Infrared-Reflexions

The Infrared Measurement/Thermography Newsletter by InfraTec GmbH

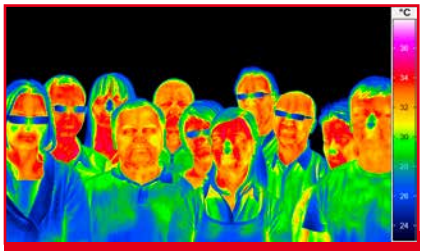
Dear readers and valued business partners,

In the first week of May 2014, I participated as conference attendee, exhibit visitor and exhibitor at the trade fair "Defense, Security and Sensing (DSS)", which is the largest global event for the thermal imaging as well as the thermography market in Baltimore/ USA. For nearly 20 years, this annual event gave me incentives for our own corporate development. For the third time at the trade fair, InfraTec was the only vendor which could present thermographic measurement systems that define the respective commercially available peak values for number of pixels, thermal resolution, IR frame rate, and accuracy for both cooled as well as uncooled technology. With this top-portfolio, we serve our demanding customers who rely on the best technology and highest reliability to solve their most challenging tasks.

Please have a look more closely at some of our new products and learn how our thermographic measurement systems have proven to be successful in interesting fields of application. We thank you for your interest in the infrared technologies and are very happy, if we could give you further suggestions for using thermography.

Kind regards from Dresden,

Dr. Matthias Krauß
Managing Director



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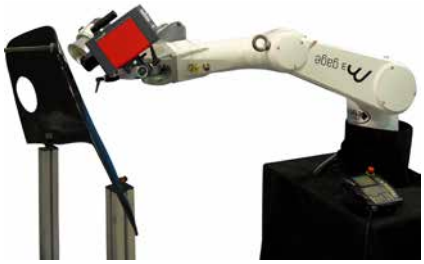
News

New robotic IR test method for reliable thermographic crack detection in complex components

In general, conventional methods for crack detection in complex components such as crankshafts and structurally supporting plastic elements are expensive, not reliable enough and sometimes even harmful to the environment and human health.



Therefore, we work together with numerous partners from industry and research within the framework of the European project "ThermoBot" on a new test method that is based on an autonomous robotic system for thermographic crack detection. This will replace previous methods and thus contribute significantly to future quality improvements and environment protection for the testing of metallic components as well as components made of composite materials in the automotive and aircraft industry.

The peculiarity of the new method is the thermal excitation of the component part by a laser. For the first time, hidden faults in geometrically complicated materials can be recognised with the help of active thermography. It is planned to use the new test method in the manufacturing process as well as for regular maintenance.

Product presentations at worldwide trade fairs and exhibitions

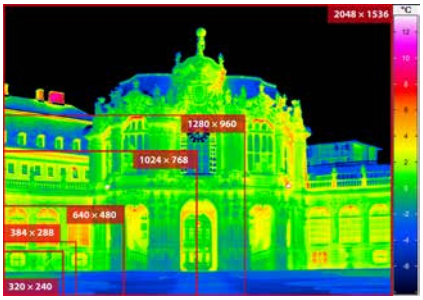
This year we are once again presenting our latest products for thermography at various national and international trade fairs and exhibitions. A special emphasis will apply thereby on increasing our market share in Asia and USA.

The introduction of our latest super-zoom thermal imaging system at the trade fair "SPIE Defence, Security and Sensing" in Baltimore was a great success. In addition, at the trade fair "SPS Industrial Automation" in Guangzhou our employees from our branch in Shanghai presented together with our Chinese distribution partners the latest products for the high-speed camera division. Due to their impressive technical performance features, the professional audience took a great interest in our camera division.

VarioCAM® High Definition – A large Selection of Models to Suit all Demands

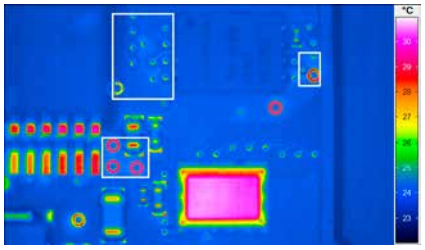
Four image formats and three equipment lines leave nothing to be desired

The new camera model VarioCAM® High Definition offer four IR image formats to choose from. The new available detector format with (640 × 480) IR pixels for this camera series represents the entry to professional thermography. In addition, the models with the detector format of (1,024 × 768) IR pixels provide more than 2.5 times higher pixel resolution and therefore, have currently one of the best native resolutions along radiometric microbolometer infrared cameras. Due to the integrated MicroScan unit, additional image formats of (1,280 × 960) or (2,048 × 1,536) IR pixels are possible. In addition to various image formats, the VarioCAM® High Definition is also available in the mobile equipment lines "inspect" and "research" as well as the stationary option "head". Due to their range of models, the cameras are suitable for operation in almost all application fields.

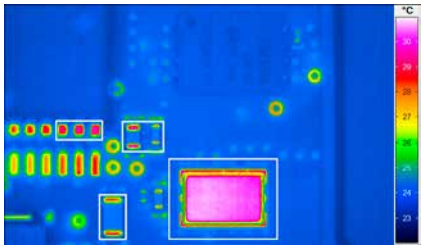


Increased resolution with the new EverSharp function

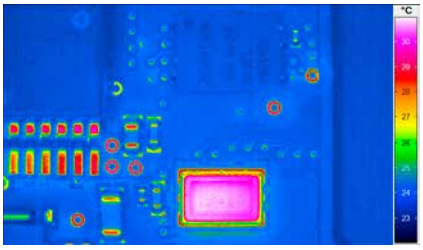
With the innovative EverSharp function all object structures in the image scene are displayed sharply, regardless of how far they are away from the camera or which lens is used. Thermal images with different focus settings are combined automatically by means of special algorithms, so that only the sharp displayed object structures are shown in the resulting thermal image. As a result, the recorded objects in the detailed thermal images are characterised by high image quality.



Without EverSharp, Focus adjustment 1



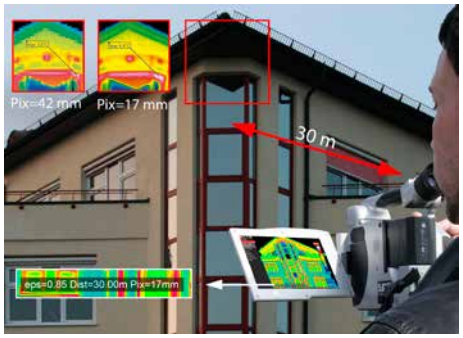
Without EverSharp, Focus adjustment 2



With EverSharp – completely focused

More precise measurement with the help of permanent autofocus and laser-based measurement spot detection

In case of a scene change, the optimal usable integrated permanent autofocus function applies the optimum focus setting accurately, independently and fast. Annoying blurred images are now finally in the past. The integrated laser rangefinder calculates the distance-dependant spot size and the resulting, error-free measurable, object size and displays it in the daylight-readable, large colour TFT screen of the camera. This allows the user to identify the remaining allowable distance to the measurement object accurately, in order to avoid geometric measurement errors.



Why customers choose VarioCAM® HD head

For airborne inspection of power lines, thermography is the best solution because of its reliable detection of small, atypical warming for a targeted and precise identification of problems on insulators and conductors.

The company "swiss controlling", for example, demonstrates with their service for network operators the proverbial Swiss precision and reliability. Even small thermal problems should be detected accurately and efficiently documented. With the der VarioCAM® HD head 880 "swiss controlling" found the ideal thermal imaging camera. The high number of (1,024 × 768) IR pixels not only ensures the accurate resolution of small details, but it also helps to avoid geometrical measurement errors. In addition, the high-quality design ensures a long-term use of the thermal imaging camera. From there, selectively thermal images can be recorded and other devices, such as a visual camera, can be used.

In order to integrate the camera into a gyrostabilised platform (so-called gimbal) for use by helicopter, InfraTec developed an optimised user interface that allows the inspector in the cockpit to control the camera directly by joystick. The fully radiometric thermographic measurement data can be stored individually or as a sequence along with GPS coordinates and other information, such as a visual image, the pole number and a precise timestamp. For the efficient preparation of reports on the state of the inspected high-voltage grids, "swiss controlling" is working with the user-friendly thermograpic software IRBIS® 3 report.

New High-end Camera ImageIR® Models

Always the right camera model for your measurement tasks

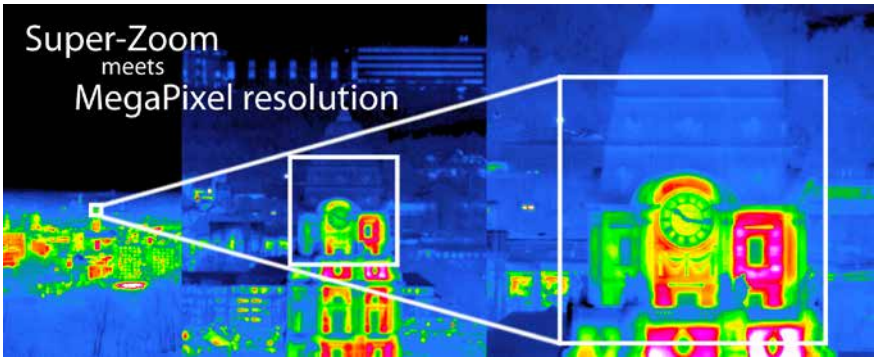
InfraTec's high-end camera series ImageIR® is characterised by outstanding measuring performance and a wide application-oriented variability. The new models of the high-speed camera ImageIR® 8300 hp and the super-zoom thermal imaging system ImageIR® 8300/9300 Z open new possibilities and more flexibility for the high demanding user. Now, they are suitable for almost every field of application for thermography, from process optimization to research and development or safety applications.

All ImageIR® models have an excellent thermal resolution of up to 0.015 K (15 mK), high frame rates of up to 13,000 Hz and extremely short integration times of up to a few micro seconds. Cooled focal-plane-array-photon detectors of different types are used with (320 × 256), (640 × 512) and (1,280 × 1,024) IR pixels that work in snapshot mode. The flexibly configurable basic concept of this series of camera optics, detector and interface modules, allows an individualised system configuration with optimum adaptation of the performance data to the measurement task. An extensive range of precise imaging, radiometric infrared interchangeable lenses, from telescope to normal and wide-angle or macro and microscopic lenses, can be tailored to virtually any measurement situation.

First super-zoom cameras in HD resolution

The latest super-zoom thermal imaging systems ImageIR® 8300 Z and ImageIR® 9300 Z are designed for a variety of demanding thermal imaging applications, which require both flexible screen fields as well as long ranges. They are used for example in border patrol, search and rescue missions, vehicle monitoring, environmental monitoring, wildlife observation and airborne system monitoring. Equipped with ultra-modern, digital InSb detector technology with resolutions of up to (1,280 × 1,024) IR pixels and a frame rate of up to 100 Hz for full screen, the camera delivers sharp thermal images with high resolution in continuous operation, even in fog or smoke.

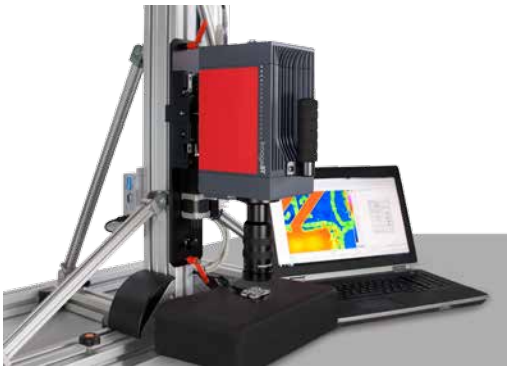
The motorised 30× zoom lens with a focal range of (28 … 850) mm enables quick and flexible adaption to different object distances. With an image field of 0.6°, it allows the recording of detailed thermographic images for extremely long distances. For example, the people-detection range is about 15 km, which can be life-saving during search and rescue missions!



New detector readout technology enables a significant increase in frame rates

The latest InSb detector with modified readout technology is used in the camera model ImageIR® 8300 hp. For the first time, frame rates of up to 250 Hz and (640 × 512) IR pixels are now possible. Compared to previous camera systems in this class, the ImageIR® 8300 hp now achives more than three times faster frame rates. Very fast thermal processes in industry and research can now be completely recorded and analysed with high pixel resolution at the required sharpness.

Accurate temperature measurement on microstructures



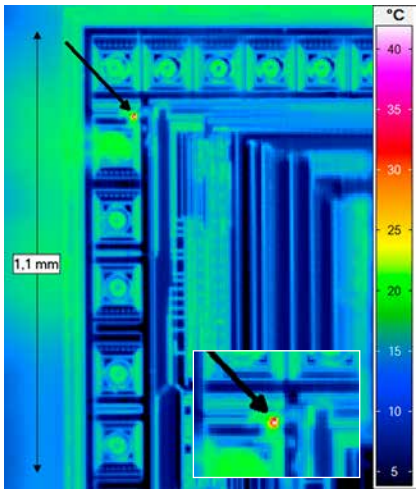
With the new eightfold microscope for the ImageIR® 9300 and ImageIR® 8300 models pixel sizes of up to 2 microns can be achieved. Thus, temperature differences can be accurately measured even on the smallest object structures. With the specially developed motor microscope body, a special mount for precise microthermography, the vibrations that occur when using conventional tripods of thermographic cameras can be reduced. Image field variations caused through vibrations that occur during the study of thermal changes can be further reduced. Simultaneously, high-precision motorised focusing is possible by adjusting the vertical object distance to ± 0.5 microns.

InfraTec's Cameras are used with increasing Success in numerous Applicaton Areas

Thermal optimisation in micrometer range

Due to increasing performance requirements for electronic components, enourmous demands for thermal management at ever smaller scales are placed. The Frauenhofer Institute for Silicon Technology (ISIT), as development partner, supports companies in meeting these growing needs in an optimal fashion.

The ISIT has to detect the smallest possible temperature differences when analysing electronic components. With InfraTec's high-end camera series ImageIR® temperature differences of 15 mK can precisely be measured and securely identify even newly emerging thermal issues. Thus, development failures can be avoided at an early stage. The cameras are available with different detector formats of up to (1,024 × 1,280) IR pixels. Using a 15 µm pitch together with different, high performance microscope lenses, a geometric resolution of only 2 µm can be achieved.



Another benefit for the ISIT derives from the precision calibration of the ImageIR®. The use of a set of additional side calibration curves compensates for drift and ensures a maximum measurement accuracy even under fluctuating measurement conditions. As with all thermographic testings of electronic components and circuits, measurements are influenced by the differing emissivity of the individual components. To overcome this situation, InfraTec offers an automated pixel-wise emissivity correction routine directly in its control and analysis software IRBIS® 3. Using these tools precise statements can be made about temperature distributions and developments over time.

Thermography for optimisation of installed wind turbines

Due to the decreasing number of suitable locations for wind turbines and the increasing push towards renewable energy sources, new activities have been introduced to improve the efficiency of rotor blades for wind turbines.

The goal towards high efficiency is of great interest, because it has a direct impact on the achievable energy output of wind turbines and thus, on the profit of the operator. Of course, the rotor blades of modern wind turbines have an already optimised efficiency resulting from decades of aerodynamic research - their profiles are designed with super computers and optimised in wind tunnels. In their production new technologies are applied, which were first designed for the construction of high performance aircrafts. The goal of these measures is to have maximum percentage as well as maximum controlling of laminar flow between the rotor surface and the surrounding air. However, turbulent flows reduce the efficiency and therefore must be reduced to what is absolutely necessary.

In addition, there are many more factors that negatively affect the efficiency of wind power stations. It starts with alignment of the blades, leading edge contamination, erosion and damages to defective flow control add-ons, such as leading edge protection, vortex generators and zig-zag tape sections.

For several years now, Thermography has been a valuable tool for investigating the boundary layer behavior on airfoils in order to aerodynamically optimise it. It makes use of the fact that the heat transfer resistance of the boundary layer is significantly lower in turbulent flow than in laminar flow. For example, if the surrounding air is colder than the rotor blade surface, a thermal pattern appears on the surface which indicates the state of the flow. Because the temperature on the turbulent flow region is colder than on the laminar low region, measuring this thermal pattern with a thermal imaging camera permits detecting the boundary layer condition in real-time.

Highly thermally sensitive high-speed infrared cameras with high performance telephoto lenses are used to visualise the boundary layer condition of rotor blades in operation, in which the rotor blades and the measurement position are several hundred meters apart. These measurements deliver qualitative information regarding the transition location along the rotor blades, and allow comparisons between different operational states and conditions.

A high-speed actively cooled (640 × 512) IR pixels InSb-focal-plane array photon detector with a thermal resolution better than 20 mK is used together with a telephoto lens of 200 mm to acquire high resolution thermal images of rotor blades in operation. Due to extremely short integration times, only minor motion blurs occur during tip speeds of 75 m/s.

With kind support from: BIMAQ, Deutsche WindGuard Engineering GmbH
C. Dollinger, N. Balaresque, M. Sorg: Thermographic Boundary Layer Visualisation of Wind Turbine Rotorblades in Operation. EWEA 2014, Bacelona, Spain: Europe's Premier Wind Energy Event. EWEA The European Wind Energy Association, Barcelona, 2014

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