

## Thermal imaging cameras for optical gas imaging (OGI) and furnace inspections



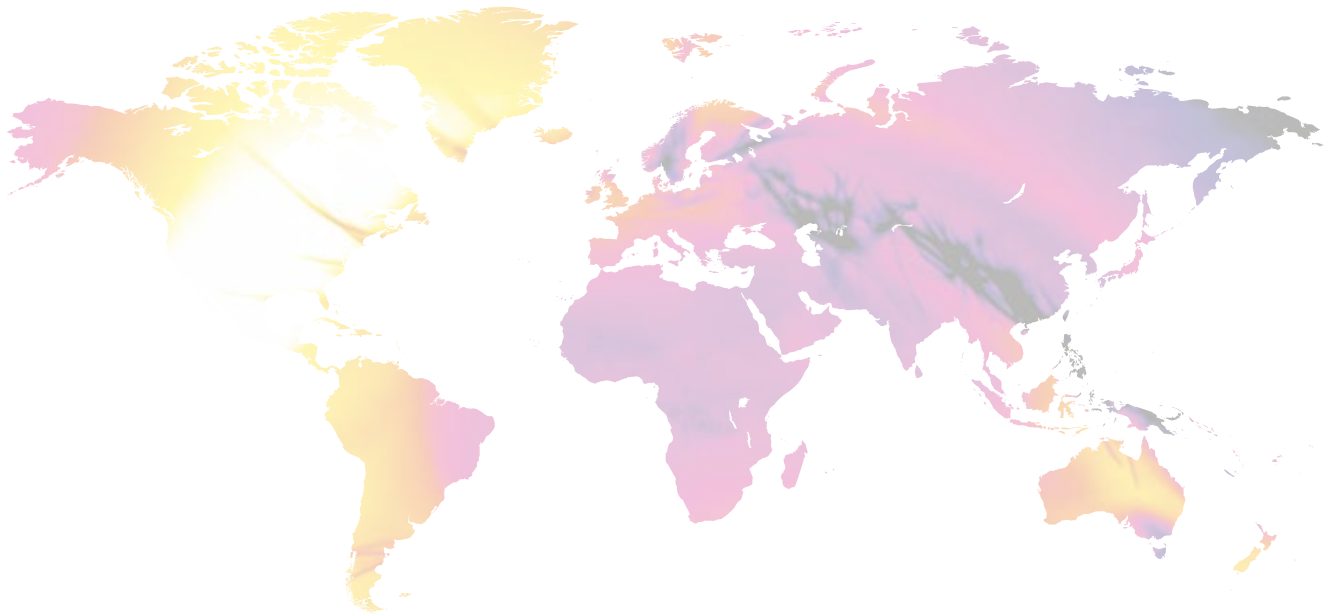
Detect gas leaks

Protect the environment

See through flames

Increase safety





## FLIR: The world leader in thermal imaging cameras

FLIR is the world leader in the design, manufacturing and marketing of thermal imaging systems for a wide variety of commercial, industrial and government applications.

FLIR thermal imaging systems use state-of-the-art infrared imaging technology that detects infrared radiation - or heat. Based on detected temperature differences, thermal imaging cameras can create a crisp image. Advanced algorithms also make it possible to read correct temperature values from this image. We design and manufacture all of the critical technologies inside our products, including detectors, electronics, and special lenses ourselves.



FLIR, Stockholm



FLIR ATS, France



FLIR, Boston



FLIR Santa Barbara

### **Rapidly emerging markets and organisation**

Interest for thermal imaging has grown considerably over the last few years in a large variety of markets. To face this increased demand, FLIR has expanded its organisation drastically. Today we employ more than 3,200 people. Together, these infrared specialists realise a consolidated annual turnover of more than 1 billion US dollars. This makes FLIR the largest manufacturer of commercial thermal imaging cameras in the world.

### **Manufacturing capabilities**

FLIR currently operates 6 manufacturing plants: three in the USA (Portland, Boston and Santa Barbara, California) one in Stockholm, Sweden, one in Estonia and FLIR ATS - Advanced Thermal Solutions, near Paris, at Marne la Vallée.

### **More than a camera, a complete solution**

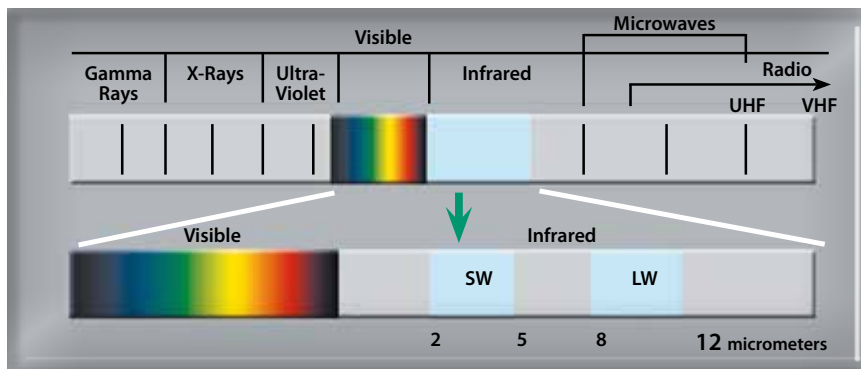
There is more to the world of thermal imaging than building a camera. FLIR is not only committed to providing you with the best camera, we are also able to offer you the best software, service and training to suit your thermal imaging needs.

## INFRARED: more than meets the eye

### Infrared - part of the electromagnetic spectrum

Our eyes are detectors that are designed to detect visible light (or visible radiation). There are other forms of light (or radiation) that we cannot see. The human eye can only see a very small part of the electromagnetic spectrum. At one end of the spectrum we cannot see ultraviolet light, while at the other end our eyes cannot see infrared. Infrared radiation lies between the visible and microwave portions of the electromagnetic spectrum. The primary source of infrared radiation is heat or thermal radiation.

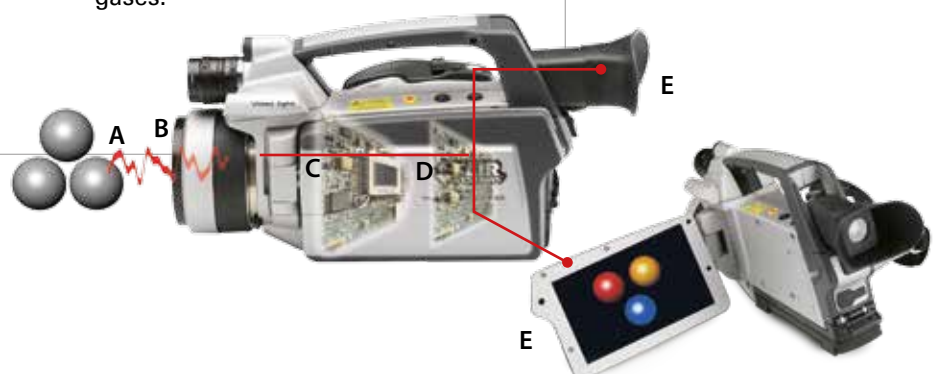
Any object that has a temperature above absolute zero (-273.15 degrees Celsius or 0 Kelvin) emits radiation in the infrared region. Even objects that we think of as being very cold, such as ice cubes, emit infrared radiation. We experience infrared radiation every day. The heat that we feel from sunlight, a fire or a radiator is all infrared. Although our eyes cannot see it, the nerves in our skin can feel it as heat. The warmer the object, the more infrared radiation it emits.



### The infrared camera

Infrared energy (A) coming from an object is focused by the optics (B) onto an infrared detector (C). The detector sends the information to sensor electronics (D) for image processing. The electronics translate the data coming from the detector into an image (E) that can be viewed in the viewfinder or on a standard video monitor or LCD screen.

Infrared thermography is the art of transforming an infrared image into a radiometric one, which allows temperature values to be read from the image. In order to do this, complex algorithms are incorporated into the infrared camera. Tuning (filtering) an infrared detector to specific wavelengths can also allow the camera to image a variety of invisible gases.



## Why use thermal imaging cameras?

Why would you choose a FLIR thermal imaging camera? There are other technologies available to help you find gases and measure temperatures in a non-contact mode. Gas sniffers and infrared thermometers for example.

### Gas sniffers versus thermal imaging cameras

In a complex petrochemical facility there may be many thousands of potential leak paths. Some may be leaking but most will not. Conventional leak detection equipment such as a Volatile Organic Compound meters (or sniffers) mean that the operator must visit and test each potential leak site. Each item must therefore be accessible or made accessible to be tested. Gas sniffers may expose inspectors to invisible and potentially harmful chemicals.

Using gas detection cameras allows the user to examine many potential leak sources in a short time and from a distance.

### Infrared thermometers vs thermal imaging cameras

Infrared (IR) thermometers are reliable and very useful for single-spot temperature readings, but, for scanning large areas or components, it's easy to miss critical components that may be near failure and need repair.

A FLIR thermal imaging camera can scan entire motors, components, or panels at once - never missing any overheating hazards, no matter how small.



IR thermometer, temperature measurement in one spot

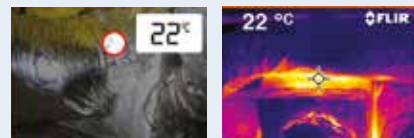


FLIR GF-Series, temperature in 76,800 spots

### Use thousands of gas sniffers and infrared thermometers at the same time

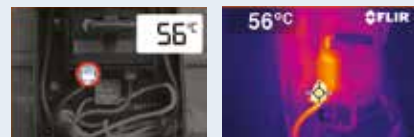
With an infrared thermometer you are able to measure the temperature at one single spot. FLIR thermal imaging cameras can measure temperatures on the entire image. FLIR GF-Series thermal imaging cameras produce an image with a resolution of 320 x 240 pixels, this means 76,800 pixels or using 76,800 infrared thermometers at the same time.

The same goes for the comparison with a gas sniffer. Using a gas sniffer, inspectors need to scan every point where gas leaks are possible, individually. A GF-Series thermal imaging camera gives the user a comprehensive overview of an entire area.



What an IR Thermometer sees.

What a thermal imaging camera sees.



What an IR Thermometer sees.

What a thermal imaging camera sees.

With a gas sniffer you can only scan one point at a time while a thermal imaging camera gives you a complete overview.

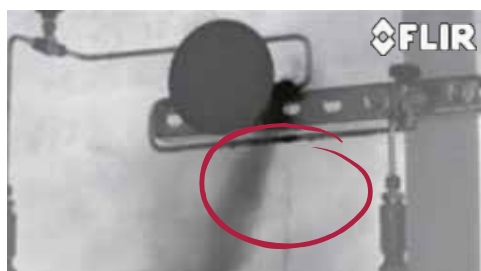


## Thermal imaging cameras for optical gas imaging (OGI) and seeing through flames

A thermal imaging camera for optical gas imaging visualizes and pinpoints gas leaks without the need to shut down the operation. The portable camera also greatly improves operator safety, by detecting gases at a safe distance, and helps to protect the environment by tracing leaks of environmentally harmful gases.



*Captured gas leak from production site.*



*A leaking pressure gauge.*



*Captured gas leak.*



*Gas leak is clearly visible on the thermal image.*

### Detecting gas leaks

Many chemical compounds and gases are invisible to the naked eye. Yet many companies work intensively with these substances before, during and after their production processes. Several gases have a high global warming potential and strict regulations govern how companies trace, document, rectify and report any leaks of harmful gaseous compounds, and how often these procedures are to be carried out.

#### Greatly Improved Efficiency

Experience shows that up to 84 percent of leaks occur in less than 1 percent of the components in a refinery\*. This means that 99 percent of what are expensive, time-consuming inspection tools are being used to scan safe, leak-free components.

Using a Gas Detection camera you get a complete picture and can immediately exclude areas that do not need any action. This means you can achieve enormous savings in terms of time and personnel.

Another advantage is that systems do not have to be shut down during the inspection. They can be carried out remotely and rapidly and – most important of all – problems can be identified at an early stage.

#### Increased worker safety

Leak detection of gases can be performed in a non-contact mode, and from a safe distance. This reduces the risk of the inspector being exposed to invisible and potentially harmful or explosive chemicals. With an optical gas imaging camera it is easy to scan areas of interest that are difficult to reach with conventional methods. The camera is ergonomically designed with a bright LCD and tiltable viewfinder, which facilitates its use over a full working day.

**Gases that can be detected are camera model dependant.**



**Thermal imaging cameras for OGI:**

- Give you a full image of the situation
- Perform inspections when systems are under load
- Find the problems before real problems occur
- Save you valuable time and money
- Identify and locate the problem
- Tell you exactly what needs to be fixed
- Increase the worker safety
- Protects the environment
- Are as easy to use as a camcorder or a digital camera
- Measure temperatures
- Store information



Visual image is obstructed by flames.



Thermal image: due to the built in flame filter the FLIR GF309 thermal imaging camera can see through flames and even measures the temperatures behind the flames.

## Seeing through flames

A wide variety of industries relies on furnaces and boilers for manufacturing processes. But furnace and boiler equipment is prone to failures from a variety of mechanisms. These include coking that plugs the inside of tubes and impedes product flow, slag build-up on the outside of tubes, clinker damage, under- and over-heating, flame impingement on tubes due to burner misalignment, and product leaks that ignite and cause serious damage to the equipment.

These failures cause not only quality problems; they can also shut down an entire process line. FLIR thermal imaging cameras can detect most of these equipment problems during operation, and at an early stage, so failures can be prevented. This allows an orderly shutdown and component replacement, thereby reducing maintenance costs and production losses.

**The FLIR GF309 is the perfect tool for seeing through flames and will help you to keep your production running efficiently at all times.**



Overheated connections.

## Maintenance inspections

All FLIR GF-Series thermal imaging cameras are dual-use systems. They not only allow the user to detect gases or see through flames. They can also be used for industrial maintenance inspections. High- and low voltage electrical installations, mechanical installations, pipework and insulation, ovens and many more can all be inspected with a FLIR GF-Series thermal imaging camera.

Temperature differences that can lead to production losses or even fires can be detected before real problems occur.

**All FLIR GF-Series thermal imaging cameras can also be used for predictive maintenance inspections.**

# FLIR GF-Series



Ergonomically designed and full featured

All FLIR GF-Series thermal imaging cameras are designed to be used several hours per day. They all contain a number of useful features that will help you to do your inspections more efficiently and to detect the smallest of gas leaks or thermal anomaly.



## High sensitivity

The GF-Series allow you to see temperature differences as small as 0.015°C. Ideal for detecting the smallest anomalies in electrical or other industrial installations.



## Tiltable viewfinder

The high-resolution viewfinder is tiltable and can be adapted to the individual user. It is ideal for outdoor use or when the LCD screen is not used.



## Large LCD screen

Super size 4.3" foldable high-quality LCD screen allows you to see the smallest details and temperature differences.



## Multi-angle handle with integrated direct access buttons

A turnable control grip allows you to use the camera in the most comfortable position. The buttons and joystick to control the camera are integrated in this handle and always stay right underneath your fingertips.



## Programmable direct access button

For increased flexibility the operator can program a button located on the top of the camera for direct access to favorite functions.



## Large number of analysis tools

Movable spotmeters, line profiles, areas and many more allow for detailed thermal analysis.



## MPEG-4 video

Create visual and infrared non radiometric MPEG-4 video files.



## High quality visual camera

An integrated 3.2 megapixel visual camera for generating crisp visual images in all conditions.



## Laser Pointer

Helps you associate the hot or cold spot in the IR image with the real physical target in the field.



## Flexible interfaces

Easy access to digital video connection, USB, and a direct connection to charge the battery inside the camera.



## Built-in GPS

GPS allows to georeference infrared images to determine their geographic location.



## Wireless connectivity

Connect to smartphone or tablet via a Wi-Fi USB adapter, use the FLIRTools mobile app (Apple iOS and Android) for processing and sharing results as well as for remote control.



## Radiometric IR video streaming

16 bit radiometric IR video can be streamed to a PC (via USB) running the FLIR software.



## High Sensitivity Mode (HSM)

Further enhances the sensitivity of the camera so that the smallest gas leaks can be detected (FLIR GF304, GF306, FLIR GF320 and FLIR GF346).

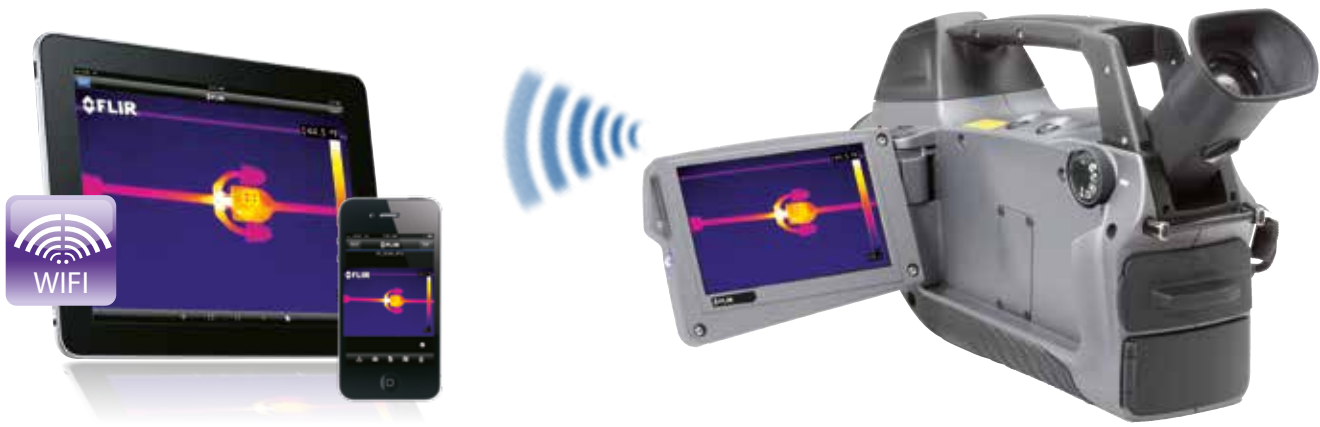


Gas leak in a petrochemical plant



High Sensitivity Mode On





Connect to smartphone or tablet via a Wi-Fi USB adapter and use the FLIRTools mobile app (Apple iOS and Android) for processing and sharing results as well as for remote control.



# FLIR GF309



## Seeing through flames

The FLIR GF309 is an IR camera for the high-temperature measurement of industrial furnaces, chemical heaters, and coal-fired boilers, without the need to shut down the operation. The portable camera also greatly improves operator safety, by measuring through flames at a safe distance, for all types of furnaces. A good knowledge of the furnace condition can avert failures and unscheduled shutdowns.

Industrial furnaces, heaters, and boilers are found in the chemical, petrochemical, and utility industries.



### See through flames

The GF309 is equipped with a special "flame filter" that allows you to see and measure high temperatures (up to +1500°C) through flames. Ideal for furnace and boiler inspections.



### Wide temperature range

The FLIR GF309 visualizes temperatures from -40°C to +1,500°C. This makes the camera extremely suited for high temperature inspections.



### Dual use

The FLIR GF309 can be used both for internal and external furnace and maintenance inspections and can make also the smallest of temperature differences clearly visible.



### Heat shield

A nickel coated heat shield improves worker safety and comfort during inspection.



### Available lenses

The FLIR GF309 comes either with a fixed 14.5° lens or with a fixed 24° lens. A version with interchangeable lenses is also available but requires a US Department of State license.



### Cooled detector

The FLIR GF309 contains a cooled Indium Antimonide (InSb) detector. This highly sensitive detector is spectrally tuned to 3.8 - 4.05 micrometer waveband for seeing through flames.

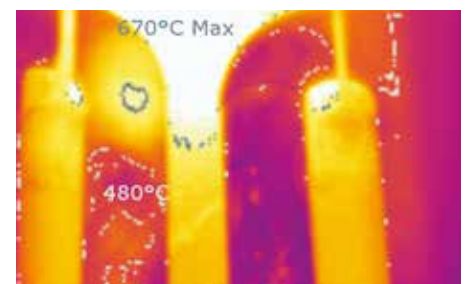
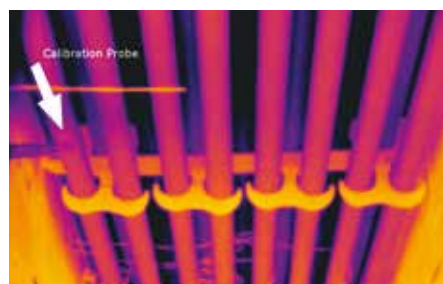
## Industries:



Oil refineries, petrochemical & chemical industries



Electrical utilities



Coke formation on an Ultrafiner Reactor Charge Heater.

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.

# FLIR GF304



## Optical gas imaging of refrigerant gases

The FLIR GF304 is a gas imaging camera which was especially developed for the detection of refrigerant gases without the need to shut down the operation.

Refrigerant gases are used worldwide in industrial refrigeration systems for production, storage and retailing of food. Refrigerant gas is also used in the chemical, pharmaceutical and automotive industries and in air conditioning systems. Keeping an industrial refrigeration system running is of great importance due to the value of the cooled goods.

Furthermore, replacing or recharging gas can be a costly exercise. Although refrigerant gases are vital for many industries they can also be dangerous for the environment and may be governed by local regulations. That is why it is of the utmost importance to find leaks quickly and easy.



### Cooled detector

The FLIR GF304 contains a cooled Quantum Well Infrared Photodetector (QWIP) and a cold band pass filter that allow to visualize gases in the 8.0-8.6 micrometer waveband. It will not only make refrigerant gases, but also the smallest of temperature differences, clearly visible.



### Temperature range

The FLIR GF304 visualizes temperatures from -20°C to +500°C.



### Dual use

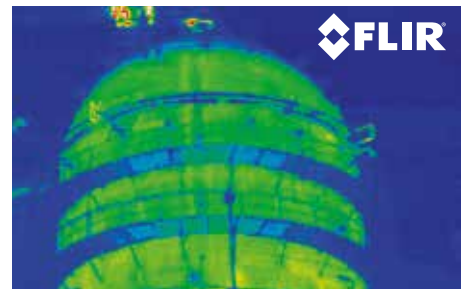
The FLIR GF304 can be used both for finding gas leaks and maintenance inspections. High voltage, low voltage, mechanical and many other inspections can all be easily done with the FLIR GF304.



### Available lenses

The FLIR GF304 comes either with a fixed 14.5° lens or with a fixed 24° lens. A version with interchangeable lenses is also available but requires a US Department of State license.

## Industries:



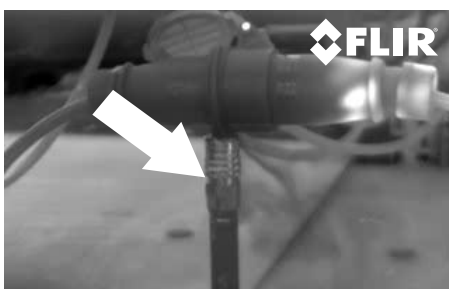
Petrochemical & chemical industries



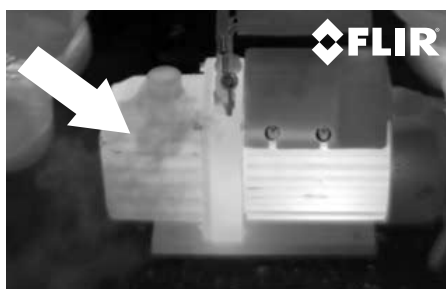
Food industry

### The FLIR GF304 detects the following refrigerant gases:

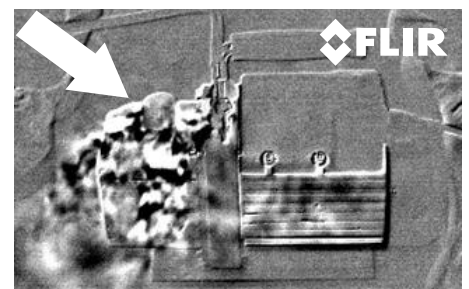
- R404A
- R407C
- R410A
- R134A
- R417A
- R422A
- R507A
- R143A
- R125
- R245fa



Leak from electrical 415V connector



Leaking car air conditioning



Leaking car air conditioning in HSM mode

# FLIR GF306



## Optical gas imaging especially of SF<sub>6</sub> and ammonia

The FLIR GF306 visualizes and pinpoints gas leaks of SF<sub>6</sub> and ammonia, without the need to de-energize high-voltage equipment or shut down the operation. The portable camera also greatly improves operator safety, by detecting emissions at a safe distance, and helps to protect the environment by tracing leaks of environmentally harmful gases.

SF<sub>6</sub> is used in the electric power industry as an insulator and quenching medium for gas-insulated substations and circuit breakers. Ammonia is produced in ammonia plants, and is used mainly for the production of fertilizers.



### Cooled detector

The FLIR GF306 contains a cooled Quantum Well Infrared Photodetector (QWIP). This highly sensitive detector visualizes gases in the 10.3 – 10.7 micrometer waveband. It will not only make gases, but also the smallest of temperature differences, clearly visible.



### Temperature range

The FLIR GF306 visualizes temperatures from -40°C to +500°C.



### Dual use

The FLIR GF306 can be used both for finding gas leaks and maintenance inspections.



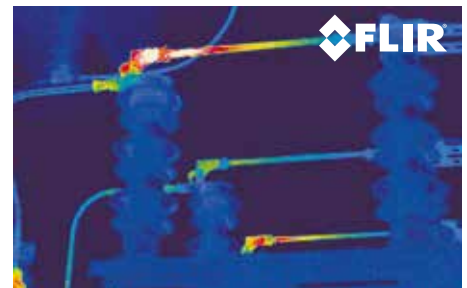
### Available lenses

The FLIR GF306 comes either with a fixed 14.5° lens or with a fixed 24° lens. A version with interchangeable lenses is also available but requires a US Department of State license.

## Industries:



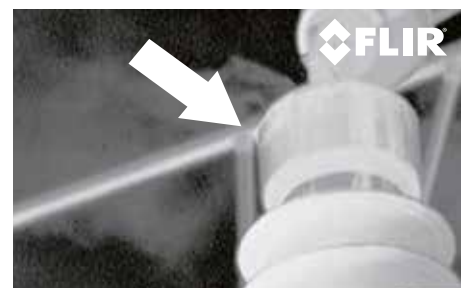
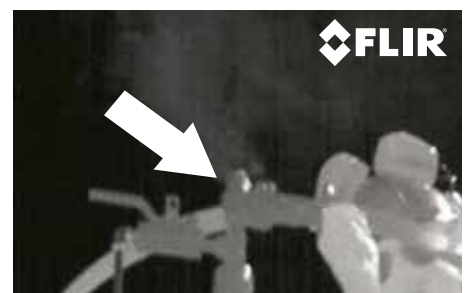
Petrochemical & chemical industries



Electrical Utility

### The FLIR GF306 detects the following gases:

- Sulfur Hexafluoride (SF<sub>6</sub>)
- Acetyl Chloride
- Acetic Acid
- Allyl Bromide
- Allyl Chloride
- Allyl Fluoride
- Ammonia (NH<sub>3</sub>)
- Bromomethane
- Chlorine Dioxide
- Ethyl Cyanoacrylate
- Ethylene
- Furan
- Hydrazine
- Methylsilane
- Methyl Ethyl Ketone
- Methyl Vinyl Ketone
- Propenal
- Propene
- Tetrahydrofuran
- Trichloroethylene
- Uranyl Fluoride
- Vinyl Chloride
- Vinyl Cyanide
- Vinyl Ether



Captured SF<sub>6</sub> leak

# FLIR GF320



## Optical gas imaging of methane and other volatile organic compounds (VOCs)

The FLIR GF320 is an IR camera for optical gas imaging (OGI) that visualizes and pinpoints leaks of VOCs, without the need to shut down the operation. The portable camera also greatly improves operator safety, by detecting emissions at a safe distance, and helps to protect the environment by tracing leaks of environmentally harmful gases. The GF320 is used in industrial settings such as oil refineries, natural gas processing plants, offshore platforms, chemical/petrochemical industries, and biogas and power generation plants.



### Cooled detector

The FLIR GF320 contains a cooled Indium Antimonide (InSb) detector. This highly sensitive detector visualizes gases in the 3.2 - 3.4 micrometer waveband. It will not only make gases, but also the smallest of temperature differences, clearly visible.



### Temperature range

The FLIR GF320 visualizes temperatures from -40°C to +350°C.



### Dual use

The FLIR GF320 can be used both for finding gas leaks and maintenance inspections.



### Available lenses

The FLIR GF320 comes either with a fixed 14.5° lens or with a fixed 24° lens. A version with interchangeable lenses is also available but requires a US Department of State license.

### The FLIR GF320 detects the following gases:

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

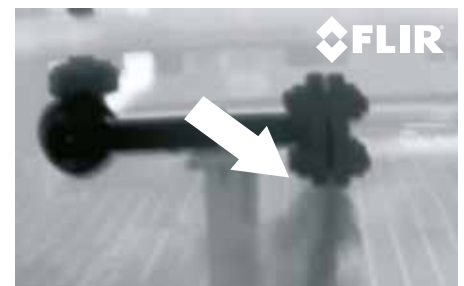
## Industries:



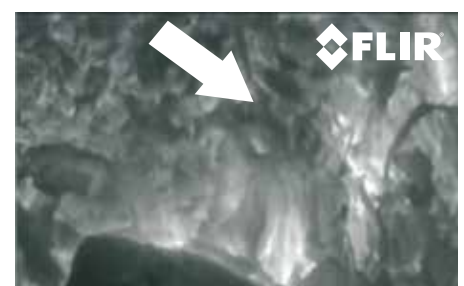
Oil refineries, petrochemical & chemical industries



Electrical utilities



Leaking valve



Gas leak on land fill surface



Real-time image of a gas leak displayed on the built in LCD screen

# FLIR GF346



## Optical gas imaging especially of carbon monoxide (CO) and other harmful gases

The FLIR GF346 is an IR camera for optical gas imaging (OGI) that visualizes and pinpoints gas leaks of CO, without the need to shut down the operation. The portable camera also greatly improves operator safety, by detecting emissions at a safe distance, and helps to protect the environment by tracing leaks of environmentally harmful gases. CO is an industrial gas with applications in the steel industry and bulk chemicals manufacturing. It is also used for packaging systems for fresh meat and fish.



### Cooled detector

The FLIR GF346 contains a cooled Indium Antimonide (InSb) detector. This highly sensitive detector visualizes gases in the 4.52 - 4.67 micrometer waveband. It will not only make gases, but also the smallest of temperature differences, clearly visible.



### Wide temperature range

The FLIR GF346 visualizes temperatures from -20°C to +300°C.



### Dual use

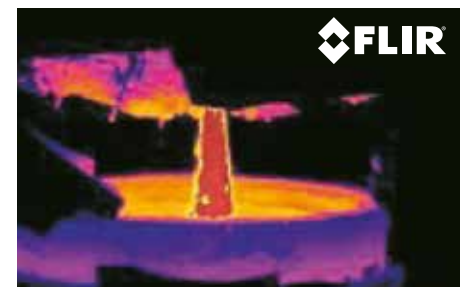
The FLIR GF346 can be used both for finding gas leaks and maintenance inspections.



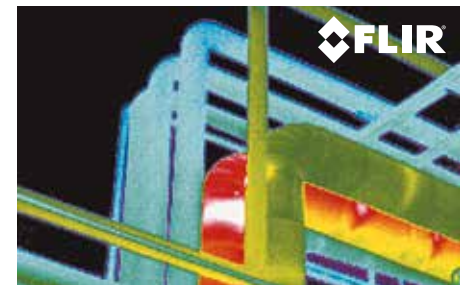
### Available lenses

The FLIR GF346 comes either with a fixed 14.5° lens or with a fixed 24° lens. A version with interchangeable lenses is also available but requires a US Department of State license.

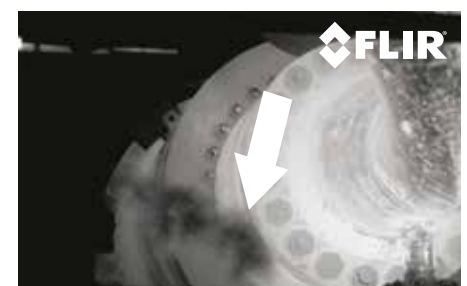
## Industries:



Steel manufacturing



Petrochemical & chemical industries



Gas leak

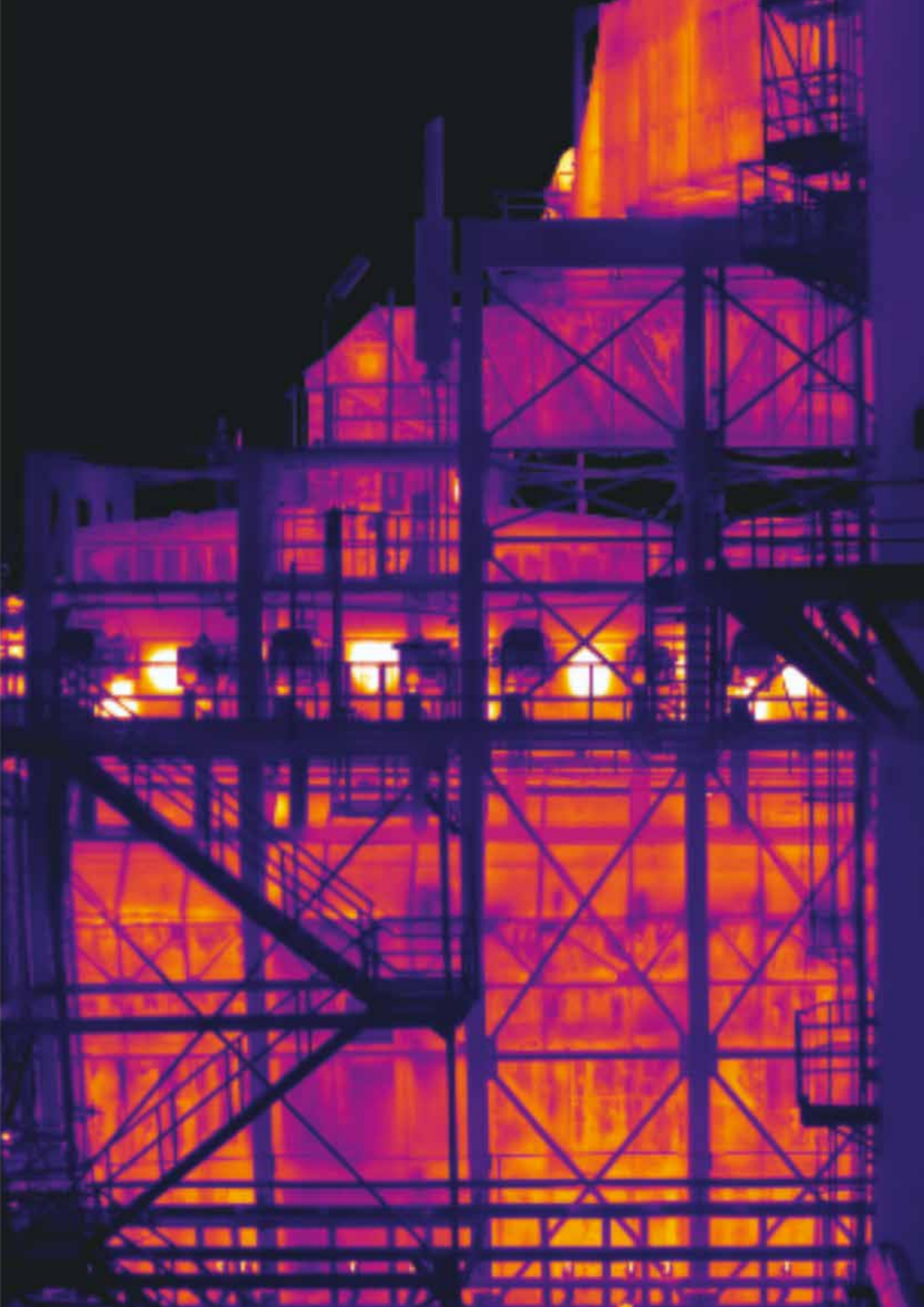


CO leak in off blast furnace

### The FLIR GF346 detects the following gases:

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





# Software

## Turning tools into solutions

At FLIR Systems, we recognize that our job is to go beyond just producing the best possible thermal imaging camera systems. We are committed to enabling all users of our thermal imaging camera systems to work more efficiently and productively by providing them with the most professional camera-software combination.

Our team of committed specialists are constantly developing new, better and more user-friendly software packages to satisfy the most demanding thermal imaging professionals. All software is Windows-based, allows fast, detailed and accurate analysis and evaluation of thermal inspections.



## FLIR Reporter

### Creating compelling and professional reports

FLIR Reporter is a powerful software for creating compelling and professional reports with the latest Microsoft operating system and Word compatibility.

#### Flexible report design and layout

- Fully integrated with Microsoft Word™
- Powerful temperature analysis
- Wizard-guided report generation
- Automatic report generation by drag-and-drop
- Predictive trending functionality
- Automatic link to Google™ Maps for images with GPS coordinates

#### Automatic report generation

With FLIR Reporter it's easy to create customized reports, such as insertion of logos, etc. The ReportWizard guides you step-by-step to make a professional inspection report.

#### Compatible with GPS

FLIR GF-Series customers have built-in GPS capability with their cameras. FLIR Reporter provides an automatic link to Google™ Maps for images with GPS coordinates.

#### Predictive trending functionality

Trending is a powerful tool to help you track thermal information relating to your IR surveys. Armed with this information you can better determine when maintenance procedures need to be performed.

#### More advanced features

FLIR Reporter includes numerous advanced features, including: digital zoom, color palette changes, play back of voice comments recorded in the field. Automate calculations with the powerful formula tool and the time-saving one-click  $\Delta T$  function. Instant report summary creation with the SummaryTable tool. Histogram and line profile graph features to facilitate more advanced analysis.



*FLIR Reporter allows for fast and easy generation of professional inspection reports.*

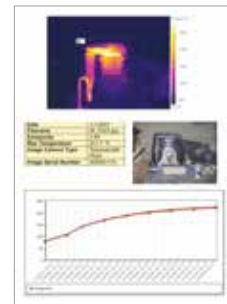


### FLIR Reporter Key features:

- Flexible report page design and layout for customized reports
- Use quick insert function to easily create custom report pages
- Fully integrated with standard Microsoft Word
- Generates reports in standard MS Office format and PDF-format
- Powerful temperature analysis
- Rapid report manager supporting automatic report generation by drag-and-drop
- Trending functionality
- Automatic link to Google™ Maps for images with GPS coordinates
- Automatic summary table for the report
- Fine tune images and make full temperature analysis directly in Microsoft Word
- Spell check
- Create your own formulas including measurement values from images
- Play radiometric sequences directly in the report
- Search functionality to quickly find images for your report
- Panorama tool for combining several images to a larger image
- Windows 7, 32 and 64-bit
- Support for MeterLink™ data
- \*.docx compatibility
- Grid function



FLIR P660 users can seamlessly integrate the GPS coordinates into Reporter.



Trends: Accurately track thermal performance over time with easy-to-understand charts and graphs.

## FLIR VideoReport: free software with every OGI-camera



Every FLIR optical gas imaging camera comes with FLIR VideoReport software included. FLIR VideoReport makes reports including videos easy. You can create and edit your video clips taken with the FLIR GF-Series thermal imaging cameras. Build your movie with a few simple drag-and-drops. Delete bad shots and include only the best scenes.

FLIR VideoReport is a software package specifically designed to provide an easy way to edit non-radiometric \*.mp4 and \*.avi video clips taken with FLIR GF-Series thermal imaging cameras.

## FLIR Tools

### FLIR Tools Mobile App for Android, iPad, iPhone, and iPod Touch

FLIR leads the way with forward-thinking Wi-Fi connectivity to Android and to iPad, iPhone and iPod Touch devices. Just download the new FLIR Tools Mobile app from Android Market or from the App Store and you're ready to see, capture and import thermal images as well as to stream and capture live video from select FLIR cameras.

FLIR Tools Mobile can also be used for remote control of the camera.

### FLIR Tools: Software with every thermal imaging camera

FLIR Systems has since long realized the importance of making inspection reports. That is why every FLIR Systems thermal imaging camera is coming with software that allows users to organize and analyze the images from their thermal imaging cameras and present them in a report. The software allows for adjusting image settings such as color palette, level and span and for basic thermal analysis. Users that want more flexibility and more analysis tools can choose for FLIR Reporter.



## FLIR Infrared Training Center



The Infrared Training Center (ITC) offers the world's leading infrared training and thermographer certification programs.



Although all our cameras are designed for easy installation and operation, there is a lot more to thermal imaging than just knowing how to handle the camera.

We therefore organize regular courses and seminars. We also organize in-company training on request, so that you, or your staff, can gain familiarity with thermal imaging and its applications.

The ITC not only welcomes FLIR Systems customers but also users of other brands of cameras. In fact, anyone who wants to learn more about thermal imaging for any applications, before deciding to purchase a camera, is also invited.

The mission of the ITC is to make our customers and partners successful by enhancing their knowledge of IR technology, thermal imaging products, and relevant applications. The ITC

offers a portfolio of courses that presents the right mix of theoretical and practical content to help professionals quickly apply thermal imaging technology to real life applications.

All our instructors are experienced thermal imaging specialists. Not only do they have a profound theoretical knowledge but they also have practical experience with numerous applications. For our customers, this means that attending one of the ITC's courses will give them a real hands-on learning experience.

**The ITC also organizes advanced gas detection courses. Participants learn to set up and operate FLIR GF cameras, to get the most out of their thermal imaging camera. Courses are ideal for people that want to complement or replace their traditional Leak Detection and Repair (LDAR) programs with a thermal imaging camera.**



*Each ITC course is a perfect combination of theoretical fundamentals and practical exercises. It guarantees participants a real hands-on learning experience.*

# After Sales

## FLIR After Sales

At FLIR Systems, building a relationship with a customer takes more than just selling a thermal imaging camera. After the camera has been delivered, FLIR Systems is there to help meet your needs.



Once purchased, thermal imaging cameras are vital pieces of equipment. To keep them running at all times, we operate a worldwide service network with subsidiaries in Belgium, China, France, Germany, Hong Kong, Italy, the Netherlands, Sweden, United Arab Emirates, the United Kingdom and the USA.

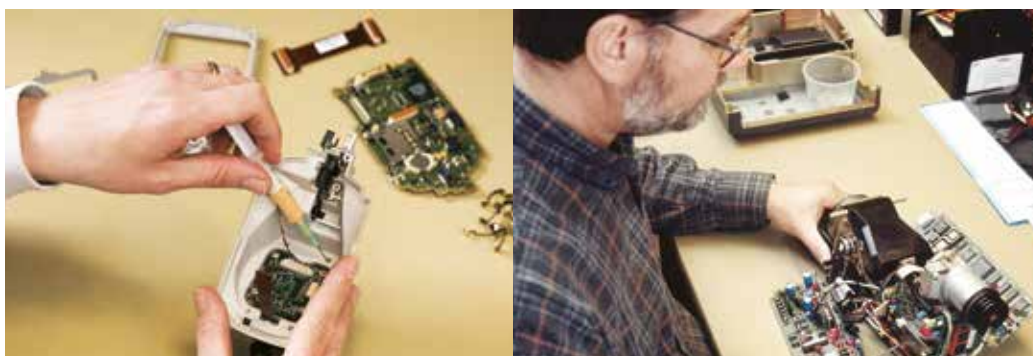
If there should be a problem with one of our camera systems, these local service centers have all the know-how and equipment to solve it within the shortest possible time. Local camera service gives you the assurance that your system will be ready for use again within an extremely short timeframe.

Buying a thermal imaging camera is a long-term investment. You need a reliable supplier who can provide you with support over a long period of time.

Our service personnel regularly follows training programs at our production facilities in Sweden or the USA. Not only to learn about the technical aspects of the products, but also to familiarize themselves with your individual customer requirements and the latest applications.

Different types of maintenance contracts can be offered to make sure that, whatever happens, your thermal imaging camera is always available for use.

**CUSTOMER CARE is not just a slogan.  
We write it in capital letters at FLIR.**



# Accessories



Flexible systems  
that meet your changing needs

In today's fast-changing environment, requirements for purchased capital equipment can change from year to year or from project to project. Things that are vital today can be redundant tomorrow.

That makes it important for the equipment in which you invest to be flexible enough to meet the ever-changing needs of your applications. 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 own, specific application.



A wide variety of accessories is available for every FLIR thermal camera



Extra Battery



24° lens



Car charger



Battery charger

# FLIR GF309

## Technical specifications

Imaging and optical data	
Field of view (FOV) / Minimum focus distance	14.5° lens: 14.5° x 10.8° / 0.5 m 24° lens: 24° x 18° / 0.3 m
F-number	1.5
Thermal sensitivity/NETD	<15 mK @ +30°C
Focus	Automatic (one touch) or manual (electric or on the lens)
Zoom	1–8× continuous, digital zoom
Digital image enhancement	Noise reduction filter
Focal Plane Array (FPA) / Spectral range	Cooled InSb / 3.8–4.05 µm
IR resolution	320 × 240 pixels
Sensor cooling	Stirling Microcooler (FLIR MC-3)
Electronics and data rate	
Full frame rate	60 Hz
Image presentation	
Display	Built-in widescreen, 4.3 in. LCD, 800 × 480 pixels
Viewfinder	Built-in, tiltable OLED, 800 × 480 pixels
Automatic image adjustment	Continuous/manual; linear or histogram based
Manual image adjustment	Level/span
Image modes	IR-image, visual image
Measurement	
Temperature range	–40 to +1500°C
Accuracy	±1°C for temperature range (0-100 °C) or ±2% of reading for temperature range (> +100 °C)
Measurement analysis	
Spotmeter	10
Area	5 boxes with max/min/average
Profile	1 live line (horizontal or vertical)
Difference temperature	Delta temperature between measurement functions or reference temperature
Reference temperature	Manually set or captured from any measurement function
Emissivity correction	Variable from 0.01 to 1.0 or selected from editable materials list
Reflected apparent temperature correction	Automatic, based on input of reflected temperature
Measurement corrections	Reflected temperature, distance, atmospheric transmission, humidity, external optics
Set-up	
Menu commands	Level, span, Auto adjust continuous/manual/semi-automatic, Zoom, Palette, Start/stop recording, Store image, Playback/recall image
Color palettes	Iron, Gray, Rainbow, Arctic, Lava, Rainbow HC
Set-up commands	1 programmable button, local adaptation of units, language, date and time formats
Storage of images	
Image storage type	Removable SD or SDHC Memory Card, two card slots
Image storage capacity	> 1200 images (JPEG) with post process capability per GB on memory card
Image storage mode	IR/visual images. Visual image can automatically be associated with corresponding IR image.
File formats	Standard JPEG, 14 bit measurement data included
GPS	Location data automatically added to every image from built-in GPS
Video recording and streaming	
Radiometric IR-video recording	15 Hz direct to memory card
Non radiometric IR-video recording	MPEG4 (up to 60 minutes/clip) to memory card. Visual image can automatically be associated with corresponding recording of non radiometric IR-video.
Digital camera video recording	MPEG4 (25 minutes/clip) to memory card
Non radiometric IR-video streaming	RTP/MPEG4
Digital camera	
Built-in digital camera	3.2 Mpixel, auto focus, and two video lamps
Laser pointer	
Laser	Activated by dedicated button
Data communication interfaces	
WLAN	Peer to peer (ad-hoc) for iOS or infrastructure (network) for Android
USB	USB-A: Connect external USB device (e.g. memory stick) USB Mini-B: Data transfer to and from PC
USB, standard	USB Mini-B: 2.0 High Speed
Video	Digital Video output (image)
Power system	
Battery type	Rechargeable Li Ion battery
Battery voltage	7.2 V
Battery operating time	> 3 hours at 25°C and typical use
Charging system	In camera (AC adapter or 12 V from a vehicle) or 2-bay charger
Start-up time	Typically 7 min. @ 25°C

Environmental data	
Operating temperature range	–20°C to +50°C
Storage temperature range	–30°C to +60°C
Humidity (operating and storage)	IEC 68-2-30/24 h 95% relative humidity +25°C to +40°C (2 cycl)
EMC	EN61000-6-4 (Emission) EN61000-6-2 (Immunity) FCC 47 CFR Part 15 class A (Emission) EN 61 000-4-8, L5
Encapsulation	IP 54 (IEC 60529)
Bump	25 g (IEC 60068-2-29)
Vibration	2 g (IEC 60068-2-6)

Physical data	
Camera weight, incl. lens and battery	2,48 kg
Battery weight	0,24 kg
Cameras size, incl. lens (L × W × H)	305 × 169 × 161 mm
Tripod mounting	Standard, 1/4"–20
Housing material	Aluminium, Magnesium
Grip material	TPE Thermoplastic Elastomers

Scope of delivery	
Thermal imaging camera	
Standard Lens, 14.5° or 24° (SI)	
Hard transport case	
Lens cap (mounted on lens)	
Shoulder strap	
Batteries 2 ea. (1 of the batteries inside camera)	
Charger	
Power supply incl. multi-plugs	
HDMI-DVI + HDMI-HDMI cable	
USB cable	
SD card	
SD card adapter (connects via USB to PC)	
Getting Started Guide (printed)	
Manual for GF-series on CD	
FLIR Tools on CD	
Heat shield	
Wi-Fi USB micro-adaptor (depending on CE and FCC regulations regarding wireless equipment for your country)	



# FLIR GF304 / GF306 / GF320 / GF346

## Technical specifications

### Camera specific

	GF304	GF306	GF320	GF346
<b>Imaging and optical data</b>				
Focal Plane Array (FPA) / Spectral range	Cooled QWIP / 8.0–8.6 $\mu\text{m}$	Cooled QWIP / 10.3–10.7 $\mu\text{m}$	Cooled InSb / 3.2–3.4 $\mu\text{m}$	Cooled InSb / Built-in cold band pass filter 4.52 - 4.67 $\mu\text{m}$
<b>Measurement</b>				
Accuracy	$\pm 1^\circ\text{C}$ for temperature range (0-100 $^\circ\text{C}$ ) or $\pm 2\%$ of reading for temperature range ( $> +100^\circ\text{C}$ )	$\pm 1^\circ\text{C}$ for temperature range (0-100 $^\circ\text{C}$ ) or $\pm 2\%$ of reading for temperature range ( $> +100^\circ\text{C}$ )	$\pm 1^\circ\text{C}$ for temperature range (0-100 $^\circ\text{C}$ ) or $\pm 2\%$ of reading for temperature range ( $> +100^\circ\text{C}$ )	$\pm 1^\circ\text{C}$ or $\pm 1\%$ of reading for temperature range 0 $^\circ\text{C}$ to $+300^\circ\text{C}$
Measurement range	-20 $^\circ\text{C}$ to $+500^\circ\text{C}$	-40 $^\circ\text{C}$ to $+500^\circ\text{C}$	-40 $^\circ\text{C}$ to $+350^\circ\text{C}$	-20 $^\circ\text{C}$ to $+300^\circ\text{C}$
<b>Power system</b>				
Battery operating time	$> 3$ hours at 25 $^\circ\text{C}$ and typical use	$> 2$ hours at 25 $^\circ\text{C}$ and typical use	$> 3$ hours at 25 $^\circ\text{C}$ and typical use	$> 3$ hours at 25 $^\circ\text{C}$ and typical use
Start-up time	Typically 8 min. @ 25 $^\circ\text{C}$	Typically 10 min. @ 25 $^\circ\text{C}$	Typically 7 min. @ 25 $^\circ\text{C}$	Typically 7 min. @ 25 $^\circ\text{C}$
<b>Environmental data</b>				
Operating temperature range	-20 $^\circ\text{C}$ to $+40^\circ\text{C}$	-20 $^\circ\text{C}$ to $+40^\circ\text{C}$	-20 $^\circ\text{C}$ to $+50^\circ\text{C}$	-20 $^\circ\text{C}$ to $+50^\circ\text{C}$
<b>Gas detection</b>				
Gases	<ul style="list-style-type: none"> <li>• R404A</li> <li>• R407C</li> <li>• R410A</li> <li>• R134A</li> <li>• R417A</li> <li>• R422A</li> <li>• R507A</li> <li>• R143A</li> <li>• R125</li> <li>• R245fa</li> </ul>	<ul style="list-style-type: none"> <li>• Sulfur Hexafluoride (SF<sub>6</sub>)</li> <li>• Acetyl Chloride</li> <li>• Acetic Acid</li> <li>• Allyl Bromide</li> <li>• Allyl Chloride</li> <li>• Allyl Fluoride</li> <li>• Ammonia (NH<sub>3</sub>)</li> <li>• Bromomethane</li> <li>• Chloride Dioxide</li> <li>• Ethyl Cyanoacrylate</li> <li>• Ethylene</li> <li>• Furan</li> <li>• Hydrazine</li> <li>• Methylsilane</li> <li>• Methyl Ethyl Ketone</li> <li>• Methyl Vinyl Ketone</li> <li>• Propenal</li> <li>• Propene</li> <li>• Tetrahydrofuran</li> <li>• Trichloroethylene</li> <li>• Uranyl Fluoride</li> <li>• Vinyl Chloride</li> <li>• Vinyl Cyanide</li> <li>• Vinyl Ether</li> </ul>	<ul style="list-style-type: none"> <li>• Benzene</li> <li>• Ethanol</li> <li>• Ethylbenzene</li> <li>• Heptane</li> <li>• Hexane</li> <li>• Isoprene</li> <li>• Methanol</li> <li>• MEK</li> <li>• MIBK</li> <li>• Octane</li> <li>• Pentane</li> <li>• 1-Pentene</li> <li>• Toluene</li> <li>• Xylene</li> <li>• Butane</li> <li>• Ethane</li> <li>• Methane</li> <li>• Propane</li> <li>• Ethylene</li> <li>• Propylene</li> </ul>	<ul style="list-style-type: none"> <li>• Acetonitrile</li> <li>• Acetyl cyanide</li> <li>• Arsine</li> <li>• Bromine isocyanate</li> <li>• Butyl isocyanide</li> <li>• Carbon monoxide</li> <li>• Chlorine isocyanate</li> <li>• Chlorodimethylsilane</li> <li>• Cyanogen bromide</li> <li>• Dichloromethylsilane</li> <li>• Ethenone</li> <li>• Ethyl thiocyanate</li> <li>• Germane</li> <li>• Hexyl isocyanide</li> <li>• Ketene</li> <li>• Methyl thiocyanate</li> <li>• Nitrous oxide</li> <li>• Silane</li> </ul>



Automatic (one Touch) and Manual Focus w/ 1 to 8 Continuous Digital Zoom helps you to deliver the perfect picture at ease.



Tilttable, flip-out 4.3" High Contrast Color LCD allows you to view targets more safely from any angle.

## General specifications

Imaging and optical data	
Field of view (FOV) / Minimum focus distance	14.5° lens: 14.5° x 10.8° / 0.5m 24° lens: 24° x 18° / 0.3 m
F-number	1.5
Focus	Automatic (one touch) or manual (electric or on the lens)
Zoom	1–8x continuous, digital zoom
Digital image enhancement	Noise reduction filter, High Sensitivity Mode (HSM)
IR resolution	320 x 240 pixels
Thermal sensitivity / NETD	<15 mK @ +30°C
Sensor cooling	Stirling Microcooler (FLIR MC-3)
Electronics and data rate	
Full frame rate	60 Hz
Image presentation	
Display	Built-in widescreen, 4.3 in. LCD, 800 x 480 pixels
Viewfinder	Built-in, tiltable OLED, 800 x 480 pixels
Automatic image adjustment	Continuous/manual; linear or histogram based
Manual image adjustment	Level/span
Image modes	IR-image, visual image, High Sensitivity Mode (HSM)
Measurement analysis	
Spotmeter	10
Area	5 boxes with max./min./average
Profile	1 live line (horizontal or vertical)
Difference temperature	Delta temperature between measurement functions or reference temperature
Reference temperature	Manually set or captured from any measurement function
Emissivity correction	Variable from 0.01 to 1.0 or selected from editable materials list
Measurement corrections	Reflected temperature, distance, atmospheric transmission, humidity, external optics
Set-up	
Menu commands	Level, span Auto adjust continuous/manual/semi-automatic Zoom Palette Start/stop recording Store image Playback/recall image
Color palettes	Iron, Gray, Rainbow, Arctic, Lava, Rainbow HC
Set-up commands	1 programmable button, overlay recording mode, local adaptation of units, language, date and time formats
Storage of images	
Image storage type	Removable SD or SDHC Memory Card, two card slots
Image storage capacity	> 1200 images (JPEG) with post process capability per GB on memory card
Image storage mode	IR/visual images Visual image can automatically be associated with corresponding IR image
Periodic image storage	Every 10 seconds up to 24 hours
File formats	Standard JPEG, 14 bit measurement data included
GPS	Location data automatically added to every image from built-in GPS
Video recording and streaming	
Non radiometric IR-video recording	MPEG4 (up to 60 minutes/clip) to memory card. Visual image can automatically be associated with corresponding recording of non radiometric IR-video.
Visual video recording	MPEG4 (25 minutes/clip) to memory card
Radiometric IR-video streaming	Full dynamic to PC using USB or WLAN
Non radiometric IR-video streaming	RTP/MPEG4
Visual video streaming	MPEG4 using Wi-Fi Uncompressed colorized video using USB
Digital camera	
Built-in digital camera	3.2 Mpixel, auto focus, and two video lamps
Laser pointer	
Laser	Activated by dedicated button
Data communication interfaces	
WLAN	Peer to peer (ad-hoc) for iOS or infrastructure (network) for Android
USB	USB-A: Connect external USB device (e.g. memory stick) USB Mini-B: Data transfer to and from PC
USB, standard	USB Mini-B: 2.0 High Speed
Video	Digital Video Output (image)
Power system	
Battery type	Rechargeable Li Ion battery
Battery voltage	7.2 V
Charging system	In camera (AC adapter or 12 V from a vehicle) or 2-bay charger
Environmental data	
Storage temperature range	–30°C to +60°C
Humidity (operating and storage)	IEC 68-2-30/24 h 95% relative humidity +25°C to +40°C (2 cycl)
EMC	EN61000-6-4 (Emission) EN61000-6-2 (Immunity) FCC 47 CFR Part 15 class A (Emission) EN 61 000-4-8, L5
Encapsulation	IP 54 (IEC 60529)
Bump	25 g (IEC 60068-2-29)
Vibration	2 g (IEC 60068-2-6)
Physical data	
Camera weight, incl. lens and battery	2.48 kg
Battery weight	0.24 kg
Cameras size, incl. lens (L x W x H)	306 x 169 x 161 mm
Tripod mounting	Standard, ¼"-20
Housing material	Aluminium, Magnesium
Grip material	TPE Thermoplastic Elastomers
Scope of delivery	
Thermal imaging camera, Hard transport case, Battery charger, Battery, 2 ea., Calibration Certificate, Downloads brochure, FLIR Tools PC software CD-ROM, FLIR VideoReport™ PC software CD-ROM, HDMI-DVI cable, HDMI-HDMI cable, Lens cap (mounted on lens), Memory card, Memory card adapter, Power supply, incl. multi-plugs, Printed Getting Started Guide, Printed important information guide, Registration card, Service & training brochure, Shoulder strap, USB cable, User documentation CD-ROM, Wi-Fi USB micro-adaptor (depending on CE and FCC regulations regarding wireless equipment for your country)	

**Note:** These specifications are for GF-Series with a fixed 14.5° or 24° lens.  
Versions with an interchangeable lens are also available but these require a US Department of State Export license.

# FLIR GF-Series



## Accessories

### Lenses

All FLIR GF-Series can be delivered with either a 14.5° or 24° fixed lens. Versions with interchangeable lenses are also available but require a US Department of State License and will be subject to limitations on resale. Also each individual lens requires a US Department of State License and will be subject to limitations on resale. For GF-Series thermal imaging cameras with interchangeable lenses, the following lens options are available:

#### FLIR GF309

**IR lens, 24° with case**[\[T197387\]](#)

The standard 24° lens is suitable for the majority of applications.

**IR lens, 14.5° with case**[\[T197385\]](#)

The 14.5° lens is a popular lens accessory and provides 1.7x magnification compared to the standard lens. Ideal for small or distant targets.

**IR lens, 6° with case**[\[T197388\]](#)

The 6° lens is a popular lens accessory and provides 4x magnification compared to the standard lens. Ideal for small or distant targets. Not compatible with the heatshield.

#### FLIR GF304

**IR lens, 24° with case**[\[T197386\]](#)

The standard 24° lens is suitable for the majority of applications.

**IR lens, 14.5° with case**[\[T197384\]](#)

The 14.5° lens is a popular lens accessory and provides 1.7x magnification compared to the standard lens. Ideal for small or distant targets.

#### FLIR GF306

**IR lens, 24° with case**[\[T197386\]](#)

The standard 24° lens is suitable for the majority of applications.

**IR lens, 14.5° with case**[\[T197384\]](#)

The 14.5° lens is a popular lens accessory and provides 1.7x magnification compared to the standard lens. Ideal for small or distant targets.

#### FLIR GF320

**IR lens, 24° with case**[\[T197387\]](#)

The standard 24° lens is suitable for the majority of applications.

**IR lens, 14.5° with case**[\[T197385\]](#)

The 14.5° lens is a popular lens accessory and provides 1.7x magnification compared to the standard lens. Ideal for small or distant targets.

**IR lens, 6° with case**[\[T197388\]](#)

The 6° lens is a popular lens accessory and provides 4x magnification compared to the standard lens. Ideal for small or distant targets. Not compatible with the heatshield.

#### FLIR GF346

**IR lens, 24° with case**[\[T198267\]](#)

The standard 24° lens is suitable for the majority of applications.

**IR lens, 14.5° with case**[\[T198298\]](#)

The 14.5° lens is a popular lens accessory and provides 1.7x magnification compared to the standard lens. Ideal for small or distant targets.

**IR lens, 6° with case**[\[T197388\]](#)

The 6° lens is a popular lens accessory and provides 4x magnification compared to the standard lens. Ideal for small or distant targets.



The following accessories are available for all GF-Series thermal imaging cameras

## Power



### Battery

Extra high capacity battery for the thermal imaging camera.

[1196209]



### Battery charger, incl. power supply with multi plugs

Stand-alone 2-bay battery charger, including power supply with multi plugs.

[T197692]



### Power supply, incl. multi plugs

Power supply, including multiple plugs, to charge the battery when it is inside the camera or in the battery charger.

[T910814]



### Cigarette lighter adapter kit, 12 VDC, 1.2 m.

This cable is used to power the thermal imaging camera or to charge the battery from the cigarette lighter socket in a car.

[1910490]

## Storage



### Adapter, SD memory card to USB

Easy to install and use; no additional driver installation required for Windows ME, 2000 and XP. Driver included for Windows 98SE.

[1910475]



### Memory card micro-SD with adapters

Micro-SD Card for data storage (e.g. images)

[T910737]

## Cables



### USB cable Std A <-> Mini-B

This cable is used to connect the thermal imaging camera with a computer, using the USB protocol.

[1910423]



### HDMI to DVI cable 1.5 m

This cable is used to connect the thermal imaging camera with an external display.

[T910816]



### HDMI to HDMI cable 1.5 m

This cable is used to connect the thermal imaging camera with an external display.

[T910815]

## Transport



### Hard transport case for FLIR GF3xx-Series

Hard transport case for FLIR GF3xx-Series

[T197555]

## Miscellaneous



### Heat Shield for FLIR GF309 only

Heat shield for the FLIR GF309.

[T197482]



### Wi-Fi USB adaptor

Wi-Fi USB adaptor for wireless connection between the thermal imaging camera and external equipment.

[T951387]

# FLIR Systems

## Export Licensing



All FLIR GF-Series can be delivered with either a 14.5° or 24° fixed lens. Versions with interchangeable lenses are also available but require a US Department of State License and will be subject to limitations on resale.

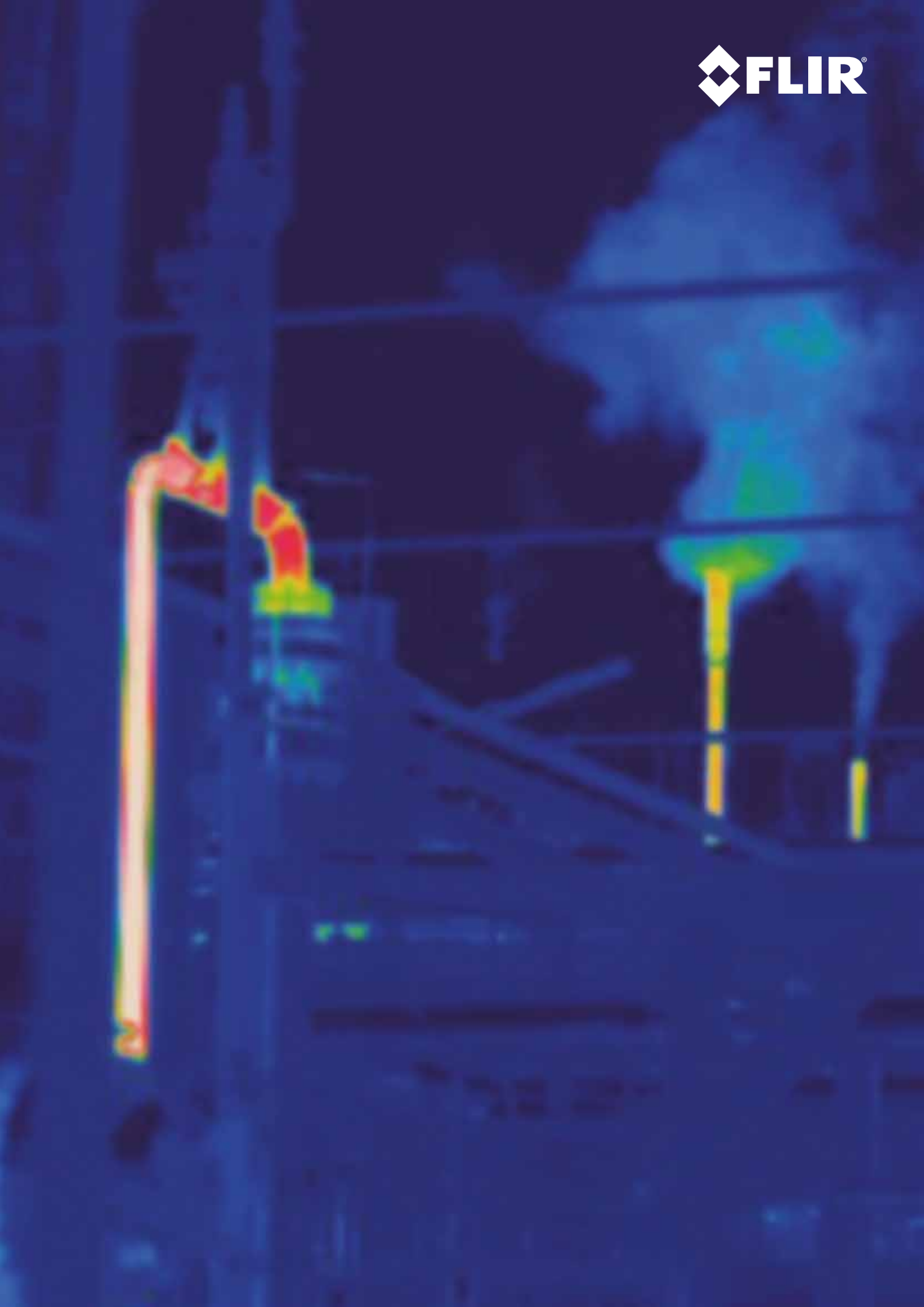
Also each individual lens requires a US Department of State License and will be subject to limitations on resale.

All products described in this publication may require government authorization for export/re-export or transfer. Contact FLIR Systems for details.

*Specifications are subject to change without notice.  
Weights and dimensions are indicative. Images used for illustration purposes only*

*April 2012*

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