Issue 2021

Infrared-Reflexions

The Infrared Measurement / Thermography Newsletter by InfraTec GmbH

Content

In this Issue:

Dear Readers,

"Necessity is the mother of invention" – this proverb often comes to mind in the course of the Corona pandemic. On the one hand, innovative ideas emerge from necessity and are quickly put into practice! On the other hand, those affected by the serious economic consequences through no fault of their own pay a high price. Let us keep our fingers crossed that after Corona the world will have made many virtues out of necessity! So far, we at InfraTec have come through the crisis unscathed with a lot of luck and we look forward to celebrating our 30th company anniversary this year. It was helpful that our products – as components in respirators or as monitoring systems to detect elevated body temperature – were in high demand. In satisfying this demand, we too became inventive – as you will read in the first article of our thermography newsletter.

With kind regards from Dresden

Dr. Matthias Krauß
Managing Director and Partner

Do Not Miss a Moment

ImageIR® 8300 hs: High-speed Thermography in Full Resolution with Over 1,000 Hz

High-speed in VGA format with the ImageIR® 8300 hs

By introducing ImageIR® 8300 hs InfraTec starts a new generation of high speed infrared cameras. Combining the image format of (640 × 512) IR pixels with the exceptionally high frame rate of 1,004 Hz sets new standards. It allows thermographic images of extremely fast moving objects or highly dynamic thermal processes. This way, the exact moment that matters is captured, displayed in high resolution and precisely measured thermally. The radiometric image data are directly available in real time for evaluation in the IRBIS® 3 thermography software from InfraTec due to digital high-speed data acquisition.

Utilizing the latest detector technology, the camera achieves a thermal resolution of ≤ 20 mK in full frame format. With its innovative T2SLS detector with HOT long-life technology, the ImageIR® 8300 hs requires significantly less cooling power than conventional models. The integrated stirling cooler is less stressed and therefore has a longer lifetime.

The individual large-area detector elements, which are arranged in a grid (pixel pitch) of 25 µm, lead to a particularly high sensitivity and allow short integration times and high frame rates. With two rotating filter wheels, which can be equipped with up to six spectral filters, the camera can be adapted to the spectral characteristics of measurement objects.

As with all cameras of the ImageIR® series, the ImageIR® 8300 hs can be combined with an optional motor focus unit. This can be controlled precisely and quickly directly from the thermography software and can be used with all standard full optics.

The integration of the ImageIR® 8300 hs from InfraTec into complex measurement setups supports InfraTec's extensively configurable and precise trigger and process interface.

Numerous Fields of Applications for InfraTec's Thermography Systems

The high-end camera series ImageIR®, designed with a very high IR-frame rate, excellent thermal as well as geometrical resolution is particularly for demanding measurement and inspection tasks. THERMAL-CHECK - this thermography system enables the non-contact and area-based detection of elevated body temperatures of persons in public areas.

Variety and Flexibility

High-end Thermography Meeting the Highest Demands

ImageIR® provides the perfect solution for users who need extremely flexible camera technology with maximum sensitivity and accuracy. Due to the modular basic concept, an individual system configuration and adaptation of the performance data to the respective task – even after several years of use – is possible without any problems.

The option of combining different functions and the optional upgradeability ensure that customer requirements are met in line with their budget. Our ImageIR® equipment packages are rounded off by a wide range of accessories.

High-speed Mode
Due to binning technology frame rates and thermal resolution are increased

HDR
Facilitates the analysis of objects with extreme temperature gradients

IR Frame Rate
Analysis of very fast temperature changes in full screen format

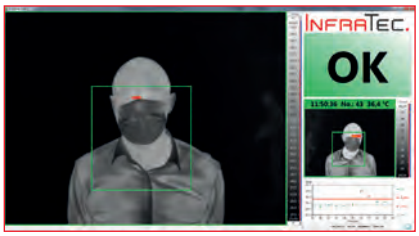
Separate Filter & Aparture Wheel
Essential for measurements of high object temperatures and spectral thermography

THERMAL-CHECK

Detecting Elevated Body Temperature Using High-resolution Thermography

Due to THERMAL-CHECK from InfraTec – Detection of elevated body temperature in viral diseases such as COVID-19, SARS and Ebola Virus

Company and shopping centre entrances, transport hubs and other public spaces are just a few examples where security measures such as the installation of infrared cameras helps to minimise the spread of dangerous infectious diseases.



As soon as the test person enters the marked area (green field in the center of the image), the measurement starts

Already a large number of customers use a solution developed by InfraTec, which supports people screening and which can be used to efficiently detect elevated body temperatures. Consisting of a thermally and geometrically high-resolution infrared camera and the thermographic special software THERMAL-CHECK installed on a computer, this solution allows the non-contact and area-based detection of body temperature with high measurement accuracy in real time.

The thermographic temperature measurement is carried out at the inner eyelid angles as demonstrably the safest and most reliable method for thermal screening. A very high, algorithm-based accuracy of up to ± 0.3 K is achieved. This system allows the simultaneous screening of several people regardless of their height. In case of exceeding the pre-defined temperature threshold, an alarm is triggered immediately. Thus, temperature control points enable the acquisition of important information as a basis for decision-making for subsequent medical examinations of persons with elevated body temperatures and therefore serve to secure public areas.

Did we spark your interest?
Just scan the QR-Code or visit **https://bit.ly/2liOikg** to find out more about THERMAL-CHECK.

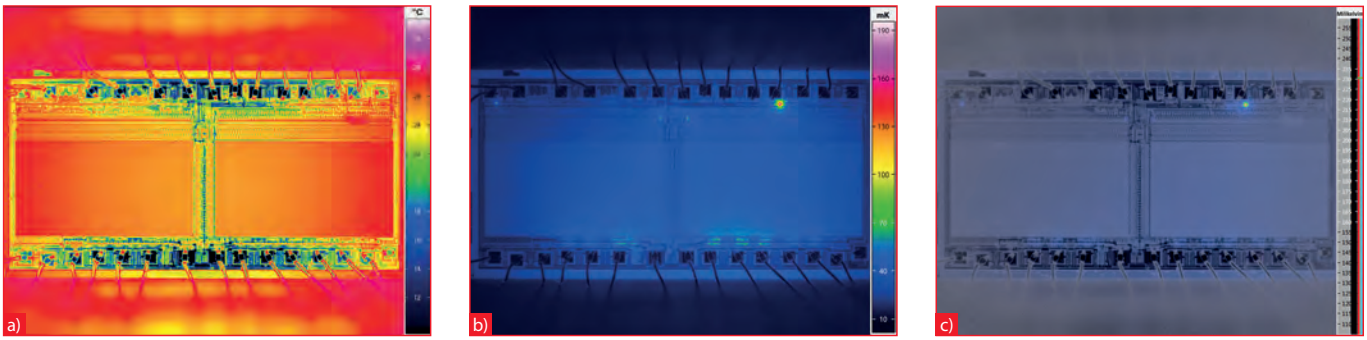
Infrared Thermography in Electronics and Electrical Engineering

Complex electronic assemblies combine a multitude of different components in a very small space. Miniaturisation, despite the tendency to reduce power dissipation, increases the demands for thermal management, error-free operation and compliance with process parameters in production. Infrared thermography is used for the efficient recording of temperature distribution and time sequences. The optical method is used for non-contact measurement of surface temperatures and does not influence the RF impedance of the measured object or the heat dissipation from it.

Thermography Systems – from Development to Quality Assurance

Thermographic analyses of electronic components and assemblies are already important during the development of the first prototypes. During every step of the development, they provide important conclusions for the optimisation of thermal management and the design of complex electronic assemblies.

In electronics production, thermographic temperature measurement is used for quality assurance, among other methods. Thermography offers decisive advantages both in the setting of critical technological parameters and their permanent monitoring, as well as in the inline testing of products against a golden board and the final functional test. InfraTec's automated inspection system E-LIT can detect even the smallest thermal defects on semiconductor materials. A special lock-in procedure and a powerful infrared camera ensure shortest inspection times.



By means of lock-in analysis procedure of InfraTec's IRBIS® 3 active, errors that only cause mK or µK deviations can be reliably detected and assigned to their location:
a) Classical thermal imaging – defect not detectable; b) Amplitude image – analysis by Lock-in Thermography; c) Combination of live and amplitude image

Reliable Localisation and Detailed Imaging of Thermal Abnormalities

Modern high-end infrared cameras have a high number of pixels, which is crucial for the recognition of the smallest details. The analysis of complex assemblies and individual components requires a technology with high geometric and thermographic resolution, which allows an exact, non-invasive measurement of temperatures, temperature distributions and their temporal progressions, even on the smallest structures.

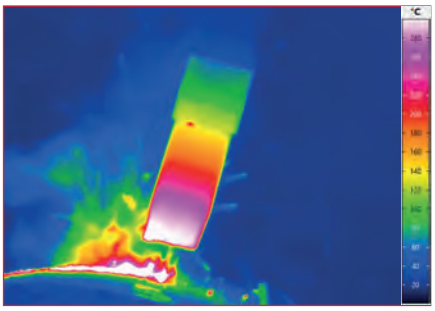
To meet these special requirements InfraTec offers thermography systems of different performance classes and spectral ranges with detector formats up to (1,920 × 1,536) IR pixels. These can be equipped with a variety of lenses. This way, several microscope lenses can be selected in combination with Solid Immersion Lenses (SIL). If required, the ImageIR® and VarioCAM® High Definition series models can be combined with a motorised focus unit, which enables precise and stable focusing. The analysis and evaluation of the measurement results is similarly conveniently carried out by using the thermography software IRBIS® 3. All InfraTec systems are offered with this software.

InfraTec has developed the IRBIS® 3 active thermography software especially for active thermography. This software detects temperature differences down to the microkelvin range and helps to reliably distinguish defective structures from intact ones. Its complex evaluation algorithms offer an excellent basis for the determination of reliable results. Depending on the respective task, InfraTec specifically assembles the appropriate equipment for the user.

High-Speed Thermography in Additive Manufacturing

Additive manufacturing – also known as 3D printing – is becoming increasingly popular in the industry. It refers to manufacturing processes in which material is applied layer by layer to create three-dimensional objects. Thereby chemical and physical hardening and melting processes take place, in which temperature plays a decisive role. Infrared cameras support the systematic monitoring of the entire manufacturing and machining process and record temperature developments and deviations in real time, for temperature is one of the factors on which the quality of the final product depends.

Monitored Process Control and Quality Assurance



Thermal spraying

Numerous of these manufacturing processes are based on laser technologies such as laser melting, sintering or build-up welding. Other processes, such as binder jetting, are completed by a sintering pass to fully cure the material. In order to localise and detail thermal conspicuities in these processes, InfraTec infrared cameras support the determination and subsequent adherence to thermal process parameters by in-line monitoring. Infrared cameras can be integrated directly into the process control system to enable a non-contact and non-invasive temperature measurement. Here, the detection of the temperature distribution of the powder bed surface and the measurement of melting temperatures are relevant in most cases. Both can be realised for temperature ranges higher than 2,000 °C and while the laser is working (insitu measurement).

Close monitoring of machines, processing plants, materials and temperatures during the production and processing of additive parts is of fundamental importance both in industry and in research. The mapping of heat flows in components is necessary for a complete understanding of the process and allows precise control of the temperature development in the parts and materials to be processed as well as exact thermal control of the process. An early detection of errors in production is therefore possible, rejects are actively avoided and returns are minimised.

Furthermore, process and cycle times can be significantly optimised and correlations between process parameters and (melting) temperatures can be derived.

Requirements for Infrared Cameras in Laser Based Additive Manufacturing

Due to the characteristics of lasers in additive manufacturing, the infrared cameras used must meet specific requirements. This applies, for example, with regard to the temporal resolution.

Working with a laser is typically characterised by short laser action times, where heat input takes place within fractions of a second. This requires measurements with high image frequencies in full and partial images. Particularly in micro material processing with pulsed laser light, the demands on thermography systems are very high. Suitable for this application is, for example, the ImageIR® 8300 hs, as it can image high-speed processes with an image format of (640 × 512) IR pixels and the high image frequency of 1,004 Hz.

The thermal and geometric resolution of infrared cameras is equally important. Depending on the process and material, lasers can be used to create very large or very small temperature differences, which must be monitored continuously and very precisely. Here InfraTec offers different camera functions, such as HighSense mode, HDR function, binning mode and geometric resolutions in the HD range.

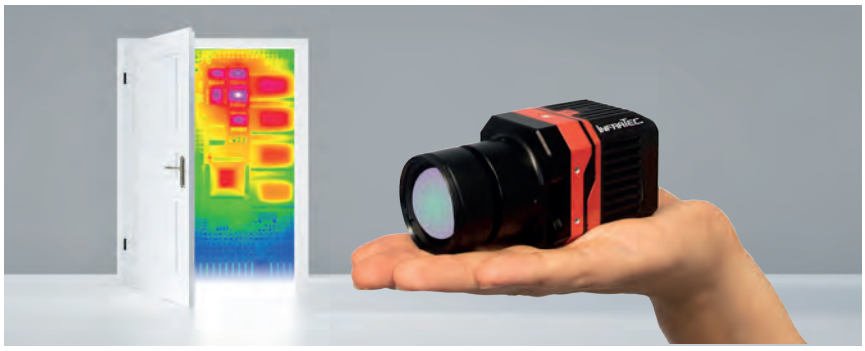
Thermographic monitoring in 3D printing: Scan QR-Code or visit **https://bit.ly/2JRUsIA**

Convenient Integration of Thermography-based OEM Solutions

Application-independent and easy integration of thermographic systems into existing system environments is crucial. InfraTec's SDK guarantees a comfortable integration. In addition, modern interfaces such as 10 GigE enable reliable camera control and high-performance data acquisition over very long distances.

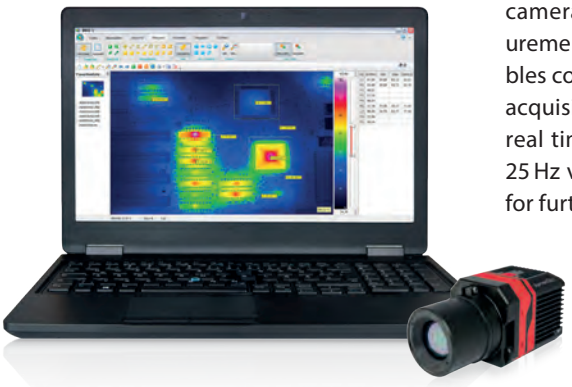
Cameras at a small price

PIR uc 605 – Fits in One Hand and Creates Crisp Thermal Images



Your successful entry into thermography with the PIR uc 605

The radiometric IR camera module PIR uc 605 is designed for universal use and, in combination with the corresponding software IRBIS® 3 from InfraTec, it is a great entry level system into stationary thermography for research and development. As an OEM module it is predestined for integration into machines, plants and devices for monitoring and measurement tasks aiming at process optimisation and quality assurance, for example in mechanical engineering, the plastics industry or electronics.



Based on an uncooled microbolometer FPA detector with (640 × 480) IR pixels, it provides detailed thermal images in high resolution and is ideal for analysing temperature distributions and their changes over time.

The low weight, a very small and robust light metal housing and IRBIS® SDK support easy integration into existing system environments.

The PIR uc 605 allows users to choose between different lenses and to adapt the camera module optimally to the measurement task. The interface concept enables convenient camera control and data acquisition. Recordings can be stored in real time with image frequencies up to 25 Hz via the Ethernet interface on a PC for further processing.

Compact, robust, versatile

Thermography-Based OEM Solutions for the Industry

InfraTec's thermography systems allow efficient and safe monitoring and control of temperature-critical processes in industry. Due to their modular concept they are also ideally suited as OEM solutions.

By using the appropriate SDK and industrial interfaces, the thermography systems can be easily and quickly integrated into existing system environments. This enables reliable camera control and data acquisition over very long distances as well as the acquisition of real-time thermographic data.

Thermography systems from InfraTec are flexibly configurable due to their modular basic concept

For the secure protection of the infrared cameras in harsh industrial environments, camera protective housings made of high-strength aluminium alloys are used, and for more extreme conditions, even more robust protective housings.

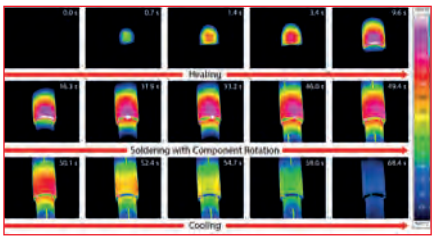
Prior to the OEM solution being used in operation, our service team will provide detailed advice and will be available to you as a reliable partner for solution development, delivery and service.

Aalen University LaserApplikationsZentrum

Use of High-Speed-Thermography in Laser High Temperature Capillary Gap Soldering

Lasers are regarded as very versatile tools due to their flexibility in industry and production technology. The LaserApplikationsZentrum (LAZ) at Aalen University therefore does intensive research and development on new methods of laser material processing. Newly developed methods such as aluminium laser polishing and high-temperature capillary gap soldering are already finding concrete application in industrial projects.

For a complete understanding of the processes involved in the use of various laser techniques, it is necessary to map the heat flow in the components in order to determine, among other things, the optimum temperature for material processing. Since laser processes are highly dynamic thermally induced and take place at temperatures of typically 500 °C to 2,000 °C, laser-based production places high demands on infrared cameras.



Process sequence for Laser High Temperature Capillary Gap Soldering of a tube-plug-in connection

The LAZ uses InfraTec's infrared camera ImageIR® 8300 hp with a high geometric and temporal resolution for its research purposes. Due to the MicroScan function of this camera, images with a geometric resolution of more than one mega pixel can be taken. The 10 GigE interface allows fast data transmission of up to 350 Hz in full frame mode directly to the evaluation unit. The camera lens can be flexibly adapted to changing working distances and sizes of objects to be measured and is protected from the reflected laser radiation by a laser protection window.

The data generated by the infrared camera provide information about the temperature control behaviour during laser beam high temperature soldering. Due to the evaluation of the thermographic data, the temperature control strategy could be optimised and soldering times of less than 10 s could be realised.

InfraTec's Infrared Cameras and GOM's ARAMIS System

Integration of Thermographic Data into the Digital Image Correlation

The combination of measurement results from digital image correlation (ARAMIS, DIC) and temperature measurement data from infrared cameras enables the simultaneous analysis of the thermal and mechanical behaviour of test specimens in material and component testing, for example in the automotive sector, in biomechanics or in aerospace.

ARAMIS System from GOM

To combine both measurement results, the ARAMIS 3D sensor and the infrared camera are aligned to the area of the sample surface to be measured and the image recordings of both systems are synchronised with the excitation unit by an electrical trigger signal.

The temperature and 3D coordinate results are aligned with each other so that a temperature value is assigned to each 3D coordinate. This allows the temperature change to be analysed stationary on the surface over the entire test period and evaluated in conjunction with 3D displacements and surface strains.

The GOM ARAMIS system measures independently of the material used and is based on the principle of digital image correlation. The images of test specimens under load, captured with high-resolution cameras, form the basis for measurement data which are used to determine material characteristics, among other things.

InfraTec's thermography systems with the latest detector technology achieve a geometric resolution of up to (2,560 × 2,048) IR pixels. This enables the creation of images with a previously unattained geometric resolution and effectively prevents measurement errors caused by geometric factors. Due to the excellent thermal resolution, even the smallest temperature differences are accurately displayed.

Imprint
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