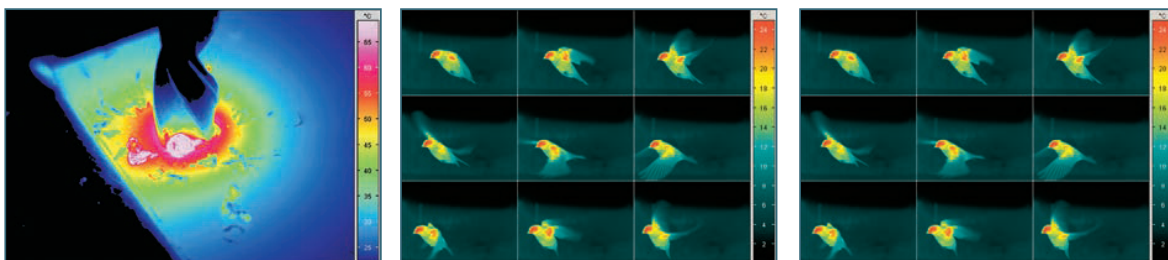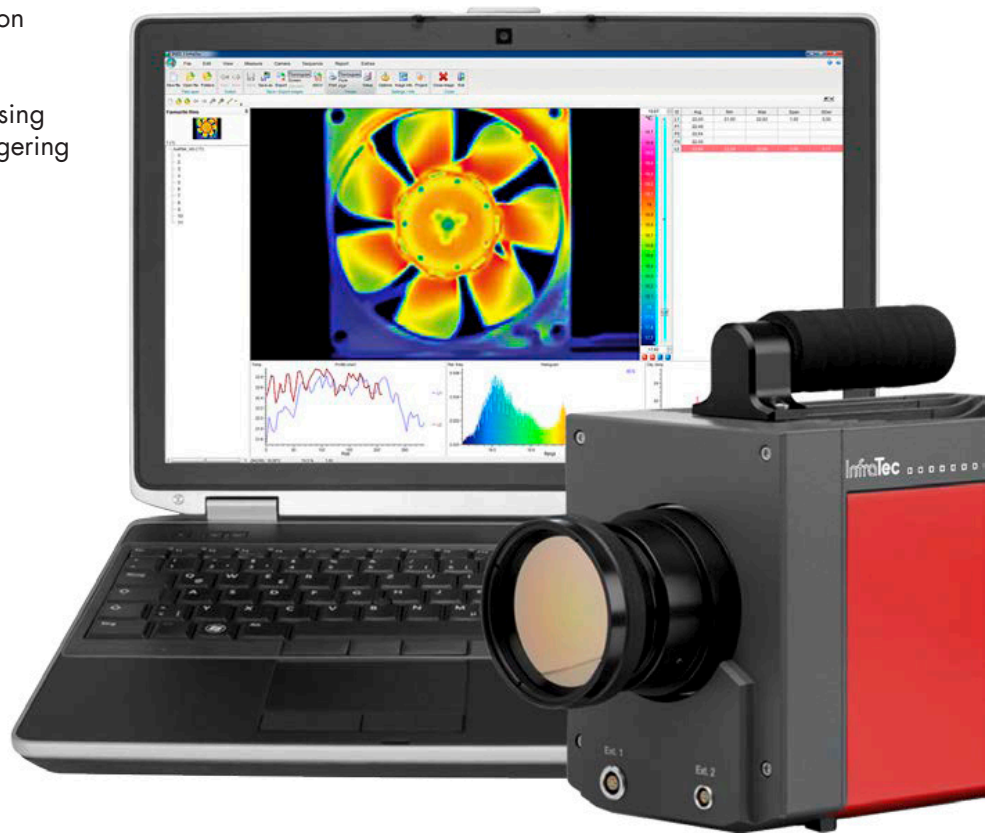# High-end camera series ImageIR®
Thermographic systems to match highest standardsa

Benefits & Features

- 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

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InfraTec.

High-end camera series ImageIR®
Thermographic systems to match highest standardsa

High-end system ImageIR®

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 back-side of the ImageIR®. The front is equipped with ports for ex-ternal sensors, motor focus and zoom lenses. At the back side of the ImageIR® the 10 GigE/GigE interface respectively CAMLink/DualCAMLink data interface are located as well as the trigger interface, CAN-Bus-RS232- and USB connector.

3   10 GigE Interface
The 10GigE interface allows for a very reliable high-speed data transfer in industrial environments indepen-dently 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 equip ped with a snap-shot detector as well as with an internal trigger inter-face, 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. Addi-tional digital and analogue in- and outputs are available in connection with the process interface of the IRBIS® 3 software. Furthermore, addi-tional information as well as an IRIG B time-stamp can be directly saved with the in-frared image data.

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 operati- on. Up to 10,000 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 adap- tor. The power adaptor provides the ImageIR® with either one or multiple direct currents, depending on the fea- tures; 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 alumini-um 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 installa-tion on different tripods or pan-tilt solutions for both process- integrated continuous operation and labora-tory applica- tion. Because of its additional mechanical interfaces, the ImageIR® can also be integrated into automated inspec- tion systems.

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Module 1

Module 2

Module 3
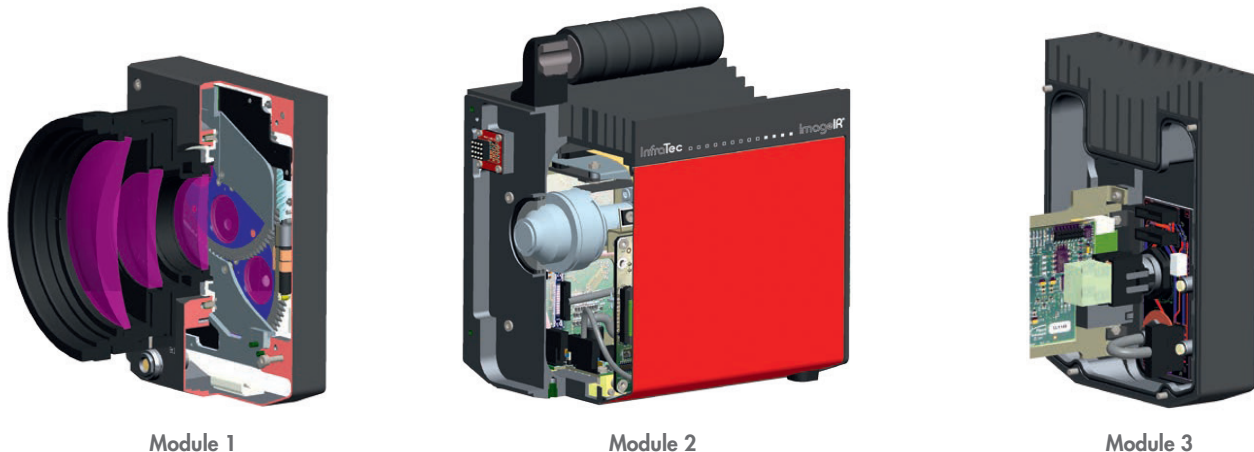
The new dimension of high-end thermography
InfraTec's high-end camera series ImageIR® excels in metrological performance characteristics and in unknown compactness and variability. Users who depend on extremely flexible camera technology with a maximum of sensitivity, accuracy, geometrical resolution 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*

Module 2
- IDCA (detector + cooler)
- Data processing
- Controller for camera, detector, temperature sensor
- Power supply

Module 3
- 10 GigE*, GigE, CAMLink*
- USB, RS232
- CAN-Bus*
- 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*
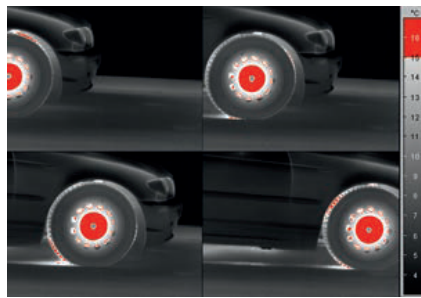- Lens protections and mounts*

* Depending on model
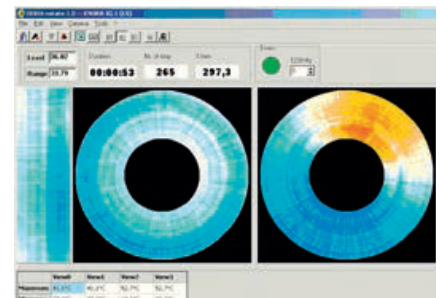
High-end camera series ImageIR®
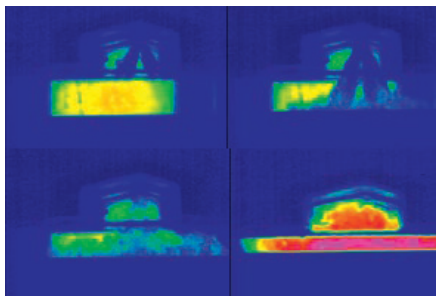# Thermographic systems to match highest standardsa
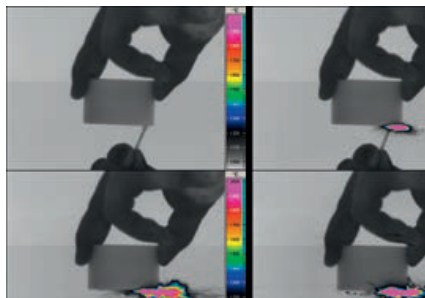
Igniting a match
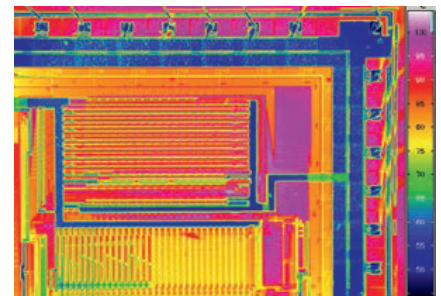

Operative surface of an ABS

Hotspot detection of fast-rotating objects

Fuel-injection of an internal- combustion engine

Micro thermography of a chip

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 blow-hole detection
- Object surveillance
- Medicine

Spectral thermography

The spectral range of the camera is optimised for mea-sure- ments corresponding to the spectral characteristics of the materials to be detected. The preferred system for spectral thermography is the ImageIR® with a me-dium 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.

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 micro-scopic lenses, which are capable of making visible smallest details with one pixel representing 2 µm of the object, are at your disposal to mea- sure 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 trig-gering 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.

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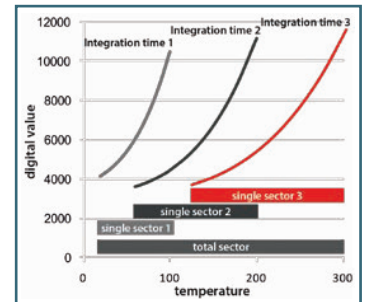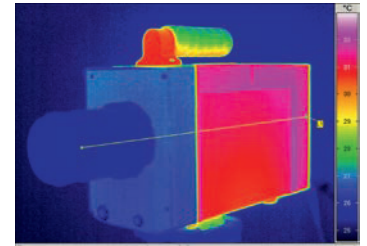
Innovations

Optical design

The infrared lenses are one of the most important components of the ImageIR®. Its optical perfor- mance parameters are calibrated with respect to functionality, quality and flexible application. By choosing the prop- er IR-transparent lens materials and high-precision anti-reflexion coating, the lenses are optimised for different spectral ranges and therefore achieve best transmission pro- perties in the entire operating temperature range. Additio- nal correction lenses reduce the distortion to a minimum and guarantee highest imaging quality.

Precision calibration & thermally decoupled optics

InfraTec's especially developed multiple charac- teris- tic lines algorithm for calibration of thermo- graphic systems compensates for environmental temperature variations. It also provides for highest repeata- bility and ideal system warm-up behaviour. High image ho- mogeneity 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 oper- ated 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 five free positions (25 com- binations) is a precondition for the universal use of ImageIR® for different applications with high object tem- pe- ratures and applications in spectral thermography. Interfering effects are prevented by signal degradation apertures 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 the possible to adjust the respective subwindowing mode. Via click and drag freely definable par- tial im- age formats can be defined in a quick and comfortable way. In doing so, frame rates up to 25,000 Hz can be reached.

Multi integration time (MIT)

The MIT feature allows more dynamic and wider temperature ranges while using different inte- gration 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 ran- ge changeover or lowering the thermal resolution.

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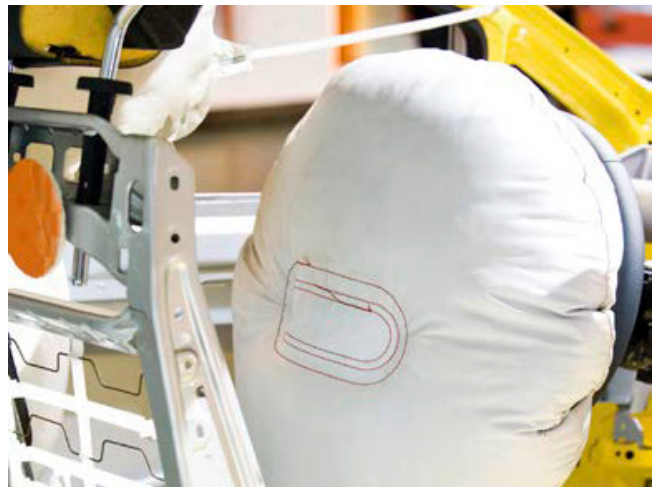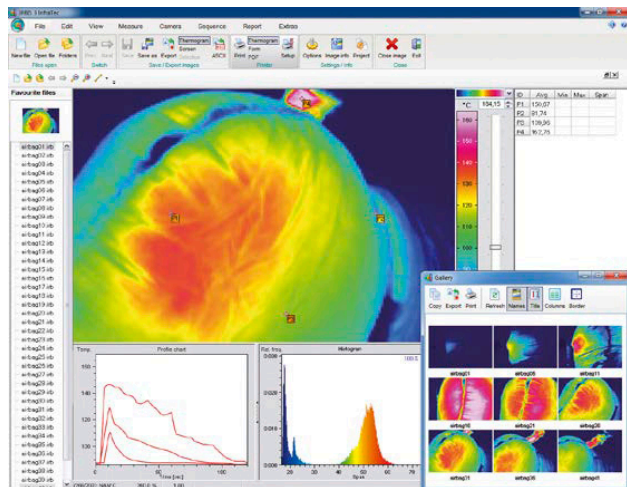
Control and analysis software IRBIS® 3

The software family IRBIS® 3, developed by InfraTec, is part of a complete package of the camera series ImageIR®. Custo- mer-specifically adaptable high-end thermography solutions for the most diverse measuring tasks and applications can be realised with this soft- ware. The convenient and professional thermography software family IRBIS® 3 offers a wide range of analy- sis- and editing tools. Besides numerous implemented models for the correction of the emissivity value, the com- pensation 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 / process

The comfortable control- and acquisition software for high- speed digital thermographic image data acqui- sition allows time and action-triggered capturing of thermographic ima- ges as well as for an intensity- and temperature-sensitive control of processes via digital or analogue 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 algo- rithms "quotient-", "pulse phase-" and "lock-in-method". All of these algorithms work independently of the degree of emissivity.

The software development kit (SDK)

The SDK enables the easy to handle integration of the ImageIR® into customer's existing software modules. It sup- ports several different program languages and of- fers an op- tional linking to Matlab and Labview.
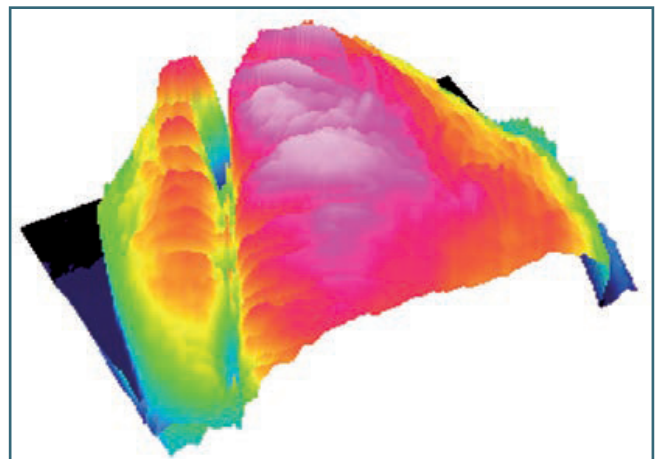
3D view of a thermogram

IRBIS® 3 sequence editor

The sequence editor offers efficient and freely definable automated selection of thermographic data from com- plex 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.
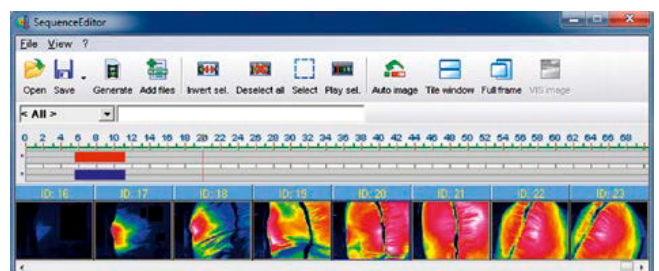
High-end camera series ImageIR®
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Model	ImageIR® 5300	ImageIR® 5800	ImageIR® 8300/8300 hp		ImageIR® 8800	ImageIR® 9300
Spectral range	(2.0 ... 5.7) µm	(8.0 ... 9.3) µm	(2.0 ... 5.7) µm		(8.0 ... 10.2) µm	(2.0 ... 5.7) µm
Pitch	30 µm	30 µm	15 µm		16 µm	15 µm
Detector	MCT or InSb	MCT or QWIP	MCT or Insb/InSb		MCT	InSb
Detector format (IR pixels)	(320 × 256)	(320 × 256)	(640 × 512)		(640 × 512)	(1,280 × 1,024)
Selection mode	ITR	ITR	ITR / IWR		ITR	ITR / IWR
Detector cooling			Stirling cooler			
Temperature measuring range	(-40 ...1,500) °C	(-40 ... 600) °C	(-40 ... 1,500) °C		(-10 ... 300) °C	(-40 ... 1,500) °C
	up to 3,000 °C*	up to 1,500 °C*	up to 3,000 °C*		up to 1,500 °C*	(up to 2,000 °C)*
Measurement accuracy	± 1 °C or ± 1 %					
Temperature resolution @ 30 °C	0.015 K	0.025 K	0.02 K		0.035 K	0.025 K
Frame rate (full screen mode/	Up to 450 /	Up to 250 /	Up to 117 /	Up to 355	Up to 100 /	Up to 106 /
half screen mode/	1,500 /	900 /	420 /	670	350 /	200 /
quarter screen mode/sub-frame)*	4,500 / 25,000 Hz	4,500 / 10,000 Hz	1,100 / 2,500 Hz	1,200 / 5,000 Hz	1,000 / 8,000 Hz	390 / 3,200 Hz
Window mode	Yes					
Focus	Manually, motorised or automatically*					
Dynamic range	Up to 16 bit*					
Integration time	(1 ... 20,000) µs in	(1 ... 20,000) µs in	(0.6 ... 20,000) µs in		(1 ... 200) µs in	(0.5 ... 18,000) µs in
	increments up to 1 µs	increments up to 1 µs	increments up to 1 µs		increments up to 1 µs	increments up to 1 µs
Rotating filter wheel*	Up to 5 positions	Up to 5 positions	Up to 5 positions		Peltier wheel	Up to 5 positions
Rotating aperture wheel*	Up to 5 positions	No	Up to 5 positions		No	Up to 5 positions
Multi Integration Time*	Yes					
Interfaces	GigE, CAMLink*, USB	GigE, CAMLink*, USB	GigE, CAMLink*, USB/ GigE, 10 GigE*, USB, 2 × CAMLink*, HDMI*		GigE, CAMLink*, USB	GigE, 10 GigE*, 2 × CAMLink*, USB, HDMI*
Trigger	2 IN/ 2 OUT, TTL					
Analog signals*, IRIG B*	1 IN, no	1 IN, yes	1 IN, yes / 1 IN/ 2 OUT, yes		1 IN, / 2 OUT, yes	1 IN, / 2 OUT, yes
Tripod adapter	1/4" and 3/8" photo thread, 2 × M5					
Storage temperature	(-40 ... 70) °C					
Operation temperature	(-20 ... 50) °C					
Protection degree	IP54, IEC 529					
Dimensions	(244 × 120 × 160) mm	(250 × 123 × 160) mm	(244 × 120 × 160) mm		(250 × 123 × 160) mm	(244 × 130 × 160) mm
Weight	3.3 kg	3.5 kg	3.3 kg		4.0 kg	4.0 kg

High-end camera series ImageIR®
Thermographic systems to match highest standardsa

Model		ImageIR® 5300	ImageIR® 5800	ImageIR® 8300 / 8300 hp	ImageIR® 8800	ImageIR® 9300
Lens	Focal length	FOV (°)	FOV (°)	FOV (°)	FOV (°)	FOV (°)
Wide-angle lens	12 mm	(43.6 × 35.5)	(40.5 × 32.9)**	(43.6 × 35.5)	(43.0 × 35.0)**	-
Standard lens	25 mm	(21.7 × 17.5)	(21.7 × 17.5)	(21.7 × 17.5)	(23.1 × 18.6)	(42.8 × 34.8)
Telephoto lens	50 mm	(11.0 × 8.8)	(11.0 × 8.8)	(11.0 × 8.8)	(11.7 × 9.4)	(21.7 × 17.5)
Telephoto lens	100 mm	(5.5 × 4.4)	(5.5 × 4.4)	(5.5 × 4.4)	(5.9 × 4.7)	(11.0 × 8.8)
Telephoto lens	200 mm	(2.7 × 2.2)	(2.7 × 2.2)	(2.7 × 2.2)	(2.9 × 2.3)	-
* Depending on model						
** Focal lenght 13 mm						

Macro and microscopic lenses	ImageIR® 5300	ImageIR® 8300 / 8300 hp	ImageIR® 9300
	Pixel (µm)/ FOV (mm)	Pixel (µm)/ FOV (mm)	Pixel (µm)/ FOV (mm)
Close-Up for telephoto lens 50 mm	180 / (58 × 46)	90 / (58 × 46)	90 / (115 × 92)
Close-Up for telephoto lens 100 mm	150 / (48 × 38)	75 / (48 × 38)	75 / (96 × 77)
Microscopic lens M=1.0×	30 / (9.6 × 7.7)	15 / (9.6 × 7.7)	15 / (19.2 × 15.4)
Microscopic lens M=3.0×	10 / (3.2 × 2.6)	5 / (3.2 × 2.6)	5 / (6.4 × 5.1)
Microscopic lens M=8.0×	3.8 / (1.2 × 0.96)	1.9 / (1.2 × 0.96)	1.9 / (2.4 × 1.92)

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