



INFRARED CAMERAS

The most portable infrared online cameras in the world

innovative infrared technology

Important features of the Optris infrared cameras



Special advantages

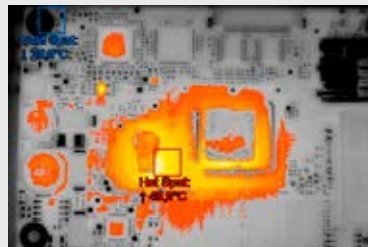
- Temperature ranges from $-20\text{ }^{\circ}\text{C}$ to $2000\text{ }^{\circ}\text{C}$
- Small cameras ideal for OEM use
- Up to 1 kHz for fast processing
- Optical resolution up to 764×480 pixels
- Includes license-free analysis software and full SDK for Windows and Linux

Made in
Germany

2 years
warranty

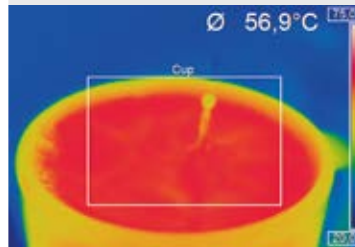
Automatic hotspot search

Objects can be thermally analyzed and **hot or cold spots** can be found automatically.



Fast measurements

Temperature distributions on a surface can be precisely recorded at **millisecond intervals**.



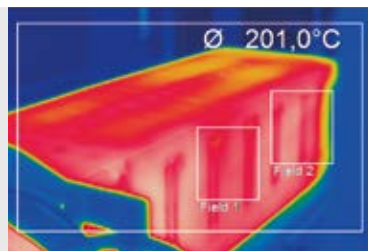
A drop of milk falling into a cup of coffee

Portable and stationary

The cameras bridge the existing gap between portable infrared snapshot cameras and purely stationary devices.

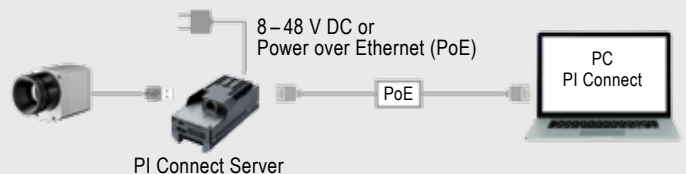
Examples of areas of application are:

- **Process automation**
- **Test stations**
- **Research & development**
- **Mobile measuring tasks**



Simple process integration

Advanced interface concepts enable integration into networks and automated systems:



- USB cable extension up to 100 m (over Ethernet)
- Industrial Process Interface (PIF) with two analogue inputs, one digital input and over three analogue outputs/alarm outputs with three isolated relays ($0 - 30\text{ V} / 400\text{ mA}$); additional fail-safe relay.
- Software Development Kit (SDK) for integration of the camera into customer-specific software via Dynamiclink Library (DLL) or COM-Port.

Small camera ideal for OEM use

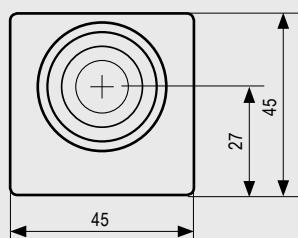
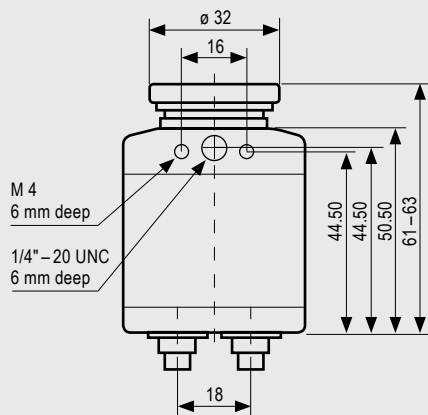
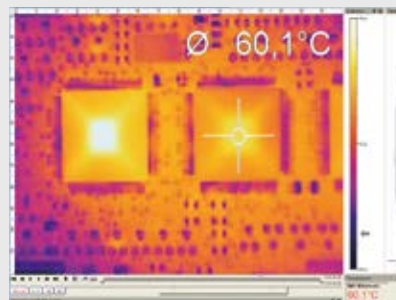


- Outstanding value for money
- Very good thermal sensitivity of 80 mK
- Thermal image up to 120 Hz
- Detector with 160 x 120 pixels
- Compact design (dimensions: 45 x 45 x 62 mm)
- Includes license-free analysis software and full SDK

Surface measurements in industrial application

The optris® PI 160 infrared camera is always used when temperature monitoring of surfaces is required and the single point measurement of pyrometers is no longer sufficient.

Nowadays surface measurements are essential in the automotive field, in plastic applications and in the solar industry.



Dimensions in mm

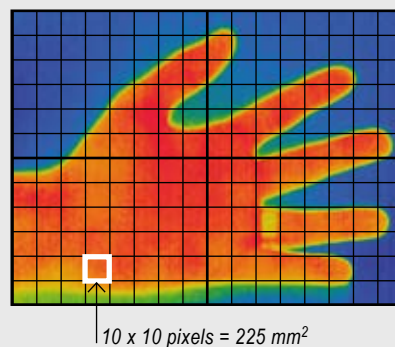
Suitable lenses for every measurement distance

Same measurement field size at different measurement distances:

- Telephoto lens:
2.13 m measurement distance
- Standard lens:
0.6 m measurement distance
- Wide-angle lens (41°):
0.32 m measurement distance
- Wide-angle lens (72°):
0.17 m measurement distance

Hand as measurement object:
measurement field size 240 mm x 180 mm
pixel size 1.5 mm

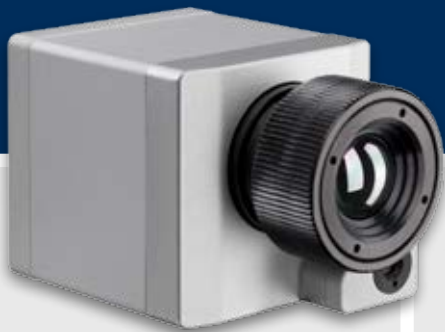
160 x 120 pixels



optris® PI 200 / PI 230

INFRARED CAMERA WITH BI-SPECTRAL TECHNOLOGY

Two cameras in one compact device



- BI-SPECTRAL Technology
- Time-synchronized visual image recording at up to 32 Hz (640 x 480 pixels)
- Real image camera is highly sensitive in low-light conditions
- Thermal images to 128 Hz (160 x 120 pixels)
- Compact design (dimensions: 45 x 45 x 62 mm)
- Includes license-free analysis software and full SDK

BI-SPECTRAL Technology

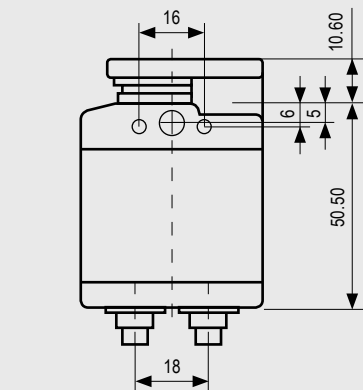
With the help of BI-SPECTRAL technology a **visual image (VIS)** can be combined with a **thermal image (IR)** and plotted synchronistically:

Surveillance mode:

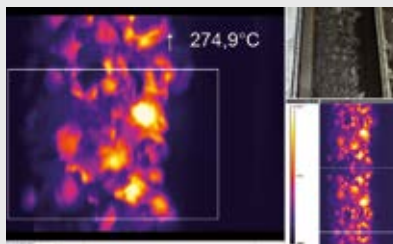
Easy orientation at the measuring point through separate display of the visual picture.

Crossfade mode:

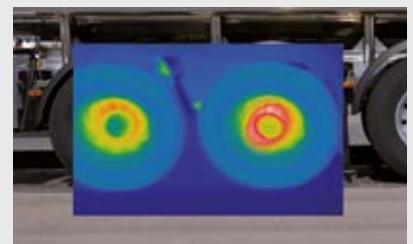
Highlight critical temperatures by means of crossfade (transparency from 0 to 100 %) or by means of superimposition of defined temperature fields (thresholds).



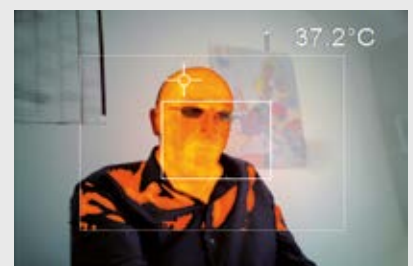
Dimensions in mm



Monitoring of a carbon ribbon



Measurement of the brake temperature in superimposed picture



Cross-fade of a VIS image above 35 °C

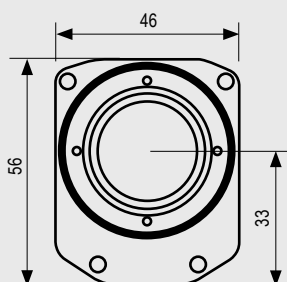
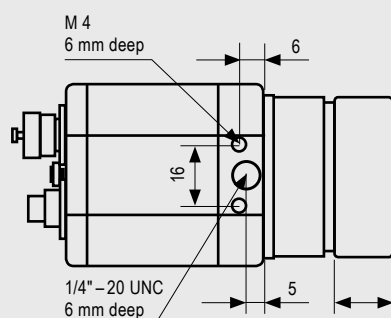
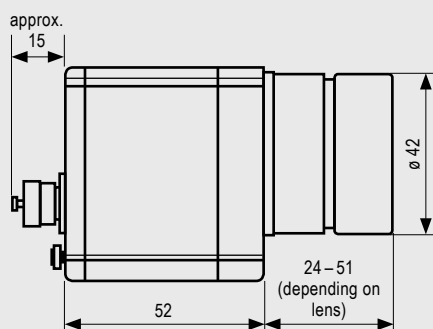
The smallest camera in its class



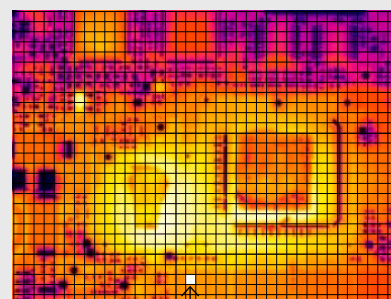
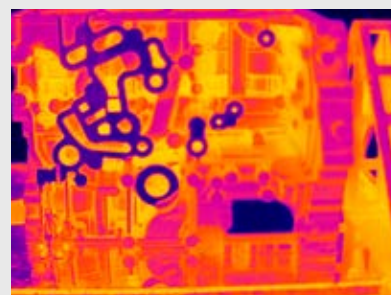
- The smallest camera in its class (46 x 56 x 90 mm)
- Very good thermal sensitivity at 80 mK
- Thermal image recording up to 80 Hz
- Interchangeable lenses & industrial accessories
- Lightweight (320 g incl. lens)
- Detector with 382 x 288 pixels
- Includes license-free analysis software and full SDK

High-performance for a wide range of uses

The high-performance optris® PI 400 infrared camera has a wide range of uses in industry. For example, thermal image shots help to monitor processes and ensure the quality of manufactured products in the automotive field in particular, in the manufacturing of plastics as well as in the semiconductor and photovoltaic industry.



Dimensions in mm

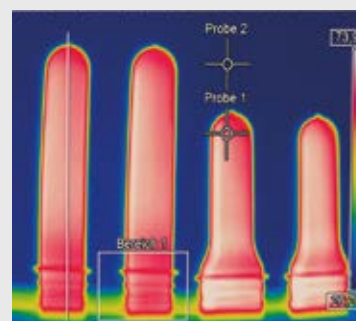


382 x 288 pixels | 10 x 10 pixels = 40 mm²

SMD chip as measurement object:
measurement field size: 240 mm x 180 mm,
pixel size: 0.63 mm

80 Hz recordings with full pixel resolution

The display and recording of thermal images at full optical resolution can be done at high measurement speeds of 80 frames per second.



Thermal image shots of preforms
in PET bottle production

optris® PI 450

INFRARED CAMERA

WITH VERY HIGH OPTICAL RESOLUTION

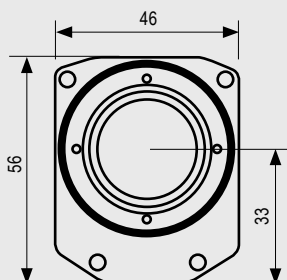
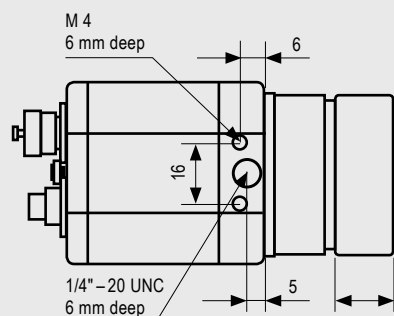
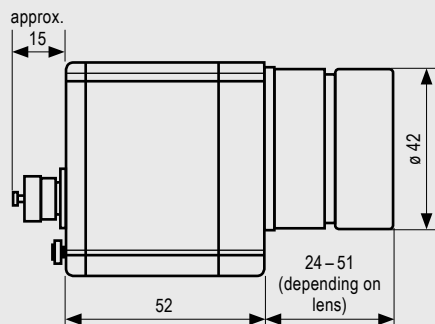
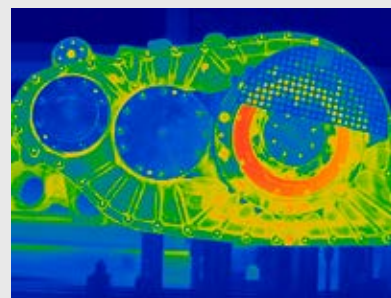
Detection of minimal temperature differences



- The smallest camera in its class (46 x 56 x 90 mm)
- Exceptional thermal sensitivity at 40 mK
- Thermal image recording up to 80 Hz
- Interchangeable lenses & industrial accessories
- Lightweight (320 g incl. lens)
- Detector with 382 x 288 pixels
- Usable at ambient temperatures of up to 70 °C without the need for additional cooling
- Includes license-free analysis software and full SDK

Highest temperature resolution of 40 mK

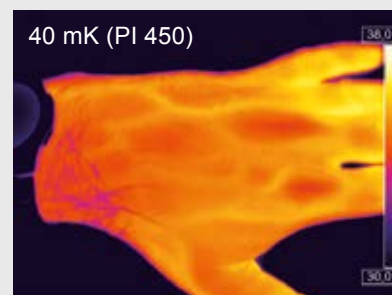
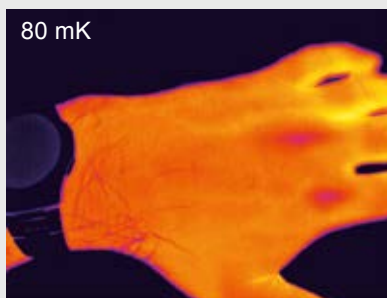
With an optical resolution of 40 mK, the optris® PI 450 is used for measuring the most subtle temperature differences, e.g. in the quality control of products or in preventive medicine.



Dimensions in mm

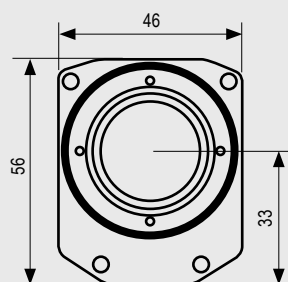
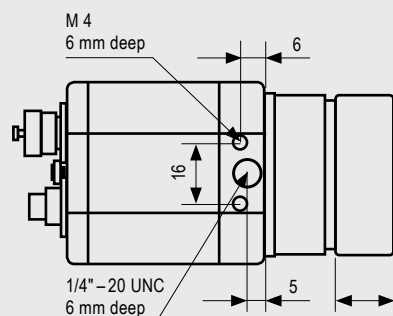
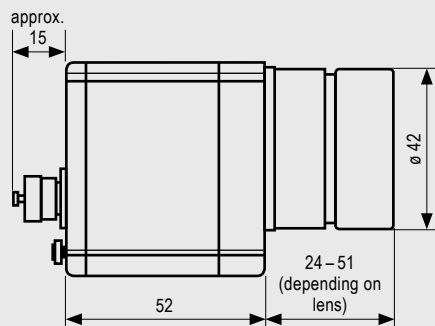
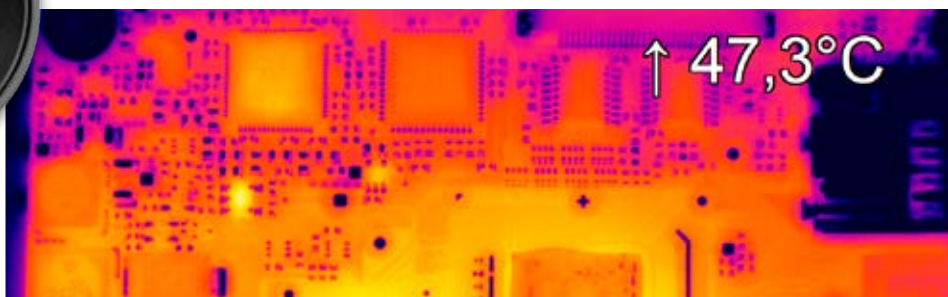
Application example in the medical sector

Due to the very high temperature resolution of the optris® PI 450, even veins can be made visible under the skin.



The smallest VGA infrared measurement camera in the world

- 640 x 480 pixels
- Radiometric video recording at 32 Hz/125 Hz in subframe-mode (640 x 120 pixels)
- Compact size of 46 x 56 x 90 mm
- Lightweight (320 g incl. lens)
- Includes license-free analysis software and full SDK



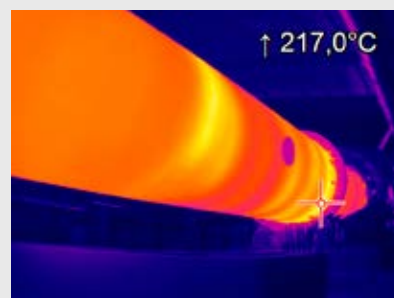
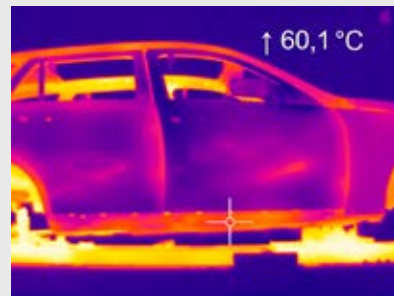
Dimensions in mm

Razor sharp infrared pictures and videos for process optimization

With a casing size of only 46 x 56 x 90 mm and a weight of 320 grams (incl. lens), the optris® PI 640 is among the most compact infrared cameras on the market.

The high-definition optris® PI 640 infrared camera is best used in applications where finest thermal details matter.

It significantly contributes to process optimization in both research and development and in industry.



Technical data

Compact infrared cameras for fast online applications, including line scanning



Base Model		PI 160	PI 200 / PI 230	PI 400 / PI 450
Type		IR	BI-SPECTRAL	IR
Detector		FPA, uncooled (25 µm x 25 µm)	FPA, uncooled (25 µm x 25 µm)	FPA, uncooled (25 µm x 25 µm)
Optical resolution		160 x 120 pixel	160 x 120 pixel	382 x 288 pixel
Spectral range		7.5–13 µm	7.5–13 µm	7.5–13 µm
Temperature ranges		–20 °C ... 100 °C, 0 °C ... 250 °C, (20) 150 °C ... 900 °C ³⁾ , 200 °C ... 1500 °C (Option) ¹⁾	–20 °C ... 100 °C, 0 °C ... 250 °C, (20) 150 °C ... 900 °C ³⁾ , 200 °C ... 1500 °C (Option) ¹⁾	–20 °C ... 100 °C, 0 °C ... 250 °C, (20) 150 °C ... 900 °C ³⁾ , 200 °C ... 1500 °C (Option) ¹⁾
Frame rate		120 Hz	128 Hz ⁴⁾	80 Hz / switchable to 27 Hz
Optics (FOV)		23° x 17° / f = 10 mm or 6° x 5° / f = 35.5 mm or 41° x 31° / f = 5.7 mm or 72° x 52° / f = 3.3 mm	23° x 17° ²⁾ / f = 10 mm or 6° x 5° / f = 35.5 mm or 41° x 31° ²⁾ / f = 5.7 mm or 72° x 52° / f = 3.3 mm	29° x 22° / f = 18,7 mm or 13° x 10° / f = 41 mm or 53° x 40° / f = 10,5 mm or 80° x 56° / f = 7.7 mm
Thermal sensitivity (NETD)		0.08 K with 23° x 17° FOV / F = 0.8 0.3 K with 6° x 5° FOV / F = 1.6 0.1 K with 41° x 31° FOV and 72° x 52° FOV / F = 1	0.08 K with 23° x 17° FOV / F = 0.8 0.3 K with 6° x 5° FOV / F = 1.6 0.1 K with 41° x 31° FOV and 72° x 52° FOV / F = 1	PI 400: 0,08 K with 29°, 53°, 80° FOV PI 450: 0,04 K with 29°, 53°, 80° FOV lenses mentioned above: F = 0,8 PI 400: 0,1 K with 13° FOV / F = 1,0 PI 450: 0,06 K with 13° FOV / F = 1,0
Option for visual camera (only for BI-SPECTRAL camera)		–	Optical resolution: 640 x 480 pixel Frame rate: 32 Hz ⁴⁾ Optics (FOV): PI 200: 54° x 40°, PI 230: 30° x 23°	–
Accuracy		±2 °C or ±2 %, whichever is greater	±2 °C or ±2 %, whichever is greater	±2 °C or ±2 %, whichever is greater
PC interface		USB 2.0 / optional USB to GigE (PoE) conversion	USB 2.0 / optional USB to GigE (PoE) conversion	USB 2.0 / optional USB to GigE (PoE) conversion
Process interface (PIF)	Standard PIF	0–10 V input, digital input (max. 24 V), 0–10 V output	0–10 V input, digital input (max. 24 V), 0–10 V output	0–10 V input, digital input (max. 24 V), 0–10 V output
	Industrial PIF (option)	2x 0–10 V inputs, digital input (max. 24 V), 3x 0–10 V outputs, 3x relay (0–30 V/400 mA), fail-safe relay	2x 0–10 V inputs, digital input (max. 24 V), 3x 0–10 V outputs, 3x relay (0–30 V/400 mA), fail-safe relay	2x 0–10 V inputs, digital input (max. 24 V), 3x 0–10 V outputs, 3x relay (0–30 V/400 mA), fail-safe relay
Ambient temperature (T _{Amb})		0 °C ... 50 °C	0 °C ... 50 °C	PI 400: 0 °C ... 50 °C / PI 450: 0 °C ... 70 °C
Storage temperature		–40 °C ... 70 °C	–40 °C ... 70 °C	PI 400: –40 °C ... 70 °C PI 450: –40 °C ... 85 °C
Relative humidity		20–80 %, non-condensing	20–80 %, non-condensing	20–80 %, non-condensing
Dimensions / protection class		45 mm x 45 mm x 62 mm / IP 67 (NEMA 4)	45 mm x 45 mm x 62 mm / IP 67 (NEMA 4)	46 mm x 56 mm x 90 mm / IP 67 (NEMA 4)
Weight		195 g, incl. lens	215 g, incl. lens	320 g, incl. lens
Shock / vibration		Shock: IEC 60068-2-27 (25 g and 50 g) Vibration: IEC 60068-2-6 (sinus-shaped) / IEC 60068-2-64 (broadband noise)	Shock: IEC 60068-2-27 (25 g and 50 g) Vibration: IEC 60068-2-6 (sinus-shaped) / IEC 60068-2-64 (broadband noise)	Shock: IEC 60068-2-27 (25 g and 50 g) Vibration: IEC 60068-2-6 (sinus-shaped) / IEC 60068-2-64 (broadband noise)
Tripod mount		¼-20 UNC	¼-20 UNC	¼-20 UNC
Voltage supply		via USB	via USB	via USB
Scope of supply (standard)		• USB camera with 1 lens • USB cable (1 m) • Table-top tripod • PIF cable with connecting terminal strip (1 m) • optris® PI Connect software package • Aluminium case	• USB camera with 1 lens and BI-SPECTRAL technology • USB cable (1 m) • Table-top tripod • Focus tool • PIF cable with connecting terminal strip (1 m) • optris® PI Connect software package • Aluminium case	• USB camera with 1 lens • USB cable (1 m) • Table-top tripod • PIF cable with connecting terminal strip (1 m) • optris® PI Connect software package • Aluminium case (PI400) • Robust hard shell case (PI 450)

¹⁾ Not available for 72° (PI 160 / 2xx), 80° (PI 4xx) and 90° (PI 640) lenses

³⁾ Accuracy statement effective from 150 °C

²⁾ For ideal combination of IR and VIS image, a 41° HFOV lens is recommended (PI 200). For the PI 230, a 23° lens is recommended.

			
PI 640	PI 450 / PI 640 G7	PI 1M	PI 05M
IR	IR	IR	IR
FPA, uncooled (17 µm x 17 µm)	FPA, uncooled PI 450 G7: 25 µm x 25 µm PI 640 G7: 17 µm x 17 µm	CMOS (15 µm x 15 µm)	CMOS (15 µm x 15 µm)
640 x 480 pixel VGA	PI 450 G7: 382 x 288 pixels PI 640 G7: 640 x 480 pixels	764 x 480 pixels @ 32 Hz 382 x 288 pixels @ 80 Hz (switchable to 27 Hz) 72 x 56 pixels @ 1 kHz 764 x 8 pixels @ 1 kHz (fast linescanning mode)	764 x 480 pixels @ 32 Hz 382 x 288 pixels @ 80 Hz (switchable to 27 Hz) 72 x 56 pixels @ 1 kHz 764 x 8 pixels @ 1 kHz (fast linescanning mode)
7.5 – 13 µm	7.9 µm	0.85 – 1.1 µm	500 nm ... 540 nm
–20 °C ... 100 °C, 0 °C ... 250 °C, (20) 150 °C ... 900 °C ³⁾ , 200 °C ... 1500 °C (Option) ¹⁾	200 °C ... 1500 °C	450 °C ⁵⁾ ... 1800 °C (27 Hz mode) 500 °C ⁵⁾ ... 1800 °C (80 Hz and 32 Hz mode) 600 °C ⁵⁾ ... 1800 °C (1 kHz mode)	900 °C ... 2000 °C (27 Hz mode) 950 °C ... 2000 °C (32 / 80 Hz mode) 1100 °C ... 2000 °C (1 kHz mode)
32 Hz * 125 Hz in sub-frame mode (640x120 pixels)	PI 450 G7: 80 Hz / switchable to 27 Hz PI 640 G7: 32 Hz / 125 Hz in subframe-mode (640x120 pixels)	Up to 1 kHz / 1ms real-time analog output (0 - 10 V) from 8 x 8 pixel (freely selectable)	Up to 1 kHz / 1ms real-time analog output (0 - 10 V) from 8 x 8 pixel (freely selectable)
33° x 25° / f = 18.7 mm or 15° x 11° / f = 41.5 mm or 60° x 45° / f = 10.5 mm or 90° x 64° / f = 7.7 mm	PI 450 G7: 29° x 22° (f = 18.7 mm) 13° x 10° (f = 41 mm) 53° x 40° (f = 10.5 mm) 80° x 56° (f = 7.7 mm) PI 640 G7: 33° x 25° (f = 18.7 mm) 15° x 11° (f = 41.5 mm) 60° x 45° (f = 10.5 mm) 90° x 64° (f = 7.7 mm)	FOV @ 764 x 480 px: 39° x 25° (f = 16 mm) 26° x 16° (f = 25 mm) 13° x 8° (f = 50 mm) 9° x 5° (f = 75 mm) FOV @ 382 x 288 px: 20° x 15° (f = 16 mm) 13° x 10° (f = 25 mm) 7° x 5° (f = 50 mm) 4° x 3° (f = 75 mm)	FOV @ 764 x 480 px: 26° x 16° (f = 25 mm) FOV @ 382 x 288 px: 13° x 10° (f = 25 mm)
75 mK	130 mK	< 1 K (700 °C) < 2 K (1000 °C)	< 2 K (1400 °C) for 27 Hz, 32 Hz, 80 Hz < 2.5 K (1400 °C) for 1 kHz
–	–	–	–
±2 °C or ±2 %, whichever is greater	±2 °C or ±2 %, whichever is greater	±1 % of reading (object temperature <1400 °C)	±1.5 % of reading
USB 2.0 / optional USB to GigE (PoE) conversion	USB 2.0 / optional USB to GigE (PoE) conversion	USB 2.0 / optional USB to GigE (PoE) conversion	USB 2.0 / optional USB to GigE (PoE) conversion
0 – 10 V input, digital input (max. 24 V), 0 – 10 V output	0 – 10 V input, digital input (max. 24 V), 0 – 10 V output	0 – 10 V input, digital input (max. 24 V), 0 – 10 V output	0 – 10 V input, digital input (max. 24 V), 0 – 10 V output
2 x 0 – 10 V inputs, digital input (max. 24 V), 3 x 0 – 10 V outputs, 3 x relay (0 – 30 V / 400 mA), fail-safe relay	2 x 0 – 10 V inputs, digital input (max. 24 V), 3 x 0 – 10 V outputs, 3 x relay (0 – 30 V / 400 mA), fail-safe relay	2 x 0 – 10 V inputs, digital input (max. 24 V), 3 x 0 – 10 V outputs, 3 x relay (0 – 30 V / 400 mA), fail-safe relay	2 x 0 – 10 V inputs, digital input (max. 24 V), 3 x 0 – 10 V outputs, 3 x relay (0 – 30 V / 400 mA), fail-safe relays
0 ... 50 °C	PI 450 G7: 0 °C ... 70 °C / PI 640 G7: 0 °C ... 50 °C	5 °C ... 50 °C	5 °C ... 50 °C
– 40 °C ... 70 °C	PI 450 G7: – 40 °C ... 85 °C PI 640 G7: – 40 °C ... 70 °C	– 40 °C ... 70 °C	– 40 °C ... 70 °C
20 – 80 %, non-condensing	20 – 80 %, non-condensing	20 – 80 %, non-condensing	20 – 80 %, non-condensing
46 mm x 56 mm x 90 mm / IP 67 (NEMA 4)	46 mm x 56 mm x 90 mm / IP 67 (NEMA 4)	46 mm x 50 mm x 90 mm / IP 67 (NEMA 4) ⁶⁾	46 mm x 56 mm x 90 mm / IP 67 (NEMA 4) ⁶⁾
320 g, incl. lens	320 g, incl. lens	320 g, incl. lens	320 g, incl. lens
Shock: IEC 60068-2-27 (25 g and 50 g) Vibration: IEC 60068-2-6 (sinus-shaped) / IEC 60068-2-64 (broadband noise)	Shock: IEC 60068-2-27 (25 g and 50 g) Vibration: IEC 60068-2-6 (sinus-shaped) / IEC 60068-2-64 (broadband noise)	Shock: IEC 60068-2-27 (25 g and 50 g) Vibration: IEC 60068-2-6 (sinus-shaped) / IEC 60068-2-64 (broadband noise)	Shock: IEC 60068-2-27 (25 g and 50 g) Vibration: IEC 60068-2-6 (sinus-shaped) / IEC 60068-2-64 (broadband noise)
¼ - 20 UNC	¼ - 20 UNC	¼ - 20 UNC	¼ - 20 UNC
via USB	via USB	via USB	via USB
• USB camera with 1 lens • USB cable (1 m) • Table-top tripod • PIF cable with connecting terminal strip (1 m) • optris® PI Connect software package • Robust hard shell case	• USB camera with 1 lens • USB cable (1 m) • Table-top tripod • PIF cable with connecting terminal strip (1 m) • optris® PI Connect software package • Robust hard shell case	• USB camera with 1 lens • Lens cap incl. protective window • USB cable (1 m) • Table-top tripod • PIF cable with connecting terminal strip (1 m) • optris® PI Connect software package • Aluminium case • Optional: CoolingJacket, high temperature cable	• USB camera with 1 lens • lens protection tube incl. protective window • USB cable (1 m) • Table tripod • PIF cable (1 m) incl. terminal block • Software package optris® PI Connect • Aluminium case • Optional: CoolingJacket, high temperature cable

⁴⁾ The following options can be set:
Option 1 (IR with 96 Hz at 160 x 120 px; VIS with 32 Hz at 640 x 480 px)
Option 2 (IR mit 128 Hz at 160 x 120 px; VIS with 32 Hz at 596 x 447 px)

⁵⁾ +75 °C higher start temperature for optics with
focal length f = 50 mm, f = 75 mm
⁶⁾ Only applies when lens protection tube is used

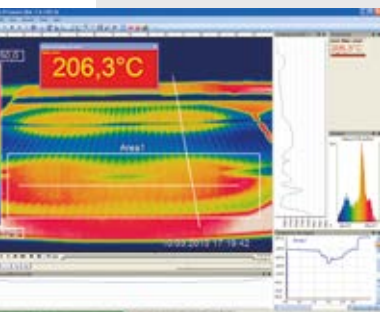
1 Comprehensive IR camera software

- No additional costs
- No licensing restrictions
- Modern software with intuitive user interface
- Remote control of camera via software
- Display of numerous images in different windows
- Compatible with Windows 7, 8 and 10 as well as Linux (ubuntu)
- Extensive license-free analysis and two Software Development Kits for Windows and Linux included



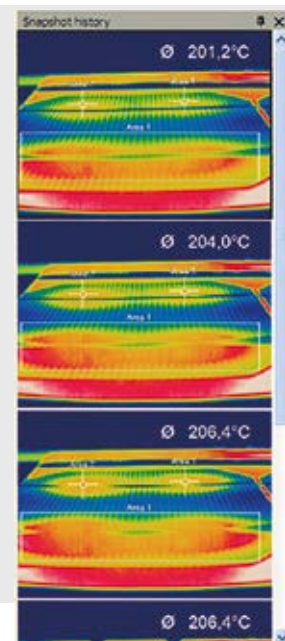
3 High degree of individualization for customer-specific imaging

- Various layout options for individual customization (window arrangement, toolbar)
- Temperature display in °C or °F
- Various language options including translate function
- Choice of individual measurement parameters tailored to the respective application
- Editing of the thermal image (flip, rotate)
- Individual start options (full screen, hidden etc.)



5 Video recording and snapshot function (IR or BI-SPECTRAL)

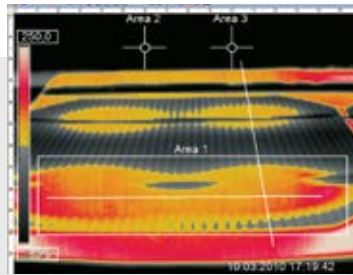
- Recording of video sequences and individual images for later analysis or documentation
- BI-SPECTRAL video analysis (IR and VIS) to highlight critical temperatures
- Adjustable frame rate to reduce data volume
- Display of snapshot process for direct analysis



2

Detailed online and offline data analysis

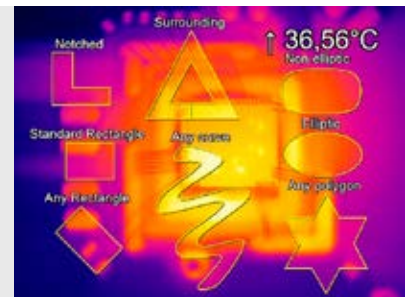
- Real time temperature information in main window, as digital display or graphic display
- Detailed analysis with the help of measurement fields, automatic hotspot and coldspot search
- Logical linking of temperature information (measurement field discrepancy, image subtraction)
- Slow-motion replay of radiometric datasets and analysis even without connected camera
- Editing of sequences, e.g. cut and save individual images
- Various color palettes to highlight thermal contrasts



4

Automatic process control and quality control

- Individual setting of alarm thresholds depending on the process
- BI-SPECTRAL monitoring mode (IR and VIS) for easy orientation at the measuring point
- Definition of visual or acoustic alarms and analog data output
- Analog and digital signal input (parameter)
- External communication of software via Comports, DLL
- Adjustment of thermal image via reference values
- Measurement fields can be freely designed or created



6

Temperature data analysis and documentation

- Triggered data gathering
- Radiometric video sequences (*.ravi)
- Radiometric snapshots (*.tiff)
- Text files including comprehensive temperature information for analysis in Excel (*.csv, *.dat)
- Files with color information for standard programs like Photoshop or Windows Media Player (*.avi, *.tiff)
- Data transfer in real time to other software programs via DLL or COM-Port interfaces

