



IRNDT

Systems for Non-Destructive Testing with Active Thermography

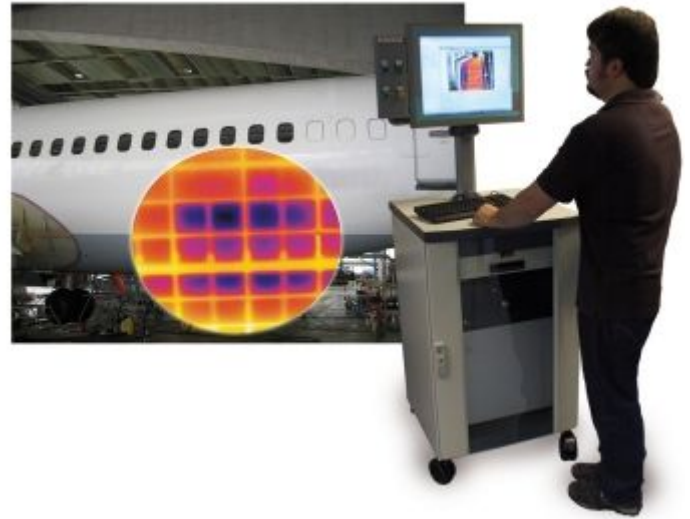
- Contactless Quality Control
- Fast, Large-Area Scans
- Modular Architecture enables Performing Lock-In, Pulse, Transient and Vibro Thermography Measurements, as well as TSA
- Supports a Wide Variety of Excitation Sources, e.g. Halogen Lamps, Flash Lamps, Laser, Ultrasound, Eddy Current, Among Others
- Presets of Inspection Parameters for the Analysis of the Most Common Materials

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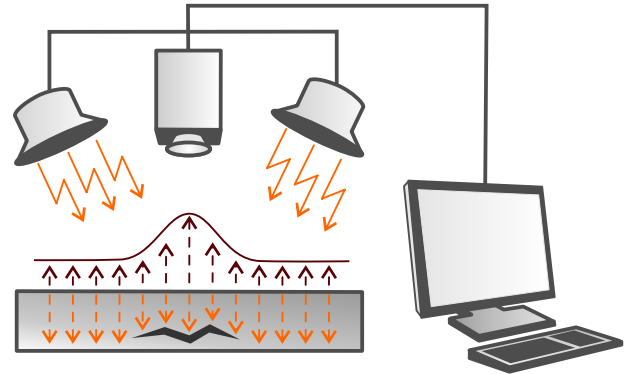
IrNDT is a modular solution for non-destructive testing that supports all known NDT techniques based on active thermography:

- Lock-In Thermography
- Pulse Thermography
- Transient Thermography
- Vibro Thermography
- Thermal Stress Analysis (TSA)



The Measuring Principle

A heat source gives the inspected material a thermal excitation. The flow of thermal energy through the material has a direct influence on the temperature development on the object's surface. This temperature development is recorded over a certain period of time with an infrared camera and subsequently analysed by the IRNDT software. The software calculates through a mathematical analysis a result image that provides us with information about the internal structure of the material or about possible defects in it.



Main Features of IRNDT



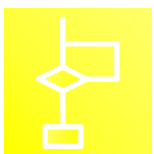
Non-Destructive Testing of Components



Modular Software Architecture enables Easy Upgrading of System Solutions



Support of all Typical Excitation Sources for Thermographic NDT Solutions



Flexible Measuring and Evaluation Algorithms for Application-Specific Systems



Graphical Interface for Easy Set-Up of Measuring Parameters



Presets of Parameters for the Inspection of the Most Common Materials



Integrated Script-Engine for the Creation of Macros for solving Complex Inspection Tasks



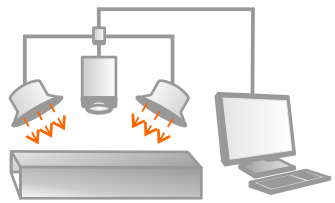
Integrated COM/DCOM Automation Interface for Control and Data Exchange

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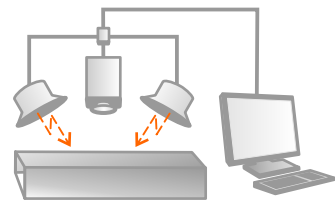
Evaluation modules

Lock-In/Lock-In Online
Evaluation Module for Lock-In Measurements



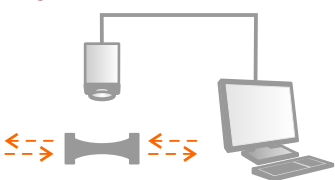
Lock-in thermography utilizes the periodical characteristics of the measuring signal. This enables the filtering of disturbance values and noise signals.

Pulse Analysis
Evaluation Module for Pulse & Transient Measurements



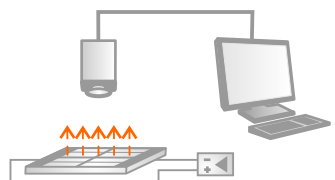
Pulse thermography analyzes a short and strong excitation and is well suited for materials with a good thermal conductivity.

TSA / Lock-In Ref / Lock-In Ref Online
Evaluation Module for Lock-In Measurements with Reference Signal for Thermoelastic Stress Analysis



TSA inspects the mechanical stress of components by the thermoelastic effect.

SolarCheck
Evaluation Module for Inspection of Photovoltaic Cells



SolarCheck tests elementary processes of a photovoltaic cell because they always involve heat dissipation.

Depending on the inspection task, the IRNDT base package is complemented with one or more evaluation modules. The different inspection methods differ not only by the type and use of the excitation source, but also by their mathematical analysis.

By applying different measuring procedures, the system can be optimally adapted to the material analyzed. As a result, customers receive compact and cost effective solutions that can be upgraded anytime.

Inspection Examples

	Lock-in Online	Lock-in	Pulse/Transient		TSA	Inspection Task
			Short	Long		
Halogen Lamps/ IR Emitter	✓	✓	-	✓	-	- Composite Materials (Disbondings, Delaminations, etc.) - Foamed Materials (Cavities, etc.) - Leather (Defects, etc.)
Flash Lamps	-	-	✓	-	-	- Metal (Welded Seams, Corrosion, etc.) - Composite Materials (Disbondings, Delaminations, etc.)
Ultrasound	✓	✓	-	✓	-	- Detection of Cracks and Delaminations
Laser	✓	✓	✓	✓	-	- Inspections, where High-Precision Energy Excitation is Required (e.g. for Small Components)
Eddy Current	✓	✓	-	✓	-	- Metal (Cracks, etc.)
Mechanical Excitation	-	-	-	-	✓	- Thermal Stress Analysis (TSA)

✓ = Applicable - = Unapplicable

IRNDT

Technical Specifications

Infrared Cameras	
Supported Cameras	Cooled and Uncooled IR Cameras of Various Manufacturers
Camera Interfaces	Gigabit Ethernet, Firewire (IEEE1394), IRFlashLink
PC	
PC Types	Industry PCs, Laptops (for Mobile Use)
Supported Operating Systems	Windows 8, 7, Vista, XP
Excitation Sources	
Light (Halogen Lamps, Infrared Emitter)	Up to 33kW
Flash Lamps	6kJ - 24kJ
Ultrasound	- Adjustment of Frequency from 15 kHz to 25 kHz - Adjustment of Amplitude from 0 to 100%
Laser	High-Precision Laser with 400µm Fiber Optic Interface, Power 32W, Wave Length 808nm
Eddy Current	DC (Max. Power 5kW), Output Frequency Control: 8 - 30kHz
Mechanical Excitation	Load Frame or Similar
IRX-Box	
Modulation Box for Synchronization of all Hardware and Software Components	
Enables Easy and Compact Measuring Setups	
IRNDT-Software	
Evaluation Modules for Lock-In, Lock-In Online, Lock-In Ref., Lock-In Ref. Online, TSA, Pulse/Transient and Photovoltaic Cell Inspection	
Graphical User Interface for an Easy Creation of Customized Solutions without Programming Skills	
Integrated Report Generator for Easy Set-Up of Inspection Reports, Export of Inspection Data to Matlab, Storing of Inspection Parameters in Workspaces and Storing of Result Images including its Measuring Parameters	
Integrated Script-Engine for the Creation of Macros for Solving Complex Inspection Processes	
Integrated COM/DCOM Automation Interface for Control and Data Exchange	
Measuring and Analysis Properties	
Parameters for the Excitation Source	- Analysis Functions: Pulse, Sinus, Trapezium, Rectangle, User-Defined Function - Rectangle Width at Rectangle Modulation: 0.1 - 99.9% - Excitation Frequency: 1µHz - 50kHz
Parameters for the IR Camera (Depending on Camera Type)	Recording Frequency, Integration Time, Temperature Range, Average Temperature, Detector Window, etc.
Parameters for the Analysis	- Several Analysis Methods, e.g. Lock-In, Pulse and Transient Thermography - Special Functions for Inspection of Photovoltaic Cells and TSA (Thermal Stress Analysis) - Automatic Noise Reduction Functions and Compensation of Exterior Interferences in all Analysis Modules
Administration of Properties	Workspaces allow the Saving of all Properties



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