High-end Camera Series ImageIR®

Thermographic Systems to Match Highest Standards

InfraTec.

Excellent thermal resolution
Very high frame rate
Modular design for individual system expansion
Long-life Stirling cooler for continuous operation
Robust light-weight metal housing
Accurate and repeatable triggering
Complete optical assortment
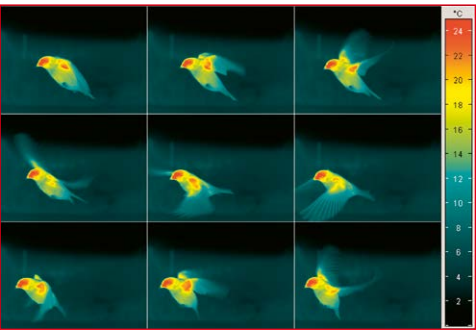
1) High-speed image of a flying bird
2) Take-off of an Airbus A400M

www.InfraTec.eu
www.InfraTec-infrared.com

Made in Germany

High-end System ImageIR®

1 Lens

High quality precision lenses allow the adaptation of the image geometry to almost every measuring situation. Its performance parameters are calibrated with respect to functionality, quality and flexible application. Due to proper IR-transparent lens materials and high-precision antireflexion coating, the lenses are optimised for different spectral ranges. Additional macro accessory lenses reduce the working distance, increase the geometrical resolution and guarantee highest imaging quality.

2 Ports / Interfaces

Numerous ports can be found on the front and backside of the ImageIR®. The front is equipped with ports for external sensors, motor focus and zoom lenses. At the back side of the ImageIR® the 10 GigE / GigE interface respectively CAM-Link / DualCAMLink data interface are located as well as the trigger interface, CAN-Bus-RS232- and USB connector.

3 10 GigE Interface

The 10 GigE interface allows for a very reliable high-speed data transfer in industrial environments independently from possible electro-magnetic radiation. It also works over very long distances and the speed of data transfer is 10 times higher in comparison with usual GigE interfaces.

4 Trigger and Process Interface

The camera series ImageIR® is equipped with a snapshot detector. It guarantees a repeatable time-driven and event-driven high-precision data recording in conjunction with the internal trigger and process interface. Two respective inputs and outputs are used to control the camera or to generate digital control signals for external devices. Additional digital and analogue in- and outputs are available in connection with the process interface of the IRBIS® 3 software.

5 Detector Unit

Modern high-performance photon detectors of different formats, spectral ranges and detector materials can be implemented application specifically.

6 Long-life Stirling Cooler

The high-quality Stirling coolers, which are used in the ImageIR®, guarantee a short cool-down time as well as a maintenance-free, long-term and low-vibration operation. Up to 15,000 hours of operation can be achieved with these latest generation long-life coolers.

7 Power Supply

The camera is powered by an external wide range adaptor. The power adaptor provides the ImageIR® with either one or multiple direct currents, depending on the features, operation with external batteries is possible.

8 Camera Housing with Handle

The camera housing is suitable for usage in industrial environments and is made out of high-tensile aluminium compositions. On the top of the housing a handle for convenient transportation of the camera is mounted. The camera housing is very compact and it protects very well the sensor system and all other electronic components inside the camera.

9 Tripod Connector

The standardised tripod connector allows an installation on different tripods or pan-tilt solutions for both process-integrated continuous operation and laboratory application. Because of its additional mechanical interfaces, the ImageIR® can also be integrated into automated inspection systems.

Module 1	Module 2	Module 3
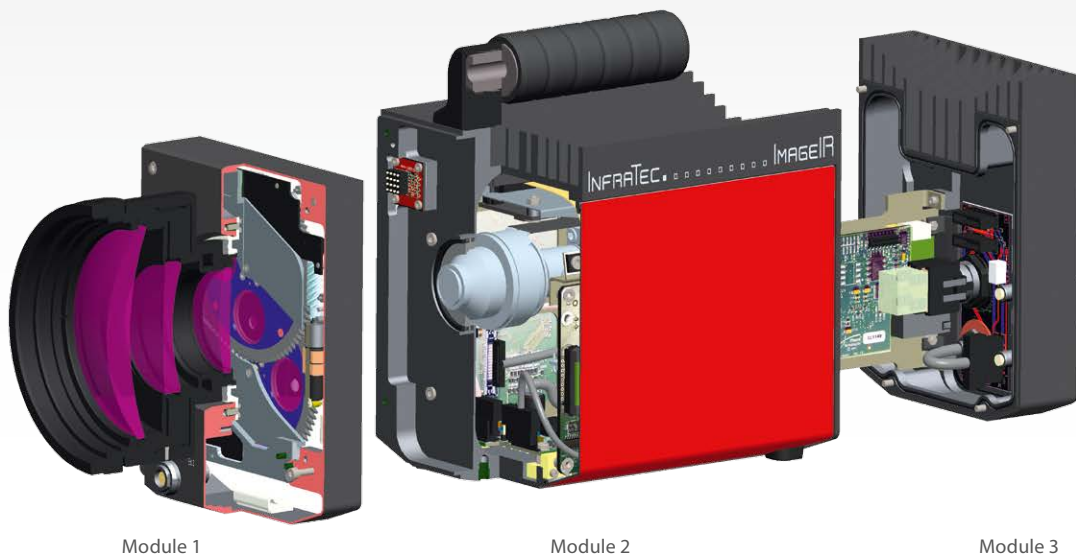
The New Dimension of High-end Thermography

InfraTec's high-end camera series ImageIR® excels in metrological performance characteristics and in unknown compactness and variability. Users who depend on extremely flexible camera technology with a maximum of sensitivity, accuracy, geometrical resolution and speed, the perfect solution can be received with the ImageIR®.

The modular concept makes it easy to adapt the individual system configurations and performance data to the respective application.

Module 1
- Lens interface
- Optomechanics controller
- Filter wheel*
- Aperture wheel*
- Shutter*
- Motor focus*
- MicroScan*

Module 2
- IDCA (detector + cooler)
- Data processing
- Controller for camera, detector, temperature sensor
- Power supply
- Fan attachment*
- Water cooling system*

Module 3
- 10 GigE*, GigE, CAMLink* / DualCAMLink*
- Trigger interface
- Power on / off
- DC-IN

Accessories

Versatile accessories and the ability to realise customer-specific solutions very quickly ensure the optimal fulfilment of every request. The equipment packages of the ImageIR® come complete with an extensive range of accessories:

- Stable, airtight carrying case with security lock
- Wires, adaptors, special tripod
- Various software packages
- Installation CD and manual
- Interchangeable lenses for manual and motorised focusing*
- Excitation unit and controller for active thermography*
- Lens protections and mounts*

* Depending on model
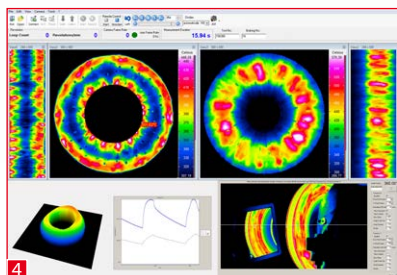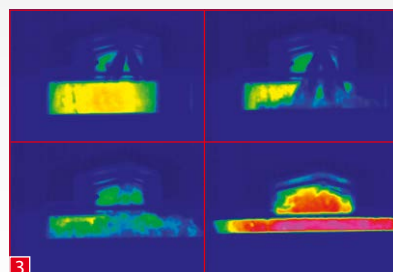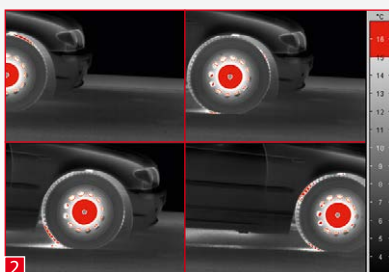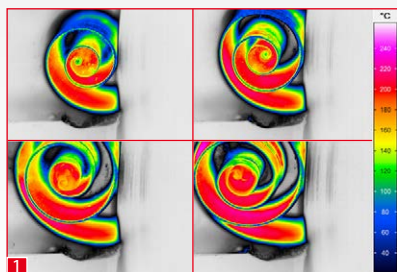
1 Thermal analysis of a turning process
2 Measurement of the operative surface of an ABS
3 Fuel-injection of an internal-combustion engine
4 Thermal analysis of brake discs using software IRBIS® 3
5 Thermal aerial image of an industrial facility

ImageIR® – Demanding Measuring and Detection Tasks

ImageIR® is a high-end camera series, which was designed for particularly demanding measuring and inspection tasks and sets highest standards with its outstanding performance characteristics.

Main Fields of Application

- Aerospace technology
- Automotive industry and mechanical engineering
- Laser and welding technology
- Electronics / microelectronics, assembly group testing
- Glass, plastic and steel industry
- Research and development
- Non-destructive testing of materials (NDT)
- Quality assurance in bonding techniques and blowhole detection
- Observation and investigation
- Medicine

Spectral Thermography

The spectral range of the camera is optimised for measurements corresponding to the spectral characteristics of the materials to be detected. The preferred system for spectral thermography is the ImageIR® with a medium infrared of (2 ... 5) µm, since a lot of technically important materials show distinctive absorption bands in this range, for instance glass, plastics and gases. Equipped with a motorised filter and aperture wheel with up to five positions, different spectral filters can be swivelled into the optical path of the detector.
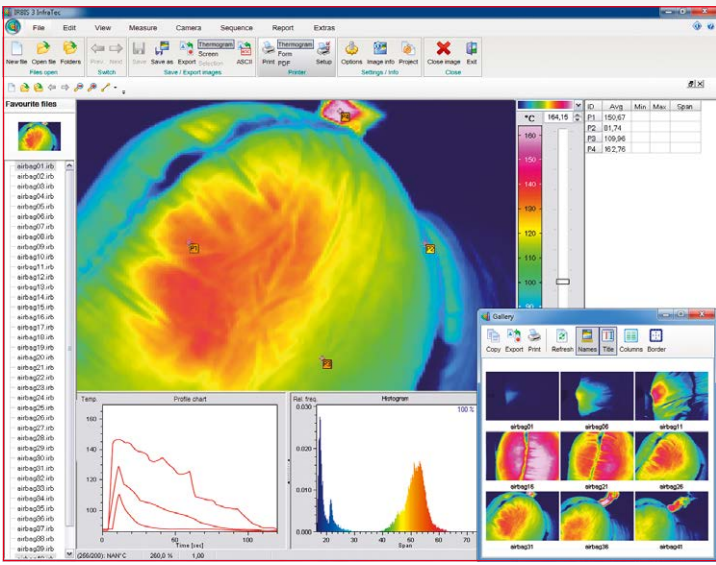
Microthermography

Microthermography permits you to analyse extremely small structures of only a few µm – if inevitable, even with working distances of up to 30 cm. Various microscopic lenses, which are capable of making visible smallest details with one pixel representing 2 µm of the object, are at your disposal to measure components and assembly groups.

Active Thermography

Due to the extremely high thermal sensitivity, fast frame rates and the snapshot mode of the detector reader electronic – which makes for an instantaneous triggering and therefore for an extremely stable phase synchronicity with external systems – the ImageIR® is perfectly suited for active and lock-in thermography. Several different analysis routines of the IRBIS® 3 active are available for that purpose. The algorithm choice depends on the material characteristics, the geometry and the type of defects which are to be detected.
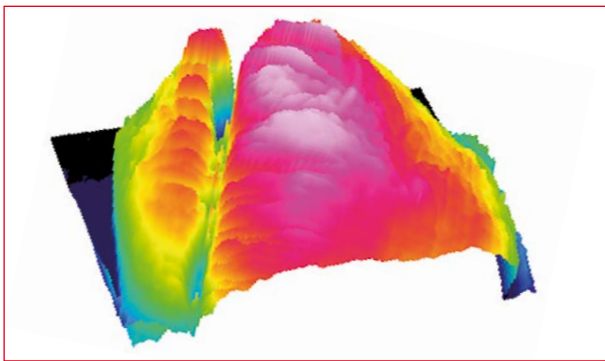
High-speed Thermography

ImageIR® can be run with extremely fast frame rates in full-screen as well as in subwindow formats. This allows for hassle-free temperature measurements of fast running processes and moving objects. To measure fast-rotating objects such as brake disks the camera is equipped with a linescan mode, which is capable of reaching line frequencies up to 25 kHz.

Control and Analysis Software IRBIS® 3

The software family IRBIS® 3, developed by InfraTec, is part of a complete package of the camera series ImageIR®. Customer-specifically adaptable high-end thermography solutions for the most diverse measuring tasks and applications can be realised with this software.

temperature-sensitive emissivity of objects, the macro editor and the IR editor cutting tool we also offer an active thermography module.

IRBIS® 3 online / IRBIS® 3 process
The comfortable control- and acquisition software for high-speed digital thermographic image data acquisition allows time and action-triggered capturing of thermographic images as well as for an intensity- and temperature-sensitive control of processes via digital or analogue in- and outputs.

3D view of the thermographic image

**IRBIS® 3 active / IRBIS® 3 active online**
The special software for non-destructive material testing allows the analysis of thermographic image sequences by means of the active thermography analysis algorithms "quotient-", "pulse phase-" and "lock-in-method". All of these algorithms work independently of the degree of emissivity.

The convenient and professional thermography software family IRBIS® 3 offers a wide range of analysis and editing tools. Besides numerous implemented models for the correction of the emissivity value, the compensation of the

The Software Development Kit (SDK)
The SDK enables the easy to handle integration of the ImageIR® into customer's existing software modules. It supports several different program languages and offers an optional linking to Matlab and Labview.

IRBIS® 3 Sequence Editor

The sequence editor offers an efficient and freely definable automated selection of thermographic data from complex sequences, as well as generating filtered image sequences. The data can be provided with comments and saved as raw material or being restructured on a new basis.

Standard mode
(1.280 × 1.024) IR pixels

MicroScan
(2,560 × 2,048) IR pixels
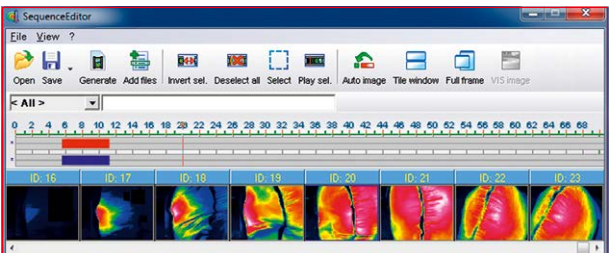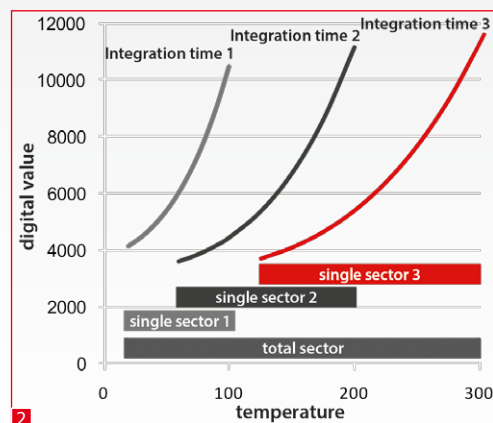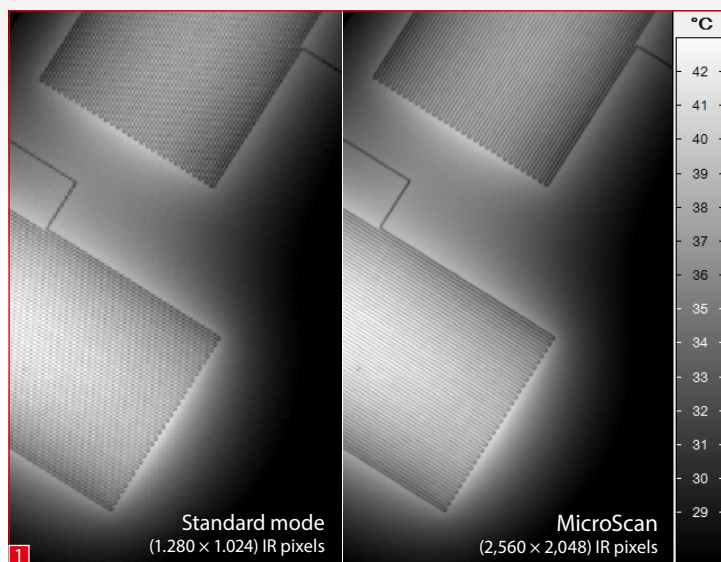
1 Comparable images of an electronic board with and without MicroScan technology
2 Combining several integration times with MIT function

Innovations

Precision Calibration and Optics

InfraTec's especially developed multiple characteristic lines algorithm for calibration of thermographic systems compensates for environmental temperature variations. It also provides for highest repeatability and ideal system warm-up behaviour. High image homogeneity and excellent measuring accuracy of 1% can be achieved by the thermally decoupled optics.

Motor Focus for ImageIR®-Full Optics

All exchangeable standard lenses of the ImageIR® can be equipped with a motor focus unit, which is operated by the camera control software. It allows precise, remote and quick motorised focusing. Furthermore, an autofocus is available which works reliably even for low image contrasts.

Separate Filter- and Aperture Wheel

The combination of a separate filter- and aperture wheel, both having up to six free positions (30 combinations) is a precondition for the universal use of ImageIR® for different applications with high object temperatures and applications in spectral thermography. Interfering effects are prevented purposefully by using neutral-density filters to degrade signals or by the combination of spectral filters and apertures.

Subwindowing

The ImageIR® can be used in full-, half-, quarter- and line frame mode. Using the camera operating software it is possible to adjust the respective subwindowing mode. Via click and drag freely definable partial image formats can be determine in a quick and comfortable way. In doing so, frame rates up to 25,000 Hz can be reached.

MicroScan

Due to the MicroScan unit images can be recorded with up to (2,560 × 2,048) IR pixels. This will be achieved by a newly developed, fast-rotating MicroScan wheel, which is integrated into the camera. It ensures that four different individual exposures are taken per wheel revolution, which are offset laterally by half a pixel each. These individual exposures are brought together in real time into a thermogram with quadruple image format. Each pixel in the image represents a genuine temperature measured value. The resulting exposures are extremely low in noise and show the measurement objects with very fine resolution.

HighSense

Cameras of the ImageIR® series have a reliable factory calibration. HighSense allows the use of additional, individual temperature measuring ranges. Depending on the measuring task, users select the required temperature range and the optimum integration time for this purpose is calculated – or they proceed in reverse order. Thus, the calibration can be retained even in the case of changed integration times.

Multi Integration Time (MIT)

The MIT function increases the dynamic range up to 16 bits and expands the temperature measuring ranges significantly. Measurement objects with high temperature gradients can be recorded with one measuring range while maintaining the maximum image updating rate and thermal resolution. With a constant aperture and filter setting, different integration times can be selected for up to four calibration ranges and combined with these to form a total range. The system calibration can remain unchanged. Manual switching of the measuring range is also dispensed with.

Model Range – ImageIR® Camera Models from InfraTec

Model	ImageIR® 4300 / ImageIR® 5300	ImageIR® 7300 / ImageIR® 8300	ImageIR® 8300 hp	ImageIR® 8800	ImageIR® 9300	ImageIR® 10300
Spectral range	(2.0 ... 5.7) µm			(7.7 ... 10.2) µm	(2.0 ... 5.7) µm	(3.6 ... 4.9) µm
Pitch	30 µm	15 µm				10 µm
Detector	MCT or InSb			MCT	InSb	
Detector format (IR pixels)	(320 × 256)	(640 × 512)	(640 × 512) / with MicroScan (1,280 × 1,024)		(1,280 × 1,024) / with MicroScan (2,560 × 2,048)	(1,920 × 1,536)
Temperature measuring range	(-40 ... 300) °C / (-40 ... 1,500) °C, (up to 3,000 °C)*		(-40 ... 1,500) °C, (up to 3,000 °C)*	(-40 ... 1,200) °C	(-40 ... 1,500) °C, (up to 2,000 °C)*	(-40 ... 500) °C
Measurement accuracy	± 2 °C or ± 2 % / ± 1 °C or ± 1 %		± 1 °C oder ± 1 %			
Temperature resolution @ 30 °C	0.02 K / 0.015 K	0.025 K / 0.02 K	0.02 K	0.025 K	0.025 K	0.03 K
Frame rate (full screen / half screen / quarter screen / sub-frame)*	Up to 75 / 265 / 706 Hz / Up to 450 / 1,500 / 4,500 / 25,000 Hz	Up to 75 / 242 / 630 Hz / Up to 125 / 420 / 1,100 / 2,996 Hz	Up to 355 / 670 / 1,200 / 5,000 Hz	Up to 233 / 874 / 2,892 / 14,592 Hz	Up to 106 / 200 / 390 / 3,200 Hz	Up to 100 / 300 Hz, (960 × 768) same FOV
Dynamic range	14 bit* / 16 bit*		16 bit*			13 bit*
Integration time	(1 ... 20,000) µs in increments up to 1 µs	(1 ... 20,000) µs / (0.6 ... 20,000) µs in increments up to 1 µs	(0.6 ... 20,000) µs in increments up to 1 µs	(10 ... 20,000) µs in increments up to 1 µs	(0.5 ... 18,000) µs in increments up to 1 µs	(1 ... 20,000) µs in increments up to 1 µs
Rotating filter wheel*, Rotating aperture wheel*	No, no / Yes, yes	Yes, yes				
Interfaces	GigE, HDMI* / GigE, CAMLink*, HDMI*	GigE, 10 GigE*, 2× CAMLink*, HDMI*				10 GigE*, HDMI*
Trigger	1 IN / 1 OUT, TTL / 3 IN / 2 OUT, TTL	1 IN / 1 OUT, TTL / 3 IN / 2 OUT, TTL	3 IN / 2 OUT, TTL			
Analog signals*, IRIG-B*	No / 1 IN, yes	No	1 IN / 2 OUT, yes	2 IN / 2 OUT, yes	1 IN / 2 OUT, yes	2 IN / 2 OUT, yes
Dimensions (mm)	244 × 120 × 160	250 × 120 × 160	244 × 120 × 160	250 × 120 × 160	235 × 120 × 160	241 × 123 × 160
Weight	3.3 kg			4.0 kg		4.7 kg

* Depending on model

Lenses – Optics Matching Your Application

Check the geometrical resolution of the ImageIR® camera for your application using our FOV calculator at **http://fov.infratec.eu.** Please choose from the following lenses:

- Wide angle lenses (12 / 25 mm)
- Standard lenses (25 / 50 mm)
- Telephoto lens (50 mm)
- Telephoto lens (100 mm)
- Telephoto lens (200 mm)
- Close-Up for telephoto lens 50 mm
- Close-Up for telephoto lens 100 mm
- Microscopic lens M=3,0×
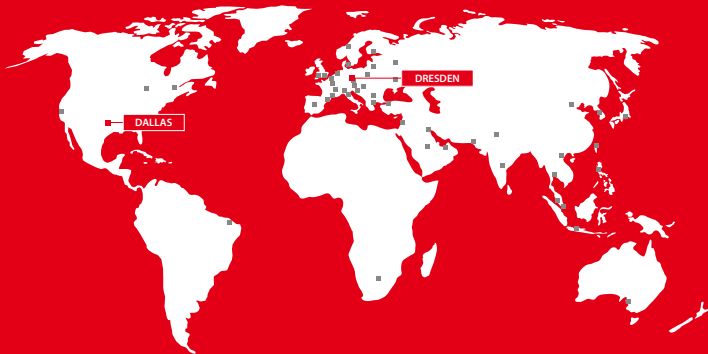- Microscopic lens M=1,0×
- Microscopic lens M=8,0×

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Latest information on the internet.