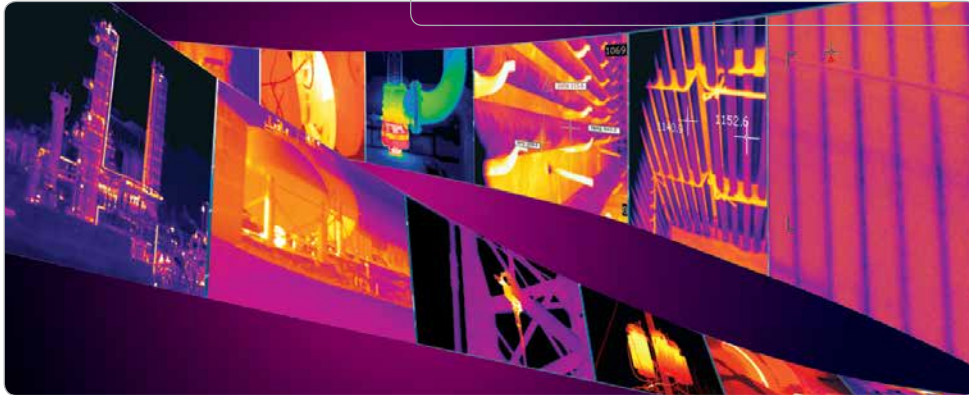


# Infrared Cameras for Optical Gas & Through- Flame Imaging



Detect gas leaks

Protect the environment

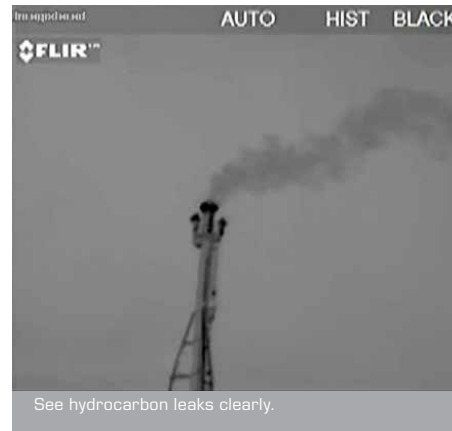
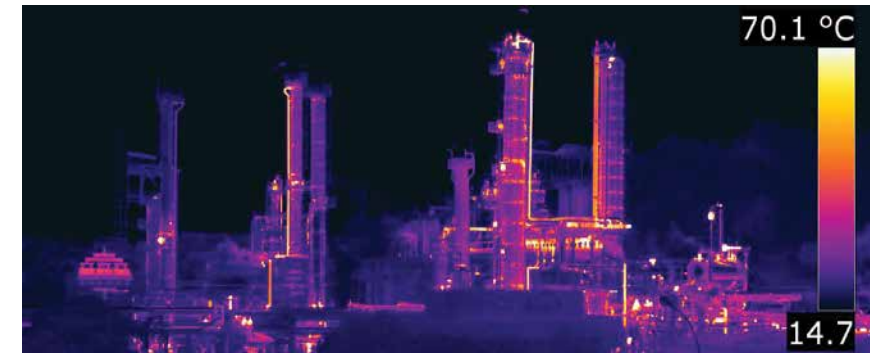
See through flames

Improve safety

# Making Invisible Gases Visible

## Save Lives, Revenue and the Day

Optical gas imaging cameras give you the power to see invisible gases escaping into the environment faster and more reliably than traditional "sniffer" detectors. With a FLIR GasFindIR camera, you can see and document gas leaks and furnace problems that lead to lost product, lost revenues, fines and safety hazards.



See hydrocarbon leaks clearly.

### Hydrocarbons

Scan thousands of connections quickly to detect hydrocarbon gas leaks from a safe distance, avoiding regulatory violations and lost revenue from service down time.



Find SF6 leaks easily.

### SF6 Leaks

Detect even small SF6 leaks from gas-filled circuit breakers found in substations safely and quickly.



Guard against product and revenue loss.

### Product Loss

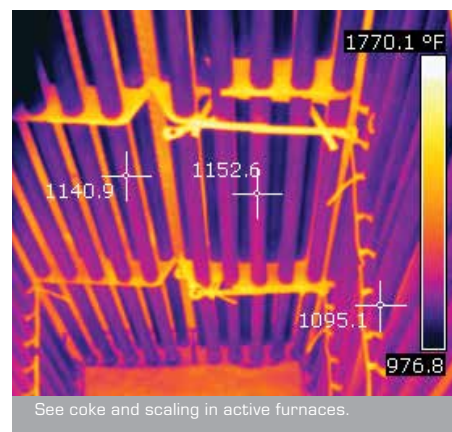
Companies have saved over \$10 million annually in lost product by using FLIR's optical gas imaging.



Find electrical and mechanical problems.

### Predictive Maintenance

Scan large areas and hundreds of connections quickly and efficiently to prevent unexpected service outages and lost revenues.



See coke and scaling in active furnaces.

### Furnace Tube Inspection

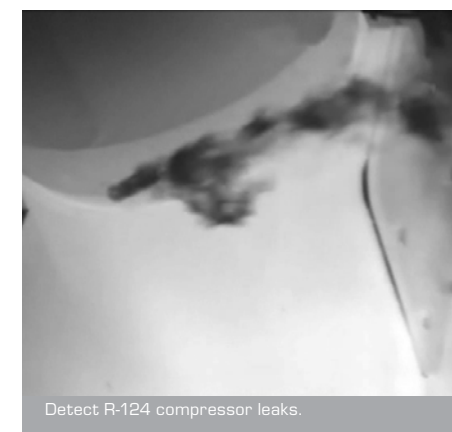
See furnace issues like internal coking and external scaling on product furnace tubes.



Find ash, slag, and clinkers in boilers.

### Boiler Inspection

Discover issues like ash, slag, and clinker build-ups in coal-fired boilers without shutting them down.



Detect R-124 compressor leaks.

### Refrigerant Gas Leaks

Detect refrigerant gas leaks from a safe distance without the need to shut down operations.



Find leaks at steel plants.

### Carbon Monoxide Detection

Protect workers and the environment from toxic levels of CO by pinpointing leaks quickly and efficiently.

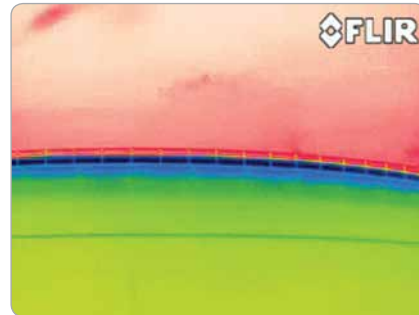
# Optical Gas Imaging Cameras

## Track Leaks to Their Source

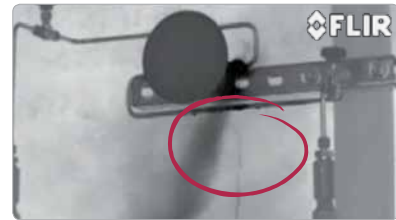
More than 80% of a facility's gas leaks will occur in less than 1% of inspected components. Inspectors spend over 99% of their time inspecting safe, non-leaking components. Not anymore.

The GF-Series optical gas detection cameras let you find hydrocarbon, natural gas and SF6 leaks quickly, accurately and safely without shutting systems down for inspection. Invisible to the naked eye, gas leaks look like smoke on infrared optical gas imaging cameras, making them easy to see. FLIR's optical gas imaging cameras provide a number of benefits compared to traditional "sniffers." They:

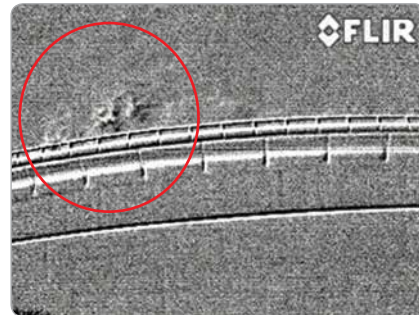
- Scan a broader area much more rapidly
- See into areas that are difficult to reach with contact measurement tools, such as the thousands of connections and fittings within large petro-chemical facilities.
- Enhance your facility's maintenance program by using the GasFindIR's temperature measurement capabilities for predictive maintenance thermography.
- Appease EPA regulations since optical gas imaging is an accepted leak detection technique in the Method 21 Leak Detection and Repair Alternative Work Practice (Method21 AWP) as well as the Green House Gas Reporting Rule.



Captured gas leak from production site.



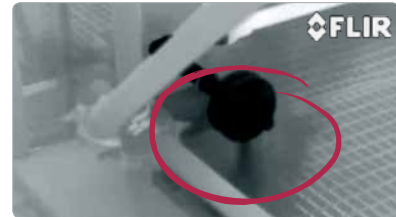
A leaking pressure gauge.



These images taken with the FLIR GF320 optical gas imaging camera illustrate the difference between regular mode and the high sensitivity mode. A leak that barely shows upon the regular rainbow color pattern thermal image in the middle shows up clearly in high sensitivity mode on the bottom.



Captured gas leak.



Gas leak is clearly visible on the thermal image.

## GF300/320

### Hydrocarbons

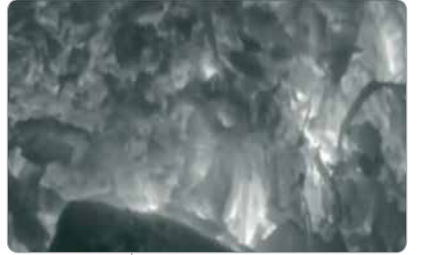
GF300 & GF320 allow you to survey large areas quickly and effectively, detecting small emissions within large complexes. These cameras are ideal for chemical/petrochemical applications such as:

- Oil refineries
- Natural gas processing plants
- Offshore platforms
- Bio-gas and power generation plants

Per EPA and API recommended testing guidelines, GF300/320 cameras can detect:

- |                |                             |             |
|----------------|-----------------------------|-------------|
| • Benzene      | • Methyl Ethyl Ketone (MEK) | • Propylene |
| • Butane       | • Methane                   | • Toluene   |
| • Ethane       | • Methanol                  | • Xylene    |
| • Ethylbenzene | • MIBK                      |             |
| • Ethylene     | • Octane                    |             |
| • Heptane      | • Pentane                   |             |
| • Hexane       | • 1-Pentane                 |             |
| • Isoprene     | • Propane                   |             |

\*GF300 and GF320 offer identical optical gas imaging capabilities. However, only GF320 is calibrated for temperature measurement.



## GF304

### Refrigerants

The FLIR GF304 was developed specifically to detect refrigerant gas leaks without interrupting or shutting down operations. Detecting refrigerant gas leaks early can save on costly replenishment and limit environmental impact. GF304 is ideal for:

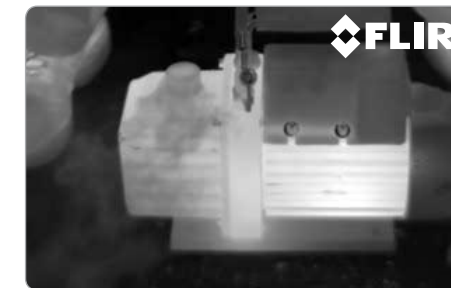
- Food production, storage and retail
- Pharmaceutical
- Automotive
- Air conditioning

GF304 detects the following refrigerant gases:

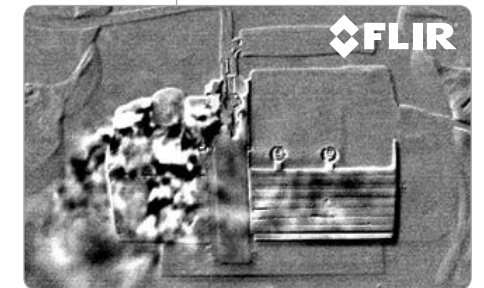
- |          |         |         |
|----------|---------|---------|
| • R125   | • R404A | • R422A |
| • R134A  | • R407C | • R507A |
| • R143A  | • R410A |         |
| • R245fa | • R417A |         |



Leaking air conditioner



Leaking air conditioner



Leaking air conditioner in HSM mode

## GF306

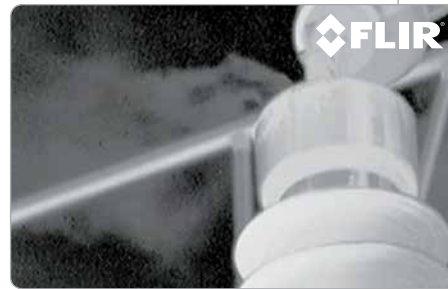
### SF6 & Ammonia

One pound of SF6 has the same global warming impact of 24,000 pounds of CO<sub>2</sub>. Because of its long lifespan and high potency, even a relatively small amount of SF6 can have a significant impact on global climate change. Safeguard the environment and meet environmental regulations with FLIR GF306, ideal for:

- Utilities
- Ammonia plants
- Fertilizer production

GF306 detects the following gases:

- Acetic Acid
- Acetyl Chloride
- Acetic Acid
- Allyl Bromide
- Allyl Chloride
- Allyl Fluoride
- Anhydrous Ammonia
- Bromomethane
- Chlorine Dioxide
- Ethyl Cyanoacrylate ("Superglue")
- Ethylene
- FREON-12
- Furan
- Hydrazine
- Methylsilane
- Methyl Ethyl Ketone (MEK)
- Methyl Vinyl Ketone
- Propenal
- Propene
- Sulphur Hexafluoride
- Tetrahydrofuran
- Trichloroethylene
- Uranyl Fluoride
- Vinyl Chloride
- Vinyl Cyanide
- Vinyl Ether



Captured SF6 leak

## GF346

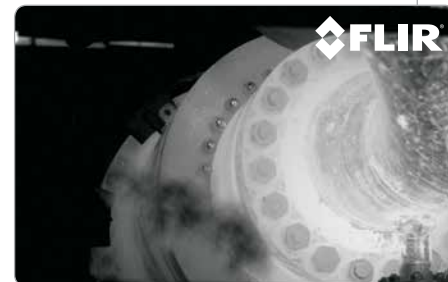
### Carbon Monoxide

FLIR GF346 is designed to detect carbon monoxide (CO) emissions from a safe distance. GF346 can quickly scan broad areas to pinpoint small leaks, increase worker safety and protect the environment in the following industries:

- Steel industry
- Bulk chemicals manufacturing
- Packaging systems
- Petrochemical industry

GF346 detects the following gases:

- Acetonitrile
- Acetyl cyanide
- Arsine
- Bromine isocyanate
- Butyl isocyanate
- Carbon monoxide
- Chlorine isocyanate
- Chlorodimethylsilane
- Cyanogen bromide
- Dichloromethylsilane
- Ethenone
- Ethyl thiocyanate
- Germane
- Hexyl isocyanate
- Ketene
- Methyl thiocyanate
- Nitrous oxide
- Silane



Gas leak



CO leak in off blast furnace

## GF309

### Through-Flame

FLIR GF309 is equipped with a special midwave "flame filter" engineered to see in the high temperatures (up to 1,500°C) encountered during industrial furnace and boiler inspections. A nickel-coated heat shield improves worker safety and comfort during inspection.

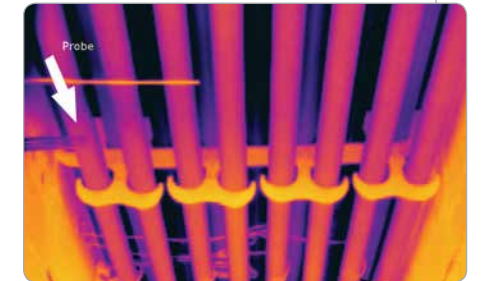
Add the furnace IR 14.5-degree lens extender to measure the temperature of furnace tubes and ovens through small view ports.

**Furnace Inspection** – The GF-309 gives inspectors clear thermal imagery of fired product tubes, allowing them to distinguish between internal coking and external scaling, helping to avoid costly tube overheat failures. The ability to identify coking also allows for proper planning of unit shutdowns and de-coke procedures.

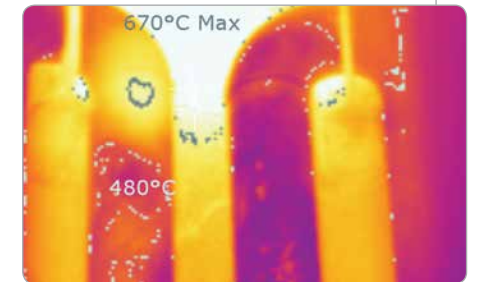
**Burner Alignment** – With the GF-309's specialized filters, inspectors can accurately scan for proper burner alignment and check for flame impingement, identifying if the flame pattern is causing localized tube overheating.

**Fire Box Inspection** – Its wide temperature range makes the GF-309 well-suited for external firebox inspections, detecting the hot spots on the outside of a firebox that indicate a problem with the internal refractory bricks or insulating blankets.

**Coal-Fired Boilers** – The GF-309 is ideal for identifying slag buildup that can potentially interfere with heat transfer, cause localized tube corrosion, and result in catastrophic mechanical failure when the slag "clinkers" fall.



The FLIR GF309 is widely used for inspecting boilers and furnaces. It is equipped with a special flame filter for high temperatures (up to +1,500°C) and seamlessly sees through flames.



Coke formation on an Ultrafiner Reactor Charge Heater.

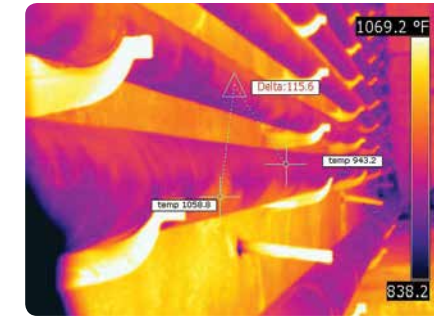


# Imaging Specifications



Imaging Specifications	GF300/320	GF304	GF306	GF346	GF309
Detector Type	Cooled InSb	Cooled QWIP	Cooled QWIP	Cooled InSb	Cooled InSb
Spectral Response	3.2 – 3.4 $\mu\text{m}$	8.0 – 8.6 $\mu\text{m}$	10.3 – 10.7 $\mu\text{m}$	4.52 – 4.67 $\mu\text{m}$	3.8 – 4.05 $\mu\text{m}$
Resolution	320 x 240				
Total Pixels	76,800				
Thermal Sensitivity	<15 mK @ +30°C (+86°F)				
Accuracy	$\pm 1^\circ\text{C}$ ( $\pm 1.8^\circ\text{F}$ ) for temperature range 0°C to +100°C (+32°F to +212°F) or $\pm 2\%$ of reading for temperature range >+100°C (>+212°F)*				
Temperature Range	-40°C to 350°C (-40°F to 662°F)	-20°C to +500°C (-4°F to +932°F)	-40°C to 500°C (-40°F to 932°F)	-20°C to +300°C (-4°F to +572°F)	-40°C to 1,500°C (-40°F to 2,732°F)
High Temp Option	X				X
Lens Options	Standard: 24° x 18°; Optional: 14.5°, 6°	Standard 24° x 18°; Optional 14.5°	Standard 14.5° x 10.8°; Optional: 24°	Standard: 24° x 18°; Optional: 14.5°, 6°	Standard: 24° x 18°; Optional: 14.5°, 6° AND New Lens Extender 24° OR 14.5°
Zoom	1 – 8x Continuous Digital	1 – 8x continuous, digital zoom	1 – 8x Continuous Digital	1 – 8x continuous, digital zoom	1-8x Continuous Digital
Focus	Auto & Manual				
Color LCD	4.3"; 800 x 480 Pixels				
Adjustable Viewfinder	Tilttable OLED, 800 x 480 pixels				
Video Camera w/ Lamp	3.2 MP				
Laser Spot	X	X	X	X	X
Video Out	HDMI				
<b>Analysis</b>					
Spotmeters	10*	10	10	10	10
Area Boxes	5 (min./max./avg.)*	5 (min./max./avg.)	5 (min./max./avg.)	5 (min./max./avg.)	5 (min./max./avg.)
Profiles	1 live line (horiz. or vert.)*	1 live line (horiz. or vert.)	1 live line (horiz. or vert.)	1 live line (horiz. or vert.)	1 live line (horiz. or vert.)
Delta T	X*	X	X	X	X
<b>Annotation</b>					
GPS	X	X	X	X	X
<b>File Storage</b>					
Radiometric JPG	X	X	X	X	X
Radiometric Video (15 Hz)					X
MPEG Video Recording	X	X	X	X	X

GF300 is not calibrated for temperature measurement.



## Reporting Software

### Help to Make the Right Call: Analysis & Recommendations

Whether you're looking for hydrocarbon emissions, SF6 leaks or furnace problems, FLIR cameras are powerful tools for finding a variety of problems in a variety of facilities. But your ability to document and report your findings is just as important as your ability to discover potential problems in the first place. Your reports need to be easily customized for any situation and customer requirement; they need to reflect your professionalism and the quality of your work; and your recommendations for action need to be clear and well-documented in order for others to complete repairs.

FLIR offers several reporting software products, including VideoReport, which is designed specifically for optical gas detection.

## FLIR Tools for PC

### Free Reporting Software that Helps You Look Good

In addition to the mobile app, FLIR Tools is also easy to load onto your PC. This versatile software program allows you to quickly import and analyze video, create inspection reports, remote control cameras over USB, and update camera firmware.

#### Key Features:

- Import video and images from the camera to PC
- Search using file name, text description and other properties
- Analyze and tune radiometric images and measure temperatures
- Create PDF reports from a variety of pre-defined templates
- Clickable GPS link in the PDF report
- Remotely control and record images and video

## FLIR Tools Mobile

### Import, Process and Share Images Quickly with the Free App that Speeds Decisions

Get the word out straight from the field with FLIR Tools Mobile for Apple® and Android™. Connect your smartphone or tablet to your GF-Series camera, then use the app to transfer video from the camera, tack on more measurement spots, add text, change palettes, add notes, and generate a PDF. Email video and findings to colleagues and customers in no time. Upload to Dropbox and Box.net accounts. Or use the app to show images right on site to those who need to know immediately.

FLIR Tools Mobile also lets you stream live video from your GF-Series, plus take remote control of GF-Series functions, including focus, level, span and many other modes. This functionality is perfect when you need to place the camera off on its own for monitoring or safety reasons, or need to share live imaging with others nearby.

#### Key Features:

- Wirelessly import images from the camera's SD card
- Stream live video
- Remotely control and record images and video
- Analyze and tune radiometric images and measure temperatures
- Create PDF reports with text and custom logos
- Share images and reports using e-mail, Box and Dropbox



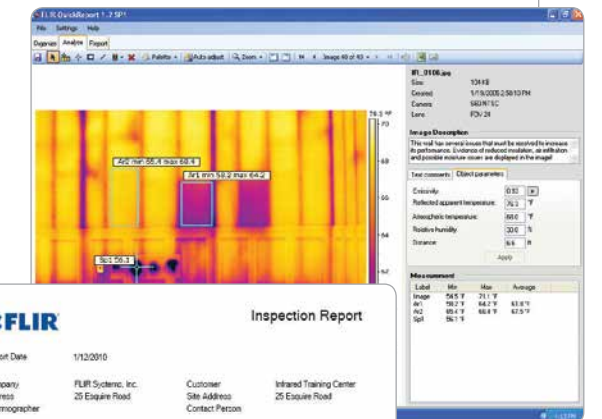
## QuickReport

### Create Reports Directly from Your Camera

All FLIR cameras come with the powerful QuickReport analysis and reporting software that allows you to import your infrared and visible-light images into an easy-to-read report. You can measure, adjust, add notes, and send your reports to others for review in PDF format.

#### Key Features

- Adjust level, span, and color palette
- Change isotherm and temperature levels
- Create spot meters, lines, and areas
- E-mail images and reports in PDF format
- Alter parameters for dew point and insulation alarms
- Add your company logo to inspection reports
- Drag-and-drop images and preview report pages
- Digitally zoom and pan up to 8 times
- Manipulate Fusion images



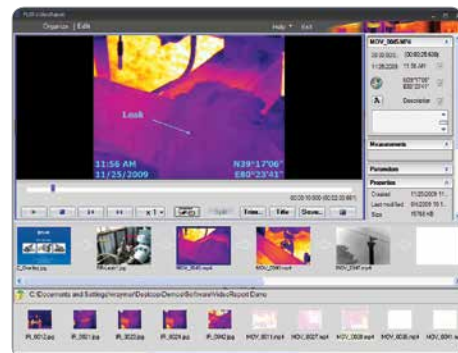
## VideoReport

### Video Editing Software for GF-Series Cameras

FLIR VideoReport is a software package specifically designed to provide an easy way to edit non-radiometric .mp4 video clips taken with FLIR GF-Series cameras. VideoReport makes building reports with video clips easy. You can take the videos captured with your GF-Series cameras, select, and edit the video you want, and build your movie report with a few simple drag-and-drops.

#### Key Features

- Use Storyboard to cut, edit, combine, and re-order clips
- Save a frame
- Add text
- Play clips at different speeds
- Add digital photos and thermal images to video clips
- Add GPS location to video clips
- Review file properties and information about the camera type, lens, and serial number
- Add markers (circle or arrow) as overlay graphics to any video clip



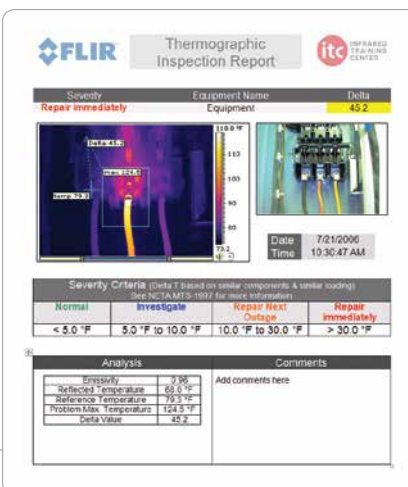
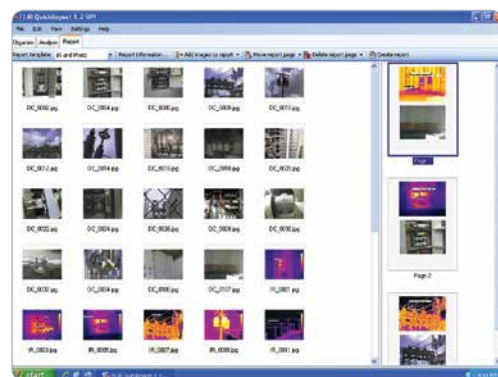
## Reporter PRO

### Enhanced Reports for the Professional Thermographer

FLIR Reporter PRO equips the busy professional thermographer with everything he needs to complete reports quickly and with total flexibility. Design your templates in Microsoft Word®, drag-and-drop your images onto the template, and generate your multipage report automatically. Import all of your measurements, Delta T analysis, or personal formulas, even load your imagery and report data into Excel and PowerPoint!

#### Key Features

- Flexible report design and layout
- Fully integrated with Microsoft Word
- Powerful analysis tools include Delta T & Auto Hot-Spot
- Wizard-guided report generation
- TripleFusion Picture-in-Picture (movable, sizable, scalable)
- Predictive trend analysis functionality
- Automatically adds GPS coordinates to images



## Infrared Training Center

### The Premier Infrared Camera User Educational & Training Resource

Your professionalism drives you to know everything you can about your business; that's why you'll want to get the most of your GF-Series camera.

FLIR cameras are easy to use and intuitive, but only expert training will give you the knowledge and skills to wring every last bit of capability from your investment. An Infrared Training Center (ITC) certificate is proof of your expertise in operating your camera and interpreting the thermal information it provides.

During the three days of the ITC's Optical Gas Imaging certification course, you'll learn how to setup and operate FLIR GF-Series cameras, what gases can be found with the technology, and discover how different environmental conditions can affect the ease or difficulty of gas leak detection while earning 2.0 IACET CEUs. Training includes classroom instruction and lab time covering basic inspection procedures, permitting requirements, safety practices, and more.

#### ITC courses provide:

- Industry-leading, high-quality interactive instruction
- Most qualified international instructors
- Most extensive hands-on laboratories
- ISO 9001 registered
- Online training courses are also available

#### Other ITC courses include:

- Level I, Level II, and Level III
- Building Diagnostics
- Building Science certificate
- Weatherization & Energy Audits
- Commercial Roof IR Inspections
- Commercial Electrical IR Inspections

Attend classes at our training center, locally at one of our regional classes, or in your facility with our on-site service.

For full course descriptions, updated schedules, and more information, visit the ITC website at [www.infraredtraining.com](http://www.infraredtraining.com) or call 1.866.872.4647.



## GF-Series Test Drive

Try Before You Buy Your FLIR: 800.464.6372

### Rent

FLIR's rental program is a great way to make sure you are getting the model, performance and features you need. Our rental department has all the current models in stock, and we are ready to help.

### Lease

Leasing is a great way to minimize your initial expense, and there may be tax advantages for you to lease. FLIR has several options for those interested in starting or upgrading your program. Give us a call and we can help.

### Trade Up

FLIR offers trade-in value for many existing cameras. Contact your FLIR representative our trade-in program, and check into our stock of Pre-Owned cameras while you're at it.



## About FLIR

### The World Leader in Designing, Manufacturing & Marketing Thermal Imaging Systems

All infrared cameras are not created equal, because infrared camera manufacturers are not all the same. FLIR stands above the rest. The largest commercial infrared company in the world, FLIR has nearly 50 years of experience building and integrating high-performance infrared cameras, giving us a command of these specialized technologies that no one else can touch. FLIR's products are at work every day saving lives, protecting our troops overseas, and helping to keep borders and facilities safe.

Now, FLIR's cameras are available for your personal use, too. You can have a FLIR on your boat, your car or even as a home security camera. The same FLIR technology in your GF-Series camera is in Audi and BMW cars as a pedestrian detection system. And if you enjoy hunting and outdoor activities, there's an inexpensive FLIR for you too. You might not know FLIR by name, but you have been seeing our products at work since the 1960's.



## FLIR.com/GF-Series

See GasFindIR in action, access case studies and much more online.

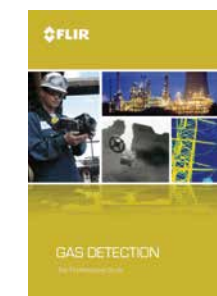
### Where There's "Smoke"...

Leaking gas looks like smoke in infrared and still images don't do justice to the GF-Series' capabilities. You'll be amazed how quickly the camera detects different gases, and you can see side-by-side comparisons of gas leaks from visible light cameras, where a potentially dangerous situation looks completely innocuous. Access "leak" footage of SF6, natural gas, carbon monoxide, methane, heptane and other gases, as well as footage of furnace and boiler inspections at [FLIR.com/GF-Series](http://FLIR.com/GF-Series).



### Online Resource Center

Find out more about GF-Series cameras and what they can do for you. Visit [FLIR.com/GF-Series](http://FLIR.com/GF-Series) to access:



- "Gas Detection: The Professional Guide"
- Case Studies
- Technical Papers
- Product Literature

Or call 866.477.3687 to speak with a FLIR Specialist.





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