VarioCAM® High Definition
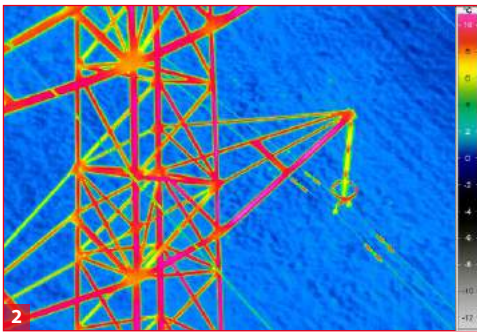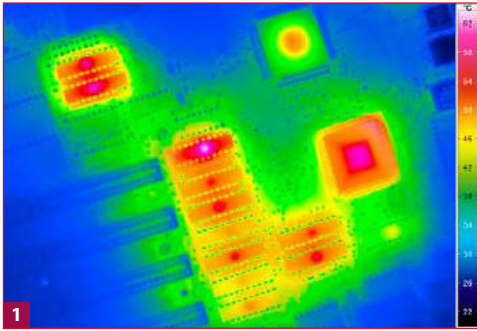
Thermography in HD Quality Opens up New Dimensions

InfraTec.

Innovative opto-mechanical MicroScan technology

Detector formats (640 × 480) and (1,024 × 768) IR pixels

Thermal images in photo quality with up to 3.1 Megapixels

Outstanding thermal resolution up to 0.02 K

High-speed data acquisition up to 240 Hz

Wide range of high-quality interchangeable lenses

Made in Germany

1) Board
2) High-voltage line

www.InfraTec.eu

HD Quality

13 Micro USB and HDMI interface	**14** Speaker **15** Microphone **16** Covered SDHC card slot

Mobile VarioCAM® HD Camera Models

Unique performance features, robustness as well as excellent handling and intuitive operation characterise the mobile cameras of the VarioCAM® HD. Qualities such as these make the top-of-the range models in the segment of high-resolution microbolometer cameras indispensable tools for professional users. The application specific equipment lines "research" as well as "inspect" guarantee the optimum usability in a very broad range of applications from industry and science.

1 Camera housing with carrying handle*

Ergonomically optimised and equipped with a comfortable supporting loop, the camera fits perfectly in your hand even over long periods of time. The intuitive handling with just one hand, the robust light metal housing (protection degree IP54) and comfortable carrying handle facilitate sustained capturing of mobile thermal images even of measuring objects difficult to access.

2 Lens

The high-quality f/1.0 precision optics stand out due to their first-class transmission and transmission quality and automatic lens detection. The range offers solutions for the exact measurement of microstructures including telephoto applications for measuring objects at great distances.

3 Display

Highly luminous, energy-efficient and framed within the light metal housing, the 5.6" colour TFT display is suitable for harsh industrial use. Due to its (1,280 × 800) pixels it enables the native displaying of thermal images in high resolution with impressive brilliance and brightness. A noticeable limit stop imparts a secure feeling when rotating and swivelling the display.

4 Battery

During mobile usage of the camera, the fast-rechargeable, exchangeable Lithium-Ion battery convinces thanks to running times of more than three hours. Indicators directly on the battery and in the display reproduce the current charge level.

5 Colour video camera with LED video light

Real images can be saved synchronously using the high-luminosity, integrated digital colour video camera with 8 megapixels. If unfavourable lighting conditions prevail during daylight shots, the high-performance power-LED can illuminate the measuring objects effectively.
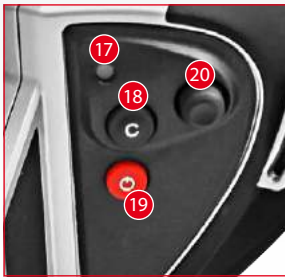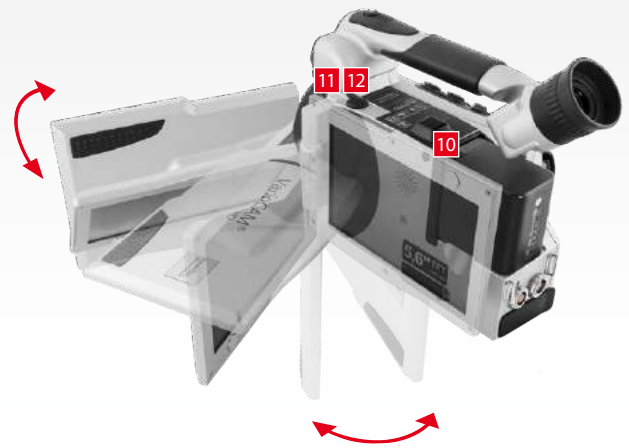
17	Power LED
18	ESC button (C)
19	Power button
20	Multi-function joystick

21	Focus rocker switch with autofocus
22	Temperature indication (T)
23	Automatic image optimisation (A)
24	Save (S)
25	Freely programmable buttons (1), (2)

TFT colour display with stable swivel joint:
170° rotatable and 280° revolvable

6 **GigE Vision Interface (LEMO®-socket, 8-pin)**

Reliable real-time thermographic image transmission and camera remote control via a standard PC interface (up to a distance of 100 m without additional hardware).

7 **Trigger and process interface (LEMO® socket, 14-pin)**

The integrated trigger and process interface guarantees precise, repeatable triggering via two bidirectional digital channels and two analogue outputs. It is connected via a Breakout box, which provides additional connections for power supply, video output (FBAS PAL / NTSC) and RS232.

8 **Colour viewfinder***

Even under difficult conditions, the high-resolution, inclinable colour TFT viewfinder with (800 × 600) pixels, diopter compensation and eyecup opens up an ideal view of the measuring object. The permanent display of the camera settings makes operation easier in such situations.

9 **Laser range finder* and laser pointer**

The laser range finder provides exact distance values of the measuring object for distances of up to 70 m in rapid succession. These values are shown in the camera display and stored as additional information in the thermographic image data. Furthermore, they are the basis for such important, innovative automatic functions like the measurement spot detection for preventing geometrical measuring errors and permanent autofocus. Moreover, the eye-safe laser pointer is used for marking the centre of the image on the measuring object.

10 **GPS receiver***

Exact positional data of the camera position at the time of the shot constitutes valuable information for the subsequent preparation of thermographic reports. This data is acquired automatically by the GPS receiver and saved in the stored thermographic image data by the camera.

11 **WLAN**

If direct operation or connection via cable is not possible, wireless remote control via WLAN offers an excellent alternative for controlling the camera completely from another location. The adaptable high-performance antenna ensures high ranges.

12 **Bluetooth***

Easy coupling with external devices such as headsets, data loggers, humidity sensors or current clamps is possible via Bluetooth.

* Depending on model

8 Power LED
9 Switches

Stationary VarioCAM® HD head Camera Models

The VarioCAM® HD head, based on the same camera core as the mobile models, is compatible with GigE-Vision and GenICam by default and has digital inputs and outputs. The different variants of the VarioCAM® HD head are suitable as high-performance cameras and as robust cameras for virtually any stationary measuring task. Through their modular design and the compact light metal housing they are particularly predestined for stationary use in harsh process environments as well as for computer-assisted laboratory tasks.

1 **Camera housing**

The very robust light metal housing is available with the protection degree IP67. In conjunction with protection degree preserving LEMO® connectors, it is excellently suited for use in harsh industrial environments. For applications under extreme environmental conditions, suitable protective housings are also available, e.g. made from stainless steel, which can optionally be equipped with a cooling and heating system.

2 **Lens**

The broad range of super wide-angle lenses, telephoto lenses and microscopic lenses provides the camera system with a high degree of flexibility. Every single lens with high luminous intensity (f/1.0) and its special calibration supports a constantly high measurement quality for the most varied tasks.

3 **Tripod adapter on the bottom of the camera**

The standard ¼" photo thread allows the use of standard tripods and adapter systems.

4 **Thread for alternative mounting of the housing**

A total of four threaded holes allow the axially rotated mounting of the camera by 90°.

5 **GigE Vision Interface (LEMO®-socket, 8-pin)**

Transmission of data fast and securely over distances of up to 100 m – this is the task of the GigE-Vision interface. In addition, the camera can be controlled remotely and supplied with current via Power over Ethernet by accessing this interface.

6 **Trigger and process interface (LEMO® socket, 14-pin)**

The integrated trigger and process interface guarantees precise, repeatable triggering via two bidirectional digital channels and two analogue outputs. It is connected via a Breakout box, which provides additional connections for power supply, video output (FBAS / PAL / NTSC) and RS232.

7 **USB and HDMI connection**

An HDMI and USB connection can be used for the digital output of video signals in high quality and for access to the optionally integrated large thermographic image data memory. These connections are fitted behind a cover for preserving the protection degree in harsh operating conditions.

Equipment and Accessories

Suitable accessories are available for all equipment packages whose wide range opens up numerous possibilities to demanding users.

Accessories*

- Wide-angle, telephoto, microscopic and macro lenses
- Infrared protective windows and laser safety filters for adaptation on the lens
- Filter slides with various spectral filters
- SDHC memory cards, HDMI-, DVI- and BNC-cables of different lengths
- Ethernet cables of different lengths with 8-pin LEMO® connectors
- Power-over-Ethernet injector, power supply, batteries, multi-compartment speed charger, vehicle adapter
- Process interface, Breakout box
- Bluetooth headset
- LWL converter
- Various tripods with 3D head
- Special tripod for telescopic and microscopic applications
- Special protective housings
- Remote control and analysis units
- Stable PELI hard shell cases of different sizes
- SDK

Software Packages and Modules

Software for analysing thermographic images and compiling reports
- Basic packages IRBIS® 3, IRBIS® 3 plus and IRBIS® 3 professional
- Thermography report software IRBIS® 3 report

Software enhancements
- IRBIS® 3 active
- IRBIS® 3 mosaic
- AVI generator
- Macro, sequence, palette editor

Control and acquisition software
- IRBIS® 3 remote HD
- IRBIS® 3 control
- IRBIS® 3 online
- IRBIS® 3 process
- IRBIS® 3 vision

Examples of accessories

* Depending on model

Technical Data of the VarioCAM® HD

Whether it is "inspect", "research" or "head" – each variant of the VarioCAM® High Definition model series offers very special options in its specific version, which are tailored to the different requirements. A modular device concept allows the cameras to be finely adapted to the field of application, from which the potential measurement and inspection task originates. The IRBIS® software family continuously developed by InfraTec also follows this exact modular, flexible approach. Extensively extended, it now includes with IRBIS® 3, IRBIS® 3 plus and IRBIS® 3 professional three packages of variously scaled performance levels, which can additionally be customised perfectly by numerous software enhancements. This means that users receive tailored software solutions for specific requirements such as the creation of reports, the preparation of panoramic shots, handling of the camera via remote control of non-destructive testing with active thermography.

Mobile and Stationary Models of VarioCAM® HD inspect, research and head

Spectral range	(7.5 … 14) µm
Detector	Uncooled microbolometer focal-plane array
Temperature measuring range	(-40 … 2,000) °C*
Measurement accuracy	± 1 °C or ± 1 %*
Temperature resolution @ 30 °C	Up to 0.02 K*
Window mode*	Half frame / quarter frame / sub frame
Storage media	SDHC card, external control computer for camera control and data acquisition*
Image storage	Time-, trigger- and temperature controlled recording of single frames or image sequences with timestamp, video streaming in MPEG format
Lens mount	Bayonet to comfortably switch objectives, automatic objective detection and data transfer
Zoom	Up to 32× digital, stepless
Dynamic range	16 bit
Interfaces	GigE-Vision*, DVI-D (HDMI), C-Video, RS232, USB 2.0, WLAN*, Bluetooth*
Trigger*	2× digital I/O, 2× analogue I/O
Tripod adapter	¼" photo thread
Storage and operation temperature	(-40 … 70) °C, (-25 … 55) °C
Impact strength, vibration resistance in operation	25 G (IEC 68 - 2 - 29), 2 G (IEC 68 - 2 - 6)
Automatic functions	Autofocus, permanent autofocus, autoimage, autolevel, min. / middle / max. temperature alarm: visual / acoustic, alarm triggered image storage
Measurement functions	8 freely choosable, movable measurement fields / points, automatic hot / cold spot display, globally and internally defined measurement fields, differential temperature measurement, temperature profile, histogram, differential image, isotherms display
Further functions	Camera internal emissivity correction, shutter free operation, use of various colour sets, contrast enhancement, user profile, language selection
Analysis and evaluation software	IRBIS® 3, IRBIS® 3 report, IRBIS® 3 view, IRBIS® 3 plus*, IRBIS® 3 professional*, IRBIS® 3 remote HD, IRBIS® 3 control*, IRBIS® 3 online*, IRBIS® 3 process*, IRBIS® 3 active*, IRBIS® 3 mosaic*, IRBIS® 3 vision*, Fornax 2*, Fornax 2 plus*

* Depending on model

Specifics of Mobile Models of VarioCAM® HD inspect and research

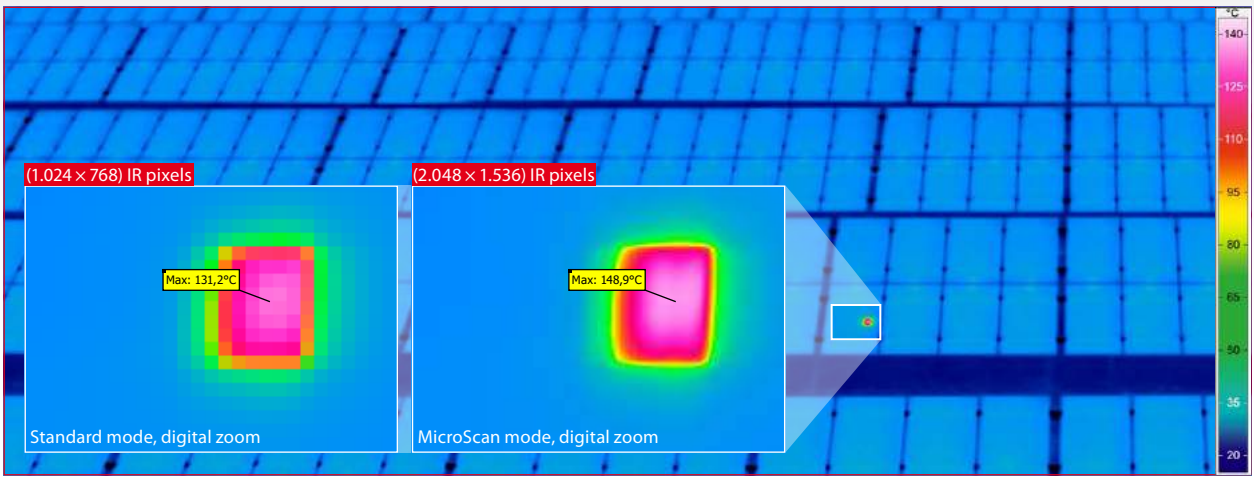|	900 series	800 series	700 series	600 series
Detector format (IR pixels)	(1,024 × 768)	(1,024 × 768)	(640 × 480)	(640 × 480)
Image format MicroScan (IR pixels)	(2,048 × 1,536)	–	(1,280 × 960)	–
Frame rate	Full-frame: 30 Hz, sub-frame formats*: 60 Hz (640 × 480) / 120 Hz (384 × 288) / 240 Hz (1,024 × 96)		Full-frame: 60 Hz , sub-frame formats*: 120 Hz (384 × 288) / 240 Hz (640 × 120)	
Focus	Motor-driven, automatic or manual, accurately adjustable, laser-supported autofocus*			
EverSharp function*	Multifocal recording allows for maximum extend of sharp focus			
Digital colour video camera	8 Megapixels, LED video light, vision mixer and cross-fade feature			
Power supply	Standard Lithium-Ion battery, energy save mode, AC adapter, (12 … 24) V DC			
Integrated microphone and speaker	Voice annotation feature, replay and audio dubbing			
Laser range finder*	Semiconductor laser red, laser protection class 2, range up to 70 m			
Integrated GPS sensor*	Image integrated storage of position data			
Display	5,6" colour TFT display (1,280 × 800) pixel, 170° rotatable and 280° revolvable, daylight suited, incl. flip mirror feature			
Colour viewfinder*	Tiltable colour viewfinder with diopter compensation			
Single-handed operation	Intuitive operation with ergonomically arranged function keys and multifunctional joystick, programmable keys			
Protection degree	IP54, IEC 60529			
Dimensions, weight	(210 × 125 × 155) mm, 1.6 kg (basic configuration with standard lens)			
Automatic functions	Automatic distance indicator, distance-dependent display of pixel size to avoid geometrically related measurement errors			
Further functions	Language selection, user-specific comment data base, EverSharp function			
Realtime storage*	Computer-aided storage of radiometric sequences by GigE interface with up to 240 Hz and for SDHC card			

* Depending on model

Specifics of Stationary Models of VarioCAM® HD head

	900 series	800 series	700 series	600 series
Detector format (IR pixels)	(1,024 × 768)	(1,024 × 768)	(640 × 480)	(640 × 480)
Image format MicroScan (IR pixels)	(2,048 × 1,536)	–	(1,280 × 960)	–
Frame rate*	Full-frame: 30 Hz, sub-frame formats*: 60 Hz (640 × 480) / 120 Hz (384 × 288) / 240 Hz (1,024 × 96)		Full-frame: 60 Hz , sub-frame formats*: 120 Hz (384 × 288) / 240 Hz (640 × 120)	
Focus	Motor-driven, automatic or manual, accurately adjustable			
Power supply	AC adapter, (12 … 24) V DC, PoE*			
Lens mount	Bayonet or screw-on interface*			
Protection degree	IP54, IEC 60529, IP67 with screw-on interface*			
Dimensions, weight	(221 × 90 × 94) mm, 1.15 kg (basic configuration with standard lens)			

* Depending on model

(1.024 × 768) IR pixels

Max: 131,2°C

Standard mode, digital zoom

(2.048 × 1.536) IR pixels

Max: 148,9°C

MicroScan mode, digital zoom

Efficient work and precise measurement results by increasing the geometrical resolution

Performance Features

3.1 Megapixel Resolution Thanks to MicroScan

3.1
MegaPixel

The MicroScan unit works opto-mechanically and is designed for continuous operation. With the latest generation of microbolometer detectors it enables in the formats (640 × 480) and (1,024 × 768) IR pixels a fourfold increase of the measuring points to (1,280 × 960) or (2,048 × 1,536) IR pixels. These represent real temperature measurement values and not interpolated image points. The significantly higher geometrical resolution not only results in qualitatively higher images, but allows access to numerous new applications. Furthermore, proven measuring tasks can be solved even more effectively. The MicroScan unit often allows extensive or remote measurement objects to be captured quickly, precisely and entirely with just one shot. This saves additional lenses, valuable time and offers a further benefit: The MicroScan unit enables a filling factor of 100 %. This means that the system ensures a continuous measurement of the temperatures on the depicted measuring object.

Permanent Autofocus

AF
Permanent

Constantly changing object scenes require manual or automatic refocusing. The integrated permanent autofocus function makes this task easier. In the case of a change of scene, the camera automatically applies the optimum focus setting quickly and precisely. The completely innovative, very powerful autofocus system is laser-based and works extremely reliably. Even under unfavourable environmental conditions, such as poor lighting conditions, darkness or low thermal contrasts on the measuring object, this function provides exactly focused thermal images.

Automatic Measurement Spot Detection

This modern function redefines professional capturing of thermographic images. Using the integrated laser range finder, the measurable minimum object size that is still error-free is determined for the current combination of detector format and lens and displayed in the daylight compatible, large colour TFT display of the camera. The user can vary the distance to the measuring object with this so that measurement errors due to geometry can safely be avoided. This additional information can be saved in the thermal image as well as retrieved if necessary and integrated into a report.
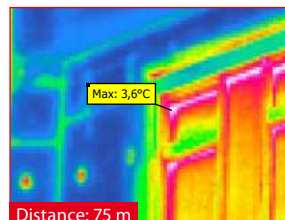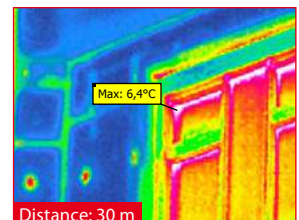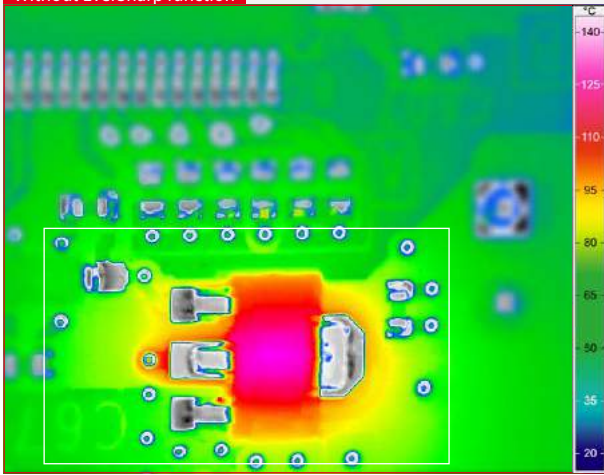

30 m

Determining the appropriate distance to the measuring object based on the measurement spot size

Max: 3,6°C

Distance: 75 m

Distance to the measuring object is too great
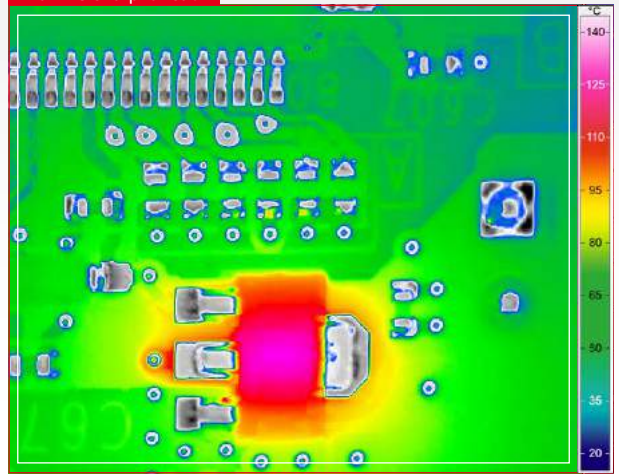

Max: 6,4°C

Distance: 30 m

Distance to the measuring object is sufficient

Without EverSharp function

Sections in the thermal image sharply focused

With EverSharp function

Highest sharpness of detail of all object structures

EverSharp Function

The innovative EverSharp function allows all objects in the image scene to be brought sharply into focus, regardless of how far these are from the camera and which lens is used. Special algorithms ensure an automatic combination of several images with different focusing (multi-focus images). In the resulting thermal image, a result from up to ten individual exposures, all object structures are thus sharply displayed so that the entire scene can be displayed and measured with the highest possible accuracy. The quality of the images depends entirely on the depth of focus of the lens used or the distance of the measuring objects from the camera. This means that the operation of the thermal imaging camera is even more convenient for the user.

Real-time Storage on SDHC Card

Recording dynamic scenes event-driven or time-controlled at full speed and all temperature data – this is possible at any time with the camera's internal real-time storage on SDHC card. In this process, radiometric data is stored in IRB format (infrared image format), which can be processed and analysed efficiently with the IRBIS® 3 evaluation software afterwards.

Consecutive numbering of the single frames within the sequence and storage of timestamps in the header ensure an exact time-based assignment of the thermal image data. The data can also be recorded as PNG or AVI files.

High-speed Image Storage

Operation of the VarioCAM® HD in so-called sub-frame mode (subwindowing) is provided for higher refresh rates. This mode enables the time or action-controlled recording of complex thermographic ces with refresh rates of up to 240 Hz. For this purpose, one defined section of the detector is read out at a time and transferred by means of GigE-Vision.

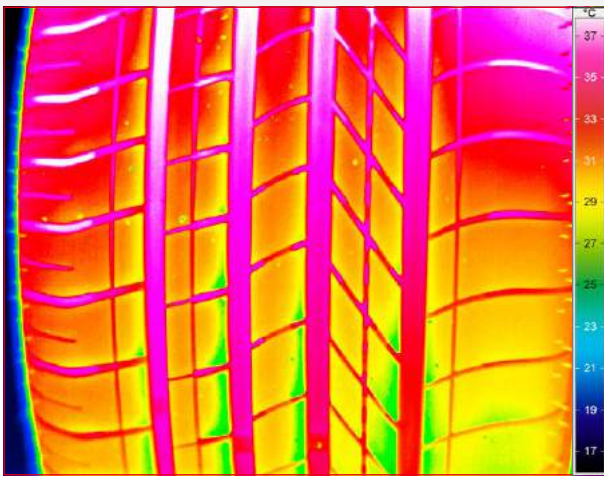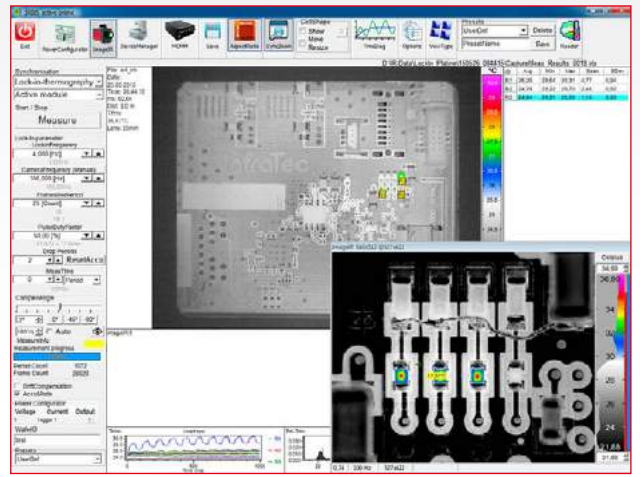| Detector format (1,024 × 768)	
Subframe	Frequency
(640 × 480) IR pixels	60 Hz
(384 × 288) IR pixels	120 Hz
(1,024 × 96) IR pixels	240 Hz

Detector format (640 × 480)	
Subframe	Frequency
(384 × 288) IR pixels	120 Hz
(640 × 120) IR pixels	240 Hz

Water drops in a cup

Prototype analysis of a tyre

IRBIS® 3 active for the non-destructive testing and component analysis

Your Application Areas

Research and Development

Whoever develops new products pays attention to every detail from the start. During the recording of even the smallest structures, you effectively avoid measurement errors due to geometry. The acquired data with a measurement accuracy of one percent meet the highest demands. You safely transfer the thermal images in your measuring environment via the GigE interface in the image format of up to (2,048 × 1,536) IR pixels at a frequency of up to 240 Hz. In addition, you adapt the VarioCAM® HD perfectly to your measuring task. The wide range of lenses ensures a high degree of flexibility when you are handling different sized measuring objects and variable operating distances.

Microthermography

Complex electronic components are becoming increasingly powerful and smaller. For this reason, precision plays a crucial role during their development. The VarioCAM® HD allows you

16 mm
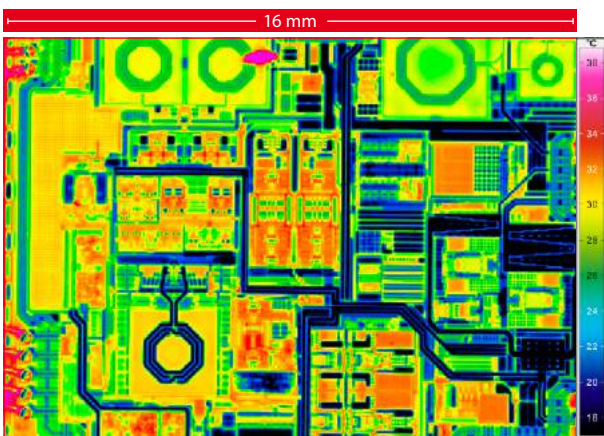
Microthermographic image of electronic components

to analyse extremely small structures of up to 17 µm, which appear consistently sharp thanks to the EverSharp function, and to determine their temperatures exactly. The detector resolution of (1,024 × 768) IR pixels opens up adequate room for you to record your component reliably with sufficient, geometrical resolution. Thus, you obtain results with a high level of measurement accuracy.

Process Optimisation

The continuous measurement in production processes places the highest demands on your devices. The compact light metal housing with IP67 of the VarioCAM® HD protects your camera even in harsh industrial environments. High-quality, protection class preserving LEMO® connectors ensure the transfer of the camera data. The GigE interface ensures fast and secure transfer up to 240 Hz in your system environment. The direct connection of the process interfaces to the special software IRBIS® 3 process allows your data to be integrated into the process environment.

Non-destructive Testing

The combination of repeatable triggering and high thermal resolution predestines the VarioCAM® HD particularly for non-destructive testing. Firstly, you create thermal images via external signals, transmit temperature-dependent signals simultaneously and thus synchronously control your test process. Secondly, the thermal resolution of up to 0.02 K ensures noiseless reproduction of the smallest temperature differences. The IRBIS® 3 active thermography software, which is adapted perfectly to the thermal image camera, supports the evaluation and display of the corresponding results with its complex evaluation algorithms.
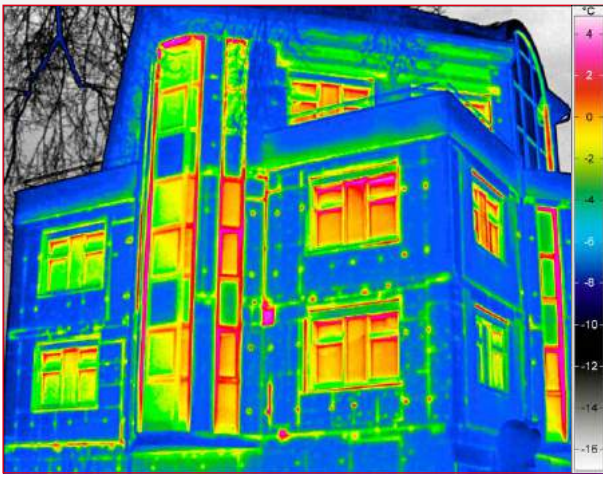
Building thermographic image of a low-energy house
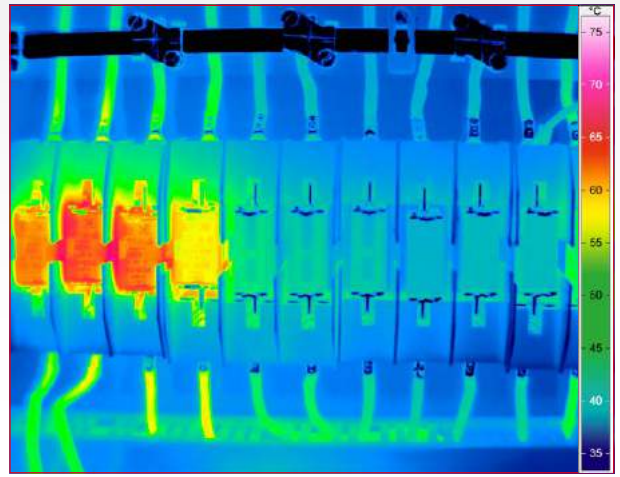
Overheated NH fuses of an overloaded system

Building Thermography

The unique geometrical resolution of the VarioCAM® HD of up to 3.1 Megapixels enables significantly more efficient analyses, particularly of large objects. You detect even the smallest structures, reduce the number of your individual images and thus save valuable time. The combination with a high thermal resolution ensures additional flexibility even under unfavourable heat flow conditions. With FORNAX 2 plus you no longer have to wait for days with the appropriate weather, but instead you can measure regardless of the time of year even in the case of slight temperature differences. The large 5.6" colour TFT display is ideally suited for the initial check of your recordings on site.

Predictive Maintenance

With the VarioCAM® HD you can carry out inspections quickly and easily. In the large 5.6" colour TFT display, your recordings are reproduced natively in the resolution of the detector. This means that you can analyse thermal images easily on the spot – even in daylight. With the integrated visual 8-megapixel camera you receive valuable additional information for orientation in the measuring environment and create videos. Thanks to the GPS function, you can later uniquely assign your recordings locally and purposefully request necessary repairs, for example. The recording of situational comments supports you during the effective creation of the inspection reports.

Airborne Thermography

Do you want to inspect overhead electrical power lines, pipelines or industrial plants from the air? Or check large areas for energetic and material environmental pollution? Then the high-resolution VarioCAM® HD head is your choice. Integrated in gyro-stabilised platforms, so-called gimbals, the camera reliably records large-scale areas. You can determine and synchronously save the GPS coordinates from the camera location for each thermal image. In this way, you efficiently plan and effectively check from the air. The large range of interchangeable lenses also helps you to solve your measuring task.

Aerial thermal image of the city centre of Graz

Further Application Areas

- Automatic solutions in quality assurance and process optimisation
- Electronics / electrical engineering
- Automotive industry
- Aerospace
- Monitoring and evaluation
- Veterinary and human medicine

Lenses

The versatile range of precision interchangeable lenses of the VarioCAM® High Definition model series ensures maximum flexibility during their use. Possible measurement and inspection tasks include microthermography as well as telephoto applications for measuring objects at great distances. In this wide application spectrum, the lens design of the VarioCAM® HD camera series has proved to be an uncompromising, athermalised full lenses with the aperture f/1.0, highest transmission and quality as well as low distortion.

Thus, the camera ensures simple handling, very fast operational readiness and extremely accurate measurement results as well as consistent image sharpness even in the event of widely varying environmental temperatures. A special, highly resistant DLC coating protects the optically active surfaces of the lenses even under harsh conditions. Extensive measuring objects such as photovoltaic systems can also be thermographically measured reliably and efficiently, such as objects requiring safety distances, as in the case of high-voltage installations. When changing a lens, this is detected automatically by the camera and the stored calibration data is loaded.

Detector format (IR pixels)		(640 × 480)	(1,024 × 768)
Lenses	Focal distance (mm)	FOV (°)	FOV (°)
Super wide-angle lens	7.5	(93.7 × 77.3)	(98.5 × 82.1)
Wide-angle lens	15	(56.1 × 43.6)	(60.3 × 47.0)
Standard lens	30	(29.9 × 22.6)	(32.4 × 24.6)
Telephoto lens	60	(15.2 × 11.4)	(16.5 × 12.4)
Telephoto lens	120	(7.6 × 5.7)	(8.3 × 6.2)

Macro and microscopic lenses	Min. object distance (mm)	Pixel (µm)	Pixel (µm)
Close-Up 0.2× for 30 mm	70	75.4	51.3
Close-Up 0.5× for 30 mm	33	41.4	28.2
Close-Up 0.5× for 60 mm	78	41.6	28.3
Microscopic lens M=1.0×	50	25	17

Filter attachment and laser protection window

DRESDEN

DALLAS

Latest information on the internet.