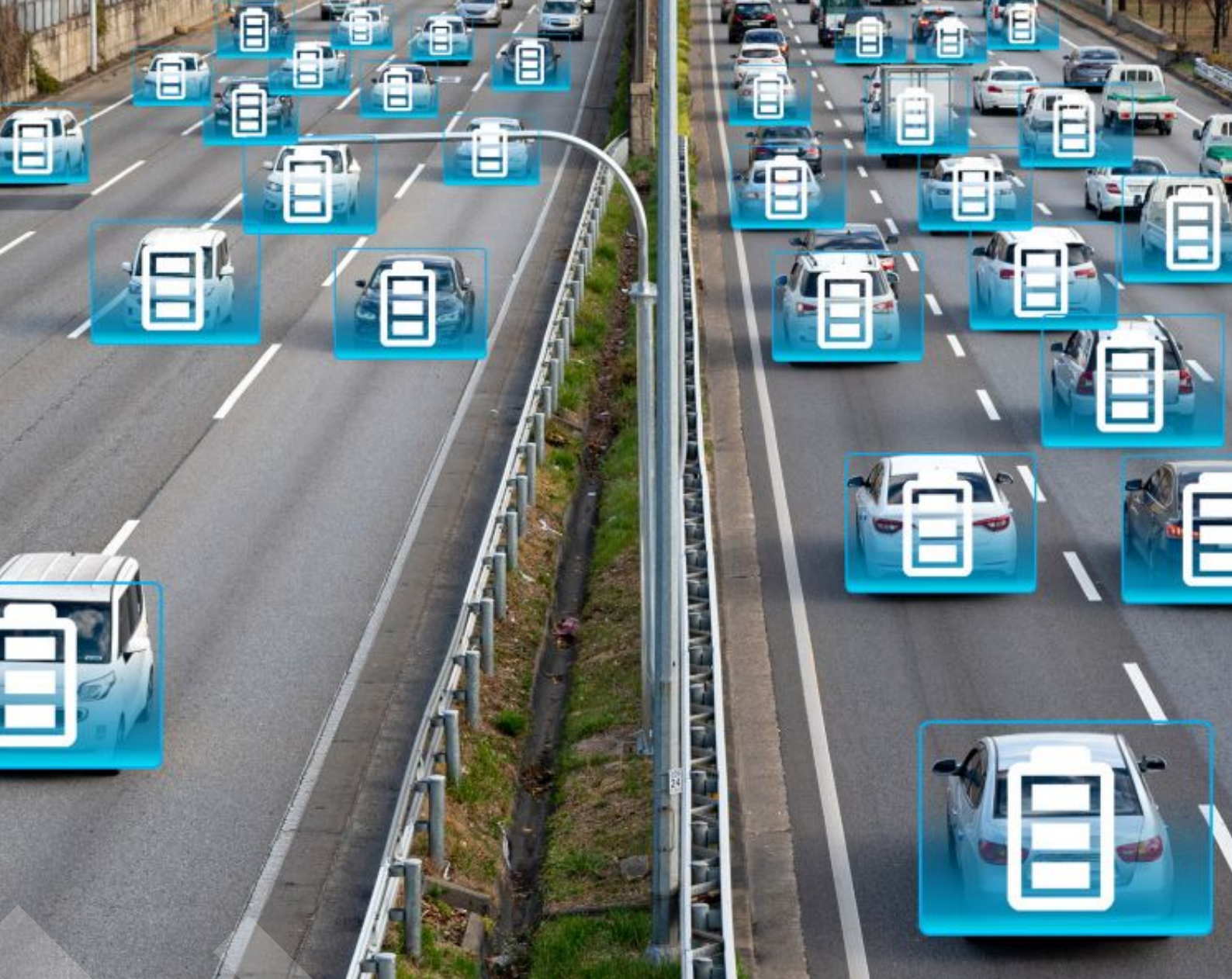




Electric Vehicle Industry Integrated Solutions for Quality Testing and Safety Monitoring





FLIR location in Täby, Sweden

About FLIR

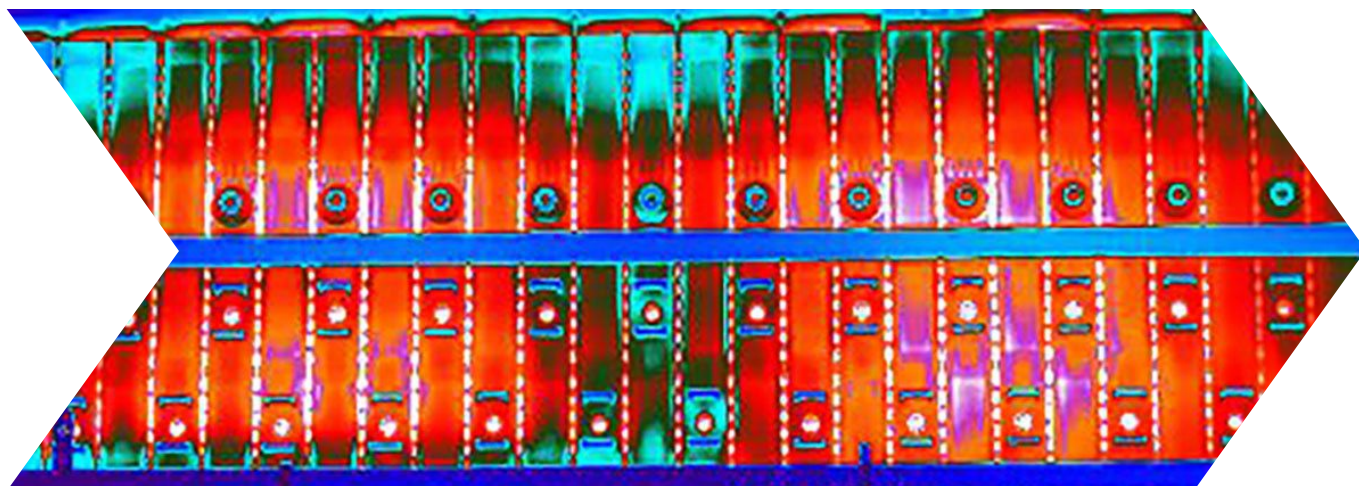
FLIR is a subsidiary of U.S. Company, Teledyne Technologies. Founded in 1978, the company specializes in the design, development, manufacture, marketing and promotion of technologies that reinforce dynamic sensing. Innovative solutions for sensors are constantly being introduced into our daily lives through technologies such as IR thermal imaging, visible light imaging, acoustic imaging, video analysis, measurement and diagnosis, and advance threat-inspection systems.

FLIR supplies thermal imaging cameras, acoustic imaging cameras, testing and measurement tools and solutions for systems connected to scientific research, industrial, commercial, emergency rescue and civilian use, helping entry-level or expert users, offering decision-making support, saving lives, improving lives and strengthening public safety as well as people's well-being, enhancing energy and time efficiency and building smart, healthy communities.

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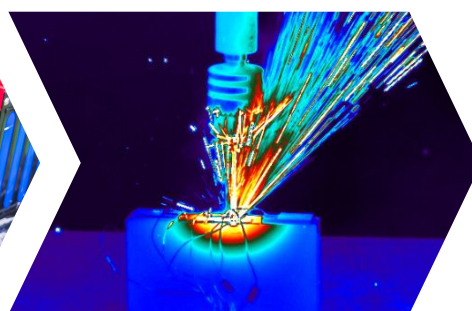
FLIR: Quality & Safety “Supervisor” for Electric Vehicle Manufacturing



In its “2024 Global Outlook for Electric Vehicles” reports, the International Energy Agency (IEA) projected that $\frac{1}{5}$ of all motor vehicles sold in 2024 would be electric vehicles (EVs), with surging demand potentially rebuilding the global vehicle industry over the next ten years. Studies have found that global sale of electric vehicles in 2024 would remain strong, with a highly optimistic outlook.

The research, development and manufacturing of batteries for electric vehicles, manufacture of fully-assembled vehicles, quality control, performance testing and inspection of vehicle spare parts, quality inspection, production management, repair and maintenance are all important aspects of EVs with regard to safe driving. FLIR thermal imaging cameras play the role of “supervisor”, looking after every single aspect of EV quality.

Through the use of thermal cameras, EV manufacturers can enhance product quality and safety, effectively preventing the occurrence of accidents with its products and services, whether they involve design and adhesion of the vehicle body, aging tests prior to mass production of batteries, the entire work processes for composite battery packs for battery modules, or the repair and maintenance of in-vehicle air-conditioners and parts such as brake drums and catalytic converters.



Production and Assembly of EV Power Batteries

The battery is a core part of an electric vehicle, and its performance is critical to ensuring safety during charging. This is why manufacturers need to conduct strict inspections of batteries before shipment, to ensure that the batteries comply with quality requirements. FLIR offers numerous products to ensure the safety of batteries.



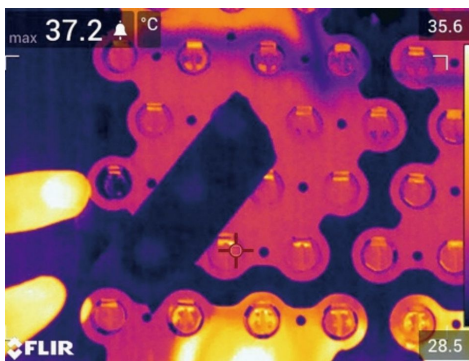
FLIR T1020 High-Definition Thermal Camera with Viewfinder

Quality Assurance Inspections on Battery Cores and Modules

Cell Leakage

Almost invisible to the naked eye, cell leakage can occur at any time during the manufacturing process and can damage the battery pack. The material leaking from a battery cell can be extremely dangerous if it comes into contact with skin.

If the cell's seal ruptures, the liquid collects on the outer layer of the cell, causing a detectable temperature difference. High-resolution thermal cameras such as the FLIR T1020 can efficiently identify minute leakages in seconds without contact.

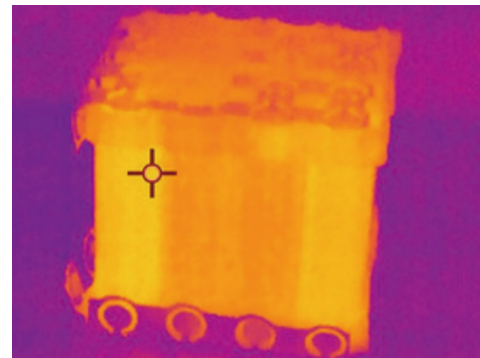


FLIR T-series thermal imaging camera detects fluid-leakage.

Uneven Heating

Even with thorough testing at every stage, sometimes a faulty cell still enters the production line. Slight temperature disparity may also occur in defective batteries during testing. Invisible to the human eye, these faults are easily captured in thermal.

Another example of uneven heating in manufacturing occurs when testing the battery packs after assembling them. Battery packs tend to heat up during charge and recharge cycles, creating a high risk of fire if the temperature is not monitored.

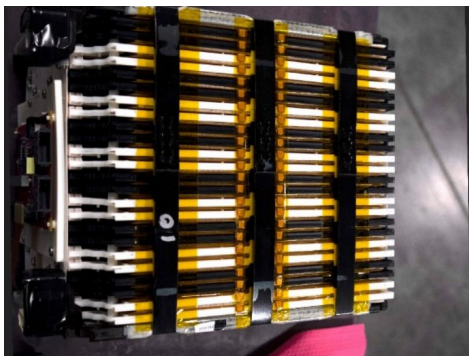


Uneven heating in a lithium battery unit is easily noted in thermal.

Defective Connection in Battery Module

An EV battery consists of multiple modules stacked in a series. Battery modules with defective connections could result in high resistance, loss of electrical power, and even fire hazards.

Industry regulations require EV manufacturers to preserve records of quality inspection and results of performance tests upon completion of a production line. This means that manufacturers must use measurement tools that give precise and repeatable results, enabling rapid testing to determine the batteries' state and spot potential problems.



Electric vehicle batteries consist of multiple modules stacked in a series.

FLIR A-Series Smart Sensors thermal cameras can be easily integrated with automatic production lines for electric vehicle batteries. These fixed units are deployed to detect temperature changes caused by increased resistance due to defective battery connections, and can provide accurate temperature information for each pixel across the infrared images.

They can also help users identify other potential issues—including unstable loading, circuit overload, deterioration in insulation performance, and damaged electrical wires—thereby reducing malfunctions in battery system terminals.



FLIR A70 thermal imaging camera monitoring battery pack tests.



FLIR T-Series handheld thermal cameras can inspect multiple connections based on the battery pack's physical dimensions, position of connection and the position at which the thermal camera is placed. This enables the final user to flexibly inspect battery packs of various dimensions or connection types, thereby preventing omission and enhancing the safety of battery packs.

Real-time Monitoring of Power Battery Manufacturing to Identify Thermal Runaway

As batteries with some electrical power are typically used in battery packs, electric current will flow between packs when connecting individual battery modules. To prevent the "thermal runaway" effect, real-time monitoring must be conducted during the assembly of batteries prior to installation. The objective is to discover damaged batteries as soon as possible to avoid fires or explosions.

The battery management system (BMS) can be deployed to monitor temperature. Battery connections should also be checked for looseness and internal short-circuiting to ensure their viability. However, BMS is typically installed towards the end of the battery-assembly process. FLIR infrared cameras are capable of monitoring the battery manufacturer's battery assembly line at source, preventing potential hazards caused



by temperature increase and thermal runaway.

A thermal camera such as the A50 Smart Sensor (below) is highly suitable for monitoring battery assembly production lines. Users can set up multiple target areas on line using



the thermal camera's control interface. They can also set the highest temperature threshold value for each ROI. When the temperature threshold value is exceeded, an alarm signal is transmitted using the Ethernet/IP to the industrial PLC in order to record data and control the alarm indicator. The configuration can also provide historical temperature data. In emergencies it provides workers with a visible indicator. The likelihood of human error when using hand held temperature measurement equipment is also eliminated.

Fire Prevention During the Power Battery Production Process

Battery pack temperatures can trend higher than the ambient temperature by five to six degrees Celsius during the charging and discharge test phases of power batteries. There is a high risk of battery assemblies catching fire if temperature is not monitored.

Manual screening or using ordinary monitors may lead to erroneous observations or omissions due to the sheer number of batteries involved. A viable alternative is a FLIR Axxx-Series thermal camera, which is capable of 24/7 real-time infrared temperature surveillance. The camera clearly shows hot spots on the surface of battery packs during charging without any need for contact with lithium-ion battery packs. An A700, for example, can record the battery pack's surface temperature; an internal temperature can then be estimated from this measurement. The FLIR Axxx-Series is small, compact, easy to integrate, and can be combined with visual cameras to provide continuous temperature monitoring and alarm functions. Whenever there is abnormality in the battery pack, workers can immediately respond to prevent potential fire.



FLIR A700 Advanced Smart Sensor Thermal Camera

Research, Development and Testing for Power Batteries

Lithium Battery Failure Tests

Lithium batteries are an important EV components that—when performing poorly—can directly impact owner satisfaction. Therefore, it is of critical importance, whether for electric vehicles or smart autonomous vehicles, to conduct comprehensive tests on the lithium battery's failure in order that only safe and reliable lithium batteries are used.

One vehicle testing research institute investigated lithium battery failure by installing units on a heating panel to conduct charging and discharging tests. Batteries typically fail when they are heated above 100°C (212°F). Some eject gas and liquid; others may catch fire or even explode. This is why quick, intuitive detection of the batteries' highest temperature is the most important aspect of the testing process.

For their failure tests on lithium batteries, researchers selected a FLIR A655sc thermal imaging camera, which offers a built-in uncooled sensor and a focal plane array (FPA) aperture coupled with 200 Hz high-speed imaging function. This camera integrates easily with GenICam and GigE vision protocols, and can read and display temperatures in real-time while automatically tracking and capturing the highest temperature points in the analytical area. This allows workers to quickly and precisely find the highest failure temperature of lithium batteries.



FLIR A655sc High-Resolution Science-Grade LWIR Camera

Abuse Test for EV Power Batteries

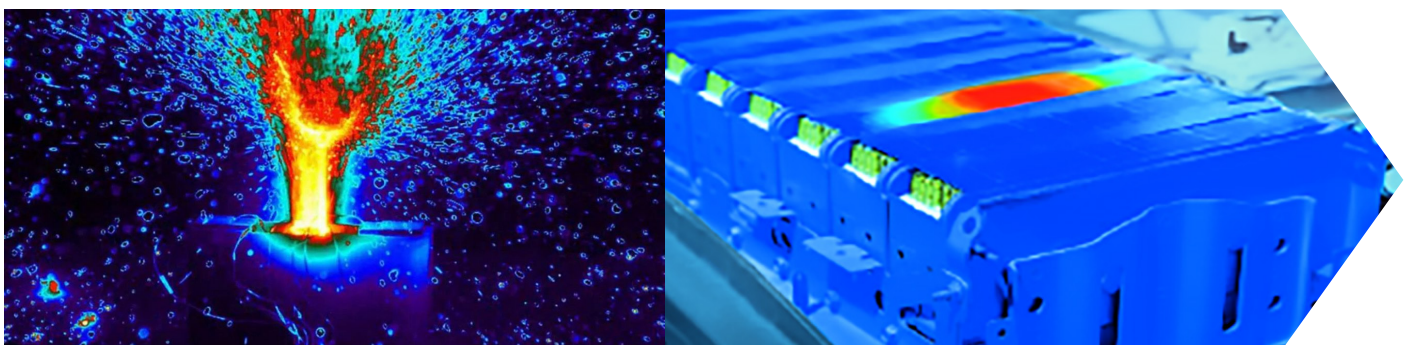
Researchers may also use abuse tests to determine battery limits—exposing them to harsh conditions in order to identify and solve safety issues. For example, they may investigate the likelihood that surrounding materials will catch fire if a battery combusts, and how fast that happens. This type of testing requires simulation of the worst-case scenario by comprehensively collecting temperature data, based on which one would be able to anticipate the consequences.

In order to collect relevant data from an abuse test, such as a pinpoint test, researchers would need a high-speed, high definition thermal camera such as the FLIR X8580. It allows research workers to clearly assess temperature distribution, short-circuiting, and the state of heat dispersion for the batteries throughout the entire process.

The FLIR X8580 combines 1280 × 1024 resolution and up to 181 Hz programmable frame rate. This would allow researchers to record every dynamic detail of high-speed events in the pinpoint test or rapid changes in the batteries' temperature, whether they are in a laboratory environment or within the testing range. Additionally, with its four-position motorized filter wheel and support for FLIR motorized focus lenses, the FLIR X8580 would provide higher quality recordings, save time, and mitigate frustration in dynamic acquisition environments.



FLIR X8580 High Definition MWIR Science-Grade Camera



Automatic Smart Detection Systems for Electric Vehicles

Modern new-energy manufacturers are generally equipped with automated facilities on their assembly floor, including those for skylights, windows, and tires. Some manufacturers even have automated assembly stations for dashboards, frame-less doors, plastic tailgates, chassis, and power batteries. Given the level of automation, how can manufacturers ensure product quality during automated assembly?

FLIR fixed-mount automated monitoring solutions can help manufacturers discover problems in time to avoid non-compliance during assembly of vehicle parts. Take battery assembly as an example. Before the assembly of a work engine, the traction battery usually has certain amount of charge. This is because completely discharged batteries can cause problems for manufacturers and consumers, including reduced battery capacity, increased consumption speed, and potential fires caused by short circuiting.



FLIR A70 Fixed-Mount Thermal Camera

Enterprises can choose preventive detection solutions to prevent serious damage due to batteries catching fire. Not only can such solutions prevent battery fires in advance, they can also carry out 24/7 real-time detection of issues concerning batteries on the assembly line, thus avoiding omission during manual quality-inspection.

It is possible to integrate the FLIR A50/A70 fixed-mounted thermal imaging camera with the automated inspection system. Its compact, robust unit makes it very easy to install and integrate, and its outstanding performance ensures that the inspection system clearly sees every component in each battery, and when a battery issue arises, it promptly emits an alarm to alert workers. It can also ensure that equipment with a temperature that exceeds the acceptable threshold value is rapidly taken off line or disposed in a hazard-free manner to avoid physical damage or harm to the company's reputation.



Quality Control & Design Optimization for Vehicle Spare Parts

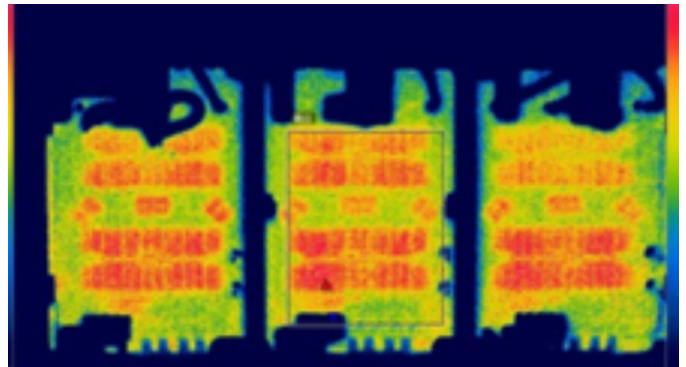
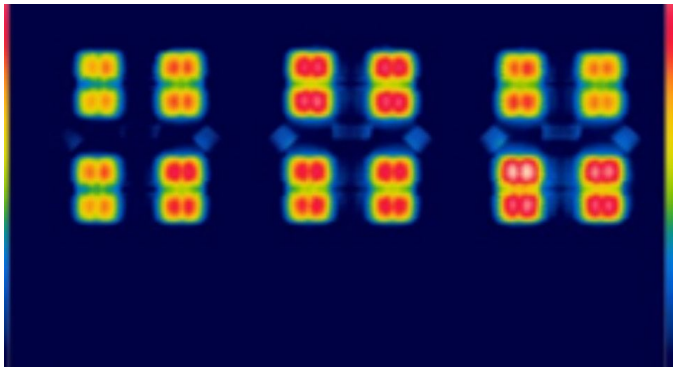
Quality is an important factor consumers consider when purchasing electric vehicles. They also compare the vehicle's brand, battery life and driving experience with that of other brands. Insofar as it involves personal safety, electric vehicle manufacturers and their suppliers can elect to use FLIR infrared cameras in their research and quality-control processes to monitor the temperature of every component of an electric vehicle, significantly improving work efficiency and product quality. They are displayed in the following aspects:

IGBT Design for Electronic Control Systems

IGBT is at the core of a electric vehicle, functioning like a brain. It boasts high technological contents, being generally subject to several thousands of volts in a distance of millimeters, and several thousand amperes of electric current at a sub-micron level. IGBT research units generally use a FLIR A615/A655sc infrared camera equipped with microscopic lens to record heat-emission process of IGBT in high working frequencies (the product supports 50 Hz @ 640 × 480, 100 Hz @ 640 × 480 and 200 Hz @ 640 × 240), allowing workers to carry out supplementary design of its safety and heat-control capability.



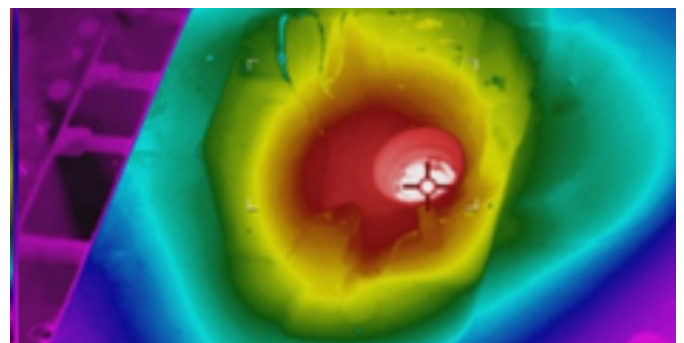
FLIR Axxx-Series Fixed-Mount Thermal Cameras



A vehicle power semiconductor company under SAIC is the major supplier of IGBT to electric vehicle manufacturers in China. Its laboratory is equipped with FLIR A615 with a 50 μ m lens. The camera records heat emission by the power parts in a simulation of an assembled vehicle, enabling workers to optimize temperature-control design to ensure product safety under vehicular conditions.

Lightweight Body Design

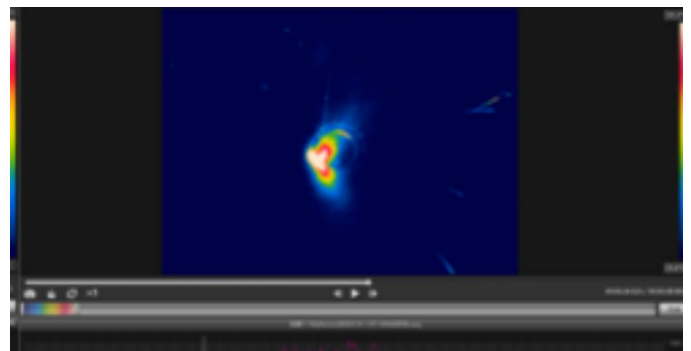
An electric vehicle's body weight has an important impact on battery life. Vehicle spare parts design and production companies can choose to use the FLIR A700 Smart Sensor thermal imaging camera to undertake testing and temperature control of casting molds in order to ensure evenness of temperature during mold-making. This will lay a good foundation for the product's quality and evenness of materials.



Mold-making.

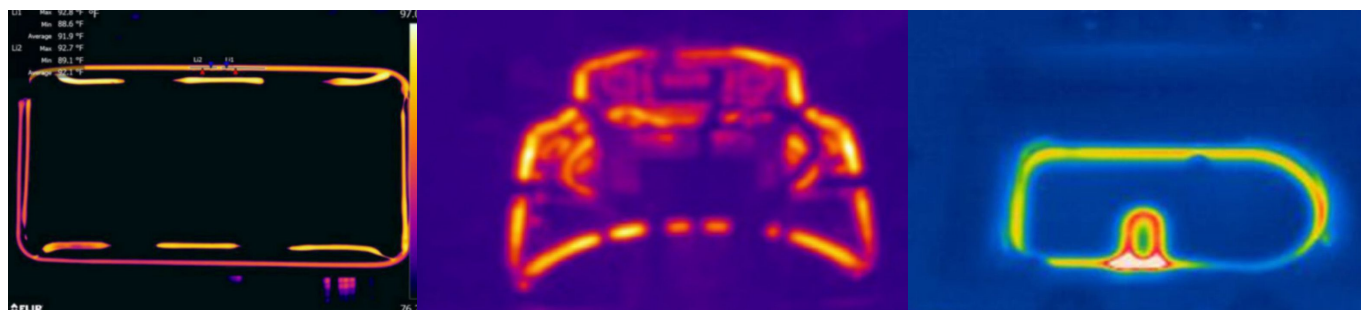
Chassis Welding Quality

As power batteries are typically installed on the vehicle's chassis, it is critical for manufacturers to note the vehicle's ability to bear the batteries' load and to prevent them from scratches and impact. With respect to production and processing of a vehicle's battery-bearing part, vehicle parts manufacturers can choose the FLIR A400 fixed-mounted thermal imaging camera to inspect welding quality on the vehicle's chassis, ensuring that the welding is stable and reliable, and improving battery-bearing safety.



Vehicle Adhesion Inspection

Modern car panels are made of a combination of a metal layer on top and a structural adhesive layer underneath, with the respective layers being joined together by a sensing structure. However, this is a complex process. The temperature has to be just right in order for the adhesive to act properly. Then there are plastic parts such as the dashboard and defroster grilles. Their surfaces need to be heat-melted for adhesion. Similarly the vehicle's skylight needs to be air tight: the sealant's volume and placement quantity need to be strictly controlled.



Heating of vehicle metallic parts.

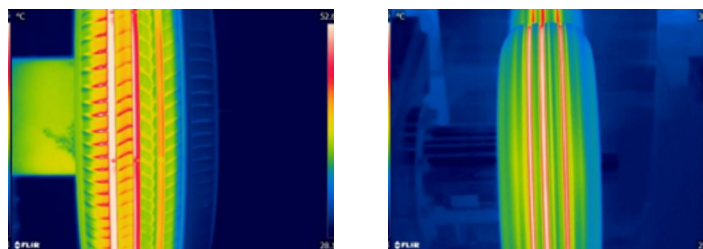
Vehicle dashboard.

Monitoring of air tightness of vehicle skylight.

For air tightness of the above components to meet high manufacturing standards, car-makers can choose the FLIR A70 thermal imaging camera to monitor temperatures throughout the adhesion process, ensuring there isn't a failure of adhesion or formation of gaps due to excessively high or low temperatures. The camera can also promptly show uneven shapes, uneven temperature distribution, or changing gradients so quality engineers can easily discover and correct production line errors.

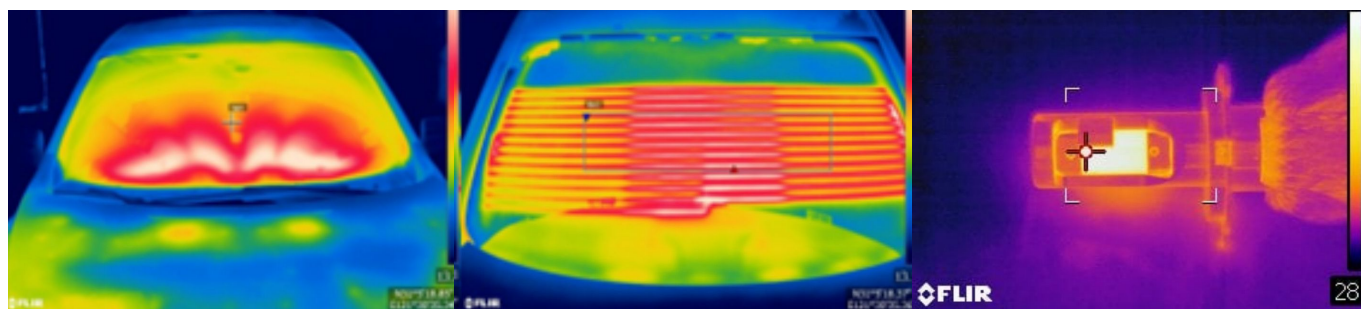
Tire Durability Test

The issues of mileage anxiety and charging time are common for the vast majority of electric vehicle owners, which is why battery life is a critically important factor to consider. Modern-day electric vehicles are typically not designed to carry spare tires. This means that safety test for their tires is highly critical. Tire companies can choose the FLIR A500 Image Streaming camera to test and record temperature distribution on the tire's surface during simulated acceleration and high-speed movement of vehicles, in order for them to monitor and study the tire's temperature anomalies. Such tests will ensure the availability of visible data on the tire's safety and durability, significantly helping its quality control and design optimization.



Research of general vehicle equipment

Enterprises engaging in the research, development and manufacture of electric vehicles can use FLIR A50/A70 research kits to conduct multi-faceted, long-duration, and refined tests on steering wheel heating, air-conditioning system design, safety air bags, in-vehicle temperature tolerance, window heating and defrosting, and vehicle lighting research. They provide powerful assurance for product quality, enhancement of the assembled vehicle's quality and reliability of product components.



Window heating and defrosting.

In-vehicle temperature tolerance.

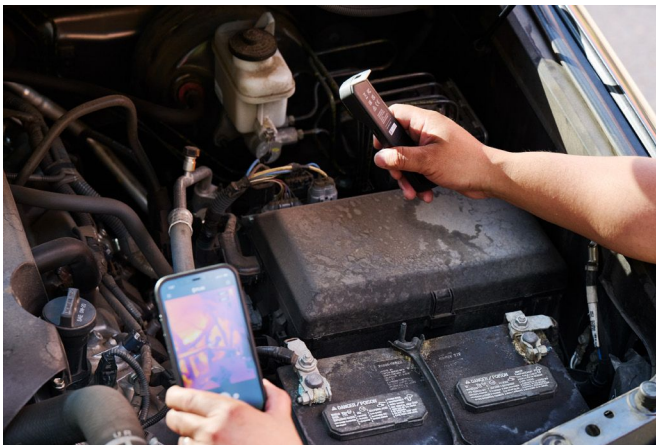
Vehicle lighting research.

Identifying Hidden Malfunctions During Vehicle Maintenance

All vehicles inevitably encounter minor faults that require repair. In addition to relying on their experience, car repair technicians or home repair pros can use outstanding testing tools such as the FLIR ONE® Edge series of handheld thermal imaging cameras. An Edge can help users find details invisible to the naked eye and precisely identify fault points. Examples include:

Detection of vehicle exhaust leakage: Using FLIR ONE Edge Pro to check for exhaust leakage, inspection staff can easily scan manifolds, pipelines and visible connections between joints and washers. The thermal imaging camera can display temperature changes which may indicate existing exhaust leakage.

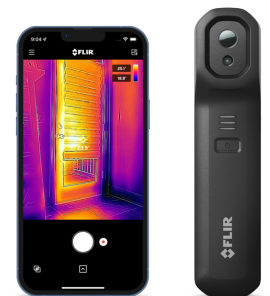
Diagnosis of catalytic converter: The FLIR ONE Edge Pro features a wireless design that allows vehicle inspection staff to move at will around the vehicle to capture detailed thermal images of catalytic converters from different angles, without being limited by electric cables or physical connections.



Inspection of brake drum: Traditional brake drum inspections can pose some difficulty as access to the area is cramped and there is little visibility. The FLIR ONE Edge Pro connects to a smart device via wireless transmission, meaning inspection staff can monitor the camera feed on their phone while moving freely around a vehicle and capturing detailed thermal images from inside small spaces. The FLIR ONE app automatically uploads thermal imaging data to the FLIR Ignite™ cloud for immediate viewing on a smartphone or computer, allowing a repair team to analyze temperature distribution across the brake drum and identify potential anomalies such as uneven heating, overheating, or wear-and-tear.

Examine heating components of the defroster grille: It is extremely dangerous for the heating components of defroster grille to encounter problems in cold weather conditions. The FLIR ONE Edge Pro's wireless transmission feature enables vehicle repair workers to precisely locate, conduct diagnosis of, and repair potential problems such as faulty or inefficient heating components and abnormally hot or cold spots in a shorter time.

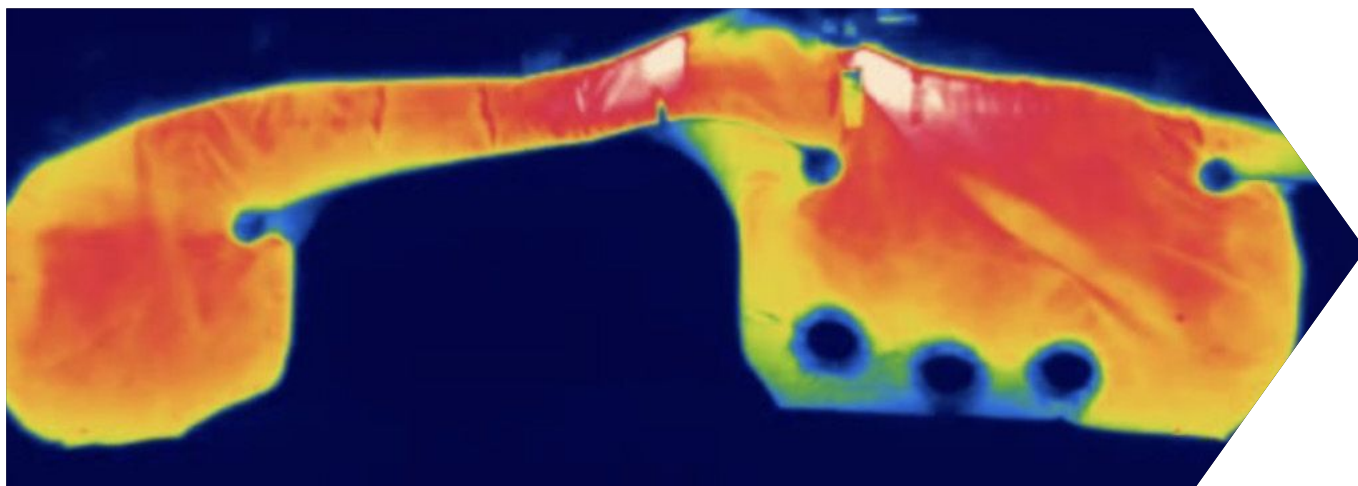
Solve air conditioner problem: For air conditioner systems which are concealed in the vehicle, vehicle maintenance workers can use the wireless function of the FLIR ONE Edge Pro to simultaneously view two sections of the system. This enables workers to quickly find potential problems affecting the air conditioner system like overheating, leakage or blockage of refrigerant.



FLIR ONE Edge Pro

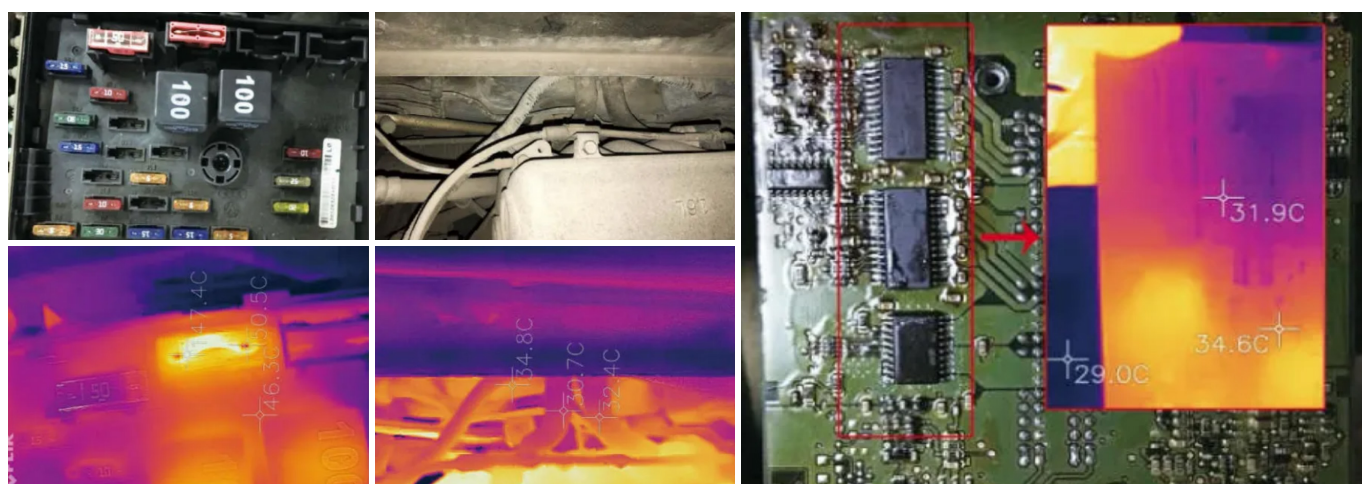


Possible leakage in air conditioning system. Normally working air conditioning system

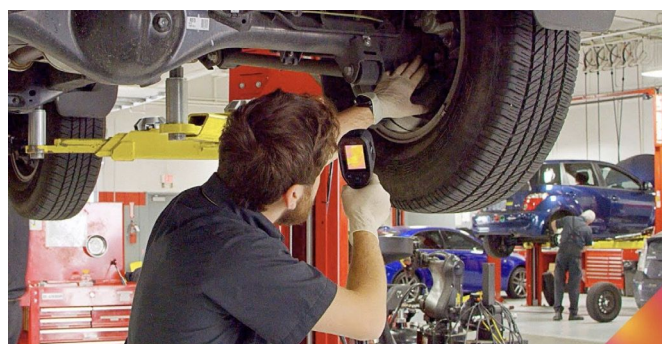


Using an infrared camera to monitor air bag detonation tests.

Inspection of minor vehicle parts: It's not always possible to pinpoint faults in the circuit board controlling a vehicle's turn signal lights, engine coolant apparatus, or air conditioning blower. FLIR ONE Series cameras offer Multi-Spectral Dynamic Imaging* (MSX[®]), a function that adds visible light details to thermal images in real time for greater clarity. Coupled with VividIR[™] image processing, these unique features improve image detail so users can quickly find minute faults.



Other vehicle repair issues: Diagnosing minor problems related to brake calipers, thermostat blockage, or engine fire can take a lot of a vehicle technician's time. Handheld thermal imaging cameras such as the FLIR TG275—designed specifically for automotive diagnostics—can speed up inspections, allowing technicians to quickly identify failing systems, conduct non-contact measurement of hot or cold spots, promptly find and eradicate faults, and discover problems such as overheated exhaust pipes, brake pads, turbo chargers, and electric vehicle battery faults.



*Patent No.: 201380073584.9

FLIR Recommended Products and Services

Automation and Industrial Safety Solutions

FLIR provides thermal imaging cameras, software, and services to help power your condition monitoring, early fire detection, or process control monitoring system.

Industry 4.0 Solutions



FLIR AX8

Combining thermal and visual cameras in a small, affordable package, the AX8 provides continuous temperature monitoring and alarm for uninterrupted condition monitoring of critical electrical and mechanical equipment.



FLIR A50/A70 Smart Sensor

FLIR A50/A70 Smart Sensor cameras integrate seamlessly into existing systems, offering comprehensive visual temperature monitoring with on-camera analytics and alarm capabilities.



FLIR Axxx-Series Smart Sensor

FLIR A400, A500, and A700 Smart Sensor cameras are designed for safety and automation applications where networking capabilities and compliance with networking protocols are the mission.



FLIR A500f/A700f Advanced Smart Sensor

FLIR A500f/A700f thermal systems offer on-camera analytics and alarm capabilities within a housing designed to withstand harsh elements, for reliable outdoor condition monitoring and early fire detection.



FLIR A655sc

A655sc helps engineers and researchers carry out real-time quantitative analysis of thermal images, leakages, dissipation, and other factors pertaining to heat generated by equipment, products, and processes.



FLIR Axxx-Series Image Streaming

FLIR A400, A500, and A700 Image Streaming cameras are plug-and-play devices with third-party machine vision software (such as NIs IMAQ Vision™ and MVTec Halcon™).



FLIR A6700/A6750

Powerful, cooled FLIR A67xx-Series thermal cameras can help you see minute temperature differences, capture high-speed processes and thermal events, and synchronize with other measuring devices



FLIR X-HS Series

The FLIR X-HS series features full frame high-speed image transmission, SSD expanded recording function, seamless data transmission and a precise time-series system.

Software

FLIR offers a set of software tools and utilities to help companies fully integrate our products into working systems for condition monitoring, early fire detection, and process control monitoring/quality assurance. To learn more and to download updates, visit flir.custhelp.com

IP Config

Practical programs for using Internet-connected thermal imaging camera and IP address setting, available for download from the FLIR Technical Support Center.

FLIR Research Studio

Robust recording and analysis capabilities paired with intuitive user interface for research and development applications. Advanced premium software offering a simplified workflow for simultaneously displaying, recording, and evaluating data from multiple FLIR thermal cameras for quick understand and analysis of key information.

FLIR Atlas SDK

Software development kit that allows developers to create custom applications supporting communication, streaming, and recording using Gigabit, RTSP and USB interfaces. Provides developers full access to the radiometric data of individual pixels.

FLIR GigE Vision-compatible SDK

Pleora eBus SDK or FLIR GEV Demo sample are downloadable from FLIR Custhelp for application development.

GigE Vision and GenICam-compatible

Third-party imaging processing software programs support the equipment's visual camera standard.

Industrial Protocol Support

FLIR Smart Sensors

- Easy web configuration interface
- FLIR Atlas SDK
- Ethernet IP
- Modbus client* and server
- MQTT
- REST API
- Digital I/O
- PTP (IEEE 1588)
- ONVIF“S” video and alarm

*requires Advanced Smart Sensor configuration

Accessory Solutions

With the rapid and ever-changing needs of modern business, it's important to invest in accessories that are flexible enough for a range of applications. FLIR offers a comprehensive range of accessories and equipment.

Optics

From microscope lenses with a resolution of 3 μm to 1 m telescopes, FLIR can supply all high-quality optical accessories you need.



Mounts and Stands

FLIR offers multiple options for mounting camera systems, including tripods and microscope stands.

Cables and Connectors

FLIR supplies a wide range of accessories including a fiber converter, fiber cable, power cable extender and Camera Link PC for all your application needs.

After-Sale Service

Because FLIR designs and manufactures thermal imaging cameras from the sensor up, we can quickly troubleshoot and effectively service all aspects of the hardware and software. FLIR provides after-sale warranty extensions plus calibration and service agreements.

FLIR CARE—this calibration is offered in two packages: FLIR CARE+, an inspection service for all types of instrument indicators, and FLIR CARE PRO, an inspection service for instrument indicators and adjustment services (including temperature calibration).

FLIR PROTECT—offers protection to your equipment for additional three years after expiration of the factory warranty, so you need not worry about material defects and faults. (Note: man-made damage is not covered by warranty-repair.)



Handheld Infrared and Acoustic Imaging Solutions



FLIR T-Series Professional Thermal Imaging Cameras

The T-Series high sensitivity and resolution proves helpful in discovering hidden design defects. The cameras offer a relatively wide temperature range, making it easier to quantify heat-emission and heat-dissipation of the object under testing. Measurement accuracy of 1°C/1% increases quality assurance and raises the factory acceptance rate for products like power batteries. The 180° rotating optical block improves ergonomics, making it easier to image target objects at any angle. FLIR T series cameras are fitted with an interchangeable AutoCal smart self-calibration lens, so there is no need for recalibration by the factory.



FLIR Exx-Series Advanced Thermal Imaging Cameras

FLIR's Exx-Series offers exceptional resolution and measurement performance, enabling their users to quickly identify hot spots and discover potential fault points in power distribution and mechanical systems. This series features resolution of up to 640 × 480 pixels, as well as a clearer LCD panel. Diagnosing problems is easier than before, with excellent detection results even at longer distances. Its robust, durable and intuitive thermal camera helps avoid expensive machine-stoppage and production delay through regular preventive maintenance work



FLIR Ex Pro-Series Thermal Imaging Cameras

The Ex Pro brings a higher level of image clarity to the Ex-Series, with a larger, 640 × 480 touchscreen and the advantage of FLIR MSX[®] technology, which embosses visual details on the thermal image for rapid identification of problems. 1-Touch Level/Span replaces manual adjustment to improve inspection efficiency. Use FLIR Ignite[™] cloud service to edit, store, organize and share images, as well as create quick reports that can be shared with a team. This camera is also compatible with FLIR Thermal Studio Suite for advanced analysis and custom reporting from a PC.



FLIR TG275 Thermal Camera for Automotive Diagnostics

The TG275 is designed to help accelerate automotive maintenance and diagnostics, so technicians can easily find hidden problems and troubleshoot failures. Featuring Infrared Guided Measurement (IGM[™]), this advanced spot temperature gun combines non-contact temperature measurement with thermal imaging to help you spot potential faults and record images that will reassure your customer that the problem has been fixed. It's ideal for diagnosing problems in relays and switches, parasitic drain on the battery, drive train components, HVAC system (vents), and much more.



FLIR ONE[®] Edge Series

The edge offers wirelessly connectivity to your smart device, so you can inspect within tight spaces or at awkward angles while monitoring the image in real-time from your smartphone or tablets. Use the FLIR ONE app for efficient thermal analysis, and seamlessly connect to the FLIR Ignite cloud solution.



FLIR Si2-Series Industrial Acoustic Imaging Cameras

FLIR Si2 is an intelligent, easy-to-use professional acoustic imaging system designed to visually show leaks in compressed air systems, display partial discharge problems in high-voltage electrical systems and faults in mechanical bearings. This lightweight, one-handed acoustic image camera can help utility, manufacturing, and engineering professionals identify efficiency loss and potential failures up to 10 times faster than traditional methods.

World-Class Thermal Imaging Training

The greater your knowledge of thermal imaging, the greater the dividends you'll realize for your company and your career. That's why the Infrared Training Center (ITC) offers classes for utility industry applications—from free, online courses to advanced certification training.

ITC Courses

ITC thermography certification courses help prepare you to take a leadership role in an infrared inspection program. Level I courses certify that you know how a thermal imaging camera works and how to use it. Level II courses crank up your credibility with more in-depth concepts and intensive labs. Level III courses assert that you have the knowledge and skills needed to develop and administer your company's thermography program. These courses offer strong validation to support the work you do as a thermographer.

ITC offers training classes at training centers around the globe, at training locations within your country, at your company's facility, and also online courses. On-site training is encouraged if your company needs to certify a group of 10 or more. ITC's on-site training courses are the best way to accommodate a large group on a limited budget. Our instructors will travel directly to your facility to limit your travel costs by keeping staff on-site, reducing downtime and staff shortage issues.

For more information about on-site training, visit www.flir.com/support-center/training.



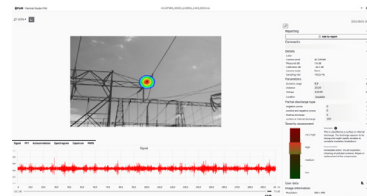
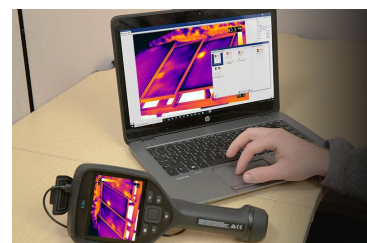
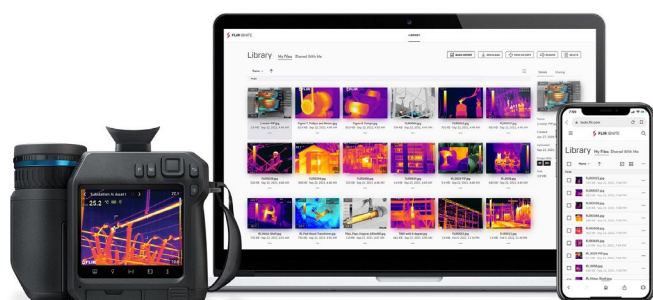
Software and Cloud Solutions for Handheld Cameras

FLIR Research Studio—Designed according to your work, it offers powerful recording and analysis functions with an intuitive user interface for all types of research and application cases. The advance thermal analysis software provides simplified work flow and can simultaneously display, record and assess data from multiple FLIR thermal imaging cameras, enabling you to rapidly interpret and understand key information.

FLIR Thermal Studio Suite—FLIR Thermal Studio Suite can help users simplify inspection, organize data, and manage thousands of thermal images and videos, whether they are taken using handheld thermal imaging cameras, unmanned aircraft systems (UAS), acoustic imaging cameras, or optical gas imaging (OGI) cameras. The subscription-based software provides the advanced processing capability required for preventive maintenance of critical components, system fault troubleshooting and increased productivity. Upgrade to Thermal Studio Pro for access to FLIR Route Creator, which allows users to create their own inspection plans to download and run from a FLIR thermal imaging camera (Inspection Route activated). The thermal imaging camera will then guide the user through the inspection according to a logical sequence, adding a reference image for each asset. This will ensure accurate data collection, and help the thermographer to determine the potential fault based on the heating trend.

FLIR's Software Development Kit (ATLAS SDK)—allows customers to use their Computerized Maintenance Monitoring Systems (CMMS) to support read-out of thermal measurements as well as inclusion of METERLiNK data embedded with the image, GPS, information on location, and other important parameters, and connect that data to third-party software systems.

FLIR Ignite™ Cloud—This safe cloud storage solution gives you a seamless experience when directly uploading and editing images for quick reports, storage, and sharing. Enabled in FLIR ONE, Cx-Series, Ex Pro-Series, Exx-Series, and T-Series thermal cameras.





For more information or to find your local support number, visit: flir.com/contactsupport

Specifications are subject to change without notice

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