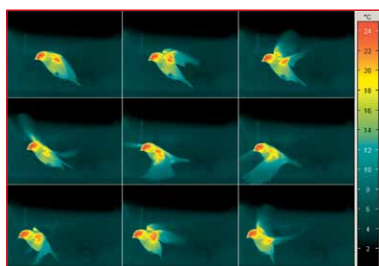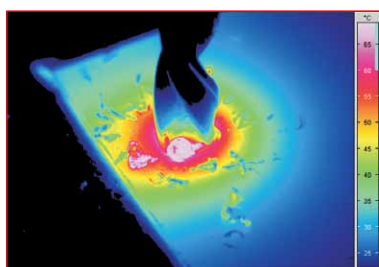# High-end Camera Series ImageIR®

Thermographic systems to match highest standards


Thermal imaging of a bird in flight

Cutting data optimisation for high-speed tools and machines (metal drill)

Excellent thermal resolution
Very high IR image 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
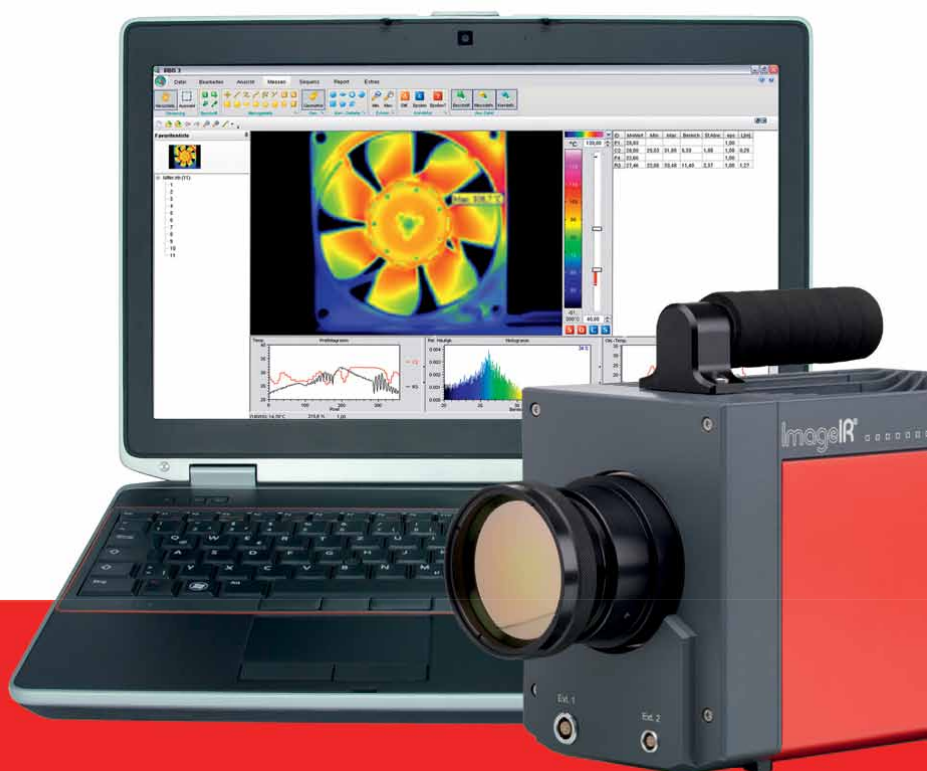
InfraTec

Just ask the specialists ...

Precision and Speed

1 Lens

The complete assortment of high-grade precision optics, which is optimised for various applications and spectral ranges, allows the adaptation of the image geometry to almost every measuring situation.

2 Ports/Interfaces

Numerous ports can be found on the front and backside of the ImageIR® (see module 1 and 3). The Gigabit Ethernet- and CAM-Link ports, as well as the trigger interface, CAN-Bus, RS232- and USB-ports are located on the backside. The front is equipped with ports for external sensors, motor focus and zoom lenses.

3 Trigger and Process Interfaces

The camera series ImageIR® is equipped with a snapshot detector as well as with an internal trigger interface, which guarantees a repeatable high-precision triggering. Two respective inputs and outputs are used to control the camera or to generate digital control signals for external devices.

Two digital channels of the data stream can be recorded synchronously with those trigger inputs. Additional digital and analogue in- and outputs are available in connection with the process interface of the IRBIS® 3 software. Furthermore, information will be saved directly with the images.

4 Detector Unit

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

5 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 20,000 hours of operation can be achieved with these latest generation long-life coolers.

6 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.

Optical design

The infrared lenses are one of the most important components of the ImageIR®. Its optical performance parameters are calibrated with respect to functionality, quality and flexible application. By choosing the proper IR-transparent lens materials and high-precision antireflexion coating, the lenses are optimised for different spectral ranges and therefore achieve best transmission properties in the entire operating temperature range. Additional correction lenses reduce the distortion to a minimum and guarantee highest imaging quality.

Precision Calibration and Thermally Decoupled 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.
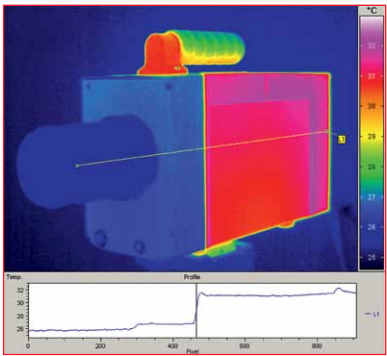
Separate Filter- and Aperture Wheel

The combination of separate filter- and aperture wheels with up to five free positions each are the basis for universal measurement applications with wide object temperature ranges and applications in spectral thermography. Interfering effects are prevented by signal degradation apertures or by the combination of spectral filters and apertures.

### 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.

Subwindowing

The ImageIR® can be operated in full screen-, half screen- and quarter as well as random screen mode. Subwindowing features can be accessed in the camera control software. The desired windows can comfortably be defined via click-and-drag. An image frequency of up to 4,500 Hz is possible for every subframe.

Multi Integration Time (MIT)
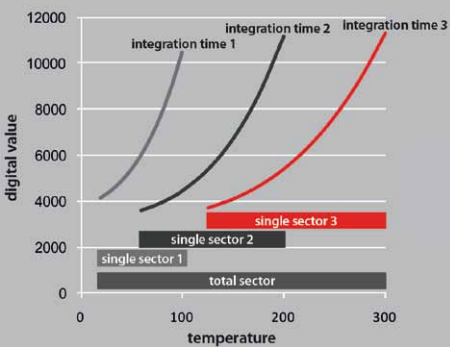
The MIT feature allows more dynamic and wider temperature ranges while using different integration times.

While conventional algorithms are setting the measuring range with only one integration time, the MIT uses multiple calibrated integration times for one measuring range.

Thus, an extended measuring- and display range can be realised.

Hereby, objects with a high temperature gradient can be measured with only one measurement range without a range changeover or lowering the thermal resolution.

A 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
- Filter wheel*
- Aperture wheel*
- Shutter*
- Interfaces for motor focus*
- External shutter*

Module 2
- IDCA (detector + cooler)
- Data processing
- Detector controller, optomechanics
- Power supply

Module 3
- GigE, CAMLink*
- USB, RS232
- CAN-Bus*
- Trigger-IO
- Power on/off
- DC-IN

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*

* depending on camera configuration

Control and Analysis Software

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. 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 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 ana-logue in- and outputs.

IRBIS® 3 active

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

The software development kit (SDK) allows for a convenient and smooth integration of ImageIR® into the user's existing system environment. It supports several different program languages and offers an optional linking to MATLAB and LABVIEW.
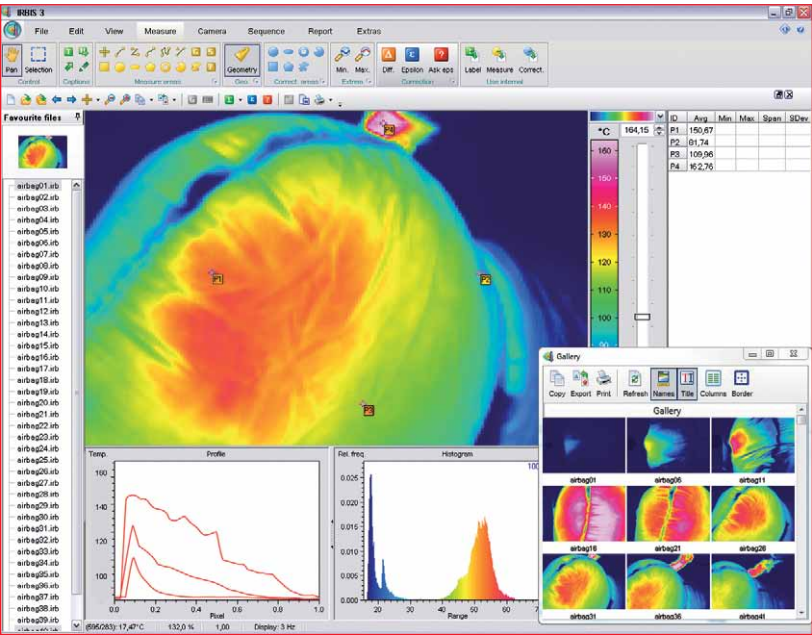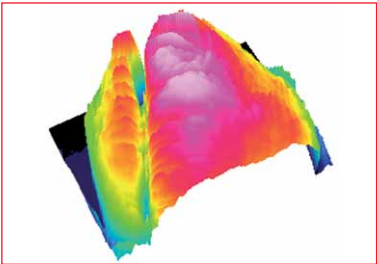
IRBIS® 3 Sequence Editor

The sequence editor offers effi-cient and freely definable auto-mated 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 beeing restructured on a new basis.
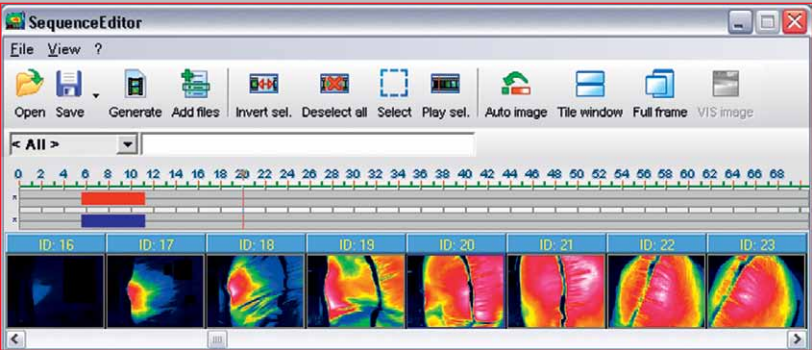
ImageIR® is a high-end camera series, which was designed for particularly demanding measuring and inspection tasks and sets highest standards with its outstanding performance characteristics.

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
- Object surveillance
- Medicine
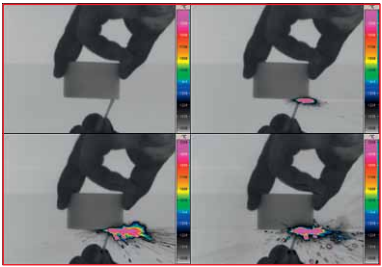
Igniting a match
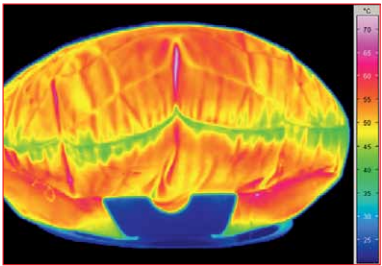
Quality inspection of an airbag
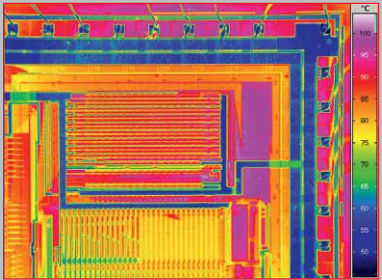
Micro thermography of a chip

Spectral Thermography

In spectral thermography, the wavelength range of the camera is adjusted to the spectral characteristics of the material which is to be investigated. 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 wheel with up to five positions, different spectral filters can be swivelled into the optical path of the detector.
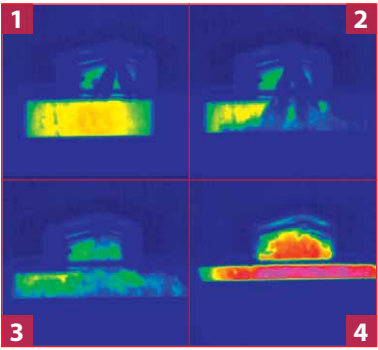
Fuel-injection of an internal-combustion engine

Micro Thermography

Micro Thermography 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 rate 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 13 kHz.
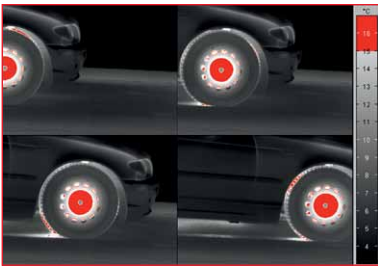
Measurement of the operative surface of an ABS
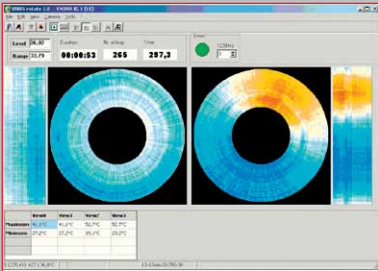
Hotspot detection of fast-rotating objects

7 Camera Handle

Handle on top of the camera for increased carrying comfort.

8 Housing

The closed, industrial-suited, high-strength aluminium alloy housing is very compact and protects the sensitive sensors and electronics even during roughest applications. It impresses with its low weight.

The modular design allows an application-specific configuration and later adaptation to varying demands. The interfaces are equipped with push-on connectors to uphold the degree of protection.

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.

Model	ImageIR® 5300	ImageIR® 5800	ImageIR® 8300	ImageIR® 8800	ImageIR® 9300
Spectral range	(1.8 ... 5.5) µm	(8.0 ... 9.3) µm	(1.8 ... 5.5) µm	(8.0 ... 10.2) µm	(3.6 ... 4.9) µm
Detector format (IR pixels)	(320 x 256)	(320 x 256)	(640 x 512)	(640 x 512)	(1,280 x 1,024)
Detector	MCT or InSb	MCT or QWIP	MCT or InSb	MCT	InSb
Detector cooling	Stirling cooler	Stirling cooler	Stirling cooler	Stirling cooler	Stirling cooler
Measurement accuracy	± 1 ℃ or ± 1 %	± 1 ℃ or ± 1 %	± 1 ℃ or ± 1 %	± 1 ℃ or ± 1 %	± 2 ℃ or ± 2 %
Temperature resolution	0.020 K @ 30 ℃	0.025 K @ 30 ℃	0.025 K @ 30 ℃	0.035 K @ 30 ℃	0.025 K @ 30 ℃
Temperature measuring range	(-40 ... 1,500) ℃ (opt. up to 2,000 ℃)	(-40 ... 1,500) ℃ (opt. up to 2,000 ℃)	(-40 ... 1,500) ℃ (opt. up to 2,000 ℃)	(-10 ... 300) ℃	(-40 ... 300) ℃ (opt. up to 2,000 ℃)
Motor focus/Auto focus	Optional	Optional	Optional	Optional	Optional
Storage temperature	(-40 ... 70) ℃	(-40 ... 70) ℃	(-40 ... 70) ℃	(-40 ... 70) ℃	(-40 ... 70) ℃
Operating temperature	(-20 ... 50) ℃	(-20 ... 50) ℃	(-20 ... 50) ℃	(-20 ... 40) ℃	(-20 ... 40) ℃
Degree of protection	IP54, IEC 529	IP54, IEC 529	IP54, IEC 529	IP54, IEC 529	IP54, IEC 529
Integration time	(10 ... 20,000) µs in increments up to 1 µs	(1 ... 20,000) µs in increments up to 1 µs	(0.6 ... 20,000) µs in increments up to 1 µs	(0.6 ... 20,000) µs in increments up to 1 µs	(1 ... 20,000) µs in increments up to 1 µs
Filter wheel/Aperture wheel (motorised)	Yes	Yes	Yes	Yes	Yes
Dynamic range	14 bit	14 bit	14 bit	14 bit	14 bit
Multi Integration Time	Yes	Yes	Yes	Yes	Yes
Window mode	Yes	Yes	Yes	No	Yes
Image rate (full screen mode/half screen mode/quarter screen mode)	up to 440/1,400/4,500 Hz line: 13,000 Hz	up to 250/900/4,500 Hz line: 10,000 Hz	up to 117/420/1,200 Hz line: 2,700 Hz	(1 ... 100) Hz/-/- -	up to 106/200/390 Hz line: 2,750 Hz
Digital interface optional	GigE CAMLink, USB	GigE CAMLink, USB	GigE CAMLink, USB	GigE CAMLink, USB	GigE 2x CAMLink, USB, HDMI, internal HDD
Trigger	2 IN/2 OUT, TTL	2 IN/2 OUT, TTL	2 IN/2 OUT, TTL	2 IN/2 OUT, TTL	2 IN/2 OUT, TTL
Tripod adapter	1/4" + 3/8"-photo thread, 2 x M5	1/4" + 3/8"-photo thread, 2 x M5	1/4" + 3/8"-photo thread, 2 x M5	1/4" + 3/8"-photo thread, 2 x M5	1/4" + 3/8"-photo thread, 2 x M5
Dimensions (mm)/ Weight (kg)	(244 x 120 x 160) 3.3	(250 x 123 x 160) 3.5	(250 x 120 x 160) 3.3	(250 x 123 x 160) 4.0	(244 x 130 x 160) 4.0

Model		ImageIR® 5300	ImageIR® 5800	ImageIR® 8300	ImageIR® 8800	ImageIR® 9300
Objektiv	Focal length	FOV (°)	FOV (°)	FOV (°)	FOV (°)	FOV (°)
Wide angle lens	12 mm	(43.6 x 35.5)	(40.5 x 32.9)*	(43.6 x 35.5)	(43.0 x 35.0)*	(86.0 x 70.0)
Standard lens	25 mm	(21.7 x 17.5)	(21.7 x 17.5)	(21.7 x 17.5)	(23.1 x 18.6)	(42.8 X 34.8)
Telephoto lens	50 mm	(11.0 x 8.8)	(11.0 x 8.8)	(11.0 x 8.8)	(11.7 x 9.4)	(21.7 x 17.5)
Telephoto lens	75 mm	-	(7.3 x 5.9)	-	(7.8 x 6.3)	-
Telephoto lens	100 mm	(5.5 x 4.4)	(5.5 x 4.4)	(5.5 x 4.4)	(5.9 x 4.7)	(10.9 x 8.8)
Telephoto lens	200 mm	-	(2.7 x 2.2)	(2.8 x 2.2)	(2.9 x 2.3)	-

* Focal length: 13 mm

Macro	ImageIR® 5300/8300 Pixelsize	ImageIR® 5300 FOV (mm)	ImageIR® 8300 FOV (mm)	ImageIR® 9300 FOV (mm)
Close-Up for Telephoto lens 50 mm	180/90 µm	(58 x 46)	(58 x 46)	(115 x 92)
Close-Up for Telephoto lens 100 mm	150/75 µm	(48 x 38)	(48 x 38)	(96 x 77)
Microscopic lens M=1.0x	30/15 µm	(9.6 x 7.7)	(9.6 x 7.7)	-
Microscopic lens M=3.0x	10/5 µm	(3.2 x 2.6)	(3.2 x 2.6)	-
Microscopic lens M=8.0x	-/1.9 µm	-	(1.2 x 0.96)	(2.4 x 1.92)

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