems to inspect parts immediately following a critical quenching process. A FLIR A310 f thermal imaging camera identifies hot spots on parts in a cooling chamber to see if additional cooling cycles will be necessary.

### THE FLIR SOLUTION



FLIR A310 f





## AUTOMOTIVE MANUFACTURING

### Thermal Imaging Value

New vehicles are subjected to many individual and automated quality control tests. Many automobile manufacturers are using thermal imaging cameras for quality control. Typical applications include inspection of rear window heating, heated seats, checking exhaust flaps, air-conditioning outlets, and more.

### Application Story

The BMW M5 has distinctive, powerful engine sound. This intentional acoustic design is the result of a second tailpipe exhaust pipe flap that opens only at higher RPMs. Company engineers needed a way to confirm that the flap worked properly without opening the exhaust system. Thermal imaging cameras for automation proved to be the answer. Through thermal imaging, BMW can record exhaust flow to confirm that the flap is opening and closing correctly. The system of 10 fixed FLIR A310 cameras with 45-degree wide-angle lenses was simple to integrate and provides easy access to the PAL video format, which is common in Europe.

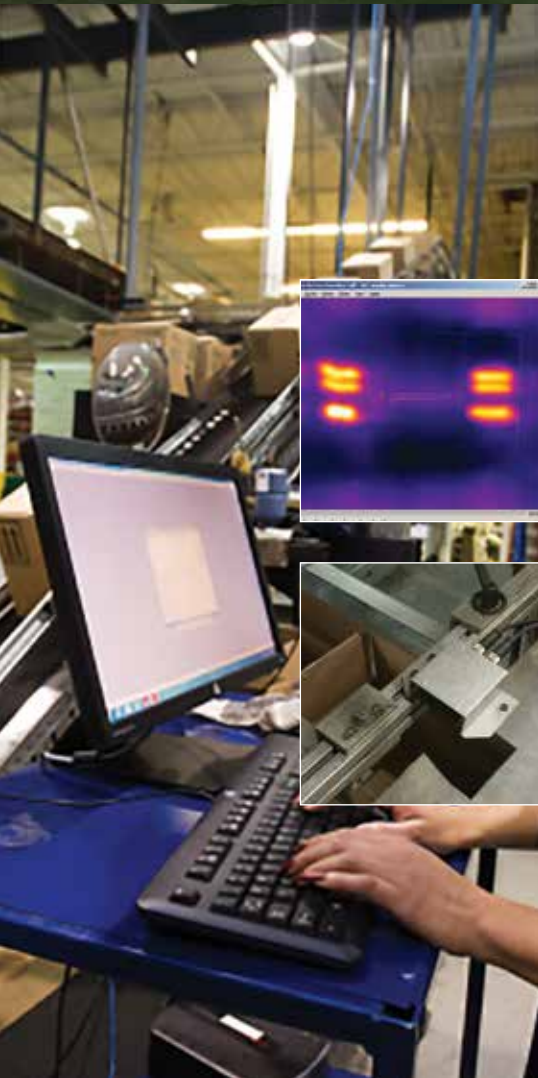
#### THE FLIR SOLUTION



FLIR A310



FLIR A310 f



## PACKAGING

### Thermal Imaging Value

Thermal imaging cameras make a clear distinction between what is hot and what is not. This, combined with emissivity effects, sometimes allows thermal imaging cameras to “see through” plastic or other material to confirm adhesive placement for packaging.

### Application Story

Recochem, a Canada-based manufacturer and distributor of chemical products and fluids, uses infrared imaging to continuously monitor the quality of its packaging. Recochem uses a FLIR AX8 to inspect the glue spots on their boxes. Thanks to its compact size, the AX8 fits in a tight area and is able to inspect the bottom of boxes. “If you look at the AX8 thermal images, then you clearly see the hotter spots where the glue has been applied,” said Adam Wolszczan, plant engineering manager at Recochem.

#### THE FLIR SOLUTION



FLIR AX8



FLIR A310

# FLIR AUTOMATION SOLUTIONS

FLIR provides thermal imaging cameras, software, and services to make your condition monitoring, early fire detection, or process control monitoring systems a reality.

## FLIR THERMAL IMAGING CAMERAS



FLIR AX8

Thermal and visual cameras are combined in a small affordable package. The AX8 provides continuous temperature monitoring and alarming for autonomous condition monitoring of critical electrical and mechanical equipment.



FLIR FC-SERIES R

FLIR FC-Series R security cameras feature on-board non-contact temperature measurement capabilities for early fire detection, safety and thermal monitoring of valuable equipment.



FLIR A310

FLIR A310 infrared cameras target safety and automation applications where networking capabilities and network compliant protocols are vital.



FLIR A310 f

FLIR A310 f (fixed mounted) monitoring systems are designed to withstand harsh elements and remotely collect valuable data.



FLIR A310 ex

FLIR A310 ex is a thermal imaging camera mounted inside an ATEX-certified enclosure for monitoring critical assets within Class I Div. 2 atmosphere.

## FLIR SOFTWARE

FLIR offers a set of software tools and utilities to help companies fully integrate FLIR automation products into working systems for condition monitoring, early fire detection, and process control monitoring. To learn more about these tools and to download updates, please visit [flir.custhelp.com](http://flir.custhelp.com).

### GENERAL

#### IP Config

Utility program for network camera detection and IP address settings. The program comes with the Utility CD or can be downloaded from [flir.custhelp.com](http://flir.custhelp.com).

#### FLIR Tools

FLIR Tools for viewing and analyzing snapshot images from the FLIR AX8 and A310 Series Thermal Imaging Cameras.

### INDUSTRIAL SAFETY

#### FLIR IR Monitor

Utility program for initial A310 Series camera connection and control as well as setup of internal features and functions. The program supports up to nine (9) cameras simultaneously. It comes with the Utility CD or download from [flir.custhelp.com](http://flir.custhelp.com).

#### Built-In Web Server

Simple built-in camera control and image viewer which can connect using `http://"camera ip address"` in a web browser or connect through the IP Config program. The AX8 web interface is a complete setup and control interface for the camera.

#### Ethernet/IP or Modbus TCP

This industrial field bus protocol allows temperature data, alarms, and camera control to be shared with PLCs. This function is always turned on in the A310 camera.

#### FLIR Atlas SDK

This software development kit enables developers to create applications. Supported by help files and sample code, developers can add functionality to interact with thermal cameras and work with infrared images.

#### ThermoVision CM™



ThermoVision CM is an industrial computer/software system designed for 24/7 condition monitoring that includes both VMS and HMI/SCADA functionality. ThermoVision CM is pre-configured with a basic set-up that is ready to record both video and temperature data based on temperature alarms and may be used either as a standard computer (connect a monitor and keyboard to it) or as a server (connecting multiple client computers on the same network). ThermoVision CM also includes a full development environment enabling the user to fully customize the VMS (video management system) and SCADA software.



## FLIR ACCESSORY SOLUTIONS

With the rapid and ever-changing needs of modern business, it is important to invest in equipment that is adaptable for a range of applications. No other infrared camera manufacturer offers a wider variety of accessories than FLIR.

### MIO Series™ from MoviTHERM

This intelligent I/O solution works with the FLIR AX8 or A310 Series providing a simple yet complete solution for remote condition monitoring, early fire detection, critical vessel, and/or process monitoring system.

- Monitor one (MIO-AX8-1 / MIO-A310-1) to seven (MIO-AX8-7 / MIO-A310-7) cameras
- Configurable alarms via the built-in web server
- Digital outputs (24 VDC)
- 4-20mA Outputs
- Ethernet connectivity

### Optics

From microscope lenses that resolve down to 3  $\mu\text{m}$ , to 1 m telescopes, FLIR has the high-quality optics you need.

### Mounts and Stands

FLIR offers multiple options for mounting camera systems, including tripods and microscope stands.

### Cables and Connectors

Fiber-optic converters, fiber cable, and extended cable lengths are just a few of the options available from FLIR to help you meet any application requirement.

## FLIR AFTER SALES SERVICE

Because FLIR designs and manufactures thermal imaging cameras from the sensor up, we can quickly troubleshoot and effectively service all aspects of the hardware and software. Different types of service contracts are available. A service contract offers you the advantage that you will never have unforeseen expenses if something should happen to your thermal imaging camera after the warranty period. Some service contracts even guarantee a replacement camera, if necessary.

To get started configuring your automated thermal imaging application, please visit [flir.com/automation](http://flir.com/automation), or call 1-866-477-3687.



For the full versions of the application stories mentioned in this primer, visit [flir.com/automation/appstories](http://flir.com/automation/appstories).

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