moviTHERM
advanced thermography solutions

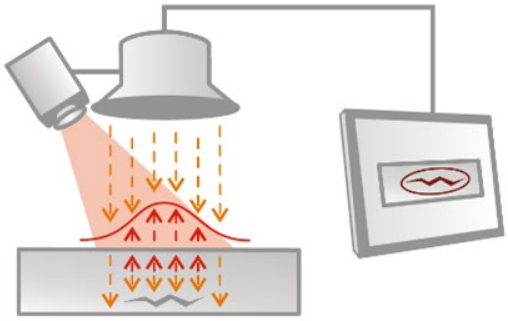
irNDT

Active Thermography Solutions for Non-Destructive Testing

MoviTHERM's infrared non-destructive testing (irNDT) systems use active thermography for the reliable detection of delaminations, impact damages, "near side" defects, water inclusions, debondings, and other defects.

The system achieves precise measurements and is **ideal for inspecting composites, metals, semiconductors, microelectronics, batteries, and ceramics**.

Our irNDT system accommodates a wide range of irNDT measurement methods, including **Flash-Thermography, Lock-In Thermography, Transient Thermography, and Vibro-Thermography**. It also works with multiple excitation sources and with cooled or uncooled infrared camera systems.



Benefits:

- Non-contact irNDT
- Works with cooled and uncooled IR Cameras
- Compatible with multiple irNDT methods
- Effective even on low emissivity targets
- Modular hardware and software
- Configurable for different geometries and materials.

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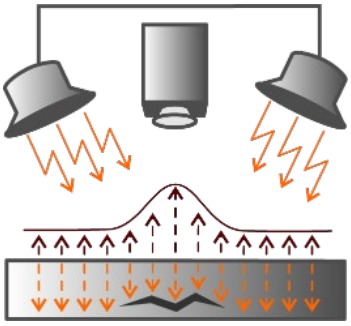
What is Active Thermography?

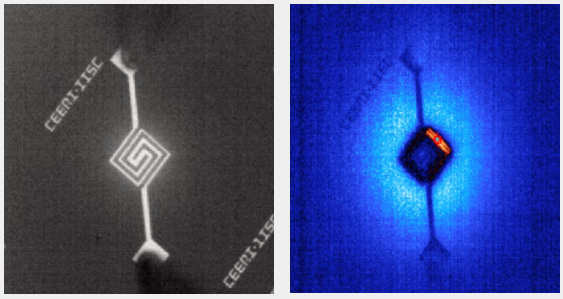
Active thermography is an effective method for non-destructive testing of materials involving the induction of heat flow in a test object by external excitation. The heat flow within the test object is influenced by internal conditions and measured on the surface by an IR camera. This technique detects the smallest surface defects and internal structural defects under the surface.



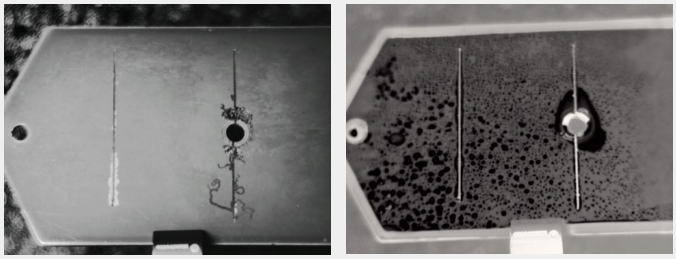
Active vs Passive Thermography

Active and passive thermography are techniques used for detecting heat patterns and abnormalities in various applications. While passive thermography relies on naturally occurring temperature changes, active thermography introduces an external energy source to create thermal contrast. Some benefits of Active Thermography include:

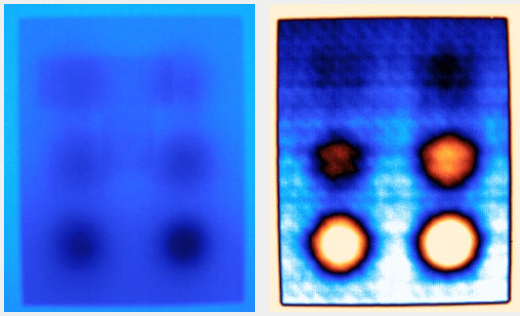
- Higher Sensitivity: Active thermography is more sensitive to thermal differences, leading to precise detection of defects.
- Controlled Conditions: This method offers adjustable testing conditions, yielding consistent results.
- Versatility: Active thermography can be used on various materials.
- Depth Analysis: It enables better depth analysis for detecting under-surface flaws.
- Reduced Environmental Dependence: Its reliance on external energy reduces dependency on environmental conditions, increasing reliability.
- Quantitative Analysis: It can provide numerical data about material properties and defects.
- Detects Subsurface Defects: It can reveal defects beneath the surface that are not detectable with passive thermography.
- Non-Destructive Testing: It provides valuable, damage-free insights.



Passive (left) and Active (right) imagery of a microelectronics circuit.



Passive (left) and Active (right) imagery of under-paint corrosion.



Passive (left) and Active (right) imagery of a composite test sample.

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Active Thermography Excitation Sources

Active Thermography employs various excitation sources to introduce thermal contrast in the test object. These sources introduce heat to the material in different ways, and the choice of excitation source will depend on factors such as the material properties, the nature of the potential defects, and the specifics of the testing scenario.

Halogen Lamp

Xenon Lamp

Ultrasound

Power Supply

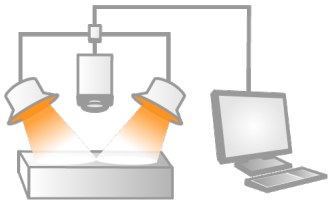
Eddy Current

Laser

Active Thermography *ir*NDT Techniques

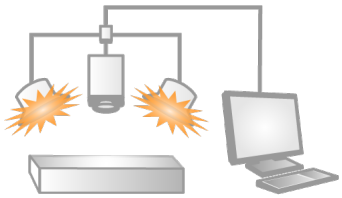
Active thermography refers to non-destructive testing techniques where an external energy source introduces thermal contrast into a test object. This approach is primarily used to detect and characterize defects within a material or to examine its thermal properties. Each technique has its strengths and weaknesses and is best suited to specific applications or types of materials.

Transient



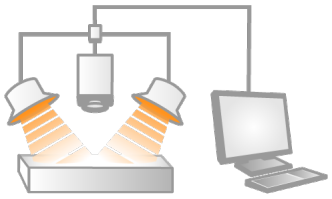
Halogen light is used to create an extended heat excitation. Thermography analyzes the change in the thermal state of the target. Used to reveal deeper defects.

Flash



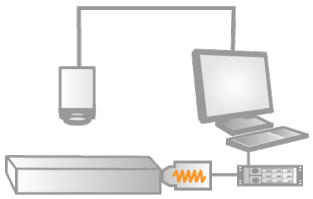
Uses a xenon light source for short, intense excitation. Acquired IR Images are processed, and shallow defects are identified. Is well suited for materials with high thermal conductivity.

Lock-In



A modulated excitation source is synchronized with the IR camera image acquisition. The software generates an amplitude and phase image to indicate the location and nature of the defect.

Vibro



Ultrasound is used to excite the specimen. Friction between vibrating cracks creates heat signatures measured by the infrared camera.

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Materials, Detection, NDT Technique, and Excitation Source

The table below describes the types of defects that can be detected with active thermography for various materials using different NDT techniques and excitation.

Inspection Material	Detection	NDT Technique	Excitation Source
Composites	Surface defects, Internal subsurface defects, voids, disbonds, delaminations, water ingress.	Transient	Halogen Lamp
	Surface defects, delaminations, cracks, porosity, disbands.	Pulse	Xenon lamp
	Small surface defects, small subsurface defects, delaminations, voids, disbonds, inclusions.	Lock-in	Halogen Lamp
Metal	Welded Seams, corrosion, fatigue damage, inclusions, voids, cracks.	Pulse	Xenon lamp
	Welded Seams, corrosion, fatigue damage, inclusions, voids, cracks.	Transient	Ultrasonic Horn Eddy current
	Fine defects, cracks, voids inclusions.	Lock-in	Ultrasonic Horn Eddy current
Semiconductor	Cracks, shunts, delaminations, inclusions, voids, dislocations, defective junctions.	Lock-in	Halogen Lamp
Microelectronics	Shorts, faulty components, current bleed.	Lock-in	Programable Power Supply
	Micron size defects.	Lock-in	Laser
Batteries	Electrode contamination, coating thickness variation, cracks, fractures.	Pulse	Xenon lamp
	Electrode tab weld quality, cell weld quality.	Lock-in	Programable Power Supply
Ceramics	Cracks.	Transient	Ultrasonic Horn

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MoviTHERM Active Thermography NDT Solutions

Modular NDT Systems

The MoviTHERM *ir*NDT modular system is a versatile non-destructive testing solution that supports multiple techniques and excitation sources. Its modular software platform facilitates various NDT methodologies, such as transient, pulse, and lock-in techniques, offering customization based on testing requirements. Compatible with cooled and uncooled infrared camera technologies, it suits diverse environmental conditions and needs. As a scalable system, it can expand to meet evolving testing requirements. Its flexible design adapts to various packaging configurations, making it ideal for lab and field settings.

Portable NDT Systems

The MoviTHERM portable *ir*NDT system is a compact and powerful non-destructive testing tool. It combines uncooled camera technology with intelligent halogen excitation, optimizing its size, weight, and power without compromising testing accuracy. Its tablet-based processing simplifies remote testing and data collection, offering a user-friendly interface and seamless operation. This blend of technologies makes the MoviTHERM portable system a highly effective, efficient, and convenient tool for diverse testing environments and applications.

*ir*NDT for Robotic and Automated Inspection

The MoviTHERM *ir*NDT for automated inspection is a compact, robust solution for robotic installations and automation applications. Utilizing uncooled camera technology and intelligent halogen excitation, it optimizes its size and longevity, proving resilient even under rigorous use. Designed for seamless integration with automated processes, it delivers reliable non-destructive testing, offering precision, repeatability, and durability.

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