

OPTICAL GAS IMAGING

Infrared Cameras for Gas Leak Detection



MAKE INVISIBLE GASES VISIBLE

SAVE LIVES, REVENUE, AND THE DAY

A facility can have thousands of connections and fittings that require regular inspection, but the reality is less than one percent of these components will ever leak. Testing them all with a traditional "sniffer" takes a great deal of time and effort.



Optical gas imaging cameras give you the power to spot invisible gases as they escape, so you can find fugitive emissions faster and more reliably than with sniffer detectors. With a FLIR GF-Series camera, you can document gas leaks that lead to lost product, lost revenue, fines, and safety hazards.

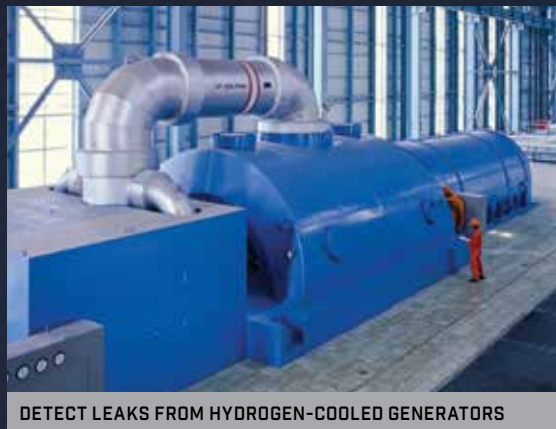
From natural gas extraction to petrochemical operations and power generation, companies have saved more than \$10 million annually in lost product by including FLIR optical gas imaging in their leak detection and repair (LDAR) programs.



SEE HYDROCARBON LEAKS CLEARLY

METHANE AND HYDROCARBONS

Scan thousands of connections for natural gas (methane) and other hydrocarbon leaks quickly and from a safe distance to avoid regulatory violations, fines, and lost revenue.



DETECT LEAKS FROM HYDROGEN-COOLED GENERATORS

HYDROGEN (CO₂ TRACER GAS)

Imaging the tracer gas, CO₂, with an optical gas camera allows operators of hydrogen-cooled generators to efficiently find hydrogen leaks.



FIND SF₆ LEAKS EASILY

SULFUR HEXAFLUORIDE (SF₆)

Scan substation circuit breakers for sulfur hexafluoride (SF₆) leaks at a safe distance from high-voltage areas, without the need to shut down operations.



SPOT HARD-TO-FIND CO₂ LEAKS

CARBON DIOXIDE (CO₂)

Prevent shut-downs by detecting carbon dioxide (CO₂) leaks early in chemical production, manufacturing, and Enhanced Oil Recovery programs.



FIND LEAKS AT STEEL PLANTS

CARBON MONOXIDE (CO)

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



DETECT R-124 COMPRESSOR LEAKS

REFRIGERANTS

Find leaks early to avoid interruptions in operations, prevent the loss of perishable products, and limit the environmental impact of toxic refrigerants.



TRACK LEAKS TO THEIR SOURCE

The GF-Series optical gas imaging cameras can detect natural gas, SF₆, and CO₂ leaks quickly, accurately, and safely without the need to shut down systems, or the need for contact with the components. Gas leaks that are invisible to the naked eye look like smoke on infrared optical gas imaging cameras, making them easy to see – even from a distance.

WITH FLIR OPTICAL GAS IMAGERS, YOU CAN:

- Scan broad areas quickly, from a safe distance
- Survey hard-to-reach connections and fittings
- Improve compliance with environmental regulations
- Check electro-mechanical systems for signs of failure, using temperature measurement capability



A LEAKING PRESSURE GAUGE



CAPTURED GAS LEAK



LEAK IS CLEARLY VISIBLE ON THE THERMAL IMAGE

HANDHELD CAMERAS

When you need to survey large work areas for industrial gas or chemical leaks, a handheld optical gas imaging camera can help you get the job done quickly and efficiently. Cameras such as the GFx320, GF306, and GF346 allow you to check every component throughout multiple sites, and are ergonomically designed for comfortable, all-day use. These cameras also offer features such as temperature calibration for improved contrast between the gas compound and the background scene.

GF-SERIES HANDHELD CAMERAS ARE IDEAL FOR:

- Natural gas wellsites
- Chemical processing plants
- Electrical substations
- Manufacturing plants
- Power generators



FIXED CAMERAS

Have a need for continuous monitoring or automated leak detection in critical areas? With thermal imaging cameras such as the G300a, G300pt, and A6604, you can constantly monitor vital gas pipelines and installations in remote or difficult to access zones. You will immediately see if a dangerous and costly gas leak appears. Monitoring is performed from a safe distance without the need to send technicians into potentially dangerous areas.

G300A, G300PT, AND THE A6604 CAMERAS ARE IDEAL FOR:

- Offshore oil platforms
- Natural gas processing plants
- Biogas generation plants
- Petrochemical facilities
- High value well sites
- Underground storage facilities
- Critical pipeline crossings

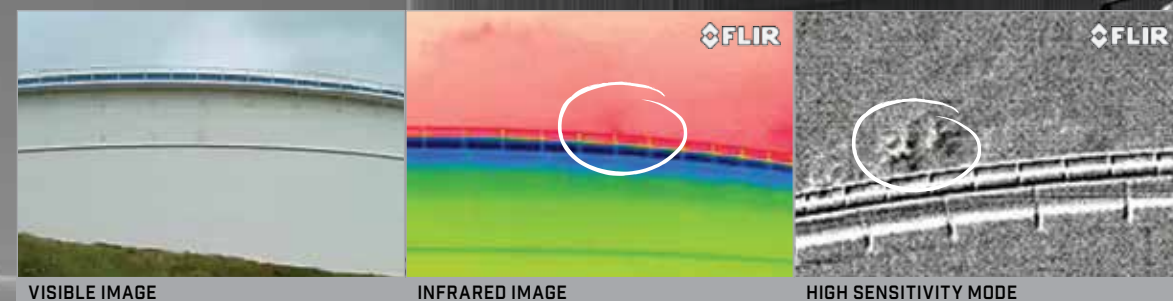
HELPFUL ACCESSORIES

FLEXIBLE SYSTEMS THAT MEET YOUR CHANGING NEEDS

No other thermal imaging camera manufacturer offers a wider range of accessories than FLIR Systems. Hundreds of accessories are available to customize our cameras for a wide variety of imaging and measurement applications. From a comprehensive range of lenses, through LCD screens, to remote control devices, everything is available to tailor your camera to your specific application.



Scan broad areas quickly, from a safe distance



VISIBLE IMAGE

INFRARED IMAGE

HIGH SENSITIVITY MODE

REFRIGERANTS

FLIR GF304

The FLIR GF304 detects refrigerant gas leaks without interrupting or shutting down operations. Most modern refrigerants are organofluorine compounds, and while they are not ozone-depleting, some blends contain Volatile Organic Compounds (VOCs). Refrigerants are used in a variety of systems, including food production, pharmaceutical storage, and air conditioning.

GF304 DETECTS THE FOLLOWING REFRIGERANT GASES:

- R22
- R125
- R134A
- R143A
- R245fa
- R404A
- R407C
- R410A
- R417A
- R422A
- R507A



GF304 CAMERAS ARE IDEAL FOR:

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



A/C COMPRESSOR - INFRARED IMAGE



HIGH SENSITIVITY MODE

SULFUR HEXAFLUORIDE AND AMMONIA

FLIR GF306

The FLIR GF306 detects sulfur hexafluoride (SF_6) – used to insulate high voltage circuit breakers – as well as the industrial refrigerant and fertilizer anhydrous ammonia (NH_3). SF_6 is a potent greenhouse gas, with a global warming potential that's 22,000 times greater than CO_2 over a 100-year period. By detecting and repairing SF_6 leaks, energy producers can avoid costly damage to circuit breakers while protecting the environment.

GF306 DETECTS THE FOLLOWING GASES:

- Acetic acid
- Acetyl chloride
- Allyl bromide
- Allyl chloride
- Allyl fluoride
- Anhydrous ammonia
- Bromomethane
- Chlorine dioxide
- Ethyl cyanoacrylate (super glue)
- Ethylene
- Freon-12
- Furan
- Hydrazine
- Methylsilane
- Methyl ethyl ketone (MEK)
- Methyl vinyl ketone
- Propenal
- Propene
- Sulfur hexafluoride
- Tetrahydrofuran
- Trichloroethylene
- Uranyl fluoride
- Vinyl chloride
- Vinyl cyanide
- Vinyl ether



GF306 CAMERAS ARE IDEAL FOR:

- Utilities
- Ammonia plants
- Industrial refrigeration systems



COMMON SF_6 PLUMBING LEAK



SF_6 LEAKING FROM CIRCUIT BREAKER

METHANE & HYDROCARBONS

FLIR **GFx320**

NEW!

FLIR **GF320**

The GFx320 and GF320 detect methane emissions from the production, transportation, and use of oil and natural gas. They allow you to survey large areas up to nine-times faster than with traditional gas sniffer methods. These OGI cameras also offer highly accurate temperature measurements, so inspectors can assess and improve thermal contrast between the gas cloud and the background.

INTRINSICALLY SAFE

The FLIR GFx320 allows you to quickly detect and visualize fugitive natural gas emissions while maintaining safety inside hazardous locations. This **Intrinsically Safe** OGI camera is **third-party certified for use in Class I Div II safety areas**. The GFx320 is verified to meet sensitivity standards defined in the **US EPA's 0000a methane rule** and meets reporting requirements by tagging each recording with GPS data. By finding leaks and fixing them quickly, your company can protect the environment while avoiding product losses and the cost of regulatory fines.

THE GFx320/GF320 DETECT MORE THAN 400 GASES, INCLUDING:

- Methane
- Methanol
- Propane
- Benzene
- Ethane
- Propylene
- Ethanol
- Pentane
- 1-Pentene
- Isoprene
- Butane
- Ethylbenzene
- MEK
- MIBK
- Toluene
- Octane
- Heptane
- Xylene
- Ethylene
- Hexane



THE GFx320 AND GF320 ARE IDEAL FOR:

- Offshore platforms
- Liquid natural gas shipping terminals
- Oil refineries
- Natural gas wellheads and processing plants
- Compressor stations
- Bio-gas and power generation plants

GFx320: SAFETY ZONE COMPLIANT

At offshore rigs, well sites, and production plants, there's often a risk of gas collecting and igniting with a stray spark or hot surface. Working in these areas requires special clothing and equipment – if it's possible at all.

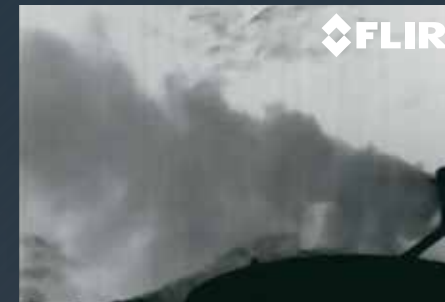
The oil and gas industry has long awaited a gas detection solution such as the GFx320, because its Intrinsically Safe designation allows the user to work confidently and focus on the job at hand.

THE GFx320 HAS THE FOLLOWING CERTIFICATIONS:

ATEX/IECEX, Ex ic nC op is IIC T4 Gc II 3 G

ANSI/ISA-12.12.01-2013, Class I Division 2

CSA 22.2 No. 213, Class 1 Division 2



VENTING STORAGE TANK PRESSURE RELIEF VALVE



NATURAL GAS LEAK ON COMPRESSOR VALVE



METHANE LEAK AT NATURAL GAS FACILITY SITE

CARBON DIOXIDE

FLIR GF343

The GF343 lets you see CO₂ leaks quickly and accurately, whether the gas is the result of a production process, part of an Enhanced Oil Recovery program, or being used as a tracer gas for hydrogen. CO₂ is a primary greenhouse gas, with emissions resulting not only from the combustion of fossil fuels but also from industrial processes, oil production, and manufacturing. Reliable non-contact CO₂ detection allows plants to inspect equipment while it is still online in the course of normal operations, avoiding unplanned outages. It also helps keep operations safe while moving towards carbon-neutral capture and storage operations.

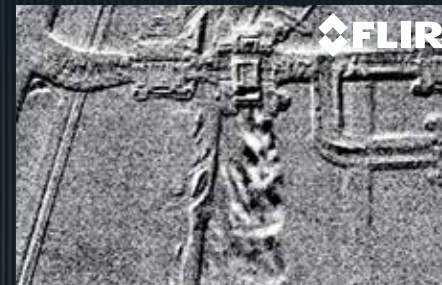


GF343 CAMERAS ARE IDEAL FOR:

- Enhanced Oil Recovery programs
- Hydrogen-cooled power generators
- Carbon capture systems
- Ethanol producers
- Industrial tightness testing



SPOT HARD-TO-FIND CO₂ LEAKS



SEE MORE WITH HIGH SENSITIVITY MODE (HSM)

CARBON MONOXIDE

FLIR GF346

The FLIR GF346 exposes invisible, odorless carbon monoxide (CO) emissions from a safe distance. CO leaking from vent stacks or pipes can be deadly, especially if the gas is allowed to collect in an enclosed area. The GF346 can quickly scan broad areas and pinpoint even small leaks from several meters away, increasing worker safety and protecting the environment.



GF346 CAMERAS ARE IDEAL FOR:

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



LEAKING FLANGE




VENTING FROM BLAST FURNACE

GF346 DETECTS CARBON MONOXIDE AND THE FOLLOWING GASES:

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

SPECIFICATIONS

	 					
Imaging Specifications	GFx320	GF320	GF304	GF306	GF343	GF346
Primary Gas Seen	Methane (CH ₄)	Methane (CH ₄)	Refrigerants	Sulfur hexafluoride (SF ₆) / Ammonia (NH ₃)	Carbon dioxide (CO ₂)	Carbon monoxide (CO)
Detector Type	Cooled InSb	Cooled InSb	Cooled QWIP	Cooled QWIP	Cooled InSb	Cooled InSb
Spectral Range	3.2 – 3.4 μm	3.2 – 3.4 μm	8.0 – 8.6 μm	10.3 – 10.7 μm	4.0 – 4.4 μm	4.52 – 4.67 μm
Resolution	320 x 240			320 x 240		
Total Pixels	76,800			76,800		
Hazardous Location Certifications	ATEX/IECEX, Ex ic nC op is IIC T4 Gc II 3 G ANSI/ISA-12.12.01-2013, Class I Division 2 CSA 22.2 No. 213, Class 1 Division 2					
Thermal Sensitivity	<15 mK at 30°C (86°F)			<15 mK at 30°C (86°F)		
Accuracy	±1°C (±1.8°F) for temperature range 0°C to 100°C (32°F to 212°F) or ±2% of reading for temperature range >100°C (>212°F)*			±1°C (±1.8°F) for temperature range 0°C to 100°C (32°F to 212°F) or ±2% of reading for temperature range >100°C (>212°F)*		
Temperature Range	-20°C to 350°C (-4°F to 662°F)		-20°C to 250°C (-4°F to 482°F)	-40°C to 500°C (-40°F to 932°F)	Not calibrated for temperature measurement	-20°C to 300°C (-4°F to 572°F)
Lenses	14.5° (38 mm), 24° (23 mm)	Standard: 24° × 18°; Optional: 14.5°, 6°	Standard: 24° × 18°; Optional: 14.5°	Standard: 14.5° × 10.8°; Optional: 24°	Standard: 24° × 18°; Optional: 14.5°	Standard: 24° × 18°; Optional: 14.5°, 6°
Zoom	1-8x continuous digital zoom			1-8x continuous digital zoom		
Focus	Manual	Auto and manual			Auto and manual	
Color LCD Monitor	4.3 in., 800 x 480 pixels			4.3 in., 800 x 480 pixels		
Adjustable Viewfinder	Tiltable OLED, 800 x 480 pixels			Tiltable OLED, 800 x 480 pixels		
Video Camera w/Lamp	3.2 MP			3.2 MP		
Laser Spot	Activated by dedicated button			Activated by dedicated button		
Video Out	HDMI			HDMI		
Analysis						
Spotmeters	10*			10*		
Area Boxes	5 (min./max./avg.)*			5 (min./max./avg.)*		
Profiles	5 (min./max./avg.)*			5 (min./max./avg.)*		
Delta T	Delta temperature between measurement functions or reference temperature*			Delta temperature between measurement functions or reference temperature*		
Annotation						
GPS	Location data automatically added to images			Location data automatically added to images		
File Storage						
Radiometric JPEG	14-bit measurement data included			14-bit measurement data included		
Radiometric IR Video	15 Hz direct to memory card			15 Hz direct to memory card		
MPEG Recording	RTP/MPEG4			RTP/MPEG4		

*GF343 is not calibrated for temperature measurement.



FLIR TOOLS MOBILE

IMPORT, PROCESS, AND SHARE DATA QUICKLY WITH THE FREE APP

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 or Box.com accounts, or use the app to display images 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.



OPTICAL GAS IMAGING: THE PROFESSIONAL GUIDE

SEE OPTICAL GAS IMAGING IN ACTION, ACCESS CASE STUDIES, AND MUCH MORE

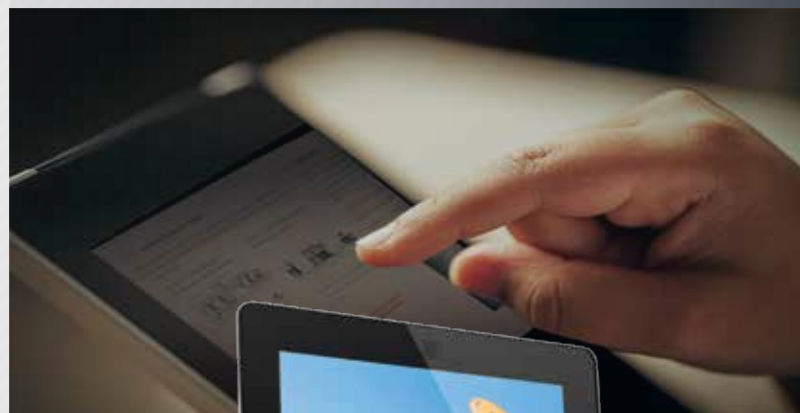
Gain a greater understanding of OGI technology and how it can help you find and repair gas leaks with FLIR's content-rich iBook, **Optical Gas Imaging: The Professional Guide**. This guide provides an in-depth look at OGI and infrared, through technical explanations, videos, and animations. You'll get expert tips for maximizing OGI surveys and see how different industries use OGI cameras to save time, money, and the environment.

Get the iBook at www.flir.com/OGI



Key Features:

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



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 out 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-day ITC Optical Gas Imaging certification course, you'll learn how to set up and operate FLIR GF-Series cameras, which gases these cameras can see, and how environmental conditions affect gas leak detection, all while earning 2.0 IACET CEUs. Training includes classroom instruction and lab time covering basic inspection procedures, permitting requirements, safety practices, and more.



For full course descriptions, updated schedules, and more information, visit the itc website at: Infraredtraining.Com or call 1.866.872.4647.

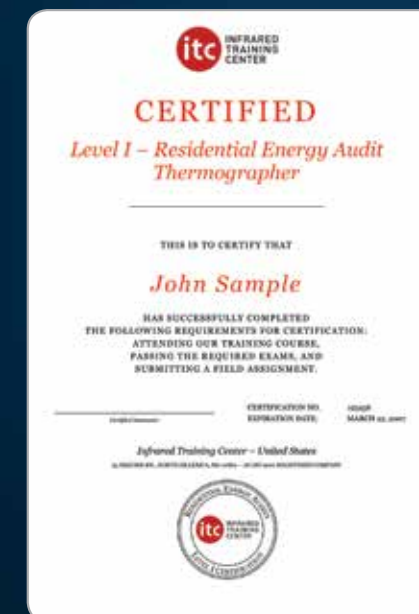
ITC COURSES PROVIDE:

- Industry-leading, high-quality interactive instruction
- The most qualified international instructors
- The most extensive hands-on laboratories
- ISO 9001-registered
- Optional online training courses

OTHER ITC COURSES INCLUDE:

- 0000a Fugitive Emissions Monitoring (U.S. Only)
- Thermography Fundamentals
- General Thermography Primer
- Level I, Level II, and Level III Thermography
- IR Electrical Inspection
- IR Mechanical inspection

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



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NASDAQ: FLIR

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