Thermal imaging cameras for Automation & Fire and Safety

Machine Vision
Process Monitoring
Quality Control
Fire Detection
Critical Equipment Monitoring
FLIR Systems: the world leader in thermal imaging cameras

FLIR Systems 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 Systems’ thermal imaging systems use state-of-the-art thermal imaging technology that detects infrared radiation - or heat. Based on detected temperature differences, thermal imaging cameras can create a crisp image. Complicated algorithms make it also 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.

Rapidly emerging markets and organization
Interest for thermal imaging has grown considerably over the last few years in a large variety of markets. To face this increased demand, FLIR Systems has expanded its organization 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 Systems the largest manufacturer of commercial thermal imaging cameras in the world.

Manufacturing capabilities
FLIR Systems currently operates 6 manufacturing plants: three in the USA (Portland, Boston and Santa Barbara, California) one in Stockholm, Sweden, one in Estonia and one in Paris, France.

Thermal imaging: more than building a camera
There is more to the world of thermal imaging than building a camera. FLIR Systems 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 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 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.

**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. The i3 has an image resolution of 60 x 60 pixels. This means that it is equal to using 3,600 IR thermometers at the same time. If we look at the FLIR P660, our top model, 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.

**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.
Production engineers and technicians are faced by the demand for higher production output at a constant quality and at lower cost. The FLIR A-series thermal imaging cameras are the most effective tool available for Infrared Machine Vision, Closed loop Process control and Quality Assurance imaging, helping you to validate and increase product quality and throughput and thereby give your products a competitive edge and increased profitability.

The FLIR A-Series thermal imaging cameras are also great tools for fire and safety applications. Safety applications exist in any industry where protection of lives and assets is of importance and where an early warning of a potential critical condition is of utmost importance.

**Automation**

Problems can occur at any time in a production process. In most cases, it will not be possible to see the problem with the naked eye or to quickly spot potentially harmful temperature variations. For many applications, such as the production of parts and components for the automotive or electronics industry, thermal data are critical.

While machine vision can see a production problem, it cannot detect thermal irregularities. Thermal imagery provides much more information to production specialists and decision makers. Indeed, for non-contact precision temperature measurement there is nothing to equal thermal imaging. It adds a new dimension to machine vision and is the perfect solution for applications involving non-contact precision temperature measurement and non-destructive testing.

**Fire and safety**

Safety applications can be found in many industries. Just a few examples are oil and gas production, power generation or distribution, steel manufacturing, or any industry which has some type of storage area where goods or material is kept that can self combust. Examples on this is storage of splint wood, batteries, waste, coal and more. All these applications have in common that there is a fundamental need to detect hot spots and then prevent that this turns in to a fire or a costly break down.

**Thermal imaging cameras**

Advanced thermal imaging cameras allow you to monitor what you can’t see, providing quality assurance and safety in the fastest and easiest way possible. They can be installed almost anywhere to monitor the efficiency and safety of your production process by detecting and measuring temperature differences.

**Thermal imaging cameras have proven to be an invaluable tool for safety monitoring and to improve production quality.**
The advantages of thermal imaging at a glance!
• Sees the heat produced
• Can trigger alarms
• Non-contact, quick and easy to use
• Performs inspections when systems are in production
• Identifies and locates the problem
• Measures the temperature
• Stores the information
• Saves you valuable time and money

Automation
Function test and quality assessment of car windows and seats
Due to the high quality demands of the automobile industry all front and rear windows, car seat heatings and various other components are assessed with thermal imaging cameras. In addition to the traditional presence check and the search for weak points in the material on the heating wires in the rear windows, the product quality of a heated front window is also monitored continuously. Furthermore infrared cameras are used for air conditioning test benches in order to acquire valuable temperature data.

Fire and safety
Fire detection in waste bunkers
In vast storage warehouses at waste incineration plants, many different materials are collected. Spontaneous fires can be caused by the decomposition processes. Also the inclusion of highly combustible objects is a fire hazard. A thermal imaging camera prevents spontaneous fires by identifying fire pockets in an early stage so that a fire alarm can be triggered.

Outdoor fire detection
After coal has been mined the various product grades are homogenised on different storage areas. As spontaneous combustion, due to an increase in temperature, cannot be disregarded, the storage areas are monitored continuously for hot spots, so that an early fire alarm may be triggered and fires can be avoided.
Fixed mounted thermal imaging cameras like FLIR A300/A310 can be installed almost anywhere to monitor your critical equipment and other valuable assets. It will safeguard your plant and measure temperature differences to assess the criticality of the situation. This allows you to see problems before they become costly failures, preventing downtime and enhancing worker safety.

**Built-in extensive analysis functions (only FLIR A310)**
Spot, area measurement and difference temperature functions.

**Built-in alarm functions (only FLIR A310)**
As function of analysis, internal temperature or digital input.

**Ethernet/IP and Modbus TCP compliance (only FLIR A310)**
Easy sharing of analysis, alarm results to PLC’s.

**Messaging functionality (only FLIR A310)**
The camera automatically sends analysis results, IR images and more as an e-mail on schedule or at alarm. Autonomous dispatch of files or e-mails, acting as an FTP- or SMTP-client.

**Image masking functionality (only FLIR A310)**
Select only the relevant part of the image for your analysis.

**MPEG-4 streamed video**
MPEG-4 streamed video output over Ethernet to show live images on a PC, 640x480 with overlay up to 30 Hz, system dependent.

**PoE (Power over Ethernet)**
Communication and power supplied with only one cable.

**Digital inputs/outputs (only FLIR A310)**
For alarms and control of external equipment.

**Video output**
Composite video output, PAL and NTSC compatible.

**Lens**
Built-in 25 degree lens with both motorized focus and autofocus. Optional lenses available.

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

**Remote control**
Remote control of the camera over the Web and TCP/IP protocol.

**16 bit image**
16 bit radiometric image streaming to PC for analysis.

**Built-in 100 Mb Ethernet connection**
100 Mb Ethernet.

**FLIR A300f / A310f**
The FLIR A300 / A310 can be ordered in an environmental housing. The housing increases the environmental specifications of the FLIR A300 / A310 to IP66, without effecting any of the camera features. It is ideal when the camera needs to be installed in dusty or wet environments. The housing is available for A300 cameras that are equipped with a 25° or 45° lens and A310 cameras that are equipped with a 25°, 45° or 90° lens.

Users that want to build in the camera in the housing themselves or that already have a FLIR A300 or A310 that needs to be extra protected against dust and water can order the housing separately as an accessory.
Who will benefit from this technology?

**Oil and Gas**
Oil refineries and exploration, petrochemical plants:
- Natural gas processing, transport and storage
- Fire prevention in storage areas
- Refractory lining monitoring
- Flare detection
- Process quality control

**Power Generation and Distribution**
- Fire prevention on coal piles
- Fire prevention in wood storage areas
- Fire prevention in waste storage areas
- Sub-station monitoring
- Critical equipment monitoring

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**FLIR A300 / FLIR A310 housing options**

**A300f / A310f**
The FLIR A300f and A310f are thermal imaging cameras with an environmental housing protecting the A300 or A310 against dust and water. The housing increases the environmental specifications of the FLIR A300 / A310 to IP66, without affecting any of the camera features.

**FLIR A310 pt**
The FLIR A310pt pan/tilt has all the necessary features and functions to build single- or multi-camera solutions. The FLIR A310pt can pan +/- 360° continuous and tilt +/- 45°. It is ideal to cover large areas. Typical application examples are coal pile, waste bunker and sub-station monitoring, utilizing standard Ethernet hardware and software protocols.

The FLIR A310pt is a multi-sensor and includes a lowlight 36x zoom color CCD camera.

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Fixed mounted thermal imaging cameras like FLIR A615/A315 can be installed almost anywhere to monitor your production process by detecting and measuring temperature differences and visualize heat patterns. The FLIR A315 / A615 is a series of compact and affordable thermal imaging cameras, fully controlled by a PC. Due to their compliance to standards, FLIR A315 / A615 are Plug&Play with 3rd parties Machine Vision software like National instruments, Cognex, Matrox, MVtec and Stemmer Imaging.

**FLIR A315 / A615**

**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.

**640x480 pixels (only FLIR A615)**

The FLIR A615 has a resolution pixel detector of 640x480 pixels that allows more accuracy and shows more details at a longer distance.

**High speed infrared windowing (only FLIR A615)**

The FLIR A615 has a high speed infrared windowing option.

**Image flow control**

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.

**Built-in Gigabit Ethernet connection**

Real time 16-bit image streaming to computer.

**Lens (only FLIR A315)**

Built-in 25 degree lens with both motorized focus and autofocus. Optional lenses available.

**FLIR A315f**

The FLIR A315 can be ordered in an environmental housing. The housing increases the environmental specifications of the FLIR A315 to IP66, without effecting any of the camera features. It is ideal when the camera needs to be installed in dusty or wet environments. The housing is available for cameras that are equipped with a 25°, 45° or 90° lens.

Users that want to build in the camera in the housing themselves or that already have a FLIR A315 that needs to be extra protected against dust and water can order the housing separately as an accessory.

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A315f, thermal imaging camera with environmental housing (IP 66 rated).
Who will benefit from this technology?

**Automotive**
Cars and commercial vehicles, engine manufacturing and subcontractors serving the industry:

- Soldering and welding
- Car seat heating
- Verification of window defrosting
- Heating, air conditioning functions
- Casting of plastic or metallic parts
- Quality checking of laminated parts such as dashboards
- Quality checking of leather upholstery
- Friction control of tires

**Electronics**
Electronics design, PCB and component manufacture and electronics assembly:

- PCB testing, validation and verification
- Fault tracing in board assemblies
- Power electronics design
FLIR A35

Thermal imaging camera for machine vision applications

Thermal imaging cameras are used worldwide across a wide variety of industries to monitor continuous processes. Thermal imaging can easily collect information on product quality and/or production efficiency that is difficult or impossible to capture using conventional means such as thermocouples or visible light cameras.

The FLIR A35 is the perfect solution for those applications that only require the benefits of a thermal image but do not need exact temperature measurement. The FLIR A35 camera has features and functions that make it the natural choice for anyone who uses PC software to solve problems.

Extremely affordable
The FLIR A35 is an extremely affordable unit. From now on price is no longer an issue for deploying thermal imaging cameras to monitor continuous processes.

Compact
Extremely compact, measuring only 40 mm x 43 mm x 106 mm the FLIR A35 can easily be integrated in every production line.

GigE Vision™ standard compatibility
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
The goal of GenICam is to provide a generic programming interface for all types 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 it possible to use third party software with the camera. GenICam makes the FLIR A35 plug-and-play when used with software packages such as IMAQ Vision and Halcon.

Power over Ethernet (PoE)
Communication and power supplied with only one cable.

Synchronization
Possible to configure one camera to be master and others to be slave(s) for applications that call for more than one camera to cover the object or for stereoscopic applications.

General Purpose Input/Output (GPIO)
One output that can be used to control other equipment and one input to read the status from the same equipment.

Wide temperature range
The FLIR A35 visualizes temperatures between –40°C and +550°C.

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

Turning tools into solutions

In order to fully utilize the FLIR A-Series cameras and integrate them into working systems for safety and automation the A-Series offer a set of software tools and utilities. Further information regarding downloads and updates is available at http://flir.custhelp.com/

General
IP Config
Utility program for network camera detection and IP address setting, the program comes with the Utility CD in the delivery box or can be downloaded from FLIR Custhelp.

For Safety (A300/A310/A310pt/A310f)
- FLIR Sensors Manager
  This software offers powerful and efficient management capabilities for any safety and security installation with FLIR A310pt and A310f cameras. FLIR Sensors Manager allows to automatically locate FLIR A310pt and FLIR A310f cameras in the network. They can be easily controlled and set-up in a distributed multi-camera environment.
- FLIR IR Monitor
  Utility program for first camera connection and control and setup of internal features/functions, supports up to 9 cameras simultaneously, the program comes with the Utility CD in the delivery box or can be downloaded from FLIR Custhelp.
- Built in WEB server
  Simple built in camera control and image viewer, connect using http://"camera ip adress" in a WEB browser or connect through the IP Config program.
- Ethernet/IP or Modbus TCP (A310 only)
  Industrial Field bus protocols, allows that Analyse, Alarm and Camera control is shared with PLC’s. This function is always turned on in the A310 Camera.
- ThermoVision SDK
  An ActiveX component that allows camera control and image grabbing and transformation, purchased separately.
- AXXX Control & Imaging interfaces
  A set of ICD’s that describes the camera control and image streaming on a low level. Includes also a set of code samples. Should only be used by expert coders, can be downloaded at FLIR Custhelp free of charge.

For Automation (A315/A615/A35)
- FLIR Camera Player
  Utility program for first camera connection and streamed image viewing, the program comes with the Utility CD in the delivery box or can be downloaded from FLIR Custhelp.
- GigE Vision and GenICam compliance
  Machine Vision camera standard supported in many 3:rd party image processing software’s like National Instruments IMAQ Vision and MVTec’s Halcon software.
- Thermovision SDK
  An ActiveX component that allows camera control and image grabbing and transformation, purchased separately.
- AXXX Control & Imaging interfaces
  A set of ICD’s that describes the camera control and image streaming on a low level. Includes also a set of code samples. Should only be used by expert coders, can be downloaded at FLIR Custhelp free of charge.
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 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.

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

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.
## Technical specifications

### Measurement analysis

<table>
<thead>
<tr>
<th>FLIR A300</th>
<th>FLIR A310</th>
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</thead>
<tbody>
<tr>
<td>Spotmeter</td>
<td>N/A</td>
</tr>
<tr>
<td>Area</td>
<td>N/A</td>
</tr>
<tr>
<td>Isotherm</td>
<td>N/A</td>
</tr>
<tr>
<td>Measurement option</td>
<td>N/A</td>
</tr>
<tr>
<td>Difference temperature</td>
<td>N/A</td>
</tr>
<tr>
<td>Reference temperature</td>
<td>N/A</td>
</tr>
<tr>
<td>Atmospheric transmission correction</td>
<td>N/A</td>
</tr>
<tr>
<td>Optics transmission correction</td>
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</tr>
<tr>
<td>Emissivity correction</td>
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</tr>
<tr>
<td>Reflected apparent temperature correction</td>
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</tr>
<tr>
<td>External optics/windows correction</td>
<td>N/A</td>
</tr>
<tr>
<td>Measurement corrections</td>
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</tr>
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</table>

### Alarm

<table>
<thead>
<tr>
<th>FLIR A300</th>
<th>FLIR A310</th>
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</thead>
<tbody>
<tr>
<td>Alarm functions</td>
<td>N/A</td>
</tr>
<tr>
<td>Alarm output</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Ethernet

<table>
<thead>
<tr>
<th>FLIR A300</th>
<th>FLIR A310</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet Control and image</td>
<td>TCP, UDP, SNMP, RTSP, RTP, HTTP, ICMP, IGMP, ftp, SMTP, SMB (CIFS), DHCP, MDNS (Bonjour), uPnP</td>
</tr>
<tr>
<td>Ethernet, protocols</td>
<td>Ethernet/IP, Modbus TCP, TCP, UDP, SNMP, RTSP, RTP, HTTP, ICMP, IGMP, ftp, SMTP, SMB (CIFS), DHCP, MDNS (Bonjour), uPnP</td>
</tr>
<tr>
<td>Ethernet, image streaming</td>
<td>16-bit 320 x 240 pixels at 3 Hz (Radiometric)</td>
</tr>
</tbody>
</table>

### Power system

<table>
<thead>
<tr>
<th>FLIR A300</th>
<th>FLIR A310</th>
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</thead>
<tbody>
<tr>
<td>External power operation</td>
<td>12/24 VDC (10-30 VDC), 24 W absolute max</td>
</tr>
<tr>
<td>Consumption</td>
<td>24 VAC (21-30 VAC) 24 VDC (21-30 VDC) 24 VAC: 215 VA max w/heater</td>
</tr>
</tbody>
</table>

**Visit www.flir.com**
General

**Imaging and optical data**
- **Field of view (FOV) / Minimum focus distance**: 25° × 18.8° / 0.4 m
- **Lens identification**: Automatic
- **Thermal sensitivity/NETD**: < 0.05°C at +30°C / 50 mK
- **Focus**: Automatic or manual (built in motor)
- **F-number**: 1.3
- **Image frequency**: 30 Hz
- **Zoom**: 1–8× continuous, digital, interpolating zooming on images

**Detector data**
- **IR resolution**: 320 × 240 pixels
- **Detector pitch**: 25 μm
- **Detector time constant**: Typical 12 ms
- **Focal Plane Array (FPA) / Spectral range**: Uncooled microbolometer / 7.5–13 μm

**Measurement**
- **Object temperature range**: –20 to +120°C
  0 to +350°C
- **Accuracy**: ±2°C or ±2% of reading

**Set-up**
- **Color palettes**: Color palettes (BW, BW inv, Iron, Rain)
- **Set-up commands**: Date/time, Temperature °C

**Storage of images**
- **Image storage type**: Built-in memory for image storage
- **File formats**: Standard JPEG, 16-bit measurement data included

**Composite video**
- **Video, standard**: Composite video output, PAL and NTSC compatible
- **Video, standard**: CVBS (ITU-R-BT.470 PAL/SMPTE 170M NTSC)

**Digital input/output**
- **Digital input**: 2 opto-isolated, 10–30 VDC
- **Digital output, purpose**: As function of ALARM, 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
- **Digital input, purpose**: Image tag (start/stop/general), Input ext. device (programmatically read)

**Ethernet**
- **Ethernet, standard**: IEEE 802.3
- **Ethernet, connector type**: RJ-45
- **Ethernet, type**: 100 Mbps
- **Ethernet, communication**: TCP/IP socket-based FLIR proprietary
- **Ethernet, power**: Power over Ethernet, PoE IEEE 802.3af class 0

**Environmental data**
- **Storage temperature range**: –40°C to +70°C
- **Humidity (operating and storage)**: IEC 60068-2-30/24 h 95% relative humidity
  +25°C to +48°C
- **EMC**:
  - EN 61000-6-2:2001 (Immunity)
  - EN 61000-6-3:2001 (Emission)
  - FCC 47 CFR Part 15 Class B (Emission)
- **Vibration**: 2 g (IEC 60068-2-6)

**Physical data**
- **Housing material**: Aluminium

**Scope of delivery**
- Hard transport case or cardboard box, Thermal imaging camera with lens, Utility CD-ROM, Calibration certificate, Ethernet™ cable, 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, 6-pole screw terminal (mounted on camera)
## Imaging and optical data

<table>
<thead>
<tr>
<th>FLIR A315</th>
<th>FLIR A615</th>
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</thead>
<tbody>
<tr>
<td><strong>Field of view (FOV) / Minimum focus distance</strong></td>
<td>25° x 18.8° / 0.4 m</td>
</tr>
<tr>
<td><strong>Spatial resolution (IFOV)</strong></td>
<td>1.36 mrad</td>
</tr>
<tr>
<td><strong>Focal length</strong></td>
<td>18 mm</td>
</tr>
<tr>
<td><strong>F-number</strong></td>
<td>1.3</td>
</tr>
<tr>
<td><strong>Image frequency</strong></td>
<td>60 Hz</td>
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</tbody>
</table>

## Detector data

<table>
<thead>
<tr>
<th>FLIR A315</th>
<th>FLIR A615</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Focal Plane Array (FPA) / Spectral range</strong></td>
<td>Uncooled microbolometer / 7.5–13 μm</td>
</tr>
<tr>
<td><strong>IR resolution</strong></td>
<td>320 × 240 pixels</td>
</tr>
<tr>
<td><strong>Detector pitch</strong></td>
<td>25 μm</td>
</tr>
<tr>
<td><strong>Detector time constant</strong></td>
<td>Typical 12 ms</td>
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</tbody>
</table>

## Measurement

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<tr>
<th>FLIR A315</th>
<th>FLIR A615</th>
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<tbody>
<tr>
<td><strong>Object temperature range</strong></td>
<td>–20 to +120°C</td>
</tr>
<tr>
<td></td>
<td>0 to +350°C</td>
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## USB

<table>
<thead>
<tr>
<th>FLIR A315</th>
<th>FLIR A615</th>
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<tbody>
<tr>
<td><strong>USB</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>USB, standard</strong></td>
<td>N/A</td>
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<tr>
<td><strong>USB, connector type</strong></td>
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<tr>
<td><strong>USB, communication</strong></td>
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</tr>
<tr>
<td><strong>USB, image streaming</strong></td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>USB, protocols</strong></td>
<td>N/A</td>
</tr>
</tbody>
</table>

## Ethernet

<table>
<thead>
<tr>
<th>FLIR A315</th>
<th>FLIR A615</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ethernet, image streaming</strong></td>
<td>16-bit 320 × 240 pixels at 60 Hz</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Environmental data

<table>
<thead>
<tr>
<th>FLIR A315</th>
<th>FLIR A315 - Environmental housing</th>
<th>FLIR A615</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating temperature range</strong></td>
<td>–15°C to +50°C</td>
<td>–25°C to +50°C</td>
</tr>
<tr>
<td><strong>Encapsulation</strong></td>
<td>IP 40 (IEC 60529)</td>
<td>IP 66 (IEC 60529)</td>
</tr>
<tr>
<td><strong>Bump</strong></td>
<td>25 g (IEC 60068-2-29)</td>
<td>5 g, 11 ms (IEC 60068-2-27)</td>
</tr>
</tbody>
</table>

## Physical data

<table>
<thead>
<tr>
<th>FLIR A315</th>
<th>FLIR A315 - Environmental housing</th>
<th>FLIR A615</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weight</strong></td>
<td>0.7 kg</td>
<td>5 kg</td>
</tr>
<tr>
<td><strong>Camera size (L × W × H)</strong></td>
<td>170 × 70 × 70 mm</td>
<td>460 × 140 × 159 mm</td>
</tr>
<tr>
<td><strong>Tripod mounting</strong></td>
<td>UNC ¼”-20 (on three sides)</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Base mounting</strong></td>
<td>2 × M4 thread mounting holes (on three sides)</td>
<td>TBA</td>
</tr>
</tbody>
</table>

## System features

<table>
<thead>
<tr>
<th>FLIR A315</th>
<th>FLIR A315 - Environmental housing</th>
<th>FLIR A615</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Automatic heaters</strong></td>
<td>N/A</td>
<td>Clears ice from window</td>
</tr>
</tbody>
</table>

Visit www.flir.com
### Imaging and optical data

<table>
<thead>
<tr>
<th>Lens identification</th>
<th>Automatic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal sensitivity/NETD</td>
<td>&lt; 0.05°C @ +30°C / 50 mK</td>
</tr>
<tr>
<td>Focus</td>
<td>Automatic or manual (built in motor)</td>
</tr>
</tbody>
</table>

### Measurement

<table>
<thead>
<tr>
<th>Accuracy</th>
<th>±2°C or ±2% of reading</th>
</tr>
</thead>
</table>

### 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

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

### Digital input/output

| 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 |
| Digital input, purpose | Image tag (start, stop, general), Image flow ctrl. (Stream on/off), Input ext. device (programmatically read) |

### 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

| Storage temperature range | -40°C to +70°C |
| Humidity (operating and storage) | IEC 60068-2-30/24 h 95% relative humidity |
| EMC | +25°C to +40°C |
| Voltage | - EN 61000-6-2:2001 (Immunity) |
| | - EN 61000-6-3:2001 (Emission) |
| | - FCC 47 CFR Part 15 Class B (Emission) |
| | - IEC 60068-2-6 |

### Physical data

| 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 A615), 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, 6-pole screw terminal (mounted on camera)
Technical specifications

**Imaging and optical data**

- **IR resolution**: 336 × 256 pixels
- **Thermal sensitivity/NETD**: < 0.05°C @ +30°C (+86°F) / 50 mK
- **Minimum focus distance**: Fixed
- **FOV (Field of view) / Focal length**: 25° (H) x 19 (V) with 19mm lens
  - 48° (H) x 39 (V) with 9mm lens
  - Lenses are not interchangeable and need to be specified at time of order
- **Spatial resolution (IFOV)**: 1.32 mrad for 19mm lens
  - 2.78 mrad for 9mm lens
- **F-number**: 1.25
- **Image frequency**: 60 Hz
- **Focus**: Non-motorized focus adjustment

**Detector data**

- **Focal Plane Array (FPA) / Spectral range**: Uncooled VOX microbolometer / 7.5–13 µm
- **Detector pitch**: 17 µm
- **Detector time constant**: Typical 12 ms

**Measurement**

- **Object temperature range**: –40 to +160°C (–40 to 320°F)
  - –40 to +550°C (–40 to +1022°F)

**Ethernet**

- **Ethernet type**: Gigabit Ethernet
- **Ethernet, standard**: IEEE 802.3
- **Ethernet, communication**: GigE Vision ver. 1.2
  - Client API GenICam compliant
- **Ethernet, image streaming**:
  - 8-bit monochrome @ 60 Hz
  - Signal linear/ DDE
  - Automatic / Manual
  - Flip H&V
  - 14-bit 336 × 256 pixels @ 60 Hz
    - Non linear/ DDE
    - GigE Vision and GenICam compatible
- **Ethernet, power**: Power over Ethernet, PoE IEEE 802.3af class 0 Power
  - Ethernet, protocols: TCP, UDP, ICMP, IGMP, DHCP, GigE Vision

**Digital input/output**

- **Digital input, purpose**: General purpose
- **Digital input**: 1× opto-isolated, “0” < 2, “1” = 2–40 VDC
- **Digital output, purpose**: General purpose Output to ext. device (programmatically set)
- **Digital output**: 1× opto-isolated, 2–40 VDC, max 185 mA
- **Digital I/O, isolation voltage**: 500 VRMS
- **Digital I/O, supply voltage**: 2–40 VDC, max 200 mA
- **Digital I/O, connector type**: 12-pole M12 connector (shared with Digital Synchronization and External power)

**Synchronization In, purpose**

- Frame sync In to control camera
- **Synchronization In, type**: LVC Buffer 0-3.3V, “0” = 0.8 V, “1” = 2.0 V
- **Synchronization Out, purpose**: Frame sync Out to control another A35 camera
  - 1×, non-isolated
- **Digital Synchronization, connector type**: 12-pole M12 connector (shared with Digital I/O and External power)

**Power system**

- **External power operation**: 12/24 VDC, < 2.5 W absolute max
- **External power, connector type**: 12-pole M12 connector (shared with Digital I/O and Digital Synchronization)
- **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 (Immunity)
    - EN 61000-6-3 (Immunity)
    - FCC 47 CFR Part 15 Class B (Emission)
- **Encapsulation**: IP 40 (IEC 60529)
- **Bump**: 25 g (IEC 60068-2-29)
- **Vibration**: 2 g (IEC 60068-2-6)

**Physical data**

- **Weight**: 0.200 kg (0.44 lb.)
- **Camera size (L × W × H)**: 106 × 40 × 43 mm (4.2 × 1.6 × 1.7 in.)
- **Tripod mounting**: Optional with Accessory T198349, Base support
- **Base mounting**: 4 × M3 thread mounting holes (bottom)
- **Housing material**: Magnesium and aluminum

**Scope of delivery**

- Packaging, contents:
  - Cardboard box
  - Infrared camera with lens
  - Downloads brochure
  - Focus adjustment tool
  - Printed Getting Started Guide
  - Printed Important Information Guide
  - Service & training brochure
  - User documentation CD-ROM
  - Registration card
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 imaging camera.
Accessories

**Lenses**

**IR lens f = 76 mm, 6° incl. case and mounting**
For maximum magnification, the 6° lens is the only choice. This optic provides almost 3.5X magnification compared to the 25° lens.

**IR lens f = 30 mm, 15° incl. case**
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.

**IR lens f = 10 mm, 45° incl. case**
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.

**IR lens f = 4 mm, 90° incl. case and mounting support**
This wide angle lens has a field of view almost four times the one of the standard 25° lens.

**Close-up 1x (25 µm) incl. case and mounting support**
This macro lens provides resolution of extremely small targets. Not suitable for thermal imaging cameras in an environmental housing.

**Close-up lens 2x, 50 µm, incl. case**
This macro lens provides resolution of extremely small targets. Not suitable for thermal imaging cameras in an environmental housing.

**Close-up lens 4x, 100 µm, incl. case**
This macro lens provides resolution of extremely small targets. Not suitable for thermal imaging cameras in an environmental housing.

**Extended measurement ranges**

**High temperature option to +1200°C**
Allow to measure temperatures of up to +1200°C with the camera.

**Power**

**Power supply**
Power supply incl. multi-plugs.

**Ethernet cable CAT-6, 2m**
This cable is used to connect the thermal imaging camera to Ethernet.

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

**Video cable (only FLIR A300/A310)**
Video cable 3 m.

**Transport**

**Hard transport case**
Rugged watertight plastic shipping case. Holds all items securely.

**Delivery Box**
Cardboard delivery box with plastic handle. Holds all items neatly.
Environmental data

Temperature range: -25 ºC to +50 ºC
Storage temperature range: -40 ºC to +70 ºC
Humidity: IEC 60068-2-30/24 h 95% relative humidity +25 ºC to +40 ºC
EMC:
- EN 61000-6-2:2001 (Immunity)
- EN 61000-6-3:2001 (Emission)
- FCC 47 CFR Part 15 Class B (Emission)
Encapsulation: IP 66 (IEC 60529)
Bump: 5 g, 11 ms, (IEC 60068-2-27)
Vibration: 2 g (IEC 60068-2-6)

Physical data

Weight: 5.0 kg (8.8 lb.)
Camera size (L × W × H): 460 × 140 × 159 mm (18.1 × 5.5 × 5.9 in.)
Tripod mounting: N/A
Base mounting: TBA
Housing material: Aluminum

Power system heater

External power operation: 24 VDC (21-30 VDC)
External power, connector type: 2-pole jackable screw terminal
Voltage: Allowed range 21–30 VDC

System features

Automatic heaters: Clears ice from window

FLIR A300 f / A310 f / A315 f

Accessories

Pedestal mount [500-0463-00]
Mount to install an A3xx f-Series network-ready fixed mount thermal imaging camera. Typically used on a flat horizontal surface such as a wall or the top of a pole.

Wall mount [500-0462-00]
Mount to install an A3xx f-Series network-ready fixed mount thermal imaging camera against a wall.

Pole mount adapter [4119507]
Can be used to mount an A3xx f-Series network-ready thermal imaging camera against a new or existing pole.

Power supply [206-0004-01]
Power supply to power an A3xx f-Series or an A310 pt network-ready thermal imaging camera.
FLIR A310pt

**Pedestal mount**
Mount to install an A310pt network-ready fixed mount thermal imaging camera. Typically used on a flat horizontal surface such as a wall or the top of a pole.

**Wall mount**
Mount to install an A310pt network-ready fixed mount thermal imaging camera against a wall.

**Pole mount adapter**
Can be used to mount an A310pt network-ready thermal imaging camera against a new or existing pole.

**Adapter plate**
Can be used to mount an A310pt network-ready Multi-Sensor to a wide variety of existing mounts.

**Power supply**
Power supply to power an A310pt or an A3xxf-Series network-ready thermal imaging camera.

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FLIR A615

**Lenses**

**IR lens f = 88.9 mm, 7° incl. case**
The 7° lens is a popular accessory and provides 3.6x magnification compared to the standard lens. Ideal for small or distant targets.

**IR lens f = 41.3 mm, 15° incl. case**
The 15° lens is a popular accessory and provides 1.7x magnification compared to the standard lens. Ideal for small or distant targets.

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

**IR lens f = 13.1 mm, 45° incl. case**
This wide angle lens has a field of view almost double compared to the standard 25° lens.

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

**Close-up 2.9x (50 µm) incl. case**
This macro lens provides resolution of extremely small targets.

**Close-up 5.8x (100 µm) incl. case**
This macro lens provides resolution of extremely small targets.
Power

**Power supply**
Power supply incl. multi-plugs. [T910922]

**Ethernet cable CAT-6, 2m**
This cable is used to connect the infrared camera to Ethernet. [T951004]

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

**USB cable**
USB cable to connect the camera with a computer, using the USB protocol. [1910423]

**Hard transport case**
Rugged watertight plastic shipping case. Holds all items securely. [T197871]

**Delivery Box**
Cardboard delivery box with plastic handle. Holds all items neatly. [T197870]

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FLIR A35

**Accessories**

**PoE injector**
Power supply, power over Ethernet (PoE) injector. [T911112]

**Cable kit Mains (UK,EU,US)**
Cable kit consisting of three power cables (UK,EU,US). [T198348]

**Cable M12 Pigtail**
Cable to access signals in M12 connector, pigtail. [T127605]

**Cable M12 Sync**
Cable to synchronize two cameras, M12 connectors in both ends. [T127606]

**Base support**
Adapter for connecting a tripod. [T198349]

**Focus adjustment tool**
Focus adjustment tool. [T198342]
The products described in this publication may require government authorization for export/re-export, or transfer. Contact FLIR Systems for details.

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