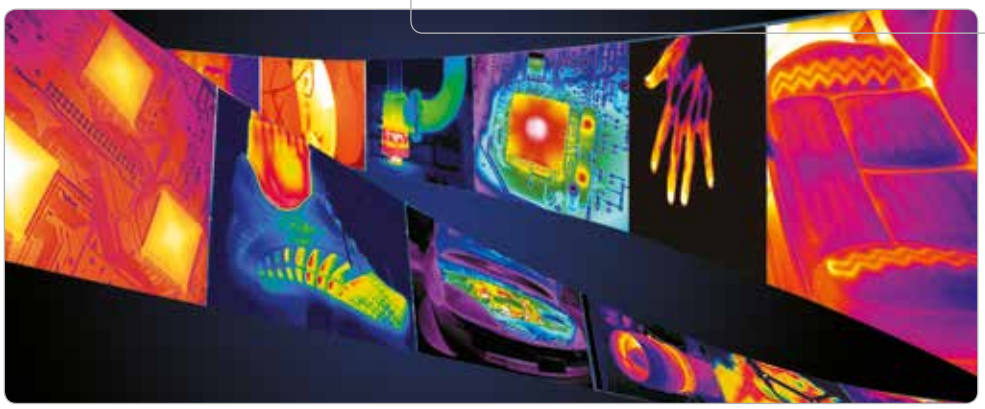
Thermal imaging cameras with uncooled microbolometer detector for Science / R&D



R&D Departments

Universities

Medical

Veterinary


FLIR

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. Complicated 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, Sweden

FLIR Systems, Portland

FLIR, Boston, USA

FLIR Santa Barbara, USA

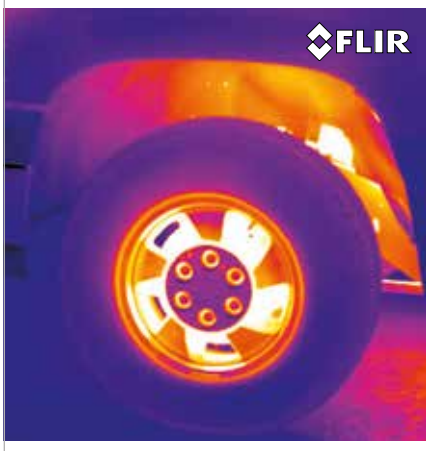
Rapidly emerging markets and organisation
Interest for thermal imaging has grown considerably over the last few years in a large variety of markets.

To face this increased demand, FLIR has expanded its organisation drastically. Today we employ more than 3,200 people. Together, these infrared specialists realize 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 5 manufacturing plants: three in the USA (Portland, Boston and Santa Barbara, California) one in Stockholm, Sweden and one in Estonia.

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.

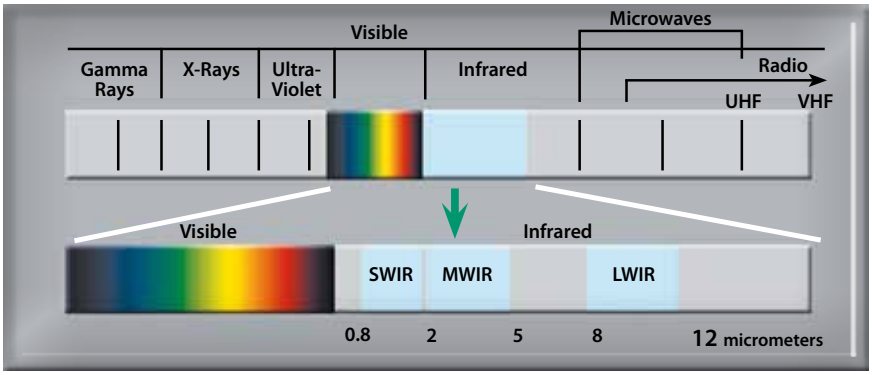
INFRARED:
more than meets the eye



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.

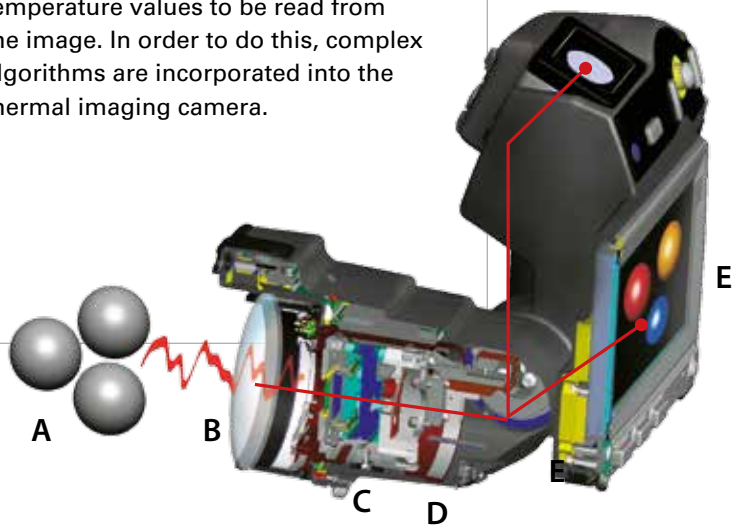
Any object that has a temperature above absolute zero (-273.15 degrees Celsius or 0 Kelvin) emits radiation in the infrared region. Even objects that we think of as being very cold, such as ice cubes, emit infrared radiation. We experience infrared radiation every day. The heat that we feel from sunlight, 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 thermal imaging 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 thermal imaging camera.



Why use thermal imaging cameras?

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

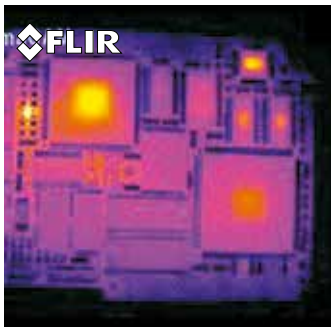
Infrared thermometers vs thermal imaging cameras
Infrared (IR) thermometers are reliable and very useful for single-spot temperature readings. But when scanning large areas or components, it's easy to miss a critical spot.

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

Use thousands of 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.

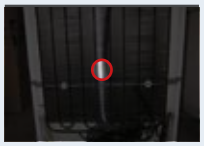
If we look at the FLIR T650sc one of our top models, which has an image resolution of 640 x 480 pixels, this means 307,200 pixels or using 307,200 infrared thermometers at the same time.

IR thermometer, measures temperature in one point



FLIR T650sc measures 307,200 temperature points

Find problems faster and easier with extreme accuracy.
It's easy to miss critical problems with a spot IR thermometer. A FLIR thermal imaging camera scans entire components giving you instant diagnostic insights showing the full extent of problems.



What an IR Thermometer sees.

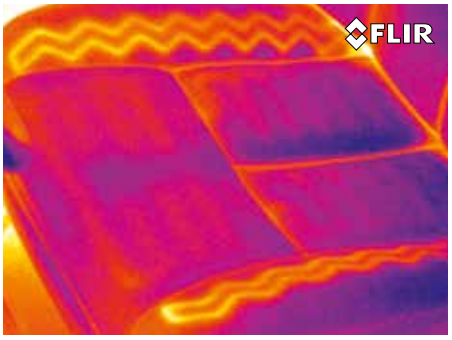
What a thermal imaging camera sees.

What an IR Thermometer sees.

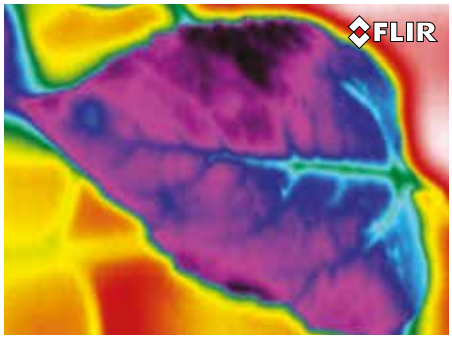
What a thermal imaging camera sees.

Thermal imaging cameras for Science / R&D applications

In Research and Development applications, accuracy, reliability, sensitivity and high performance are vitally important. That's why FLIR thermal imaging cameras are widely used around the world for applications as diverse as microelectronics, paper processing, automotive, plastics, assessment of materials, target heat signatures, mechanical testing, R&D and much more.



Industrial R&D
Numerous new products have been developed with the help of a thermal imaging camera. Product developers study the heat dissipation and thermal characteristics.



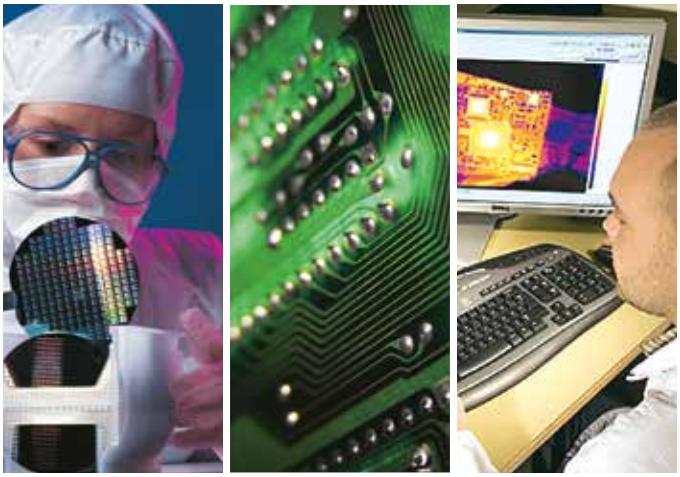
Scientific R&D
Fundamental or applied research, thermal imaging is used for a wide variety of applications.

FLIR's thermal imaging cameras are used for capturing and recording thermal distribution and variations in real-time, allowing engineers and researchers to see and accurately measure heat patterns, dissipation, leakage, and other temperature factors in equipment, products and processes.

These cameras can distinguish temperature changes as subtle as 0.02°C. They feature state-of-the-art detector technology and advanced mathematical algorithms for high performance and precise measurements from -80°C to +3000°C. The R&D camera ranges combine extremely high imaging performance and precise temperature measurements, with powerful tools and software for analysing and reporting.

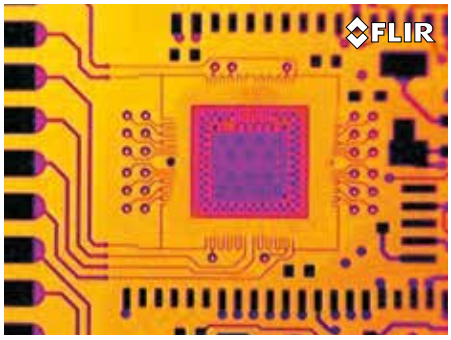
This combination makes them ideal for a wide range of research, thermal testing and product validation applications. With a vast choice of camera models, the FLIR R&D range can meet a wide variety of targets, applications and budget needs. They can be used as hand-held, portable devices, fix-mounted or tripod-mounted for continuous testing and operation.

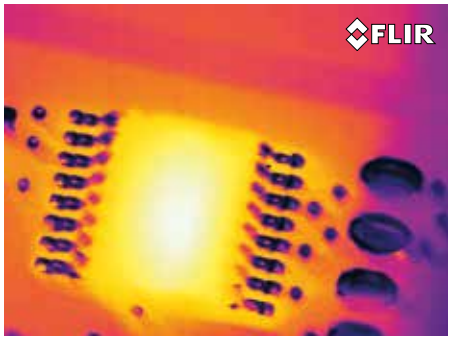
Infrared thermography has proven to be an invaluable tool to solve a wide range of scientific questions and problems.



The advantages of infrared thermography for Science / R&D applications

- Gives a full, real-time thermal pattern of the situation
- Is contactless, non-destructive and non-intrusive
- Identifies and locates thermal anomalies
- Stores thermal information
- Allows for detailed analysis
- Addresses numerous applications





Printed Circuit Boards
Scientists designing printed circuit boards are challenged with managing the heat dissipation without sacrificing performance or cost. Accurately understanding heat has been extremely difficult. However, thanks to thermography, engineers are able to easily visualize and quantify heat patterns in the devices that they create.

Heat patterns are very difficult to predict. This means that it is not always possible to know where to attach the thermocouples necessary to make accurate measurements and effectively evaluate heat dissipation. Furthermore, since the thermocouple needs to be in contact with the component to be tested, it can influence the results of the measurement. Infrared has the advantage that it produces very comprehensive images without contact or intrusion.

A wide range of thermal imaging cameras for R&D applications
FLIR markets a full product range of thermal imaging cameras for R&D applications. Whether you are just discovering the benefits that thermal imaging cameras have to offer or if you are an expert thermographer, FLIR offers you the correct tool for the job.

Discover our full product range and find out why FLIR is the world leader in thermal imaging cameras.


FLIR

Science packs

Hardware and software: the perfect combination

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

Our team of committed specialists is 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.

Maximize your cameras potential

FLIR Systems markets a wide range of thermal imaging cameras for a variety of applications. Industrial environments, buildings, maritime, security and many more they all benefit from the power of thermal imaging.

There is however no environment in which the combination hardware-software is more important than in Research and Development.

Researchers need to be able to quickly connect their thermal imaging camera, do the necessary analysis of their experiments and report the results of these experiments to their management or the R&D community. They need to be sure that every detail of their, sometimes unique, experiment is captured for further research.

Science (SC) Packs for every R&D application

Realizing the importance of software in an R&D environment FLIR Systems is not offering thermal imaging cameras only. Each thermal imaging camera comes, free of charge, with ResearchIR software that allows you to connect your camera to your PC and to analyse your experiments.

FLIR SYSTEMS IS NOT MARKETING SCIENCE THERMAL IMAGING CAMERAS BUT REAL SCIENCE PACKS.

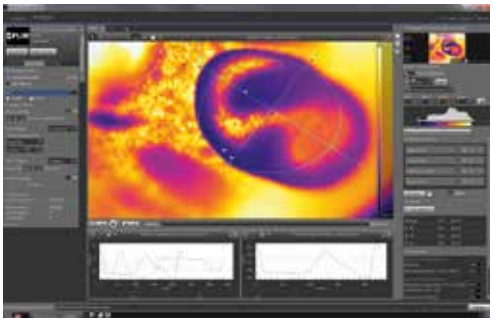
FLIR ResearchIR

FLIR ResearchIR was especially developed for R&D-Science users of thermal imaging cameras with a cooled or uncooled detector. FLIR ResearchIR takes the most out of your thermal imaging camera and allows high speed recording and advanced thermal patterns analysis. ResearchIR is the perfect tool for industrial R&D.

ResearchIR comes standard with every SC-Pack.

Users that are interested in more advanced science applications can, optionally, choose for ResearchIR Max.

Recorded sequence of a car engine



Study of a biological cell

FLIR SC325 and SC655 R&D packs

Speed up your design cycle with infrared

The FLIR SC325 and SC655 R&D packs contain a thermal imaging camera that is designed to keep the thermal efficiency of your development project under constant control. The FLIR SC-packs prevent design faults in the making, ensure quality and cut time-to-market. Each pack contains a thermal imaging camera with infrared lens and ResearchIR software.

Perfect your design, improve your design process

In the design process it is rarely possible to see a thermal problem with the naked eye or to measure temperature over surfaces accurately. Often, theoretical calculations and simulations do not give a satisfactory result without practical tests. And these are time consuming, requiring the precise connection of multiple thermocouples to prove the design.

Thermal imaging speeds up the development process and makes it more efficient. It shows the complete picture so that nothing is left to chance.

A thermal imaging camera gives you a sixth sense, allowing you to measure, monitor and analyze what you can't see, providing data and evidence in the fastest and easiest way possible. It is the perfect tool for verifying and validating design to ensure that the product fulfills specifications. Infrared also adds another dimension to non-destructive testing.

640x480 pixels
Some models of the Axxsc-Series have an IR resolution of 640x480 pixels that creates clear images with more details and lead to higher accuracy.

High speed infrared windowing
The FLIR A655sc model has a high speed infrared windowing function. It allows you to record thermal images at a frame rate up to 200 Hz by windowing.

External Triggering
Control start/stop recording in FLIR R&D software. Let an external signal control the image streaming.

High sensitivity < 50 mK
< 50 mK thermal sensitivity captures the finest image details and temperature difference information.

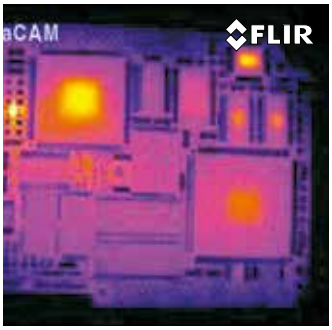
Compact & lightweight design
Compact thermal imaging cameras for fixed R&D installations in lbs or test benches.

GigE Vision™ standard compatibility
An industry first. GigE Vision is a new camera interface standard developed using the Gigabit Ethernet communication protocol. GigE Vision is the first standard to allow for fast image transfer using low cost standard cables even over long distances. With GigE Vision, hardware and software from different vendors can interoperate seamlessly over GigE connections.

GenICam™ protocol support
An industry first. The goal of GenICam is to provide a generic programming interface for all kinds of cameras. Regardless of interface technology (GigE Vision, Camera Link, 1394 DCAM, etc.) or features implemented, the application programming interface (API) will always be the same. The GenICam protocol also makes third party software being possible to use with the camera.

Built-in Gigabit Ethernet connection
Real time 16 bit image streaming.

FLIR ResearchIR
FLIR ResearchIR comes standard with every SC-Pack.



Verification of PCB

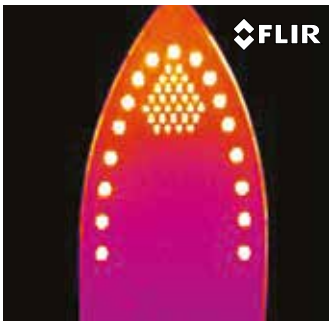
GiGE VISION GEN<i>CAM

Gigabit Ethernet connection

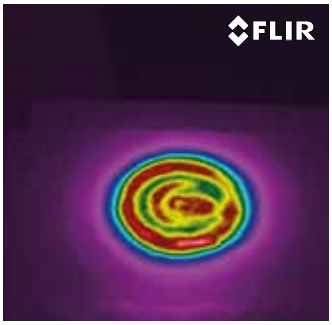
Power connection

USB 2 HS

Digital input/output connection



Thermal quality control on domestic appliances



Thermal image of a laser beam

Camera Model Comparison

	 **FLIR A325sc**	 **FLIR A655sc**
IR resolution	320 x 240 pixels	640 x 480 pixels
Image frequency	60 Hz	50 Hz Windowing option: 100/200 Hz
Temperature range	–20 °C to +350 °C in 2 ranges (+1200 °C optionally)	–40 °C to +650 °C in 2 ranges (+2000 °C optionally)
Ethernet	Control and image	Control and image
Ethernet communication	TCP/IP socket-based FLIR proprietary and GenICam	TCP/IP socket-based FLIR proprietary and GenICam
Ethernet image streaming	16-bit 320 × 240 pixels at 60 Hz	16-bit 640 × 480 pixels at 50 Hz Up to 200 Hz by windowing
USB	N/A	Control and image
USB communication	N/A	TCP/IP socket-based FLIR proprietary
USB image streaming	N/A	16-bit 640 × 480 pixels at 25 Hz Up to 100 Hz by windowing

FLIR SC450 and SC650 R&D packs

State-of-the-art thermal imaging cameras that combine good ergonomics and flexibility with high image quality

The FLIR SC450 and SC650 R&D packs contain a thermal imaging camera with a rotating optical block and touch screen interface. These handheld thermal imaging cameras are the perfect portable thermal cameras for bench-top testing in the lab or dynamic testing in the field.

Up to 640x480 pixel resolution
The high definition 640x480 pixels detector of the FLIR T650sc wich is included in the SC650 pack generates crisp and clear detailed images that are easy to interpret, resulting in reliable inspections with higher accuracy. Users that do not need this high image quality can chose for the SC450 pack that includes a T450sc generating thermal images of 320 x 240 pixels.

High sensitivity
The T650sc allows you to see temperature differences as small as 0.02°C at 30°C.

Outstanding measurement accuracy
High accuracy of +/- 1°C or +/- 1% of reading, for ambient temperature 15°C to 35°C.

Tiltable IR unit
The tiltable IR unit gives you great flexibility and allows you to conduct your experiments fast and in a comfortable position.

Large bright LCD screen
The high quality LCD screen presents sharp and bright images.

High quality visual camera
An integrated visual camera generates crisp visual images in all conditions. Field of view adapts to IR-lens.

Laser Pointer
The position of the laser pointer is highlighted on the thermal image, which helps you associate the hot spot in the image with the physical target.

Flexible interfaces
Easy access to Digital Video Interface, USB for connecting external devices, USB2 for PC communication and a direct connection to charge the battery inside the camera.

Radiometric IR video streaming
Full dynamic to PC using USB or to mobile devices using Wi-Fi.

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

Picture-in-picture
Create an infrared overlay on your visual image. Moveable and resizable.

Touch screen
The LCD touch screen brings interactivity and user comfort to a new level. In combination with the large backlit buttons and joystick the cameras are very easy to use.

Sketch annotations
Draw a sketch on the thermal image or digital photo or add predefined stamps.

Text and voice annotations
Text comments can be selected from a list. A Bluetooth headset can be connected to make voice annotations.

Digital zoom
The FLIR T450sc and T650sc are equipped with a 1-8x digital zoom, T650sc has a continuous zoom.

FLIR ResearchIR
FLIR ResearchIR comes standard with every SC-Pack.

Auto orientation
The image and menu automatically adjusts to the vertical or horizontal position of the camera.

Radiometric recording
Both the T450sc and T650sc can record radiometric IR sequences in real-time. These sequences that include all temperature data can be saved on an SD card inside the camera.

FLIR unique features

Multi Spectral Dynamic Imaging (MSX)
The innovative MSX feature produces an image more rich in every detail than ever before.

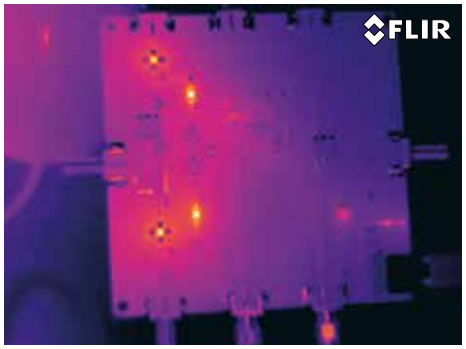
Image sketch
Indicate problem areas directly on the thermal image.

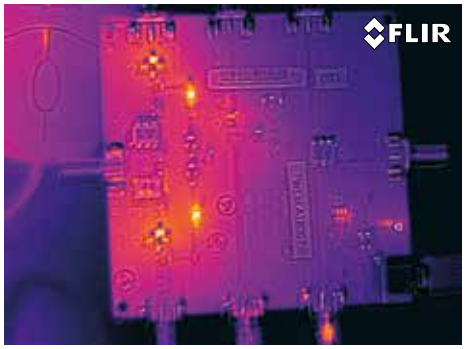
Continuous auto-focus
Continuous automatic focus on the object that you are inspecting.

Features dependant on camera model, please check technical specifications for more details.

Connect to smartphone or tablet via Wi-Fi, using the FLIR Tools mobile app (Apple iOS and Android) for processing and sharing results as well as for remote control.

Multi Spectral Dynamic Imaging (MSX)





MSX allows seeing even more detail on the thermal image.

Camera Model Comparison

FLIR T450sc	FLIR T650sc
Thermal image quality: 320x240 pixels	Thermal image quality: 640x480 pixels
Thermal sensitivity: <30 mk @ +30°C	Thermal sensitivity: <20 mk @ +30°C
Temperature range: -20°C up to +1,500°C	Temperature range: -40°C up to +2,000°C
Image frequency: 60 Hz	Image frequency: 30 Hz
Simultaneous storage of IR and visual images	Simultaneous storage of IR and visual images automatically grouped together
Spectral range: 7.5 - 13 µm	Spectral range: 7.5 - 14 µm
3.5 inch LCD touch screen, 320 x 240 pixels	4.3 inch LCD touch screen, 800 x 480 pixels
5 spotmeters	10 spotmeters
3.1 megapixel digital camera	5 megapixel digital camera
Composite video out	Digital Video Out (DVI), HDMI compatible
	GPS
	Continuous auto-focus
	Viewfinder

FLIR SC660

FLIR SC660: state-of-the-art thermal imaging cameras, designed for demanding R&D specialists.

Highest sensitivity and most advanced feature set available in portable cameras. Offers a combination of infrared and visible spectrum images of superior quality and temperature measurement accuracy – plus contrast optimizer, laser pointer, voice annotation and a host of other advanced features.

640x480 pixel resolution
The FLIR SC660 has a high resolution pixel detector of 640 x 480 pixels for more accuracy and higher resolution.

High sensitivity
< 30 mK thermal sensitivity captures the finest image details and temperature difference information.

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

Contrast Optimizer
Automatic optimization of brightness and contrast adjustments to make it easier to perform thermal analyzes of detailed objects).

Multifunction Video Capture
The FireWire interface can transfer 14-bit radiometric data directly into a PC for real-time analysis of captured images. Furthermore, radiometric sequences can be stored on high capacity SD-cards. MPEG-4 non-radiometric video sequences can also be streamed to a PC via USB, FireWire or WLAN (optional).

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 composite video connection, USB, FireWire, IrDA, and a direct connection to charge the battery inside the camera.

FLIR Thermal Fusion
Merges visual and thermal images to offer better analysis.

Picture-in-picture
Create an infrared overlay on your visual image. Moveable and resizable.

Thumbnail image gallery
An easy-to-access thumbnail image gallery helps you to quickly review and find your infrared images.

Radiometric JPEG
FLIR uses a non proprietary radiometric JPEG image format that allows for post processing and report writing with Microsoft Word® based FLIR software.

Text and voice annotations
Text comments can be uploaded to the camera through a wireless IrDA interface. A headset can be connected to make voice annotations.

Automatic- and Manual focus, Digital zoom
Focus possibilities include; single shot auto focus, continuous auto focus, laser based (660-models) or manual focus. Digital zoom 1-8x continuous.

Large LCD screen
Super size 5.6" 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.

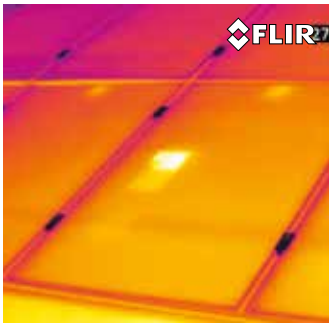
Programmable direct access buttons
For increased flexibility the operator can program buttons located on the top of the camera for direct access to favourite functions.

FLIR ResearchIR
FLIR ResearchIR comes standard with every SC-Pack.

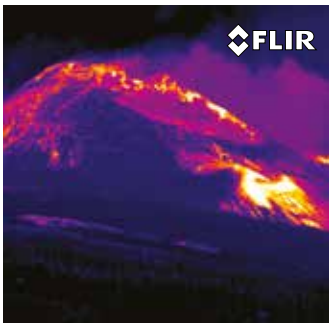
Contrast optimizer

Basic thermal image.

Thermal image enhanced with the Contrast Optimizer function.

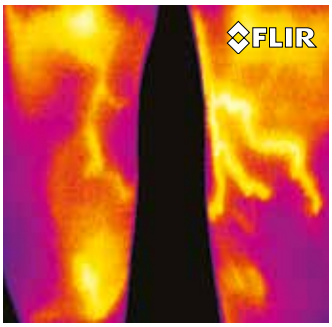


Solar panels inspection



Thermal surveillance of volcanos

Connect to smartphone or tablet via Wi-Fi, using the FLIR Tools mobile app (Apple iOS and Android) for processing and sharing results as well as for remote control.



Vein cartography

R&D - Science Software

Turning tools into solutions

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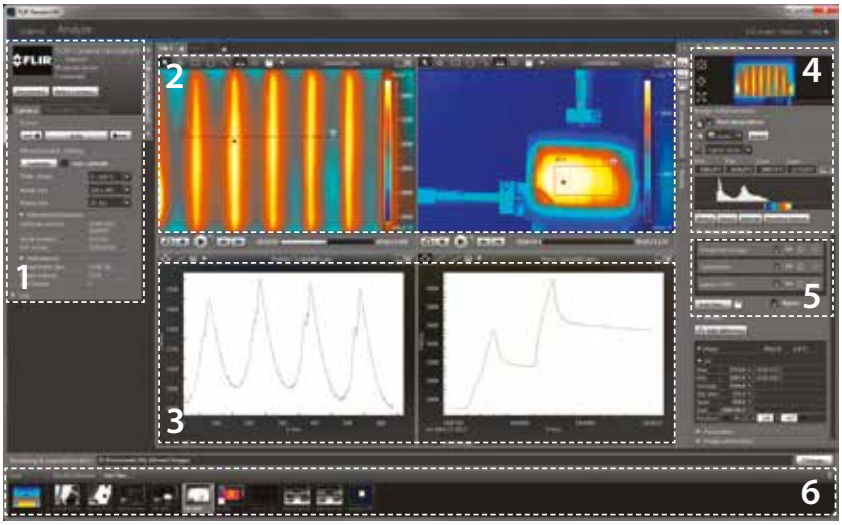
FLIR ResearchIR

FLIR ResearchIR is aimed at R&D-Science users of thermal imaging cameras with a cooled or uncooled detector. FLIR ResearchIR takes the most out of your thermal imaging camera and allows high speed recording and advanced thermal pattern analysis. ResearchIR is the perfect tool for industrial R&D. Users that are interested in more advanced science applications can choose for ResearchIR Max.

FLIR ResearchIR key features:

- More than 20 language versions available
- View, record and store images at high speed (only RIR/RIR Max 3.x release)
- Post-processing of fast thermal events
- Generate time-temperature plots from live images or recorded sequences
- Advanced Start/Stop recording conditions
- Unlimited number of analysis functions (Spot, Line, Area)
- File organizer with Quick Collection and preview of sequences
- Zoom & Pan allows a closer look
- Multiple user-configurable tabs for live images, recorded images or plot

FLIR ResearchIR User interface



1. **Camera and recording control:**
   FLIR ResearchIR software connects directly to FLIR thermal imaging cameras to acquire thermal snapshots or movie files. ResearchIR supports multiple acquisition options, including camera triggering or conditional start/stop, based on thermal measurements.

2. **Flexible measurement workspace:**
   Imagery, data and charts can be arranged by a simple drag and drop. Measurement analysis can be done live when connected to a thermal imaging camera or in playback with recorded snapshots or movie sequences.

3. **Charts and graphics:**
   Line profiles are easy to add. Measurement tools or complete image statistics can be plotted against time. A result table presents data statistics for all images in parallel allowing for seamless comparative analysis.

4. **Intuitive image colorization control:**
   Allows changing the color palette, color distribution, contrast and isotherms, zooming and panning.

5. **Image processing pipe:**
   Provides powerful real time processing such as image subtraction, sliding subtraction or averaging. Each process can be individually configured and its order can be easily managed.

6. **Quick collection bar:**
   Shows the active images and sequences.

FLIR ResearchIR Max key features:

FLIR ResearchIR Max contains all the features or FLIR ResearchIR. Furthermore it contains features for advanced thermal analysis, such as:

- Pre/Post Triggering
- Mathematical processing toolbox
- Image filtering toolbox
- Multiple camera support for parallel recording
- Radiometric Digital Detail Enhancement (DDE): improves dramatically the understanding of the thermal scene, still keeping the radiometric measurement accuracy.

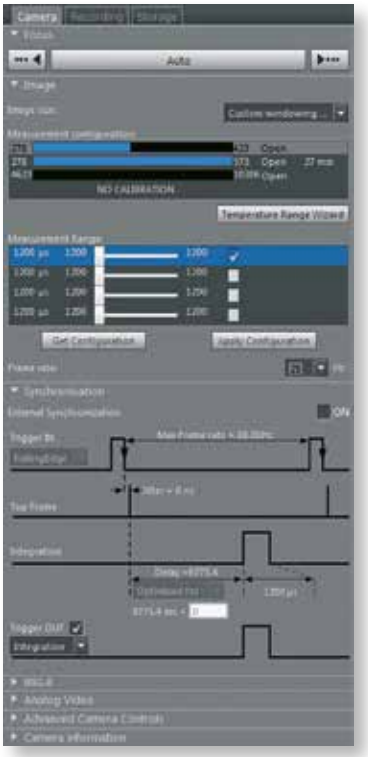
Advanced recording options

Controls multiple parameters and options to achieve the most reliable acquisition

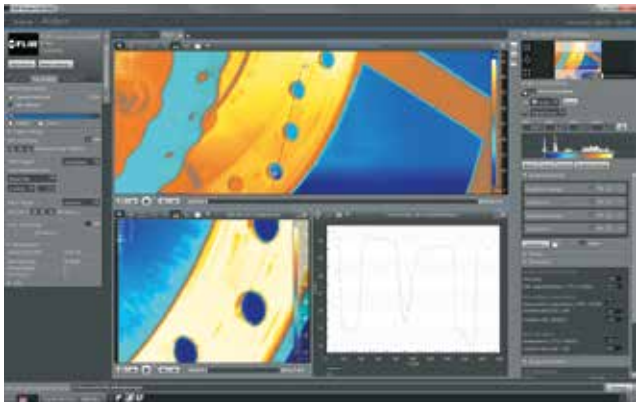
- Pre / Post triggering allows to catch the most fleeting event.
- Multiple start and stop acquisition options. Can be based on camera trigger signal status, image measurement threshold or time.
- Acquisition performance is clearly shown. No doubt remains about your acquisition quality.

Complete control of camera parameters

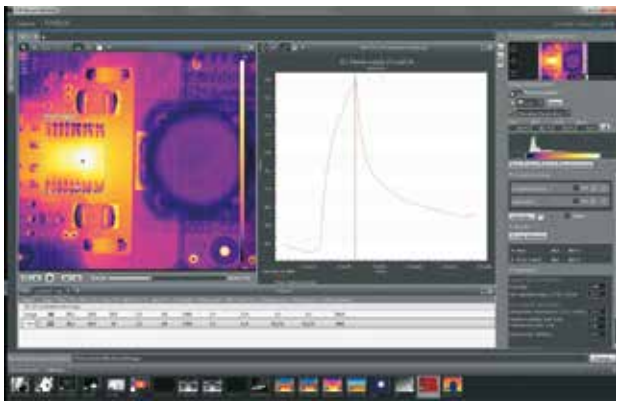
Complete, yet easy to use camera control. Measurement configuration, ranges, image size, frame frequency and synchronization to external signal is exposed.



Application examples



Recorded sequence of a brake disk



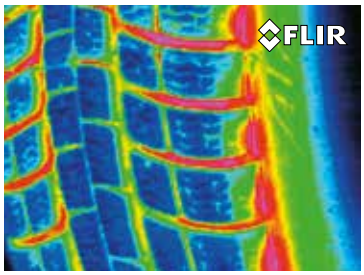
Electronic board thermal design

Software Development Kits

Optional Software Development Kit (SDK) for Visual Studio users and a LabVIEW™ toolkit are also available enabling the functionality of the camera to be optimised for specific needs.

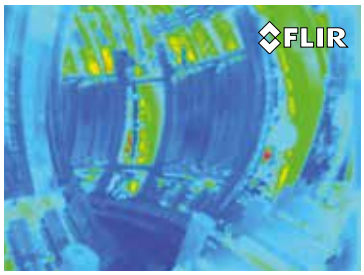
Advanced Thermography measurements

In many circumstances, R&D applications require advanced measurement capabilities. In addition to the FLIR A3xx sc, FLIR A6xx sc Series, FLIR T450sc and FLIR T650sc, FLIR is also offering a large range of ultra fast, ultra sensitive cooled IR cameras, the FLIR X6000sc, FLIR SC7000 and FLIR X8000sc Series. These cameras provide superior measurement capabilities in challenging setups for fast motion and thermal event, wide temperature range, small amplitude phenomena, multispectral analysis or very small object evaluation.



Fast motion - Short integration time

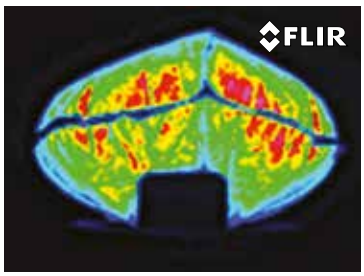
Application description:
Thermal image of a tire during a quality test done at 200km/h.
Camera model:
FLIR SC7650 with an external synchronization sensor.
Requirement:
Short Snapshot integration time, external trigger input with a slave camera mode for the data acquisition.



© CEA/IRFM – JET/EFDA – 2008

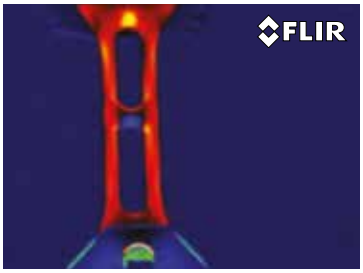
Large temperature range - Multi-TI Mode

Application description:
JET Fusion plasma reactor temperature measurement.
Camera model:
FLIR SC5500 with rolling integration time.
Requirement:
Superframing and real time extended range.



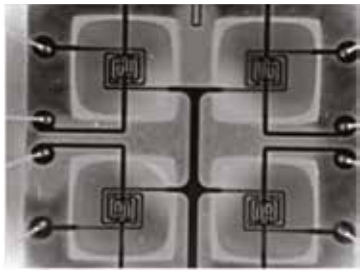
Fast thermal event - Fast frame rate

Application description:
Airbag deployment analysis.
Camera model:
FLIR SC5500 at 3.5Khz fps in a windowing mode.
Requirement:
Fast frame rate in a Snapshot mode with an external trigger input.



Small amplitude phenomena - Thermal resolution & Lock-in thermography

Application description:
Thermal stress analysis
Camera model:
FLIR SC7200 with a lock-in signal input
Requirement:
A very high thermal sensitivity (<20mK), a lock-in signal input, a snapshot mode

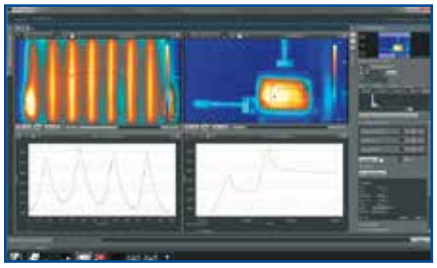


Very small object analysis - High spatial resolution

Application description:
Thermal evaluation of an integrated circuit.
Camera model:
FLIR SC5650 with x5 microscopy lens with a 3µm/pixel resolution.
Requirement:
High quality image resolution due to advanced design microscopic lens, a very low NETD and a large FPA detector. A very short integration time will also allow transient analysis.

FLIR ResearchIR Max software

As a complementary tool to these Advanced Thermal Imaging systems, FLIR ResearchIR Max software is capable to offer you all necessary functionalities for ultra-fast and real time image acquisition, accurate triggering, lock-in thermography and stress analysis. ResearchIR Max contains all the features of ResearchIR but was especially developed to work together with thermal imaging cameras that are equipped with a cooled detector.

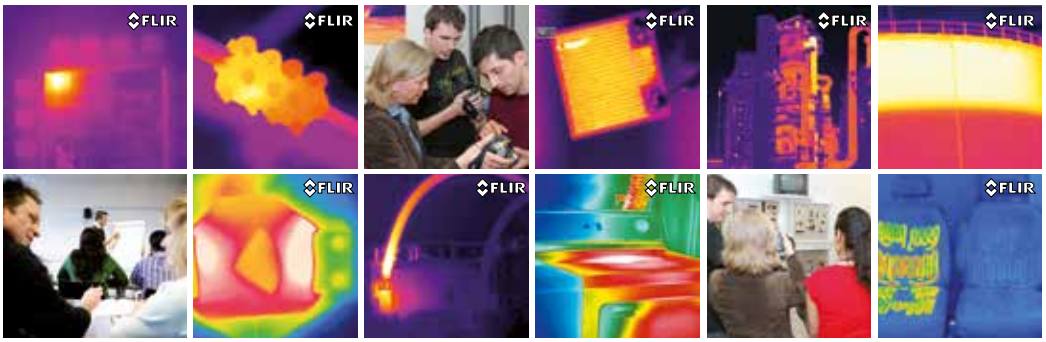


For more information regarding these more Advanced Thermal Solutions, please consult our catalogue for cooled products or visit www.flir.com

ITC

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. As the leading company for thermal imaging technology, we like to share our knowledge with our customers and other interested parties.

We therefore organise regular courses and seminars. We also organise 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 customers but also users of other brands of cameras. In fact, anyone who wants to learn more about thermal imaging for any application, 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.

Follow one of our courses and become a thermal imaging expert.

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

After Sales

FLIR After Sales

At FLIR, building a relationship with a customer takes more than just selling a thermal imaging camera. After the camera has been delivered, FLIR 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 China, Germany, Hong Kong, Italy, 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 familiarise 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.

FLIR A325sc and FLIR A655sc

Technical specifications

Camera specific

	FLIR A325sc	FLIR A655sc
Imaging and optical data		
Focal length	18 mm (0.7 in.)	24.6 mm (0.97 in.)
Spatial resolution (IFOV)	1.36 mrad	0.68 mrad
F-number	1.3	1.0
Image frequency	60 Hz	50 Hz (100/200 Hz with windowing)
Detector data		
IR resolution	320 × 240 pixels	640 × 480 pixels
Detector pitch	25 µm	17 µm
Measurement		
Object temperature range	–20 to +120°C 0 to +350°C (+1200°C as an option)	–40 to +150°C 100 to +650°C (+2000°C as an option)
USB		
USB	N/A	Control and image USB, standard USB 2 HS
USB, connector type	N/A	USB Mini-B
USB, communication	N/A	TCP/IP socket-based FLIR proprietary
USB, image streaming	N/A	16-bit 640 × 480 pixels at 25 Hz - Signal linear - Temperature linear - Radiometric
USB, protocols	N/A	TCP, UDP, SNTP, RTSP, RTP, HTTP, ICMP, IGMP, ftp, SMTP, SMB (CIFS), DHCP, MDNS (Bonjour), uPnP
Ethernet		
Ethernet, image streaming	16-bit 320 × 240 pixels at 60 Hz - Signal linear - Temperature linear - Radiometric GigE Vision and GenICam compatible	16-bit 640 × 480 pixels at 50 Hz Up to 200 Hz by windowing - Signal linear - Temperature linear - Radiometric GigE Vision and GenICam compatible

YEAR 2 FULL PRODUCT WARRANTY*

YEAR 10 DETECTOR WARRANTY*

** After product registration on www.flir.com*

General

Imaging and optical data	
Field of view (FOV) / Minimum focus distance	25° × 19° / 0.25 m (0.82 ft.)
Lens identification	Automatic
Thermal sensitivity/NETD	< 0.05°C at +30°C (+86°F) / 50 mK
Focus	Automatic or manual (built in motor)

Imaging performance	
Focal Plane Array (FPA) / Spectral range	Uncooled microbolometer / 7.5–14 µm

Measurement	
Accuracy	+/- 2°C (+/- 3.6°F) or +/- 2% of reading

Measurement analysis	
Atmospheric transmission correction	Automatic, based on inputs for distance, atmospheric temperature and relative humidity
Optics transmission correction	Automatic, based on signals from internal sensors
Emissivity correction	Variable from 0.01 to 1.0
Reflected apparent temperature correction	Automatic, based on input of reflected temperature
External optics/windows correction	Automatic, based on input of optics/window transmission and temperature
Measurement corrections	Global object parameters

Ethernet	
Ethernet	Control and image
Ethernet, type	Gigabit Ethernet
Ethernet, standard	IEEE 802.3
Ethernet, connector type	RJ-45
Ethernet, communication	TCP/IP socket-based FLIR proprietary and GenICam protocol
Ethernet, protocols	TCP, UDP, SNTP, RTSP, RTP, HTTP, ICMP, IGMP, ftp, SMTP, SMB (CIFS), DHCP, MDNS (Bonjour), uPnP

Digital input/output	
Digital input, purpose	Image tag (start, stop, general), Image flow ctrl. (Stream on/off), Input ext. device (programmatically read)
Digital input	2 opto-isolated, 10–30 VDC
Digital output, purpose	Output to ext. device (programmatically set)
Digital output	2 opto-isolated, 10–30 VDC, max 100 mA
Digital I/O, isolation voltage	500 VRMS
Digital I/O, supply voltage	12/24 VDC, max 200 mA
Digital I/O, connector type	6-pole jackable screw terminal

Power system	
External power operation	12/24 VDC, 24 W absolute max
External power, connector type	2-pole jackable screw terminal
Voltage	Allowed range 10–30 VDC

Environmental data	
Operating temperature range	–15°C to +50°C (+5°F to +122°F)
Storage temperature range	–40°C to +70°C (–40°F to +158°F)
Humidity (operating and storage)	IEC 60068-2-30/24 h 95% relative humidity +25°C to +40°C (+77°F to +104°F)
EMC	• EN 61000-6-2:2001 (Immunity) • EN 61000-6-3:2001 (Emission) • FCC 47 CFR Part 15 Class B (Emission)
Encapsulation	IP 30 (IEC 60529)
Bump	25 g (IEC 60068-2-29)
Vibration	2 g (IEC 60068-2-6)

Physical data	
Weight	0.9 kg (1.98 lb.)
Camera size (L × W × H)	170 x 70 x 70 mm (6.7 x 2.8 x 2.8 in.) for FLIR- A325sc 216 x 73 x 75 mm (8.5 x 2.9 x 3.0 in.) for FLIR - A655sc
Tripod mounting	UNC ¼"-20 (on three sides)
Base mounting	2 × M4 thread mounting holes (on three sides)
Housing material	Aluminium

Scope of delivery

- Hard transport case or cardboard box
- Thermal imaging camera with lens
- Utility CD-ROM
- Calibration certificate
- Ethernet™ cable
- USB cable (FLIR A655sc only)
- Mains cable
- Power cable, pig-tailed
- Power supply
- Printed Getting Started Guide
- Printed Important Information Guide
- User documentation CD-ROM
- Warranty extension card or Registration card
- Included in pack; ResearchIR

FLIR A325sc

Accessories

FLIR A325sc:

Lenses

IR lens, f = 30 mm, 15° incl. case [1196961]
When the target in question is a distance away it may be useful to use a telescope lens. The 15° lens is a popular lens accessory and provides 1.7 X magnification compared to the 25° lens. Ideal for small or distant targets.

IR lens, f = 10 mm, 45° incl. case [1196960]
Sometimes there isn't enough room to step back and see the whole picture. This wide angle lens has a field of view almost double than the one of the standard 25° lens. Perfect for wide or tall targets.

Lens 76 mm (6°) with case and mounting support [T197407]
For maximum magnification, the 6° lens is the only choice. This optic provides almost 3.5X magnification compared to the 25° lens.

Lens 4 mm (90°) with case and mounting support [T197411]
Sometimes there isn't enough room to step back and see the whole picture. This wide angle lens has a field of view almost four times the one of the standard 25° lens. This wide angle lens is perfect for wide or tall targets.

Close-up 1× (25 µm) incl. case and mounting support [T197415]
This macro lens provides resolution of extremely small targets.

Close-up lens 2x, (50 µm), incl. case [T197214]
This macro lens provides resolution of extremely small targets.

Close-up lens 4x, (100 µm), incl. case [T197215]
This macro lens provides resolution of extremely small targets.

Extended measurement ranges

High temperature option to +1,200°C [T197000]
Allow to measure temperatures of up to +1,200°C with the camera.

Power

Power supply incl. Multi-plugs [T910922]
This power supply is used when powering the camera from the mains supply or to charge the batteries. It comes with different types of plugs.

Power cord EU [1910400]
Power cord with EU plugs for the power supply.

Power cord US [1910401]
Power cord with US plugs for the power supply.

Power cord UK [1910402]
Power cord with UK plugs for the power supply.

Cables

Ethernet cable CAT-6, 2m/6.6 ft. [T951004]
This cable is used to connect the thermal imaging camera to Ethernet.

Power cable, pigtailed [1910586]
This cable is used, when a separate power supply is used (not the one supplied with the camera)

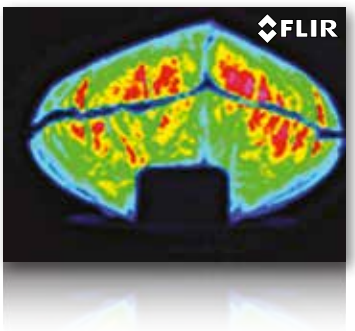
Transport

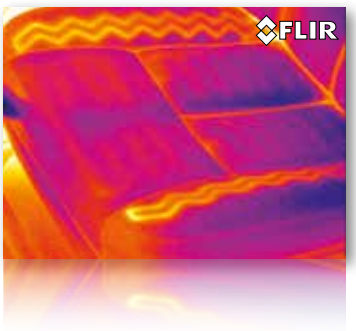
Hard transport case [T197871]
Rugged watertight plastic shipping case. Holds all items securely. The case can be locked with padlocks and features a breather valve to prevent pressure build-up in airplane cargo holds.

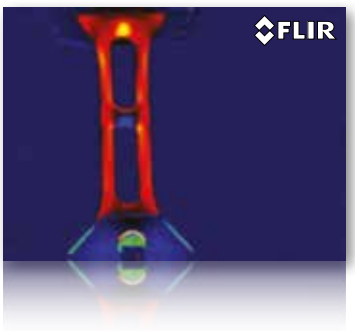
Environmental housing

Fixed housing for A325sc with 6° / 15° lens [61301-0001]
Protects the A325sc against dust and water. Suited for A3xx sc thermal imaging cameras with a 6° or 15° lens.

Fixed housing for A325sc 25° / 45° / 90° lens [61301-0002]
Protects the A325sc against dust and water. Suited for A3xx sc thermal imaging cameras with a 25°, 45° or 90° lens.







FLIR A655sc

Accessories

Lenses

IR lens, f = 88.9 mm, 7° incl. case [T198165]
The 7° lens is a popular accessory and provides 3.6× magnification compared to the standard lens. Ideal for small or distant targets such as overhead power lines.

IR lens, f = 41.3 mm, 15° incl. case [T197914]
The 15° lens is a popular lens accessory and provides 1.7x magnification compared to the standard lens. Ideal for small or distant targets such as overhead power lines.

IR lens, f = 24.6 mm, 25° incl. case [T197922]
The standard 25° lens is suitable for the majority of applications.

IR lens, f = 13.1 mm, 45° incl. case [T197915]
This wide angle lens has a field of view almost double of that of the standard 25° lens. Perfect for wide or tall targets or when working in confined areas.

IR lens, f = 6.5 mm, 80° incl. case [T198065]
This wide angle lens has a field of view almost three times that of the standard 25° lens. This lens is suitable for cramped situations where the operator can not step further back from the object.

Close-up IR lens, 2.9x (50 µm) incl. case [T198059]
For R&D usage or development purposes. A typical example is looking at PCB's or small electronic components.

Close-up IR lens, 5.8x (100 µm) incl. case [T198060]
For R&D usage or development purposes. A typical example is looking at PCB's or small electronic components.

Extended measurement ranges

High temperature option to +2,000 °C [T197896]
Allow to measure temperatures of 300 °C up to +2,000 °C with the camera.

Power

Power supply incl. multi-plugs [T910922]
This power supply is used when powering the camera from the mains supply or to charge the batteries. It comes with different types of plugs.

Power cord EU [1910400]
Power cord (EU) for the power supply.

Power cord US [1910401]
Power cord with US plugs for the power supply.

Power cord UK [1910402]
Power cord (UK) for the power supply.

Cables

Ethernet cable CAT-6, 2m/6.6 ft. [T951004]
This cable is used to connect the thermal imaging camera to Ethernet.

Power cable, pigtailed [1910586]
This cable is used, when a separate power supply is used (not the one supplied with the camera)

USB cable Std-A <-> Mini-B, 1.8 m [1910423]
USB cable to connect the camera with a computer, using the USB protocol.

Transport

Hard transport case [T197871]
Rugged watertight plastic shipping case. Holds all items securely. The case can be locked with padlocks and features a breather valve to prevent pressure build-up in airplane cargo holds.

FLIR T450sc and FLIR T650sc

Technical specifications

Camera specific

	FLIR T450sc	FLIR T650sc
Imaging performance		
Resolution	320x240 pixels	640x480 pixels
Thermal sensitivity	<30 mK @ 30 °C	<20 mK @ 30 °C
Field of view (FOV) / Minimum focus distance	25° x 19° / 0.4 m	25° x 19° / 0.25 m
Image frequency	60 Hz	30 Hz
Spectral range	7.5 to 13 µm	7.5 to 14 µm
Spatial resolution	1.36 mrad	0.68 mrad
Focus	Automatic (one shot) or manual	Continuous, one shot or manual
Image presentation		
Display	3.5" superbright touchscreen LCD 320x240 pixels	4.3" superbright touchscreen LCD 800x480 pixels
Viewfinder		Built-in 800 x 400 pixels
Automatic image adjustment		Continuous, histogram based
Manual image adjustment		Linear based; possible to adjust level/span/max/min
Set-up		
Set-up commands	Define user presets, Save options, Programmable button, Reset options, Set up camera, Wi-Fi, Compass, Bluetooth, Language, Time & Units, Camera information	Define user presets, Save options, Programmable button, Reset options, Set up camera, Wi-Fi, Compass, Bluetooth, Language, Time & Units, Camera information
Measurement		
Temperature range	-20 °C to +120 °C 0 °C to +650 °C +250 °C to +1,500 °C	-40 °C to +150 °C +100 °C to +650 °C +300 °C to +2,000 °C
Measurement analysis		
Spotmeter	5	10
Automatic hot/cold detection	Auto hot or cold markers within area and profile	Auto hot or cold markers within area and profile
Reference temperature	Manually set	Manually set
Digital camera		
Built-in digital camera	3.1 Mpixel with LED light	5 Mpixel with LED light
Data communication interfaces		
Interfaces	USB-mini, USB-A, Bluetooth, Wi-Fi, composite video	USB-mini, USB-A, Bluetooth, Wi-Fi, Digital Video Output
Video out	Composite video	Digital Video Output (DVI)
Video connector type	4-pole 3.5 mm jack	HDMI compatible
Physical characteristics		
Camera weight incl. battery	0.88 kg	1.3 kg
Camera size (L x W x H)	106 x 201 x 125 mm	143 x 195 x 95 mm

General

Imaging performance	
Focal Plane array (FPA)	Uncooled microbolometer
Digital zoom	1-8x continuous
Image presentation	
Image modes	Thermal, Thermal MSX, Picture inPicture, Digital Camera
Manual image adjustments	Level/span/max/min
Picture in picture	Resizable and moveable IR area on visual image
MSX®	IR image with enhanced detail presentation
Report generation	
Instant Report in camera	Automatic generation of PDF report based on selected images direct in camera
Measurement	
Accuracy	± 1 °C or ± 1% of reading

YEAR 2 FULL PRODUCT WARRANTY*

YEAR 10 DETECTOR WARRANTY*

*After product registration on www.flir.com

Measurement analysis	
Area	5 Max/Min/Average value within box or circle
Profile	1 live line
Automatic hot/cold detection	Auto hot or cold spotmeter markers
Measurement presets	Yes
Difference temperature	Delta temperature between measurement functions or reference temperature
Emissivity correction	Variable from 0.01 to 1.0 or selected from materials list
Measurement corrections	Emissivity, reflected temperature, relative humidity, atmospheric temperature, object distance, external IR window compensation
Measurement function alarm	Audible/visual alarms (above/below) on any selected measurement function
Set-up	
Color palettes	Arctic, White hot/ Black hot, Iron, Lava, Rainbow and Rainbow HC
Image storage	
Type	IR/visual images; simultaneous storage of visual and IR images
Format	Standard JPEG - including digital photo and measurement data on memory card
Time laps	15 seconds to 24 hours
Laser pointer	
Laser	Activated by dedicated button
Laser alignment	Laser position shown on IR-image
Image annotations	
Voice	60 seconds via Bluetooth®
Text	Add table. Select between predefined templates or create your own in FLIR Tools
Sketch	Draw on thermal/digital photo or add predefined stamps
Image sketch	On IR and visual image or add predifined stamps
External sensors	Wireless connection to: Extech Moisture meter MO297 or Extech clamp meter EX845
Report generation	• Instant Report (*.pdf file) in camera including IR and visual images • Separate PC software with extensive report generation
Video streaming / recording	
Radiometric IR video recording in camera	CSQ to memory card
Video recording in camera	Non-radiometric IR-video recording MPEG4 to SD-card
Radiometric IR video streaming	Full dynamic to PC using USB
Non radiometric IR-video /visual video streaming	MPEG-4 to memory card
Update of camera	
Automatic update of camera to latest version	Automatic update of camera from PC running FLIR Tools
Data communication interfaces	
Bluetooth	Communication with headset and external sensors
USB	USB-A: Connect external USB device - USB-mini-B: Data transfer to and from PC / Uncompressed colorized video
Wi-Fi	Peer to peer (adhoc) or infrastructure (network)
Radio	
Wi-Fi	Standard: 802.11 b/g Frequency range: 2412-2462 MHz Max output power: 15 dBm
Bluetooth	Frequency range: 2402-2480 MHz
Antenna	Internal
Power	
Battery type	Lithium-Ion (field replaceable)
Battery operating time	T450sc 4 hours / T650sc 2.5 hours
Charging system	In camera, AC adaptor, 2-bay charger or 12 V from a vehicle
Power management	Automatic shutdown and sleep mode (user selectable)
Environmental specifications	
Operating temperature range	-15 to +50 °C
Storage temperature range	-40 °C to +70 °C
Humidity, operating and storage, non-condensing	IEC 60068-2-30 /24 h, 95% relative humidity +25 °C to +40 °C
EMC	• ETSI EN 301 489-1 (radio) • ETSI EN 301 489-17 • EN 61000-6-2 (Immunity) • EN 61000-6-3 (Emission) • FCC 47 CFR Part 15 Class B (Emission) • ICES-003
Radio spectrum	• ETSI EN 300 328 • FCC Part 15.247 • RSS-210
Encapsulation	IP 54, IEC 60529
Bump, Operational	25g, IEC 60068-2-29
Vibration, Operational	2g, IEC 60068-2-6
Safety	EN/UL/CSA/PSE 60950-1
Physical characteristics	
Tripod Mounting	1/4" - 20

Standard package

FLIR T450sc: Hard transport case, Thermal imaging camera with lens, Battery, Battery charger, Calibration certificate, Camera lens cap, Neck strap, FLIR Tools™ download card, Bluetooth Headset, Memory card, Power supply incl. multi-plugs, Printed documentation, Sunshield, USB cable, User documentation CD-ROM, Video cable, FLIR ResearchIR Max

FLIR T650sc: Hard transport case, thermal imaging camera with lens, Battery (2), Battery charger, Large eyecap, Tripod adaptor, Neck strap, Lens cap, Bluetooth® headset, Calibration certificate, FLIR Tools™ download card, Memory card, Power supply incl. multiplugs, Printed documentation, USB cable, User documentation CD-ROM, HDMI cable (2), FLIR ResearchIR Max

FLIR T450sc

Accessories

Power

Battery [1196398]
Extra battery that will allow you to spend extra time in the field doing inspections.

2-bay battery charger, incl. power supply with multi-plugs [T197650]
This 2 bay battery charger is used for charging FLIR Systems' camera batteries.

Cigarette lighter adaptor kit, 12 V DC, 1.2 m [T198509]
Can be used to power the camera from the cigarette lighter socket in a car.

Power supply incl. Multi-plugs [T910750]
Combined power supply, including multi plugs and battery charger to charge the battery when it is inside or outside of the camera.

Battery package [T197667]
A complete battery package consisting of three standard products: a battery, 2-bay battery charger including power supply with multi-plugs and a cigarette lighter adaptor kit.

Storage

Memory card SDHC 4 GB [T911230ACC]
Capture images on the go with your camera. These small cards are easy to use and can hold a great amount of data.

Cables

Video cable [1910582ACC]
This cable can be used to transfer the images of the T/B-Series thermal imaging cameras to a monitor.

USB cable Std-A <-> Mini-B [1910423]
USB cable to connect the camera with a computer, using the USB protocol.

Headsets

Bluetooth® headset [T197771ACC]
Headset with Bluetooth® for wireless connection with the thermal imaging camera, including microphone.

Lenses

Lens 4 mm, 90° field of view, incl. case and mounting support [T197412]
Sometimes there isn't enough room to step back and see the whole picture. This wide angle lens has a field of view almost four times the one of the standard 25° lens. This wide angle lens is perfect for wide or tall targets such as electrical panels or paper machinery.

Lens 10 mm, 45° field of view incl. case [1196960]
Sometimes there isn't enough room to step back and see the whole picture. This wide angle lens has a field of view almost double than the one of the standard 25° lens. Perfect for wide or tall targets such as electrical panels or paper machinery.

Lens 30 mm, 15° field of view, incl. case [1196961]
When the target in question is a distance away it may be useful to use a telescope lens. The 15° lens is a popular lens accessory and provides almost 2X magnification compared to the 25° lens. Ideal for small or distant targets such as overhead power lines.

Lens 76 mm, 6° field of view, incl. case and mounting support [T197408]
For maximum magnification, the 6° lens is the only choice. This optic provides almost 3.5X magnification compared to the 25° lens and is ideally suited for inspection of overhead power lines. Due to the narrow field of view, a tripod is recommended.

Close-up lens 4x (100µm) incl. case [T197215]
The close-up lens provides a 4X magnification and is ideal for development purposes like looking at PCB´s or small electronic components.

Close-up lens 2x (50µm) incl. case [T197214]
The close-up lens provides a 2X magnification and is ideal for development purposes like looking at PCB´s or small electronic components.

Miscellaneous

Hard transport case [T198370]
Rugged, watertight plastic shipping case. Holds all items securely. The case can be locked with padlocks and features a breather valve to prevent pressure build-up in airplane cargo holds.

Neck strap [T198499]
Ties the camera around your neck so that it is protected against falling.

Pouch [T198499]
Soft pouch to protect the camera. Possible to attach to tool belt.

Tool belt [T911093]
Tool belt for thermal imaging camera pouches.

Sun shield [T198493]
Snap-on sunshield to increase visibility of the LCD display.

FLIR T650sc

Accessories

Power

Cigarette lighter adaptor kit, 12 V DC, 1.2 m [T198509]
Can be used to power the camera from the cigarette lighter socket in a car.

2-bay battery charger, incl. power supply with multi-plugs [T198126]
This 2-bay battery charger is used for charging FLIR Systems' camera batteries.

Battery [T198056]
Extra battery that will allow you to spend extra time in the field doing inspections.

Power supply incl. Multi-plugs [T910814]
This power supply is used when powering the camera from the mains supply or to charge the batteries. It comes with different types of plugs.

Storage

Memory card SDHC 4 GB [T911230ACC]
Capture images on the go with your camera. These small cards are easy to use and can hold a great amount of data.

Cables

USB cable Std-A <-> Mini-B [1910423]
USB cable to connect the camera with a computer, using the USB protocol.

HDMI to DVI cable, 1.5 m [T910930ACC]
Can be used to show the high resolution images of the camera on a screen with DVI input.

HDMI to HDMI cable, 1.5 m [T910891ACC]
Can be used to show the high resolution images of the camera on a screen with HDMI input.

Headsets

Bluetooth® headset [T197771ACC]
Headset with Bluetooth® for wireless connection with the thermal imaging camera, including microphone.

Lenses

Lens 88.9 mm, 7° field of view incl. case [T198166]
The 7° lens is a popular lens accessory and provides 3.6x magnification compared to the standard lens. Ideal for small or distant targets.

Lens 41.3 mm, 15° field of view incl. case [T197914]
The 15° lens is a popular lens accessory and provides 1.7x magnification compared to the standard lens. Ideal for small or distant targets such as overhead power lines.

Lens 24.6 mm, 25° field of view incl. case [T197922]
The standard 25° lens is suitable for the majority of applications.

Lens 13.1 mm, 45° field of view incl. case [T197915]
This wide angle lens has a field of view almost double that of the standard 25° lens. Perfect for wide or tall targets or when working in confined areas.

Lens 6.5 mm, 80° field of view incl. case [T198065]
This wide angle lens has a field of view of more than 3 times that of the standard lens. Ideal for shooting images of large objects from a short distance.

Close-up IR lens, 1.5x (25 µm) incl. case [T198066]
For R&D usage or development purposes. A typical example is looking at PCB's or small electronic components.

Close-up IR lens, 2.9x (50 µm) incl. case [T198059]
For R&D usage or development purposes. A typical example is looking at PCB's or small electronic components.

Close-up IR lens, 5.8x (100 µm) incl. case [T198060]
For R&D usage or development purposes. A typical example is looking at PCB's or small electronic components.

Miscellaneous

Hard transport case [T197924]
Rugged, watertight plastic shipping case. Holds all items securely. The case can be locked with padlocks and features a breather valve to prevent pressure build-up in airplane cargo holds.

Pouch [T911048]
Soft pouch to protect the camera. Possible to attach to tool belt.

Tool belt [T911093]
Tool belt for thermal imaging camera pouches.

Tripod adapter [T197731]
Tripod adapter, necessary to be able to mount the camera on a tripod.

Neck strap [1124544]
Ties the camera around your neck so that it is protected against falling.

Large eyecup [T198497]

FLIR SC660

Technical specifications

Imaging Performance	
IR resolution	640 x 480 pixels
Field of View (FOV) / minimum focus distance	24° x 18° / 0.3 m 12° x 9° / 1.2 m 45° x 34° / 0.2 m lens needs to be specified when ordering
Spatial resolution	0.65 mrad for 24°lens 0.33 mrad for 12° lens 1.3 mrad for 45° lens
Thermal sensitivity	30 mK at 30°C
Electronic zoom	1-8x continuous including pan function
Electric and manual focus with USM technology	Auto (follows laser spot) and manual
Spectral range	7.5 - 13 µm
Image frequency	30 Hz (60 / 120 Hz with windowing)
Focus	Automatic or manual
Focal Plane Array (FPA)	Uncooled microbolometer
Image presentation	
Automatic contrast optimization	Adjustable DDE
Thermal Fusion	IR image shown above, below or within temperature interval on the visual image (with 24° lens only)
Picture in Picture	Resizeable and moveable IR area on visual image (with 24° lens only)
Display	Built-in Widescreen, 5.6" color LCD, 1024 x 600 pixels
Viewfinder	Built-in, tiltable LCD, 800 x 600 pixels
Automatic image adjustments	Continuous/manual; linear or histogram based
Manual image adjustments	Level/span/max./min.
Image modes	IR image, Visual image, Thumbnail gallery, Thermal Fusion, Picture in Picture
Reference image	Shown together with live IR image
Measurement	
Temperature range	-40°C to +1500°C (optional up to +2000°C)
Accuracy	+/- 1°C or +/- 1% of reading (restricted range) +/- 2°C or +/- 2% of reading
Measurement analysis	
Spotmeter	10
Area	5 boxes or circles with Max./Min./Average
Measurement function alarm	Audible/visual alarms (above/below) on any selected measurement function
Profile	1 live line, horizontal or vertical
Isotherm	2 with above/below interval
Difference temperature	Delta temperature between measurement functions or reference temperature
Automatic hot / cold detection	Max./Min. temp. value and position shown within box, circle or on a line
Reference temperature	Manually set or captured from any measurement function
Emissivity correction	Variable from 0.01 to 1.0 or selected from list of materials
Measurement corrections	Reflected temperature, optics transmission, atmospheric transmission and external optics
External optics/windows correction	Automatic, based on inputs of optics/window transmission and temperature

Connect to smartphone or tablet via Wi-Fi, using the FLIR Tools mobile app (Apple iOS and Android) for processing and sharing results as well as for remote control.

YEAR 2 FULL PRODUCT WARRANTY*

YEAR 10 DETECTOR WARRANTY*

** After product registration on www.flir.com*

Setup	
Set-up controls	Local adaptation of units, language, date and time formats
Programmable buttons	2

Image storage	
In-camera storage	Built-in RAM for burst recording
Type	SD memory card
Format	Standard JPEG - including measurement data
Modes	IR/visual images, simultaneous storage of IR and visual images, visual image is automatically associated with corresponding IR image
Periodic image storage	Every 10 seconds up to 24 hours
Panorama	For creating panorama images in FLIR Reporter Building software

Image annotations	
Voice	60 seconds via Bluetooth stored with the image
Text	Predefined text or free text from PDA (via IrDA) stored with the image
Image marker	4 on IR or visual image

Digital camera	
Built-in digital camera	3.2 Mpixel auto-focus and video lamp

Laser Pointer	
Laser	Semiconductor AlGaInP diode laser, Class 2
Laser alignment	Position is automatically displayed on IR image
Laser mode	Auto-focus / level / spotmeter

Geographic Information System	
Built-in GPS	Location data automatically added to every image for referencing on WEB maps

Power System	
Battery type	Rechargeable Lithium-ion battery
Battery operating time	3 hours at 25 °C
Charging system	In camera, AC adaptor, 2-bay charger or 12 V from a vehicle
Power management	Automatic shutdown and sleep mode (user selectable)
AC operation	AC adaptor, 90–260 V AC, 50/60 Hz
Adaptor voltage	12 VDC out

Environmental specifications	
Operating temperature range	-15 °C to +50 °C
Storage temperature range	-40 °C to +70 °C
Humidity (operating and storage)	IEC 68-2-30/24 h 95% relative humidity +25 °C to +40 °C
Shock	25 g (IEC 60068-2-29)
Vibration	2 g (IEC 60068-2-6)
Encapsulation	IP 54 (IEC 60529)

Interfaces	
1394 Firewire	Fully Radiometric 14 bit real time video to PC
USB-A	Connect external USB device (copy to memory stick)
USB-Mini-B	Data transfer to and from PC / streaming MPEG-4
Composite video	PAL or NTSC
IrDA	For sending text comment files from PDA to camera,
WLAN	Using Wi-Fi USB micro adapter (depending on CE and FCC regulations regarding wireless equipment for country)
Headset connection	Yes

Physical characteristics	
Camera weight, incl. battery	1.8 kg
Camera size (L × W × H)	299 x 144 x 147 mm
Shipping size	520 x 400 x 200 mm
Shipping weight	8.2 kg

Standard package

FLIR SC660: Hard transport case, Thermal imaging camera with lens, Battery (2 ea., one inserted in camera, one outside camera), Battery charger, Bluetooth Headset, Bluetooth USB-micro adapter, Wi-Fi USB microadaptor (depending on CE and FCC regulations regarding wireless equipment for your country), Calibration certificate, FireWire cable, 4/6, FireWire cable, 6/6, Lens cap (mounted on lens), Lens cap (2 ea.), Memory card-to-USB adaptor, Memory card with adaptor, Power supply incl. multi-plugs, Printed Getting Started Guide, Printed Important Information Guide, Shoulder strap, USB cable, User documentation CD-ROM, Video cable, Warranty extension card or Registration card. Pack includes ResearchIR

FLIR SC660

Accessories

Lenses

Lens 131 mm, 7° field of view, incl. case [T197190]
For maximum magnification, the 7° lens is the only choice. This optic provides almost 3.5X magnification compared to the 24° lens. Due to the weight of this lens, a tripod is recommended.

Lens 76 mm, 12° field of view, incl. case [T197188]
When the target in question is a distance away it may be useful to use a telescope lens. The 12° lens is a popular lens accessory and provides 2X magnification compared to the 24° lens. Ideal for small or distant targets.

Lens 38 mm, 24° field of view, incl. case [T197187]
The 24° lens can be used for daily inspections. Suitable for the majority of applications.

Lens 19 mm, 45° field of view [T197189]
Sometimes there isn't enough room to step back and see the whole picture. This wide angle lens has a field of view almost double than the one of the standard 24° lens. Perfect for wide targets.

Protective window (fits 24° lens) incl. case [T197343]
A protective plastic window: suitable when the camera is used in a dusty environment or when there is a risk of liquids splashing on the lens. The window is made of monocrystalline fluoride.

Close-up lens 1x (25µm) incl. case [T197341]
Provides resolution of extremely small targets. For R&D usage or development purposes.

Close-up lens 2x (50µm, fits on 24° lens) incl. case [1196683]
This close-up optic attaches to the standard 24° lens and provides resolution of very small targets.

Power

Battery [1196209]
Extra battery that will allow you to spend extra time in the field doing inspections.

Battery charger [T197692]
This 2 bay battery charger is used for charging FLIR camera batteries.

Cigarette lighter adaptor kit, 12 V DC, 1.2 m [1910490]
Can be used to power the camera from the cigarette lighter socket in a car.

Power supply incl. Multi-plugs [T910814]
This power supply is used when powering the camera from the mains supply or to charge the batteries. It comes with different types of plugs.

Accessories

Hard transport case [T197262]
Rugged, watertight plastic shipping case. Holds all items securely. The case can be locked with padlocks and features a breather valve to prevent pressure build-up in airplane cargo holds.

Extended measurement ranges

High temperature option to +2,000°C [1196745]
Allow to measure temperatures of up to +2,000°C with the camera.

Miscellaneous

Headset, 3.5 mm plug [1910489]
This head-set is used when annotating thermal images with voice messages. It features an adjustable microphone that can be on the right or on the left side of the head-set. It connects to the head-set connector on the camera.

Bluetooth® headset [T197771]
Headset with Bluetooth® for wireless connection with the thermal imaging camera, including microphone.

Bluetooth® USB micro adaptor [T951235]
Bluetooth® USB micro adaptor for wireless connection between the thermal imaging camera and external Bluetooth® equipment.

Wi-Fi USB adaptor [T951387]
Wi-Fi USB adaptor for wireless connection between the thermal imaging camera and external equipment.

Storage

Adaptor, SD memory card to USB [1910475]
Allows to transfer the images from the SD card to a PC.

Memory card micro-SD with adaptors [T910737]
Capture images on the go with your camera. These small cards are easy to use and can hold a great amount of data.

Cables

FireWire cable 4/6, 2 m [1910483]
This cable is used to connect a thermal imaging camera to a computer using the FireWire protocol.

FireWire cable 6/6, 2 m [1910482]
This cable is used to connect a thermal imaging camera to a computer using the FireWire protocol.

USB cable Std-A to Mini-B, 1.8 m [1910423]
Can be used to transfer images from the camera to a computer using the USB protocol.

Video Cable RCA to RCA [1910484]
This cable can be used to transfer the images of the SC-Series thermal imaging cameras to a monitor.

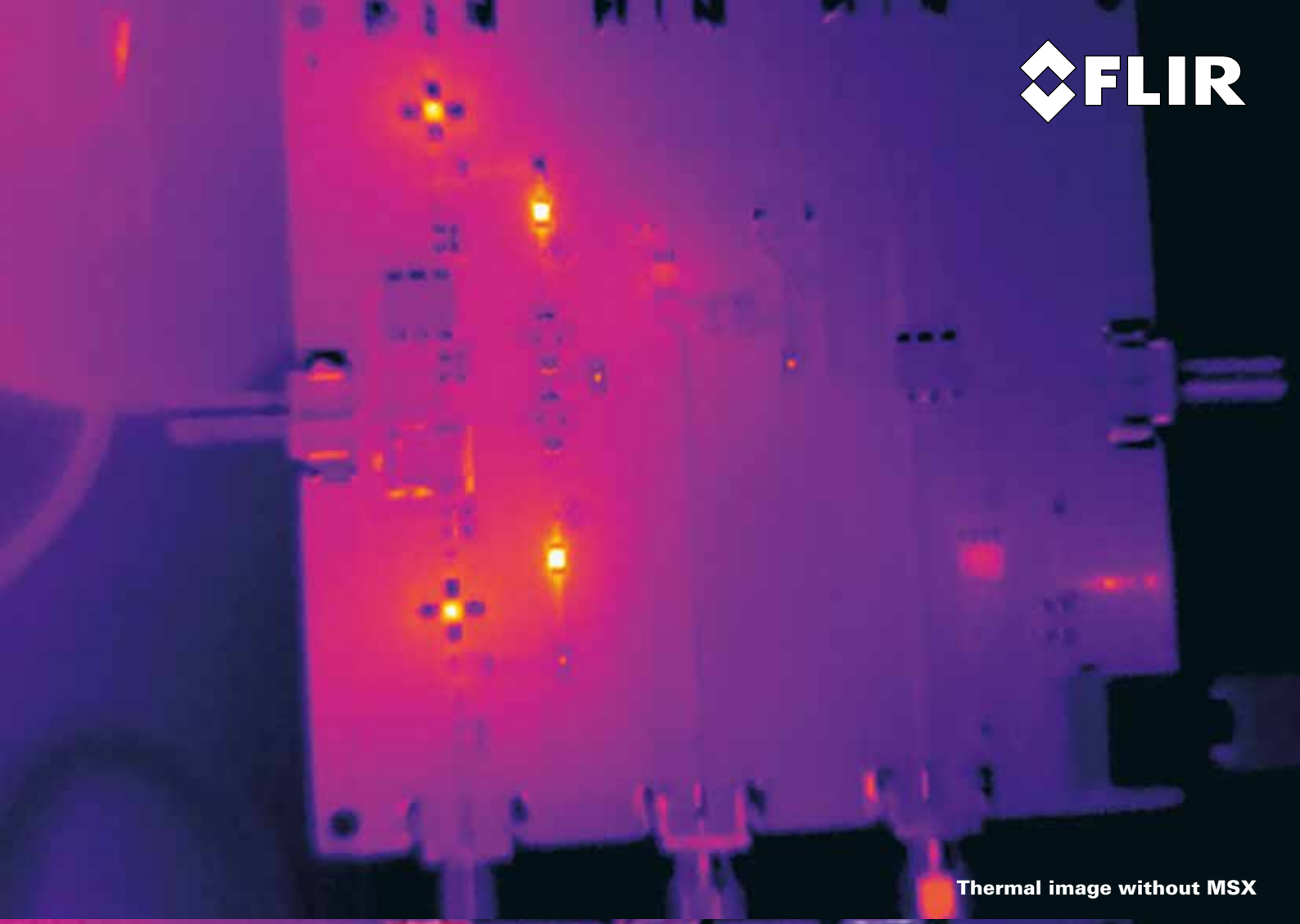
FLIR

Export Licensing

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

Specifications are subject to change without notice. The images displayed may not be representative of the actual resolution of the camera shown. Images for illustrative purposes only.

April 2014. All previous catalogues are obsolete.



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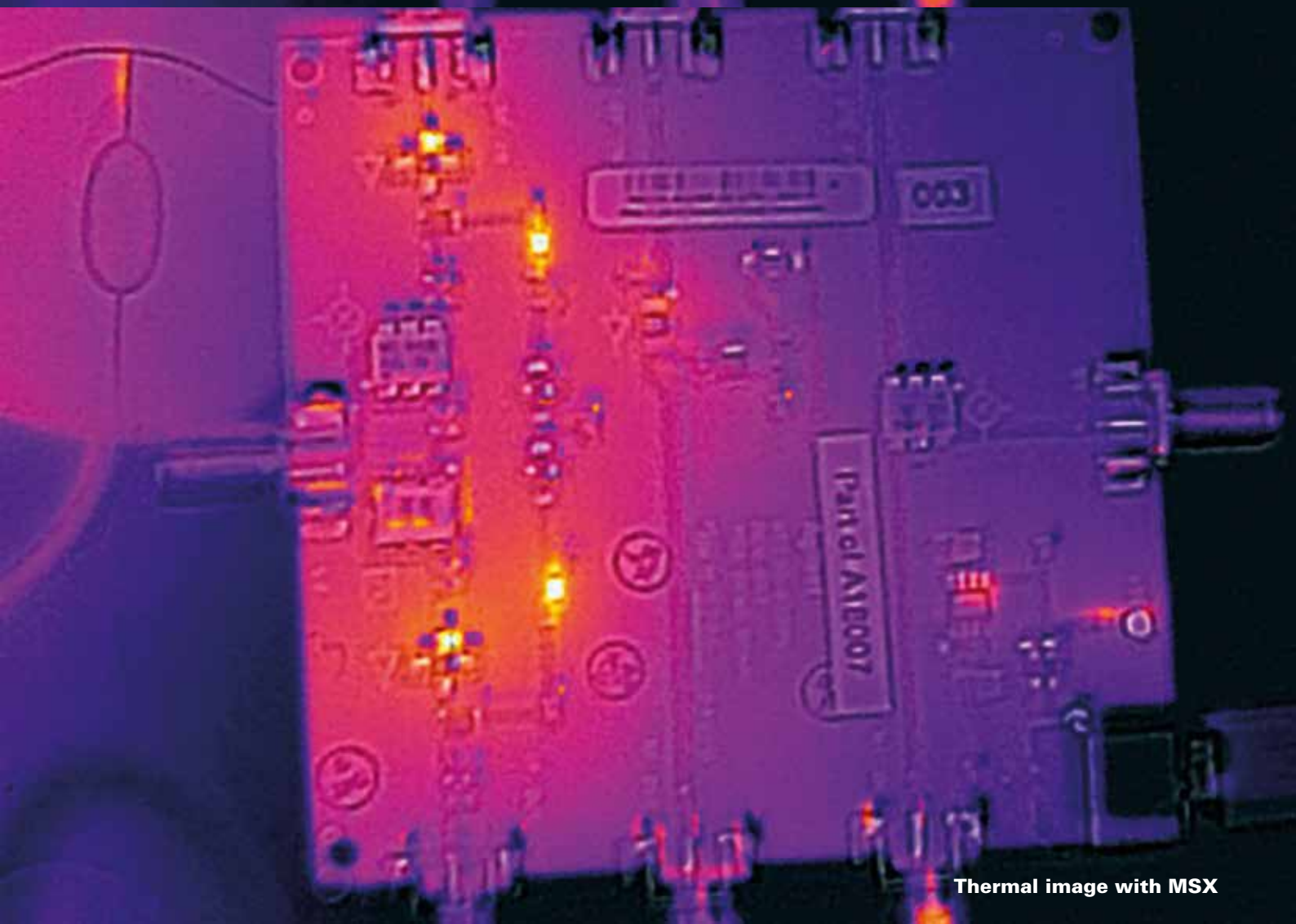
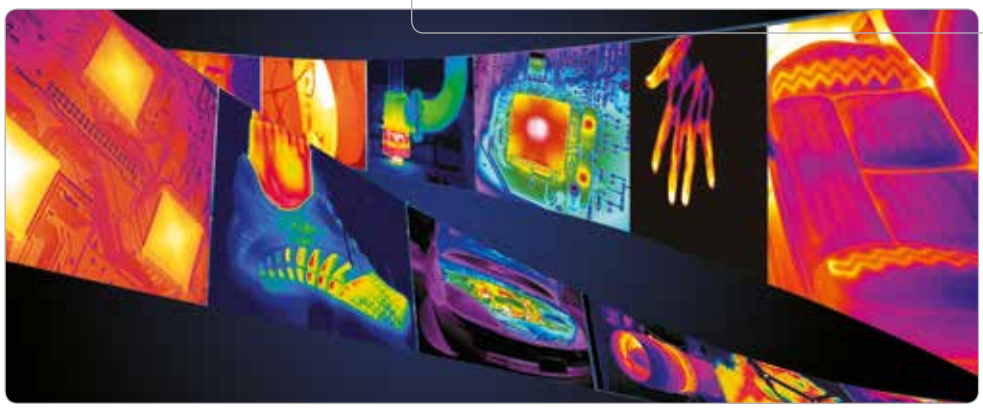


Thermal image with MSX



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