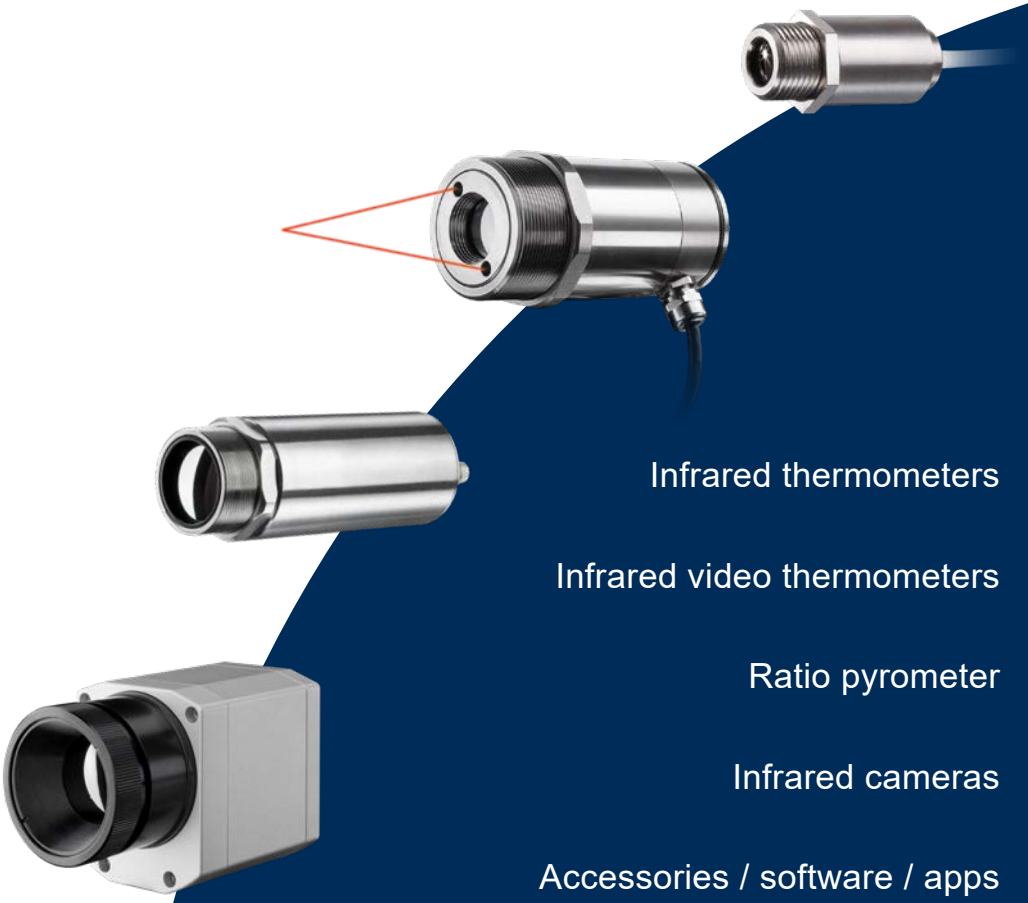
optris
infrared measurements



Infrared thermometers

Infrared video thermometers

Ratio pyrometer

Infrared cameras

Accessories / software / apps

PRODUCT OVERVIEW

Non-contact temperature measurement
Made in Germany

when temperature matters

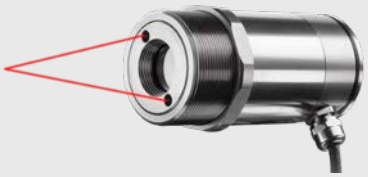
The adequate measurement device

Spot measurement or thermal image?

First of all, it is important to define the measurement task and to decide on one of these two measures:

Which measure?

A **point measuring infrared thermometer** should be used if you know where the critical point or the area to be measured is positioned within your application. The size of the measuring object is important to define which lens is necessary. It is therefore possible to monitor the accurate temperature and optimize processes – if necessary – before quality problems arise.



Pyrometer configurator:
www.optris.com/ir-thermometer-configurator

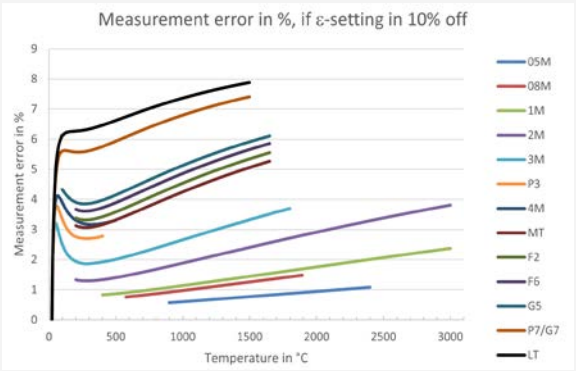
Infrared cameras should be used in cases where more than one critical area exists or the area cannot be clearly defined. Critical areas can be localized by the camera through the demonstration of thermal images. The areas can then be permanently monitored by one or multiple fixed infrared thermometers.

IR camera configurator:
www.optris.com/ir-camera-configurator

Which object surface?

The condition of the object surface defines the measurement device and wavelength to be used for the application. The **emissivity Ɛ** occupies a central position. The choice of the right device is of great importance especially for metals, where the emissivity depends on the temperature and wave length.

We are able to offer appropriate measurement devices for most applications throughout a wide product range.
The following explanation helps to find the right **wavelength** for your application:

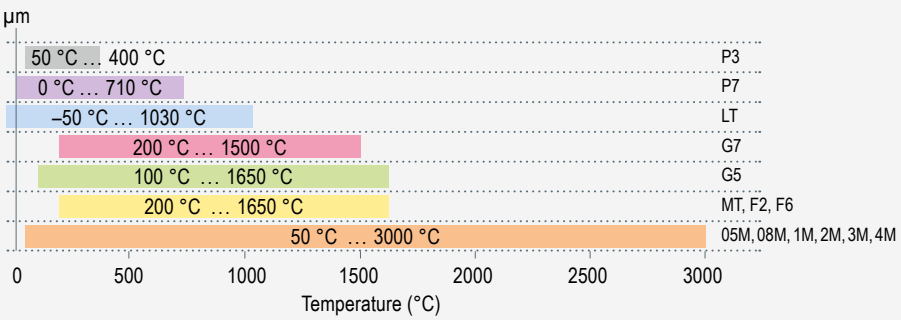


- **8 – 14 µm**
  for non-metal surfaces
  (Type of device: LT)
- **0.5; 1.0; 1.6; 2.3 µm**
  mainly for liquid metals and metal surfaces (Type of device:
  05M; 08M; 1M; 2M; 3M; 4M)
- **3.43 µm**
  for thin plastic films like PE, PP and PS
  (Type of device: P3)
- **3.9 ; 4.24; 4.64 µm**
  for special applications
  (Type of device: MT; F2; F6)
- **5.0 µm**
  for glass surfaces (Type of device: G5)
- **7.9 µm**
  for plastic foils and glass surfaces
  (Type of device: P7 / G7)

Short wavelengths reduce measurement errors on surfaces with low, unknown or changing emissivity. This occurs mostly with metals. The diagram above shows the measurement errors across different wavelengths if the emissivity is wrongly adjusted by only 10 percent.

Which temperature range?

The temperature is another factor to decide on. The range should cover all relevant temperatures of the application. The measurement range of the devices is between **–50 °C and 3000 °C**.



Display of temperature over wavelength for the devices of the compact and the high performance series

For further information on non-contact temperature measurement see our brochure:

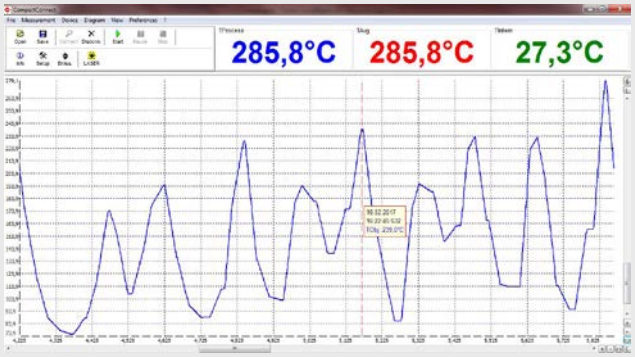
IR Basic Principles

www.optris.com/download/infrared-basics

Which process velocity?

To achieve accurate temperature measurement it is important to know how fast measuring objects are moving in front of the sensor or how fast they change temperature.

Our fastest infrared thermometer captures changes within **1 ms**.



Display of fast temperature changes over a period of time.

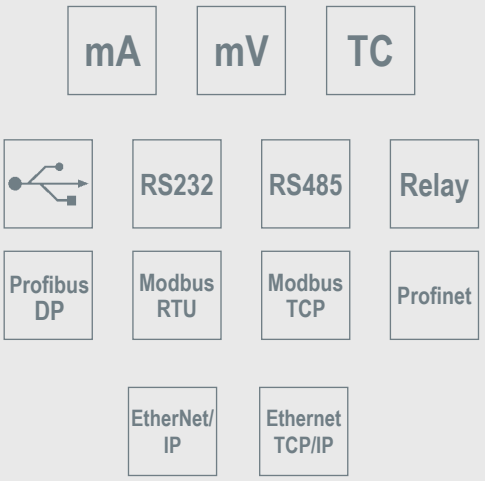
Integration of sensors?

Our temperature sensors can be installed as part of the process with **mounting brackets** or **flanges**.

Depending on the device, we offer different analog and digital interfaces for **data evaluation** such as triggering, alerting or saving of data.

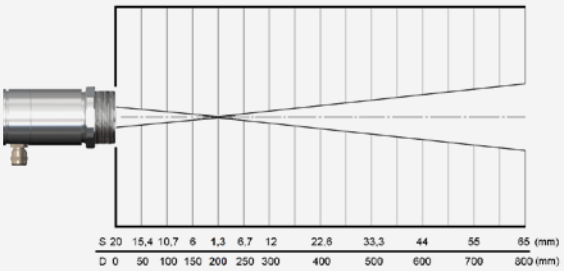
Analog Interfaces:
0 – 20 mA, 4 – 20 mA, 0 – 5 V, 0 – 10 V,
Thermocouple (type J, type K)

Digital Interfaces:
USB, RS232, RS485, Relay, Profibus DP, Modbus RTU, EtherNet/IP, Ethernet TCP/IP, Modbus TCP, Profinet



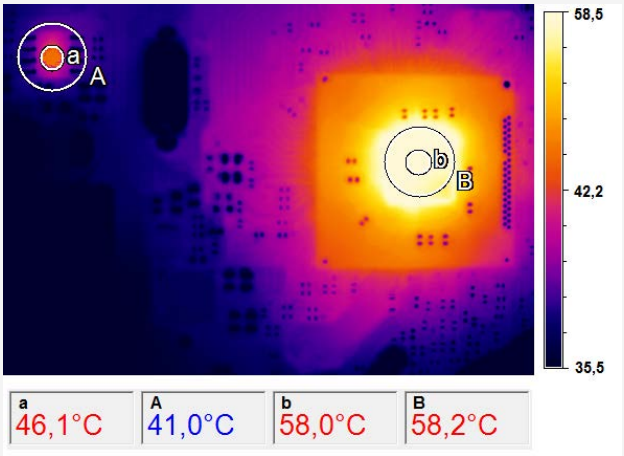
Object size and measurement distance

IR thermometers use the radiation signal emitted by the entire measurement spot. The size of the measurement spot (S) largely depends on the device, the optics selected and the distance between the sensor and measurement object plane (D):



Measurement spot diameter (S) depending on the measurement distance (D) with an IR thermometer

For a precise temperature measurement, the measurement spot needs to be smaller than, or the same size as the object to be measured.
If the measurement spot is larger than the object, a temperature is calculated from the averaged heat radiation signal from the object and its environment. In a colder environment, it means that correspondingly, the temperature measurement value determined is too low.



IR image of an electronics circuit board – adaptation of the measurement spot to the object size

When transferred to the two-dimensional measurement with IR cameras, the pixel size there needs to suit the object size for the selected measurement distance. Here, the object should fill at least 3x3 pixels.

In the example above, the correct temperature of a chip of 46 °C is determined with the suitable measurement spot size (a). A measurement spot (A) which is three times larger already leads to a measurement error of 5 °C or 10%. If you select a larger component on the same circuit board (on the right in the picture), then in this case, both measurement spots (b and B) provide the correct temperature measurement value of 58 °C.

Infrared thermometers

Small, compact infrared thermometers, ideal for use in cramped and hot surroundings

CS series

Single-piece pyrometer - Electronic within sensing head

In this device design, the optics are installed together with the electronics in a compact housing.

CSmicro series

Single-piece pyrometer - Electronic within cable

To increase the robustness of the sensor head, Optris developed two-wire devices whose electronics are integrated into the cable. This makes the IR sensor, for example, significantly less sensitive to heat. In addition, the heat generated by the two-wire electronics has no influence on the thermal stability of the sensor head.

CTi series

Two-piece pyrometer - Sensing head with separate electronic box

The Optris CTi LT series pyrometers feature one of the world's smallest infrared sensing heads with an optical resolution of up to 22:1. The sensing heads can withstand ambient temperatures up to 180 °C or, in case of the CTi LThot, even 250 °C without cooling. The separate electronics allows a simple device configuration with three buttons and a temperature display. The CTi offers the possibility to choose between different interfaces, such as USB, RS232, RS485. Fieldbuses like Modbus RTU, Profibus DP or modern Industrial Ethernet interfaces like Profinet, EtherNet/IP, Ethernet TCP/IP and Modbus TCP are also available.

For further information on our CTi Series visit our website

CTi Series

www.optris.com/products/category/infrared-thermometers-pyrometers/cti-series/

Infrared thermometers

CS/ CSmicro series

Basic model	
Type	
Classification / special features	
Detector	
Sensing head exchangeable	
Head cable shortening	
Thread (sensing head)	
Spectral range	
Temperature ranges	
Temperature resolution	
Optical resolution	
Option: CF lens	
Smallest spot (CF optics / add. CF lens)	
Smallest spot (SF optics)	
Sighting	
Response time (90 %)	
Accuracy	
Outputs analog: 0 – 20 mA / 4 – 20 mA / 0 – 5 V / 0 – 10 V / t/c (K/J)	
Second analog output	
Interfaces: USB / RS232 / RS485 / Relay	
Fieldbuses: Profibus DP / Modbus RTU	
Industrial Ethernet: EtherNet/IP / Ethernet TCP/IP / Modbus TCP / Profinet	
Signal processing: Peak / Valley / AVG	
T_{Amb} Head min.	
T_{Amb} Head max.	
T_{Amb} Electronics max.	
Functional inputs/ number	
External emissivity adjustment	
External background temperature control	
Trigger input for reset of hold functions	
Digital I/O pins / number	
Simultaneous analog and digital output	
Alarm output as an alternative to analog output	
Additional alarm output/ switching output	
Voltage supply	
Standard cable length	
Cable length options	

Optris calculator App with spot size calculator · p. 35

				
CS	**CSmicro**	**CSmicro**	**CSmicro**	**CSmicro**
LT	**LT02 / LT15 (H) / LT 22 H**	**LT15 HS**	**2M**	**3M**
Single-piece sensor with smart LED display (self diagnostics, aiming support, alarm, temperature code)	Single-piece sensor with electronics in cable; smart LED display	Single-piece two-wire sensor with electronics in cable; high thermal sensitivity; smart LED display	Single-piece sensor for temp. measurements on **metal**; electronics in cable; smart LED display	Single-piece sensor for temp. measurements on **metal**; electronics in cable; smart LED display
Thermopile	Thermopile	Thermopile	InGaAs	Ext. InGaAs
–	–	–	–	–
■	■ (behind electronics)	■ (behind electronics)	■ (behind electronics)	■ (behind electronics)
M12x1	M12x1	M18x1	M12x1	M12x1
8 – 14 µm	8 – 14 µm	8 – 14 µm	1.6 µm	2.3 µm
–50 ... 1030 °C	–50 ... 1030 °C	–20 ... 150 °C	2ML: 250 ... 800 °C 2MH: 385 ... 1600 °C	3ML: 50 ... 350 °C 3MH: 100 ... 600 °C
0.1 K	0.1 K	0.025 K [>20 °C]	0.1 K	0.1 K
15:1	LT02: 2:1 / LT15 (H): 15:1 / LT22 H: 22:1	15:1	2ML: 40:1 2MH: 75:1	3ML: 22:1 3MH: 33:1
■	■	■	■	■
0.8 mm @ 10 mm	LT02: 2.5 mm @ 23 mm LT15 (H): 0.8 mm @ 10 mm LT 22 H: 0.6 mm @ 10 mm	0.8 mm @ 10 mm	2ML: 2.7 mm @ 110 mm 2MH: 1.5 mm @ 110 mm	3ML: 1.5 mm @ 30 mm 3MH: 1 mm @ 30 mm
7 mm	7 mm	7 mm	7 mm	7 mm
LED aiming	LED aiming	LED aiming	LED aiming	LED aiming
25 ms	LT: 14 ms / LTH:150 ms	150 ms	8 ms (mA version: 20 ms)	8 ms (mA version: 20 ms)
±1.5 °C or ±1.5 %	±1 °C or ±1 %	±1°C or ±1 %	±(0.3 % T_{Meas} +2 °C)	±(0.3 % T_{Meas} +2 °C)
– / – / ■ / ■ / ■	– / – / ■ / ■ / – or – / ■ / – / – / –	– / – / ■ / ■ / – or – / ■ / – / – / –	– / – / ■ / ■ / – or – / ■ / – / – / –	– / – / ■ / ■ / – or – / ■ / – / – / –
–	–	–	–	–
■ / – / – / –	■ / – / – / –	■ / – / – / –	■ / – / – / –	■ / – / – / –
– / –	– / –	– / –	– / –	– / –
– / – / – / –	– / – / – / –	– / – / – / –	– / – / – / –	– / – / – / –
■ / ■ / ■	■ / ■ / ■	■ / ■ / ■	■ / ■ / ■	■ / ■ / ■
–20 °C	–20 °C	–20 °C	–20 °C	–20 °C
80 °C	LT02 / LT15: 120 °C LT15 H / LT22 H: 180 °C	75 °C	125 °C	85 °C
	80 °C / 75 °C (mA version)	80 °C / 75 °C (mA version)	80 °C / 75 °C (mA version)	80 °C / 75 °C (mA version)
■ / 1	■ / 1	■ / 1	■ / 1	■ / 1
■ (via V_{cc} adjust)	■ (mV version)	■ (mV version)	■ (mV version)	■ (mV version)
■	■ (mV version)	■ (mV version)	■ (mV version)	■ (mV version)
■	■	■	■	■
–	–	–	–	–
–	■ (mA version only)	■ (mA version only)	■ (mA version only)	■ (mA version only)
■	■	■	■	■
■	■	■	■	■
5 – 30 VDC	5 – 30 VDC	5 – 30 VDC	5 – 30 VDC	5 – 30 VDC
1 m	0.5 m + 0.5 m	0.5 m + 0.5 m	0.5 m + 0.5 m	0.5 m + 0.5 m
3 / 8 / 15 m	Options up to 9 m	Options up to 9 m	Options up to 9 m	Options up to 9 m

Infrared thermometers
CTi / CT series

Basic model	CTi	CTfast	CTi LThot
Type	LT02 / LT15 / LT22	LT15F / LT25F	LT02H / LT10H
Classification / special features	Two-piece design with easy accessible programming keys and LCD backlit display	Two-piece sensor with fast response time and separate electronic box incl. programming keys and display	Two-piece design with easy accessible programming keys and LCD backlit display
Detector	Thermopile	Thermopile	Thermopile
Sensing head exchangeable	■	–	■
Head cable shortening	■ [–0.1 K/m]	■ [max. 3 m]	■ [–0.1 K/m]
Thread (sensing head)	M12x1	M12x1	M18x1
Spectral range	8 – 14 µm	8 – 14 µm	8 – 14 µm
Temperature ranges	LT02: –50 ... 650 °C LT15: –50 ... 800 °C LT22: –50 ... 1050 °C	–50 ... 975 °C	–50 ...1050 °C
Temperature resolution	0.1 K	LT15F: 0.2 K / LT25F: 0.4 K	0.1 K
Optical resolution	LT02: 2:1 / LT15: 15:1 / LT22: 22:1	LT15F: 15:1 LT25F: 25:1	LT02H: 2:1 LT10H: 10:1
Option: CF lens	■	■	■
Smallest spot (CF optics/ add. CF lens)	LT02: 2.5 mm @ 23 mm LT15: 0.8 mm @ 10 mm LT22: 0.6 mm @ 10 mm	0.5 mm @ 8 mm	3 mm at 30 mm
Smallest spot (SF optics)	7 mm	7 mm	7 mm
Sighting	–	–	–
Response time (90 %)	40 ms (LT02) / 115 ms (LT15 & LT22)	LT15F: 9 ms / LT25F: 6 ms	45 ms (LT02) / 40 ms (LT10)
Accuracy	±1 °C or ±1 %	±2 °C or ±1 %	±1.5 °C or ±1 %
Outputs analog: 0 – 20 mA / 4 – 20 mA / 0 – 5 V / 0 – 10 V / t/c (K/J)	■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■
Second analog output	■	■	■
Interfaces: USB / RS232 / RS485 / Relay	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■
Fieldbuses: Profibus DP / Modbus RTU	– / ■	■ / ■	– / ■
Industrial Ethernet: EtherNet/IP / Ethernet TCP/IP / Modbus TCP / Profinet	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■
Signal processing: Peak / Valley / AVG	■ / ■ / ■	■ / ■ / ■	■ / ■ / ■
T_{Amb} Head min.	–20 °C	–20 °C	–20 °C
T_{Amb} Head max.	LT02: 130 °C / LT15 / LT22: 180 °C	120 °C	250 °C
T_{Amb} Electronics max.	85 °C	85 °C	85 °C
Functional inputs/ number	– / –	■ / 3	– / –
External emissivity adjustment	■	■	■
External background temperature control	■	■	■
Trigger input for reset of hold functions	■ (via I/O pins)	■	■ (via I/O pins)
Digital I/O pins / number	■ / 3	–	■ / 3
Simultaneous analog and digital output	■	■	■
Alarm output as an alternative to analog output	■	■	■
Additional alarm output/ switching output	■ (via I/O pins)	■	■ (via I/O pins)
Voltage supply	8 – 30 VDC	8 – 36 VDC	8 – 30 VDC
Power consumption (typical values)	1.2 W	1.2 W	1.2 W
Standard cable length	1 m	1 m	3 m
Cable length options	3 / 8 / 15 m	3 / 8 / 15 m	8 / 15 m

Optris calculator App with spot size calculator · p. 35

				
CT	**CT**	**CT**	**CT**	**CT**
1M / 2M	**3M**	**4M**	**G5**	**P3 / P7**
Two-piece sensor for high temp. meas. of **metal** with separate electronic box incl. programming keys and display	Two-piece sensor for low temp. meas. of **metal** with separate electronic box incl. programmin. keys and display	Two-piece sensor for low temp. and high speed meas. with separate electronic box incl. programming keys and display	Two-piece sensor for temp. meas. of **glass** with separate electronic box incl. programming keys and display	Two-piece sensor for temp. meas. on **thin plastic film** and **glass** (P7) with separate electronic box incl. programming keys and display
1M: Si / 2M: InGaAs	Extended InGaAs	InAsSb	Thermopile	Thermopile (P7)
■	■	–	■	–
■ [max. 3 m]	■	■	■ [–0,1 K/m]	–
M12x1	M12x1	M12x1	M12x1	M18x1
1M: 1.0 µm / 2M: 1.6 µm	2.3 µm	2.2 – 6 µm	5.0 µm	P3: 3.43 µm / P7: 7.9 µm
1ML: 485 ... 1050 °C 1MH: 650 ... 1800 °C 1MH1: 800 ... 2200 °C 2ML: 250 ... 800 °C 2MH: 385 ... 1600 °C 2MH1: 490 ... 2000 °C	L: 50 ... 400 °C H: 100 ... 600 °C H1: 150 ... 1000 °C H2: 200 ... 1500 °C H3: 250 ... 1800 °C	0 °C ... 500 °C	L: 100 ... 1200 °C H: 250 ... 1650 °C	P3: 50 ... 400 °C P7: 0 ... 710 °C
0.1 K	0.1 K	0.1 K	L: 0.1 K / H: 0.2 K	P3: 0.1 K / P7: 0.5 K
L: 40:1 H: 75:1	L: 22:1 / H: 33:1 / H1– H3: 75:1	10:1	L: 10:1 H: 20:1	P3: 15:1 P7: 10:1
■	■	■	–	–
1.5 mm @ 110 mm	3.4 mm @ 110 mm	5.0 mm @ 50 mm	–	P7: 1.2 mm @ 10 mm
7 mm	7 mm	7 mm	7 mm	7 mm
–	–	–	–	–
1 ms	1 ms	300 µs (90 µs exposure time)	L: 120 ms / H: 80 ms	P3: 100 ms / P7: 150 ms
±(0.3 % T_{Meas} +2 °C)	±(0.3 % T_{Meas} +2°C)	±(0.3 % T_{Meas} +2 °C)	±2 °C or ±1 %	P3: ±3 °C or ±1 % P7: ±1.5 °C or ±1 %
■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■
–	–	■	■	■
■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■
■ / ■	■ / ■	– / ■	■ / ■	■ / ■
■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■
■ / ■ / ■	■ / ■ / ■	■ / ■ / ■	■ / ■ / ■	■ / ■ / ■
–20 °C	–20 °C	0 °C	–20 °C	P3: 0 °C / P7: –20 °C
1M: 100 °C / 2M: 125 °C	85 °C	70 °C	85 °C	P3: 75 °C / P7: 85 °C
85 °C	85 °C	70 °C	85 °C	P3: 75 °C / P7: 85 °C
■ / 3	■ / 3	– / –	■ / 3	■ / 3
■	■	■	■	■
■	■	■	■	■
■	■	■ (via I/O pins)	■	■
–	–	■ / 3	–	–
■	■	■	■	■
■	■	■	■	■
■	■	■ (via I/O pins)	■	■
8 – 36 VDC	8 – 36 VDC	8 – 30 VDC / 5 V USB / max. 1.2 W	8 – 36 VDC	8 – 36 VDC
1.2 W	1.2 W	1.2 W	1.2 W	1.2 W
3 m	3 m	3 m	3 m	3 m
8 / 15 m	–	8 / 15 m	8 / 15 m	P3: 8 m / P7: 8 m, 15 m

CTex LT + CTex LT hot

OPTCTEX

Aluminum housing with mounting device to accommodate the Zener barriers (top-hat rail) and the CT electronics

Advantage

- Two-piece measuring system with active electronic for evaluation and passive IR receiver (sensing head)
- CTex sensing head can be installed as passive element in hazardous areas
- Energy limitation with appropriate zener barriers (STAHL) with approval for zone 1 (PTB 01 ATEX 2053/ E II (1/2) GD [EEx ia/ib] IIC/IIB)

Mechanical accessories

ACCTFB / ACCTFBMH / ACCTFB2

Mounting bracket, adjustable in one axis (M12x1 sensing head, massive housing, mounting of CT sensing head + Laser-Sightingtool)

ACCTTAS

Tilt assembly for heads with optical resolution ≥10:1

ACCTKF40GE / ACCT-KF40B270 / ACCTKF40SI

KF40 flange for CTLT with Ge window, for CT1M, 2M, 3M with B270 window, for CT4M with Si window (up to 10-7 mbar)

ACCTRAIL

Rail mount adapter for CT electronics

ACCTMB

Mounting bolt with thread M12x1

ACCTMG

Mounting fork, adjustable in 2 axes, with thread M12x1

Optical accessories

ACCTCF / ACCTPW

CF-lens or protective window (for LT) for M12x1 sensing head
ACCTCFHT / ACCTPWHT for 1M, 2M, 3M
ACCTPWSI35M for 4M

ACCTCFE / ACCTPWE

CF-lens or protective window (for LT) with external thread for air purge or massive housing
ACCTCFHTE / ACCTPWHTE for 1M, 2M, 3M
ACCTPWSI35ME for 4M

D08ACCTLST / ACCTOEMLST

Laser-Sightingtool (for CT)/ OEM Laser-Sightingtool, 635 nm, rotation symmetrical, for connection to CT electronics, power supply via CT electronic box or battery

ACCTRAM

Right angle mirror for measurements 90° to the sensor axis for sensing heads with optical resolution ≥10:1

ACCTPA + ACCTST20 (20 mm length) / ACCTST40 (40 mm length) / ACCTST88 (88 mm length)

Pipe adapter with M12x1 internal thread + Sighting tube with M12x1 external thread

Air purges and protective housings

ACCSAP

Air purge collar (for heads with optical resolution ≥10:1)

ACCTAPMH / ACCTAPMHPW1M

Air purge collar for Massive housing (D06) CSmicro hs/ CTi LThot/ CT P3/ CT P7/ CTratio, optional with protective window (for 1M and 2M models)

Massive housing of:

- stainless steel (**D06ACCTMHS**)
- compact, brass (**D06ACCTMHB**)
- anodized aluminium (**D06ACCTMHA**)

- stainless steel version with CF optics (**D06ACCTMHSCF)**
- stainless steel version for HT CF optics (**D06ACCTMHSCFHT)**

ACCTAPLCFHT

Air purge collar, laminar, with integrated CF lens (for 1M / 2M / 3M)

ACCTAPL

Air purge collar, laminar

ACCTAP / ACCTAP2 (2:1 optics)

Air purge for CT heads
(not for heads with 32 mm length)

Combinations

ACCTAPL + ACCTMG =

ACCTAPL	ACCTMG	
Air purge collar, laminar	Mounting fork	Device adjustable in two axes

ACCTFB2 + D08ACCTLST/ACCTOEMLST =

ACCTFB2	D08ACCTLST/ACCTOEMLST	
Mounting bracket for sensing head + Sighting tool	OEM Laser-Sightingtool	Sensing head with Laser-Sighting tool

ACCTFB + ACCTMB = ACCTAB

ACCTFB	ACCTMB	ACCTAB
Mounting bracket for M12x1 sensing head	Mounting bolt	Device adjustable in two axes

D06ACCTAPMH + ACCTAPMH =

D06ACCTAPMH	ACCTAPMH	
Massive housing, stainless steel	Airpurge, stainless steel	Massive housing with air purge

Infrared thermometers

with highest optical resolution
and double laser

CSlaser series

Single-piece - Electronic within sensing head

Probably the most space-saving design is the one-piece measuring head. Optics and electronics are built into one compact device.

CTlaser series

Two-piece - Sensing head and separate electronic box

The two-part thermometer design consists of the measuring head and separate electronics box.
In addition to easy device configuration and a temperature display, the electronics box offers the possibility to choose between different interfaces, such as USB, RS232, RS485, Modbus RTU, Profibus DP, EtherNet/IP, Ethernet TCP/IP and Modbus TCP.

Ratio pyrometers

The CTratio and CSvision provide constant measurement results even with a partially dirty lens or for objects that move within the measurement area (e.g. metal rods or wires). The sensing head of the CTratio can be used in high ambient temperatures up to 315 °C without cooling. The CSvision is a single-piece designed ratio pyrometer with video sighting, motorized focus and Brightness reduction filter.

For further information on our CTratio Series visit our website

CTratio Series

www.optris.com/optris.com/products/category/infrared-thermometers-pyrometers/ctratio-series

For further information on our CSvision Series visit our website

CSvision Series

www.optris.com/products/category/infrared-thermometers-pyrometers/csvision-series

Infrared thermometers
CSlaser series

Basic model	**CSlaser**	**CSlaser**	**CSlaser**
Type	**LT**	**hs LT**	**2M**
Classification / special features	Single-piece two-wire sensor with electronics in sensing head	Single-piece two-wire sensor with electronics in sensing head	Single-piece two-wire sensor with electronics in sensing head for measurement of **metal**
Detector	Thermopile	Thermopile	InGaAs
Sensing head exchangeable	–	–	–
Head cable shortening	■	■	■
Thread (sensing head)	M48x1.5	M48x1.5	M48x1.5
Spectral range	8 – 14 µm	8 – 14 µm	1.6 µm
Temperature ranges	–30 ... 1000 °C	–20 ... 150 °C	L: 250 ... 800 °C H: 385 ... 1600 °C
Temperature resolution	0.1 K	0.025 K	0.1 K
Optical resolution	50:1	50:1	2ML: 150:1 2MH: 300:1
Option: CF lens	–	–	–
Smallest spot (CF optics/ add. CF lens)	1.4 mm @ 70 mm	1.4 mm @ 70 mm	0.5 mm @ 150 mm
Smallest spot (SF optics)	24 mm @ 1200 mm	24 mm @ 1200 mm	3.7 mm @ 1100 mm
Sighting	Double laser	Double laser	Double laser
Response time (90 %)	150 ms	150 ms	10 ms
Accuracy	±1 °C or ±1 %	±1 °C or ±1 %	±(0.3 % T_{Meas} +2 °C)
Outputs analog: 0 – 20 mA / 4 – 20 mA / 0 – 5 V / 0 – 10 V / t/c (K/J)	– / ■ / – / – / –	– / ■ / – / – / –	– / ■ / – / – / –
Second analog output	–	–	–
Interfaces: USB / RS232 / RS485 / Relay	■ / – / – / –	■ / – / – / –	■ / – / – / –
Fieldbuses: Profibus DP / Modbus RTU	– / –	– / –	– / –
Industrial Ethernet: EtherNet/IP / Ethernet TCP/IP / Modbus TCP / Profinet	– / – / – / –	– / – / – / –	– / – / – / –
Signal processing: Peak / Valley / AVG / Advanced hold	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■
T_{Amb} Head min.	–20 °C	–20 °C	–20 °C
T_{Amb} Head max.	85 °C	85 °C	85 °C
Functional inputs/ number	– / –	– / –	– / –
External emissivity adjustment	–	–	–
External background temperature control	–	–	–
Trigger input for reset of hold functions	–	–	–
Digital I/O pins / number	–	–	–
Simultaneous analog and digital output	■	■	■
Alarm output as alternative to analog output	■	■	■
Additional alarm output/ switching output	■	■	■
Voltage supply	5 – 30 VDC	5 – 30 VDC	5 – 30 VDC
Standard cable length	3 m	3 m	3 m
Cable length options	8 / 15 m	8 / 15 m	8 / 15 m

1) At object temperatures >0 °C, ε = 1

Infrared thermometers
CTlaser series




Basic model	**CTlaser**	**CTlaser**	**CTlaser**	**CTlaser**
Type	**LT / LTF**	**05M**	**1M / 2M**	**3M**
Classification / special features	Two-piece sensor with separate electronic box with fast response time, incl. programming keys and display	Two-piece sensor with separate electronic box for high temp. measurement of liquid **metal**, incl. programming keys and display	Two-piece sensor with separate electronic box for high temp. measurement of **metal**, incl. programming keys and display	Two-piece sensor with separate electronic box for low temp. measurement of **metal**, incl. programming keys and display
Detector	Thermopile	Si	1M: Si / 2M: InGaAs	Extended InGaAs
Sensing head exchangeable	■	■	■	■
Head cable shortening	■ [max. 6 m]	■ [max. 6 m]	■ [max. 6 m]	■ [max. 6 m]
Thread (sensing head)	M48x1.5	M48x1.5	M48x1.5	M48x1.5
Spectral range	8 – 14 µm	0.525 µm	1M: 1.0 µm 2M: 1.6 µm	2.3 µm
Temperature ranges	–50 ... 975 °C	1000 ... 2000 °C	1ML: 485 ... 1050 °C 1MH: 650 ... 1800 °C 1MH1: 800 ... 2200 °C 2ML: 250 ... 800 °C 2MH: 385 ... 1600 °C 2MH1: 490 ... 2000 °C	L: 50 ... 400 °C H: 100 ... 600 °C H1: 150 ... 1000 °C H2: 200 ... 1500 °C H3: 250 ... 1800 °C
Temperature resolution	LT: 0.1 K / LTF: 0.5 K	0.2 K	0.1 K	0.1 K
Optical resolution	LT: 75:1 LTF: 50:1	150:1	L: 150:1 H: 300:1	L: 60:1 / H: 100:1 / H1-H3: 300:1
Option: CF lens	–	–	–	–
Smallest spot (CF optics/ add. CF lens)	LT: 0.9 mm @ 70 mm LTF: 1.4 mm @ 70 mm	–	0.5 mm @ 150 mm	0.5 mm @ 150 mm
Smallest spot (SF optics)	LT: 16 mm @ 1200 mm LTF: 24 mm @ 1200 mm	7.3 mm @ 1100 mm	3.7 mm @ 1100 mm	11 mm @ 1100 mm
Sighting	Double laser	Double laser	Double laser	Double laser
Response time (90 %)	LT: 120 ms / LTF: 9 ms	1 ms	1 ms	1 ms
Accuracy	LT: ±1 °C or ±1 % LTF: ±1.5 °C or ±1.5 %	±(0.3 % T_{Meas} +2 °C)	±(0.3 % T_{Meas} +2 °C)	±(0.3 % T_{Meas} +2 °C)
Outputs analog: 0 – 20 mA / 4 – 20 mA / 0 – 5 V / 0 – 10 V / t/c (K/J)	■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■
Second analog output	■	–	–	–
Interfaces: USB / RS232 / RS485 / Relay	■ / ■ /■ / ■	■ / ■ /■ / ■	■ / ■ /■ / ■	■ / ■ /■ / ■
Fieldbuses: Profibus DP / Modbus RTU	■ / ■	■ / ■	■ / ■	■ / ■
Industrial Ethernet: EtherNet/IP / Ethernet TCP/IP / Modbus TCP / Profinet	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■
Signal processing: Peak / Valley / AVG / Advanced hold	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■
T_{Amb} Head min.	–20 °C	–20 °C	–20 °C	–20 °C
T_{Amb} Head max.	85 °C	85 °C	85 °C	85 °C
T_{Amb} Electronics max.	85 °C	85 °C	85 °C	85 °C
Functional inputs/ number	■ / 3	■ / 3	■ / 3	■ / 3
External emissivity adjustment	■	■	■	■
External background temperature control	■	■	■	■
Trigger input for reset of hold functions	■	■	■	■
Digital I/O pins / number	–	–	–	–
Simultaneous analog and digital output	■	■	■	■
Alarm output as alternative to analog output	■	■	■	■
Additional alarm output/ switching output	■	■	■	■
Voltage supply	8 – 36 VDC	8 – 36 VDC	8 – 36 VDC	8 – 36 VDC
Power consumption (typical values)	2.0 W	2.0 W	2.0 W	2.0 W
Standard cable length	3 m	3 m	3 m	3 m
Cable length options	8 / 15 m	8 / 15 m	8 / 15 m	8 / 15 m

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CTlaser	**CTlaser**	**CTlaser**	**CTlaser**	**CTlaser**	**CTratio**
4M	**MT / F2 / F6**	**G5**	**G7**	**P7**	**1M / 2M**
Two-piece sensor for low temp. and high speed meas. with separate electronic box incl. programming keys and display	Two-piece sensor with separate electronic box incl. progr. keys and display for measurement: MT: through flames F2: CO_2 flame gas F6: CO flame gas	Two-piece sensor with separate electronic box for measurement of **glass**, incl. programming keys and display	Two-piece sensor with separate electronic box for measurement of ultra-thin **glass** sheets, incl. programming keys and display	Two-piece sensor with separate electronic box for measurement of ultra-thin **plastic foils**, incl. programming keys and display	Ratio pyrometer with separate electronic box for high temp. measurement of **metal** with green laser, incl. programming keys and display
InAsSb	Thermopile	Thermopile	Thermopile	Thermopile	Sandwich
–	■	■	■	■	–
■	■ [max. 6 m]	■ [max. 6 m]	■ [max. 6 m]	■ [max. 6 m]	–
M48x1.5	M48x1.5	M48x1.5	M48x1.5	M48x1.5	M18x1
2.2 – 6 µm	MT: 3.9 µm / F2: 4.24 µm / F6: 4.64 µm	5.0 µm	7.9 µm	7.9 µm	1M: 0.8 – 1.1 µm 2M: 1.45 – 1.75 µm
0 °C ... 500 °C	MT / F2 / F6: 200 ... 1450 °C MTH / F2H / F6H: 400 ... 1650 °C	L: 100 ... 1200 °C H: 250 ... 1650 °C HF: 200 ... 1450 °C H1F: 400 ... 1650 °C	100 ... 1200 °C	0 ... 710 °C	1ML[1]: 450 (525) ... 1400 °C 1MH[1]: 650 (700) ... 2000 °C 1MH1[1]: 900 (1000) ... 3000 °C 2ML[1]: 250 (275) ...1000 °C 2MH[1]: 375 (400) ... 1500 °C 2MH1[1]: 500 (550) ... 3000 °C
0.1 K	0.1 K	0.1 K	0.5 K	0.5 K	0.1 K (> 900 °C)
30:1	45:1	L / HF / H1F: 45:1 H: 70:1	45:1	45:1	1ML / 2ML: 38:1/ 1MH / 1MH1 / 2MH / 2MH1: 100:1
■	–	–	–	–	■
2.4 mm @ 70 mm	1.6 mm @ 70 mm	1 mm @ 70 mm	1.6 mm @ 70 mm	1.6 mm @ 70 mm	1.5 mm @ 150 mm
36.7 mm @ 1100 mm	27 mm @ 1200 mm	17 mm @ 1200 mm	27 mm @ 1200 mm	27 mm @ 1200 mm	3 mm @ 300 mm
Double laser	Double laser	Double laser	Double laser	Double laser	Laser
300 µs (90 µs exposure time)	10 ms	L: 120 ms / H: 80 ms HF / H1F: 10 ms	150 ms	150 ms	1 ms – 10 s
±(0.3 % T_{Meas} +2 °C)	±1 %	±1.5 °C or ±1 %	±1.5 °C or ±1 %	±1.5 °C or ±1 %	±(0.5 % T_{Meas} +2 °C)
■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■	■ / ■ / – / – / –
■	■	■	■	■	■
■ / ■ /■ / ■	■ / ■ /■ / ■	■ / ■ /■ / ■	■ / ■ /■ / ■	■ / ■ /■ / ■	■ / ■ /■ / ■
■ / ■	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■
■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■
■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■
0 °C	–20 °C	–20 °C	–20 °C	–20 °C	–20 °C
70 °C	85 °C	85 °C	85 °C	85 °C	200 °C (optional: 315 °C)
70 °C	85 °C	85 °C	85 °C	85 °C	1M: 60 °C / 2M: 50 °C
– / –	■ / 3	■ / 3	■ / 3	■ / 3	– / –
■	■	■	■	■	■
■	■	■	■	■	■
■ (via I/O pins)	■	■	■	■	■ (via I/O-Pins)
■ / 3	–	–	–	–	■ / 3
■	■	■	■	■	■
■	■	■	■	■	■
■ (via I/O pins)	■	■	■	■	■ (via I/O-Pins)
8 – 30 VDC / 5 V USB / max. 1.2 W	8 – 36 VDC	8 – 36 VDC	8 – 36 VDC	8 – 36 VDC	8 – 30 VDC or USB
2.0 W	2.0 W	2.0 W	2.0 W	2.0 W	5.0 W
3 m	3 m	3 m	3 m	3 m	3 m
8 / 15 m	8 / 15 m	8 / 15 m	8 / 15 m	8 / 15 m	8 / 15 m

1) Values in brackets are valid for two-color mode

optris CSvision / CSvideo / CTvideo Series

Optris calculator App with spot size calculator · p. 35

Infrared video thermometers
CSvision / CSvideo / CTvideo
with vario focus and patented cross hair laser

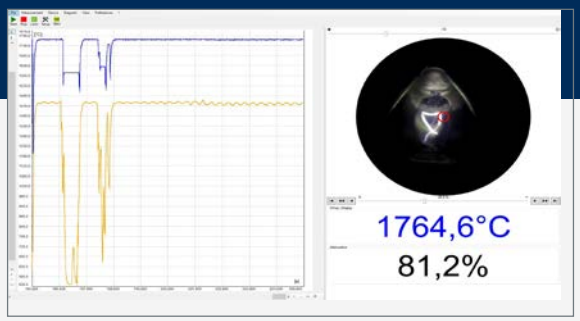
Basic model	**CSvision**	**CSvideo**	**CTvideo**	**CTvideo**
Type	**R1M/ R2M (L / H)**	**2M / 3M (L / H)**	**1M / 2M (L / H)**	**3M (L / H)**
Classification / special features	Single-piece ratio pyrometer with video camera, cross hair laser and motorized focus for measuring metal	Single-piece two wire sensor with electronics in sensing head, video camera and cross hair laser for measuring **metal**	Two-piece sensor with electronic box for high temperature measurement of **metals**, video camera and cross hair laser	Two-piece sensor with electronic box for low temperature measurement of **metals**, video camera and cross hair laser
Detector	Sandwich	InGaAs	1M: Si / 2M: InGaAs	Extended InGaAs
Sensing head exchangeable	–	–	[+CT 1M / 2M]	[+CT 3M]
Head cable shortening	–	■	[max. 6 m]	[max. 6 m]
Thread (sensing head)	M48x1.5	M48x1.5	M48x1.5	M48x1.5
Spectral range	R1M: 0.8 – 1.1 µm R2M: 1.35 – 1.75 µm	2M: 1.6 µm 3M: 2.3 µm	1M: 1.0 µm / 2M: 1.6 µm	2.3 µm
Temperature ranges (scalable via software)	R1ML[2]: 550 (600)... 1800 °C R1MH[2]: 900 (1000)... 3000 °C R1MH1[2]:900 (1000)... 3500 °C R2ML[2]: 250 (300)... 1400 °C	2ML: 250 ... 800 °C 2MH: 385 ... 1600 °C 3ML: 50 ... 400 °C 3MH: 100 ... 600 °C	1ML: 485 ... 1050 °C 1MH: 650 ... 1800 °C 1MH1: 800 ... 2200 °C 2ML: 250 ... 800 °C 2MH: 385 ... 1600 °C 2MH1: 490 ... 2000 °C	3ML: 50 ... 400 °C 3MH: 100 ... 600 °C 3MH1[1]: 150 ... 1000 °C 3MH2[1]: 200 ... 1500 °C 3MH3[1]: 250 ... 1800 °C
Temperature resolution	0.1 K	0.1 K	ML: 0.1 K / MH: 0.1 K	0.1 K
Optical resolution	R1ML: 100:1 R1MH: 150:1 R1M1: 150:1 R2M: 75:1	2MH: 300:1 / 2ML: 150:1 3ML: 60:1 / 3MH: 100:1	L: 150:1 / H: 300:1	L: 60:1 / H: 100:1 / H1 – H3: 300:1
Smallest spot (CF optics) CF vario optics: focusable from 90 mm to 250 mm	R1ML: 2 mm @ 200mm R1MH: 1.3 mm @ 200 mm R1MH1: 1.3 mm @ 200 mm R2ML: 2.7 mm @ 200 mm	2ML: 0.6 mm @ 90 mm 2MH: 0.3 mm @ 90 mm 3ML: 1.5 mm @ 90 mm 3MH: 0.9 mm @ 90 mm	1ML / 2ML: 0.6 mm @ 90 mm 1MH-H1 / 2MH-H1: 0.3 mm @ 90 mm	3ML: 1.5 mm @ 90 mm 3MH: 0.9 mm @ 90 mm 3MH1 – H3: 0.3 mm @ 90 mm
Smallest spot (SF optics) SF vario optics: focusable from 200 mm to infinity	R1ML: 3.5 mm @ 350 mm R1MH: 2.3 mm @ 350 mm R1MH1: 2.3 mm @ 350 mm R2ML: 4.7 mm @ 350 mm	2ML: 1.3 mm @ 200 mm 2MH: 0.7 mm @ 200 mm 3ML: 3.3 mm @ 200 mm 3MH: 2.0 mm @ 200 mm	1ML / 2ML: 1.3 mm @ 200 mm 1MH-H1 / 2MH-H1: 0.7 mm @ 200 mm	3ML: 3.3 mm @ 200 mm 3MH: 2.0 mm @ 200 mm 3MH1 – H3: 0.7 mm @ 200 mm
Sighting	video camera and cross hair laser	video camera and cross hair laser	video camera and cross hair laser	video camera and cross hair laser
Response time (90 %)	1 ms – 10 s	2M: 10 ms / 3M: 20 ms	1 ms	1 ms
Accuracy	± (0.5 % of reading + 2 °C)	±(0.3 % T_{Meas} +2 °C)	±(0.3 % T_{Meas} +2 °C)	±(0.3 % T_{Meas} +2 °C)
Outputs analog: 0 – 20 mA / 4 – 20 mA / 0 – 5 V / 0 – 10 V / t/c (K/J)	2x 0/4 – 20 mA	– / ■ / – / – / –	■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■
Interfaces: USB / RS232 / RS485 / Relay	■ / – / ■ / –	■ / – / – / –	■ / – / – / –	■ / – / – / –
Fieldbuses: Profibus DP / Modbus RTU	– / ■	– / –	– / –	– / –
Industrial Ethernet: EtherNet/IP / Ethernet TCP/IP / Modbus TCP / Profinet	■ / ■ / ■ / ■	– / – / – / –	– / – / – / –	– / – / – / –
Signal processing: Peak / Valley / AVG / Advanced hold	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■
T_{Amb} Head min.	0 °C	–20 °C	–20 °C	–20 °C
T_{Amb} Head max.	R1M: 60 °C R2M: 65 °C	2M: 70 °C 3M: 70 °C (50 °C at Laser ON)	70 °C	70 °C
T_{Amb} Electronics max.			85 °C	85 °C
Functional inputs / number	– / –	– / –	■ / 3	■ / 3
External emissivity adjustment	■	–	■	■
External background temperature control	■	–	■	■
Trigger input for reset of hold functions	■	–	■	■
Digital I/O pins / number	■ / 1	–	–	–
Simultaneous analog and digital output	■	■	■	■
Alarm output as an alternative to analog output	■	■	■	■
Additional alarm output	24 V/ 1 A (open-collector)	0 – 30 V / 500 mA (open-collector)	24 V / 50 mA (open-collector)	24 V / 50 mA (open-collector)
Voltage supply	8 – 30 VDC	5 – 28 VDC	8 – 36 VDC	8 – 36 VDC
Standard cable length	3 m	3 m	3 m	3 m
Cable length options	8 / 15 m	8 / 15 m	5 / 10 m	5 / 10 m

1) Specifications available for object temperatures ≥ lower measurement range 50 °C
2) Values in brackets are valid for two-color mode

Pyrometer Software

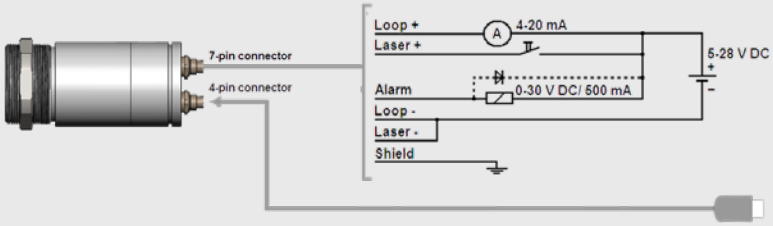
Software CompactConnect / CompactPlus Connect

Suitable for all optris infrared thermometer of
the high performance series and compact line



- Automatic snapshots (time or temperature dependent) to control and document the process
- Graphic display and recording of the measurement values
- Setup of sensor parameters and signal processing functions
- Remote control of the sensor

Connection options for CSvideo 2M



Analog operation mode:
4 – 20 mA and alarm interface

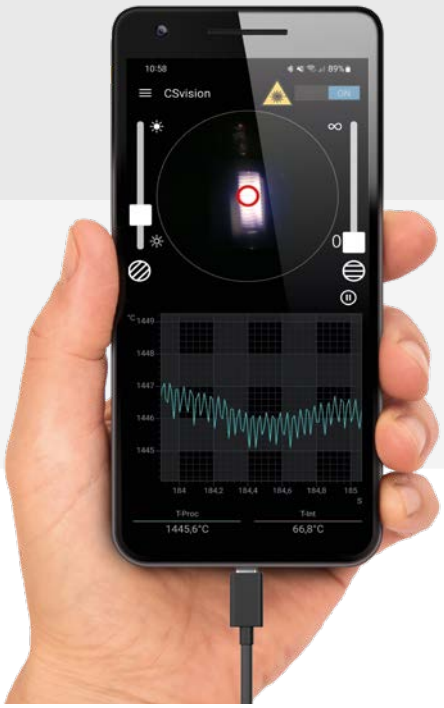
Setup & installation by IRmobile App
via USB cable (Plug & Play)

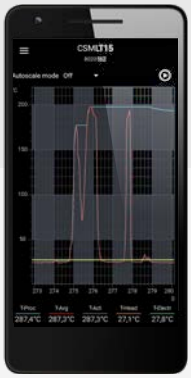
Digital operation mode:
process control (video and temperature)
via IRmobile App

IRmobile App

tool for all optris pyrometers

- Change of the temperature unit: Celsius or Fahrenheit
- Integrated simulator
- Save / load configurations and T/ t diagrams





Pyrometer

- Alignment of the sensor via live video image with integrated simultaneous temperature display (CSvideo / CTvideo / CSvision)
- Adjustment of emissivity, transmissivity and other parameters
- Scaling the analog output and setting the alarm output

GET IT ON Google Play

Supported for

- PI and Xi series and all pyrometers
- For Android devices from version 5.0 or higher with Micro-USB or USB-C connectors that support USB OTG (On The Go)

Accessories CSlaser / CTlaser / CSvision / CSvideo / CTvideo series

Mechanical accessories

ACCTLFB

Mounting bracket, adjustable in one axis

ACCTLABT

Mounting bracket, adjustable in two axes

ACHAMA

Mounting adapter: Mounting and pipe flange incl. screws

ACCTRAIL

Rail mount adapter for CT electronics

Optical accessories

ACHAST300 + ACHAPA

Sighting tube M48x1.5, 300 mm length + pipe adapter with M48x1.5 internal thread for CoolingJacket

ACCJAFPCXL

Front part + optional with protective window for CoolingJacket

Combinations

ACHAMA

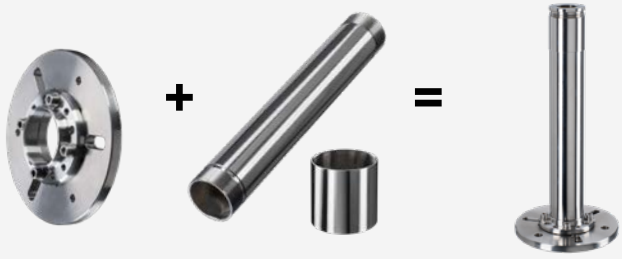
Mounting adapter

ACHAST300 + ACHAPA

Sighting tube + pipe adapter

ACCTLRM

Furnace wall mount for CSlaser / CTlaser



Air purges and cooling units

ACCTAPMH

Air purge collar CTratio

ACCTLAP

Air purge collar CxL / CxV

ACCTLW

Water cooled housing CxL / CxV, stainless steel, for T_{Amb} up to 175 °C

ACCSVIWA

Water cooled housing CSvision, stainless steel, for Tamb up to 250 °C

ACCTLCJA

CoolingJacket Advanced

ACCJAAPLS

Air purge laminar for CoolingJacket Advanced

CoolingJacket Advanced-with air purge laminar

ACCTLAP

Air purge collar

ACCTLW

Water cooled housing

Cooling sensing head + purging of optics

Applications

Applications pyrometer

Laminating interior fittings of vehicles

Vehicle interiors are partly equipped with different surface decors during a laminating process. This process takes place at around 120°C – the decor temperature is controlled and optimized during this time.

Recommended device:
CSmicro LT

Blown film extrusion

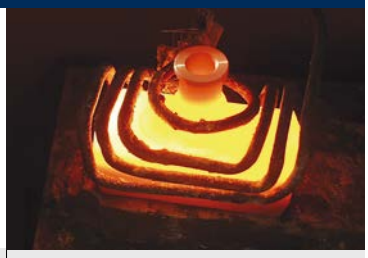
From the moment the melt emerges through the die at the extruder, the temperature of the tubular film must be measured at different points in order to ensure product quality.

Recommended device:
CT P3

Sterilization of glass bottles

A sterilization of a defined temperature level is important to produce aseptic glass bottles for pharmaceutical products.
The right tempe-rature is secured and monitored by a punctual measuring pyrometer.

Recommended devices:
CT G5,
CT LT

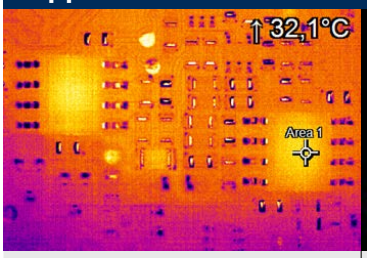


Inductive heat treatment of metals

A variant of the heat treatment of metals is induction hardening. The desired microstructure of the metal depends on an optimal temperature-time curve.

Recommended device:
CTlaser 1M

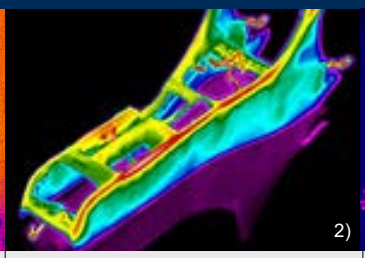
Applications infrared cameras



Component inspection of circuit boards

More and more manufacturers of electronic circuit boards rely on noncontact temperature measurement due to the constantly increasing performance of their components.

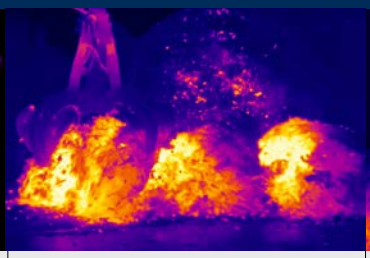
Recommended devices:
PI 640i Microscope optics,
Xi 400 Microscope optics



Injection molding

In order to prevent component distortion during injection molding, the process is monitored by thermal imaging cameras detecting and adjusting temperature over- or undershoots during molded part measurement.

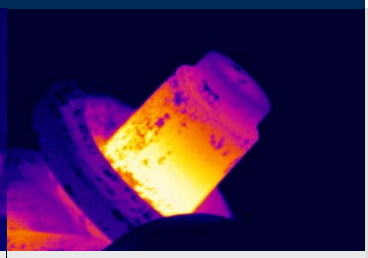
Recommended device:
PI 450i



Infrared technology in waste processing

Early fire detection with infrared cameras is an important protective measure in industry to prevent irreparable damage to industrial plants and buildings.

Recommended device:
Xi 400 LT USB



Workpiece control during drop forging

In drop forging, the semi-finished products must be at a certain forging temperature before forming.
In order to achieve the optimum production result, the surface temperature of the material is controlled accordingly.

Recommended devices:
PI 1M,
PI 05M

References: 1) AdobeStock / romaset 2) GTT Willi Steinko

Infrared cameras

compact affordable industrial
imager for temperature measurements

Xi series
Compact Line

The Xi Compact Line is a testament to innovation in infrared camera technology, offering a comprehensive solution for high-resolution, non-contact temperature measurement. Its robust design, autonomous operation (Xi ETH series), and versatile interfaces make it a go-to choice for professionals seeking accurate and efficient thermal imaging in industrial settings. With its advanced features, the Optris Xi Compact Line sets a new standard in the field of infrared imaging, providing a cost-effective and powerful solution for diverse industrial applications.

Xi ETH series
Usable with Ethernet or USB

- Xi 80 LT ETH
- Xi 410 LT ETH
- Xi 1M ETH

Direct Ethernet and RS485 communication. Possibility for autonomous stand-alone operation without using software or PC (smart pyrometer). Also, USB operation with PC possible.

Xi USB series
Usable with USB only

- Xi 400 LT USB
- Xi 640 LT USB

Fast configuration of the cameras due to licensed free software solution and USB communication. No extra driver installations necessary, Plug & Play ready.

IR camera configurator:
www.optris.com/ir-camera-configurator

For further information on our infrared cameras visit our website

Xi Series – the Compact Line
www.optris.com/products/category/thermal-cameras/compact-line

Infrared cameras
Xi ETH series

Basic model	**Xi 80 LT ETH**	**Xi 410 LT ETH**
Detector	FPA, uncooled (34 µm pitch)	FPA, uncooled (17 µm pitch)
Optical resolution / Frame rate	80 x 80 pixels @ 50 Hz	**Ethernet:** 384 x 240 pixels @ 25 Hz **USB:** 384 x 240 pixels @ 4 Hz **autonomous operation:** 384 x 240 pixels @ 1.5 Hz
Spectral range	8 – 14 µm	8 – 14 µm
Temperature ranges	–20 ... 100 °C; 0 ... 250 °C; (20) 150 ... 900 °C[1)]	–20 ... 100 °C; 0 ... 250 °C; (20) 150 ... 900 °C[1)]; 200 ... 1500 °C (option)[2)]
Optics (FOV)	30° (f = 5.1 mm / F = 0.9) 12° (f = 12.7 mm / F = 1.0) 55° (f = 3.1 mm / F = 0.9) 80° (f = 2.3 mm / F = 0.9)	29° x 18° (f = 12.7 mm / F = 0.9) 18° x 12° (f = 20 mm / F = 1.1) 53° x 31° (f = 7.7 mm / F = 0.9) 80° x 44° (f = 5.7 mm / F = 0.9)
Microscope optics	–	–
Focus	Motorized focus	Motorized focus
Autonomous operation	Yes	Yes
Optical resolution (D:S)	190:1 (12° optics)	390:1 (18° optics)
Thermal sensitivity (NETD)[3)]	100 mK	60 mK
System accuracy (at T_{Amb}= 23 ±5 °C)	±2 °C or ±2 %, whichever is greater	±2 °C or ±2 %, whichever is greater
PC interfaces	USB 2.0 / Ethernet (100 Mbit/s) / PoE	USB 2.0 / Ethernet (100 Mbit/s) / PoE
Direct in-/outputs / **Standard process interface (PIF)**	1x 0/4–20 mA output 1x input (analog or digital) electrically isolated	1x 0/4–20 mA output 1x input (analog or digital) electrically isolated
Industrial process interface (PIF)	3x analog outputs (0/4–20 mA or 0–10 V) or alarm OUT (relais), 3x inputs (analog or digital), fail-safe (LED and relay), stackable up to 3 PIFs; electrically isolated	3x analog outputs (0/4–20 mA or 0–10 V) and 3x alarm outputs (relais) / 3x inputs (analog or digital) / fail-safe (LED and relay) stackable up to 3 PIFs; electrically isolated
Industrial Ethernet: EtherNet/IP / Ethernet TCP/IP / Modbus TCP / Profinet	■ / ■ / ■ / ■	■ / ■ / ■ / ■
Cable length	USB: 1 m, 3 m, 5 m Ethernet: 100 m, RS485: 500 m	USB: 1 m, 3 m, 5 m Ethernet: 100 m, RS485: 500 m
Ambient temperature (T_{Amb})	0 °C ... 50 °C	0 °C ... 50 °C
Size	Ø 36 x 90 mm (M30x1 thread)	Ø 36 mm x 100 mm (M30x1 thread)
Environmental rating	IP 67 (NEMA 4)	IP 67 (NEMA 4)
Weight (without mounting bracket)	201 - 210 g (depending on lens)	216 - 220 g (depending on lens)
Power supply	USB / PoE / 5-30 VDC	USB / PoE / 5-30 VDC
Power consumption (typical values)	1.5 W	1.5 W
Scope of supply (standard)	• Xi camera • USB cable (1 m) • Cable for in-/outputs (1 m) with terminal block • Mounting bracket with tripod thread, mounting nut • Software package optris PIX Connect • Quick start guide	• Xi camera • Ethernet / PoE cable (1 m) / USB cable (1 m) • Cable for in-/outputs (1 m) with terminal block • Mounting bracket with tripod thread, mounting nut • Software package optris PIX Connect • Quick start guide

1) *Accuracy effective starting at 150 °C*
2) *If this option is ordered the (20)150 ... 900 °C range is not available*
3) *LT: Measurement of the noise equivalent temperature difference (NETD) according to VDI 5585 standard, method B; 25 °C black body temperature (-20 - 100 °C range), frame rate 20 Hz averaged*

Infrared cameras
Xi ETH series

Basic model	**Xi 1M ETH**	**Xi 05M ETH**
Detector	CMOS (15 µm pitch)	CMOS (15 µm pitch)
Optical resolution / Frame rate	**Ethernet:** 396 x 300 pixels @ 20 Hz 396 x 8 pixels @ 500 Hz **USB:** 132 x 100 pixels @ 20Hz **autonomous operation:** 132 x 100 pixels @ 20 Hz 396 x 1 pixels @ 500 Hz	**Ethernet:** 396 x 300 pixels @ 20 Hz 396 x 8 pixels @ 500 Hz **USB:** 132 x 100 pixels @ 20Hz **autonomous operation:** 132 x 100 pixels @ 20 Hz 396 x 1 pixels @ 500 Hz
Spectral range	0.85 – 1.1 µm	500 – 540 nm
Temperature ranges	450[2] °C ... 1800 °C (20 Hz mode)	20Hz: 950 ... 2450°C 500Hz: 1050 ... 2450°C
Optics (FOV)	28° x 21° (f = 12 mm) 14° x 10° (f = 25 mm) 7° x 5° (f = 50 mm)	14° x 10° (f = 25 mm)
Microscope optics	-	-
Focus	Motorized focus	Motorized focus
Autonomous operation	No	No
Optical resolution (D:S)	806:1 (7° optics)	830:1 (14° optics)
Thermal sensitivity (NETD)[3]	< 2 K (< 900 °C)/ < 4 K (< 1400 °C)	< 2,5 K (< 1800 °C) / < 4,5 K (> 1800 °C)
System accuracy (at T_{Amb}= 23 ±5 °C)	For object temperature < 1400 °C: ±1 % of reading for 20 Hz For object temperature < 1600 °C: ±2 % of reading for 20 Hz	For object temperature < 2000 °C: ±1 % of reading for 20 Hz, 500Hz For object temperature > 2000 °C: ±2 % of reading for 20 Hz, 500Hz
PC interfaces	Fast Ethernet / USB 2.0 / RS485	Fast Ethernet / USB 2.0 / RS485
Direct in-/outputs / Standard process interface (PIF)	1x 0/4–20 mA output 1x input (analog or digital) electrically isolated	1x analog output (0/4-20 mA) / 1x input (analog or digital); electrically isolated
Industrial process interface (PIF)	3x analog outputs (0/4–20 mA or 0–10 V) and 3x alarm outputs (relais) / 3x inputs (analog or digital) / fail-safe (LED and relay) stackable up to 3 PIFs; electrically isolated	3x analog outputs (0/4–20 mA or 0–10 V) and 3x alarm outputs (relais) / 3x inputs (analog or digital) / fail-safe (LED and relay) stackable up to 3 PIFs; electrically isolated
Industrial Ethernet: EtherNet/IP / Ethernet TCP/IP / Modbus TCP / Profinet	■ / ■ / ■ / ■	■ / ■ / ■ / ■
Cable length	USB: 1 m, 3 m, 5 m Ethernet: 1 m (standard), 5 m, 10 m, 20 m (up to 100 m)	Ethernet: 1 m (standard), 5 m, 10 m, 20 m (up to 100 m) USB: 1 m, 3 m, 5 m
Ambient temperature (T_{Amb})	5 °C ... 50 °C	5 °C ... 50 °C
Size	Ø 36 mm x 112 – 126.5 mm, depending on lens (M30x1 thread)	Ø 36 mm x 112 (M30x1 thread)
Environmental rating	IP 67 (NEMA 4)	IP 67 (NEMA 4)
Weight (without mounting bracket)	270 g (depending on lens)	270 g, depending on lens
Power supply	8 - 30 VDC / PoE / USB	8 - 30 VDC / PoE / USB
Power consumption (typical values)	2.5 W	2.5 W
Scope of supply (standard)	• Process imager Xi 1M ETH • Ethernet / PoE cable (1 m) / USB cable (1 m) • IN/ OUT cable incl. terminal block (1 m) • Mounting bracket with tripod thread, mounting nut • Software package optris PIX Connect	• Process imager Xi 05M • Ethernet / PoE cable (1 m) / USB cable (1 m) • IN/ OUT cable incl. terminal block (1 m) • Mounting bracket with tripod thread, mounting nut • Software package optris PIX Connect

1) *Accuracy effective starting at 150 °C*
2) *If this option is ordered the (20)150 ... 900 °C range is not available*
3) *LT: Measurement of the noise equivalent temperature difference (NETD) according to VDI 5585 standard, method B; 25 °C black body temperature (-20 - 100 °C range), frame rate 20 Hz averaged*

Infrared cameras
Xi USB series

Basic model	Xi 400 LT USB	Xi 400 Microscope Optics	Xi 640 LT USB
Detector	FPA, uncooled (17 µm pitch)	FPA, uncooled (17 µm pitch)	FPA, uncooled (12 µm pitch)
Optical resolution / Frame rate	382 x 288 pixels @ 80 Hz (switchable to 27 Hz)	382 x 288 pixels @ 80 Hz (switchable to 27 Hz)	640 x 480 pixels @ 32 Hz
Spectral range	8 – 14 µm	8 – 14 µm	8 – 14 µm
Temperature ranges	–20 ... 100 °C; 0 ... 250 °C; (20) 150 ... 900 °C; 200...1500 °C (option)	–20 ... 100 °C; 0 ... 250 °C; (20) 150 ... 900	–20 ... 100 °C; 0 ... 250 °C; (20) 150 ... 900 °C[1)]
Optics (FOV)	29° x 22° (f = 12.7 mm / F = 0.9) 18° x 14° (f = 20 mm / F = 1.1) 53° x 38° (f = 7.7 mm / F = 0.9) 80° x 54° (f = 5.7 mm / F = 0.9)	18° x 14° (f = 20 mm / F = 1.1)	22° x 17° (f = 20) 36° x 26° (f = 12.7) 65° x 45° (f = 7.7)
Microscope optics	18° x 14° (f = 20 mm / F=1.1)	18° x 14° (f = 20 mm / F=1.1), Smallest measuring spot (IFOV): 80 µm	–
Focus	Motorized focus	Motorized focus	Motorized focus
Autonomous operation	No	Yes	No
Optical resolution (D:S)	390:1 (18° optics)	375:1	550:1 (22° optics)
Thermal sensitivity (NETD)[3)]	50 mK	80 mK	80 mK
System accuracy (at T_{Amb}= 23 ±5 °C)	±2 °C or ±2 %, whichever is greater	±2 °C or ±2 %, whichever is greater	±2 °C or ±2 %, whichever is greater
PC interfaces	USB 2.0 / optional USB to GigE (PoE) interface	USB 2.0 / optional USB to GigE (PoE) interface	USB 2.0 / optional USB to GigE (PoE) conversion
Direct in-/outputs / Standard process interface (PIF)	1x 0–10 V input 1x digital input (max. 24 V) 1x 0–10 V output	1x 0–10 V input 1x digital input (max. 24 V) 1x 0–10 V output	1x 0–10 V input 1x digital input (max. 24 V) 1x 0–10 V output
Industrial process interface (PIF)	2 x 0–10 V inputs, 1 x digital input (max. 24 V), 3x 0/4-20 mA outputs, 3 x relais (0–30 V / 400 mA), faile-safe relay	2 x 0–10 V inputs, 1 x digital input (max. 24 V), 3x 0/4-20 mA outputs, 3 x relais (0–30 V / 400 mA), faile-safe relay	2 x 0–10 V inputs, 1 x digital input (max. 24 V), 3x 0/4-20 mA outputs, 3 x relais (0–30 V / 400 mA), faile-safe relay
Cable length	USB: 1 m, 3 m, 5 m, 10 m, 20 m	USB: 1 m, 3 m, 5 m, 10 m, 20 m	USB: 1 m, 3 m, 5 m, 10 m, 20 m
Ambient temperature (T_{Amb})	0 °C ... 50 °C	0 °C ... 50 °C	0 °C ... 50 °C
Size	Ø 36 x 100 mm (M30x1 thread)	Ø 36 x 100 mm (M30x1 thread)	Ø 36 mm x 100 mm (M30x1 thread)
Environmental rating	IP 67 (NEMA 4)	IP 67 (NEMA 4)	IP 67 (NEMA 4)
Weight (without mounting bracket)	216 - 220 g (depending on lens)	216 - 220 g (depending on lens)	216 - 220 g, depending on lens
Power supply	via USB	via USB	via USB
Power consumption (typical values)	1.5 W	1.5 W	1.5 W
Scope of supply (standard)	• Xi camera • USB cable (1 m) • Standard PIF cable (1 m) incl. terminal block • Mounting bracket with tripod thread, mounting nut • Software package optris PIX Connect • Quick start guide	• Xi camera • USB cable (1 m) • Standard PIF cable (1 m) incl. terminal block • Mounting bracket with tripod thread, mounting nut • Software package optris PIX Connect • Quick start guide	• Process imager Xi 640 LT USB • USB cable (1 m) • Standard PIF cable (1 m) incl. terminal block • Mounting bracket with tripod thread, mounting nut • Software package optris PIX Connect

1) *Accuracy effective starting at 150 °C*
2) *Lens with focal length f = 50 mm has an elevated starting temperature of +525 °C*
3) *Specified NETD value applies to all frequencies*

Accessories Xi series

Laminar Air Purge

part number: ACXIAPL / ACXI1MAPL / ACXI05MAPL (with mounting bracket ACXIAPLAB)

Features

- The air purge attachment can be used in combination with the water cooled housing and protects the optics from contamination
- Used in rough and dusty areas to guarantee a reliabe temperature measurement

Water cooled housing

part number: ACXIMW

Features

- The rugged water cooled housing allows the Xi infrared cameras to be employed in hot environments up to 250°C
- Respective heat-resistant cables are also available

Shutter

part number: ACXISCBxx + ACXIAPLAB (Mounting bracket)

Features

- In addition Xi cameras can be equipped with a shutter
- The shutter protects the optics from falling parts within a response time of 100 ms
- Protects infrared camera optics
- Fast-closing mode (100 milliseconds)
- Complete seal when closed prevents dirt and contaminants
- Includes a control box for connections, allowing integration with other systems

Outdoor protective housing

for Xi series

part number: ACXIOPH24/ ACXIOPH24VIS

Features

- Environmental rating IP 66
- Additional air purge collar allows continuous operation in dusty and humid environments
- Heating element and built-in fan enable for a 24/7 operation from -40 °C to 50 °C
- Installation of USB Server Gigabit 2.0 and industrial process interface possible for integration into control systems over large outdoor distances
- Optional with integrated HD video camera for condition monitoring applications
- USB-Server Gigabit enables easy integration of both camera streams (IR + VIS) in video control systems

Accessories Xi series

USB server Gigabit 2.0
for Xi USB series

part number: ACPIUSBSGB

Features

- Fully USB 2.0 compatible, Data rates: 1.5 / 12 / 480 mbps, USB transfer mode: Isochronous
- Network connection via Gigabit Ethernet
- Full TCP/IP support incl. routing and DNS
- Two independent USB ports
- Supply from PoE or external power supply with 24 – 48 VDC
- Galvanic isolation 500 V_{RMS} (network connection)
- Remotely configurable via Web Based Management

Industrial process interface (PIF)
for Xi series

part number: **ACXIPIFCBx (for Xi ETH series) ACPIPIFMACBx (for Xi USB series)**

Features

- Industrial process interface for Xi USB series with 3 analog / alarm outputs, 2 analog inputs, 1 digital input, 3 alarm relais
- Industrial process interface for Xi ETH series with 3 analog- / alarm outputs, 3 inputs (analog or digital), 3 alarm relais
- 500 V AC_{RMS} isolation voltage between camera and process
- Separate fail-safe relay output
- Xi hardware including all cable connections and PIX Connect software are permanently observed during operation
- Option Xi 80 LT ETH & Xi 1M ETH: stackable up to 3 PIFs

Industrial Ethernet interfaces

part numbers: ACXICSVIEIPK / ACXICSVIENMBTCPK / ACXICSVIPFNK

Features

- EtherNet/IP / Ethernet TCP/IP / Modbus TCP / Profinet interfaces
- Certified by ODVA/ PROFIBUS Nutzerorganisation e.V.
- Full documentation and easy integration with GSD or EDS files

Air Purge Flange Laminar
for Xi water cooled housing

part number: ACXIMWAPFL

Features

- Protection for rugged environments
- Air and water cooling, flexible laminar air stream for protection from dirt and dust
- Easy maintenance due to folding mechanism
- Protection window for mechanical protection integrated

Infrared cameras

with high resolution for fast online applications and exchangeable lenses, including line scan function

PI series
Precision Line

The PI Precision Line includes numerous IR cameras for temperature measurement in industrial process control and research applications. From the mid-range resolution of the PI 400i / 450i to the high resolution PI 640i, special thermal imagers for metal, glass and special optics for microscopic targets or super wide-angle optics with 120° field of view – IR cameras of the Precision line meet every customer requirement.

IR camera configurator:
www.optris.com/ir-camera-configurator

For further information on our infrared cameras visit our website

PI series - the Precision Line
www.optris.com/products/category/thermal-cameras/precision-line

Infrared cameras
PI series

Basic model		**PI 400i / PI 450i**
Detector		FPA, uncooled (17 µm pitch)
Optical resolution / Frame rate		382 x 288 pixels @ 80 Hz (switchable to 27 Hz)
Spectral range		8 – 14 µm
Temperature ranges		–20 ... 100 °C 0 ... 250 °C (20) 150 ... 900 °C [1] 200 ... 1500 °C (optional)
Optics (FOV) exchangeable		29° x 22° (f = 12.7 mm / F = 0.9) 18° x 14° (f = 20 mm / F = 1.1) 53° x 38° (f = 7.7 mm / F = 0.9) 80° x 54° (f = 5.7 mm / F = 0.9)
Thermal sensitivity (NETD)[2]		**PI 400i**: 75 mK with 29°, 53°, 80° FOV **PI 400i**: 100 mK with 18° FOV / F = 1.1 **PI 450i**: 40 mK with 29°, 53°, 80° FOV **PI 450i**: 60 mK with 18° FOV / F = 1.1
System accuracy (at T_{Amb}= 23 ±5 °C)		±2 °C or ±2 %, whichever is greater
Temperature coefficient		±0.05 % / K[3]
PC interfaces		USB 2.0 / optional USB to GigE (PoE) Interface
Process interface (PIF)	**Standard PIF**	1x 0 – 10 V input, 1x digital input (max. 24 V), 1x 0 – 10 V output
	Industrial PIF (optional)	2x 0 – 10 V input, 1x digital input (max. 24 V), 3x 0 / 4– 20 mA output, 3x relais (0 – 30 V / 400 mA), 1x fail-safe-relay
Ambient temperature (T_{Amb})		**PI 400i**: 0 ... 50 °C / **PI 450i**: 0 ... 70 °C
Size		46 x 56 x 68 – 77 mm (depending on lens and focus position)
Environmental rating		IP 67 (NEMA 4)
Weight		237 - 251 g, depending on lens
Power supply		via USB
Power consumption (typical values)		1.5 W
Scope of supply (standard)		• USB camera with 1 lens • USB cable (1 m) • Table tripod • PIF cable with terminal block (1 m) • Manual • Aluminum case (PI 400i) • Rugged outdoor case (PI 450i) • Software package optris PIX Connect

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PI 640i	**PI 640i Microscope optics**	**PI 450i G7**	**PI 640i G7**
FPA, uncooled (17 µm pitch)	FPA, uncooled (17 µm pitch)	FPA, uncooled (17 µm pitch)	FPA, uncooled (17 µm pitch)
640 x 480 pixels @ 32 Hz 640 x 120 pixels @ 125 Hz	640 x 480 pixels @ 32 Hz 640 x 120 pixels @ 125 Hz	382 x 288 pixels @ 80 Hz (switchable to 27 Hz)	640 x 480 pixels @ 32 Hz 640 x 120 pixels @ 125 Hz
8 – 14 µm	8 – 14 µm	7.9 µm	7.9 µm
–20 ... 100 °C 0 ... 250 °C (20) 150 ... 900 °C [1] 200 ... 1500 °C (optional)	–20 ... 100 °C 0 ... 250 °C **MO2X:** (20) 150 ... 500 °C [1] **MO44:** (20) 150 ... 900 °C [1] 200 ... 1500 °C (optional)	150 ... 900 °C 200 ... 1500 °C	150 ... 900 °C 200 ... 1500 °C 200 ... 3000 °C (optional)
33° x 25° (f = 18.7 mm / F = 0.8) 15° x 11° (f = 41.5 mm / F = 1.0) 60° x 45° (f = 10.5 mm / F = 0.8) 90° x 64° (f = 7.7 mm / F = 0.8) 120° x 100° FOV / f = 3.5 mm	**MO2X:** 5.4 x 4.0 mm (F=1.3) / f = 60 mm Smallest measuring spot (IFOV): 8 µm **MO44:** 20.0 x 14.0 mm (F=1.1) / f = 44 mm Smallest measuring spot (IFOV): 28 µm	29° x 22° (f = 12.7 mm / F = 0.9) 18° x 14° (f = 20 mm / F = 1.1) 53° x 38° (f = 7.7 mm / F = 0.9) 80° x 54° (f = 5.7 mm / F = 0.9)	33° x 25° / (f = 18.7 mm / F = 0.8) 15° x 11° / (f = 41.5 mm / F = 1.0) 60° x 45° / (f = 10.5 mm / F = 0.8) 90° x 64° / (f = 7.7 mm / F = 0.8)
40 mK with 33°, 60° and 90° FOV 60 mK with 15° FOV, 60 mK for 120° FOV	80 mK	150 mK 175 mK with 18 ° FOV	80 mK with 33°, 60°, 90° FOV 120 mK with 15° FOV
±2 °C or ±2 %, whichever is greater	±2 °C or ±2 %, whichever is greater	±2 °C or ±2 %, whichever is greater	±2 °C or ±2 %, whichever is greater
±0.05 % / K[3]	±0.05 % / K[3]	-	-
USB 2.0 / optional USB to GigE (PoE) Interface	USB 2.0 / optional USB to GigE (PoE) Interface	USB 2.0 / optional USB to GigE (PoE) Interface	USB 2.0 / optional USB to GigE (PoE) Interface
1x 0 – 10 V input, 1x digital input (max. 24 V), 1x 0 – 10 V output	1x 0 – 10 V input, 1x digital input (max. 24 V), 1x 0 – 10 V output	1x 0 – 10 V input, 1x digital input (max. 24 V), 1x 0 – 10 V output	1x 0 – 10 V input, 1x digital input (max. 24 V), 1x 0 – 10 V output
2x 0 – 10 V input, 1x digital input (max. 24 V), 3x 0 / 4– 20 mA output, 3x relais (0 – 30 V / 400 mA), 1x fail-safe-relay	2x 0 – 10 V input, 1x digital input (max. 24 V), 3x 0 / 4– 20 mA output, 3x relais (0 – 30 V / 400 mA), 1x fail-safe-relay	2x 0 – 10 V input, 1x digital input (max. 24 V), 3x 0 / 4– 20 mA output, 3x relais (0 – 30 V / 400 mA), 1x fail-safe-relay	2x 0 – 10 V input, 1x digital input (max. 24 V), 3x 0 / 4– 20 mA output, 3x relais (0 – 30 V / 400 mA), 1x fail-safe-relay
0 ... 50 °C	0 ... 50 °C	0 ... 70 °C	0 ... 50 °C
46 x 56 x 76 - 100 mm (depending on lens and focus position)	52 x 59 x 139 mm (depending on lens and focus position)	46 x 56 x 68 – 77 mm (depending on lens and focus position)	46 x 56 x 76 – 100 mm (depending on lens and focus position)
IP 67 (NEMA 4)	IP 67 (NEMA 4)	IP 67 (NEMA 4)	IP 67 (NEMA 4)
269 - 340 g, depending on lens	410 g	237 - 251 g, depending on lens	269 - 340 g, depending on lens
via USB	via USB	via USB	via USB
1.5 W	1.5 W	2.5 W	2.5 W
• USB camera with 1 lens • USB cable (1 m) • Table tripod • PIF cable with terminal block (1 m) • Manual • Rugged outdoor case • Software package optris PIX Connect	• USB camera with microscope lens • Base plate with ESD pad • Microscope stand (MO44) • Premium microscope stand (MO2X) • USB cable (1 m)/ Standard-PIF • Manual/ Microscope accessory case • Software package optris PIX Connect	• USB camera with 1 lens • USB cable (1 m) • Table tripod • PIF cable with terminal block (1 m) • Manual • Rugged outdoor case • Software package optris PIX Connect	• USB camera with 1 lens • USB cable (1 m) • Table tripod • PIF cable with terminal block (1 m) • Manual • Rugged outdoor case • Software package optris PIX Connect

1) *Accuracy effective starting at 150 °C*
2) *LT: Measurement of the noise equivalent temperature difference (NETD) according to VDI 5585 standard, method B; 25 °C black body temperature (-20-100 °C range), frame rate 20 Hz averaged*
G7: Measurement of the noise equivalent temperature difference (NETD) according to VDI 5585 standard, method B; 650 °C black body temperature, frame rate 20 Hz averaged
3) *For T_{Amb} 10...50 °C and T_{Obj} ≤ 500 °C; otherwise: ± 0.1 K/K or 0.1%/K (whichever is greater)*

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Infrared cameras **PI series**			
Basic model	**PI 05M**	**PI 08M**	**PI 1M**
Detector	CMOS (15 µm pitch)	CMOS (15 µm pitch)	CMOS (15 µm pitch)
Optical resolution	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 line scan 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 line scan 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 line scan mode)
Spectral range	500 – 540 nm	780 – 820 nm	0.85 – 1.1 µm
Temperature range	900 °C (950 °C for f=50mm - optics) ... 2450 °C (27 Hz mode) 950 °C (1000 °C for f=50mm - optics) ... 2450 °C (32 / 80 Hz mode) 1100 °C (1150 °C for f=50mm - optics) ... 2450 °C (1 kHz mode)	575 ... 1900 °C (27 Hz mode) 625 ... 1900 °C (32 / 80 Hz mode) 750 ... 1900 °C (1 kHz mode)	450[1] ... 1800 °C (27 Hz mode) 500[1] ... 1800 °C (80 / 32 Hz mode) 600[1] ... 1800 °C (1 kHz mode)
Frame rate	Up to 1 kHz / 1 ms real time analog output (0 - 10 V) of 8 x 8 pixels (freely selectable)	Up to 1 kHz / 1 ms real time analog output (0 - 10 V) of 8 x 8 pixels (freely selectable)	Up to 1 kHz / 1 ms real time analog output (0 - 10 V) of 8 x 8 pixels (freely selectable)
Optics (FOV) **exchangeable**	**FOV @ 764 x 480 px:** 27° x 17° (f = 25 mm) 13° x 8° (f = 50 mm) **FOV @ 382 x 288 px:** 14° x 11° (f = 25 mm) 7° x 5° (f = 50 mm)	**FOV @ 764 x 480 px:** 41° x 25° (f = 16 mm) 27° x 17° (f = 25 mm) **FOV @ 382 x 288 px:** 20° x 15° (f = 16 mm) 14° x 11° (f = 25 mm)	**FOV @ 764 x 480 px:** 41° x 25° (f = 16 mm) 27° x 17° (f = 25 mm) 13° x 8° (f = 50 mm) 9° x 6° (f = 75 mm) **FOV @ 382 x 288 px:** 20° x 15° (f = 16 mm) 14° x 11° (f = 25 mm) 7° x 5° (f = 50 mm) 4° x 3° (f = 75 mm)
F-number	1.4	1.4	1.4 (39° and 26° lens) 2.4 (13° lens) 2.8 (9° lens)
Thermal sensitivity NETD[2]	< 2 K (< 1400 °C) < 4 K (< 2100 °C)	< 2 K (< 1000 °C) < 4 K (< 1600 °C)	< 2 K (< 900 °C) < 4 K (< 1400 °C)
System accuracy **(at T_{Amb} = 23 ±5 °C)**	**For object temperature < 2000 °C:** ±1 % of reading for 27/32/80 Hz ±1.5 % of reading for 1 kHz **For object temperature > 2000 °C:** ±2 % of reading for 27/32/80 Hz ±2.5 % of reading for 1 kHz	**For object temperature < 1500 °C:** ±1 % of reading for 27/32/80 Hz ±1.5 % of reading for 1 kHz **For object temperature > 1500 °C:** ±2 % of reading for 27/32/80 Hz ±2.5 % of reading for 1 kHz	**For object temperature < 1400 °C:** ±1 % of reading for 27/32/80 Hz ±1.5 % of reading for 1 kHz **For object temperature < 1600 °C:** ±2 % of reading for 27/32/80 Hz ±2.5 % of reading for 1 kHz
PC interfaces	USB 2.0 / optional USB to GigE (PoE) interface	USB 2.0 / optional USB to GigE (PoE) interface	USB 2.0 / optional USB to GigE (PoE) interface
Process Interface (PIF) – **Standard PIF**	1x 0 – 10 V input, 1x digital input (max. 24 V), 1x 0 – 10 V output	1x 0 – 10 V input, 1x digital input (max. 24 V), 1x 0 – 10 V output	1x 0 – 10 V input, 1x digital input (max. 24 V), 1x 0 – 10 V output
Process Interface (PIF) – **Industrial PIF (optional)**	2x 0 – 10 V inputs, 1x digital input (max. 24 V), 3x 0 / 4-20 mA outputs, 3x relais (0 – 30 V / 400 mA), 1x fail-safe relay	2x 0 – 10 V inputs, 1x digital input (max. 24 V), 3x 0 / 4-20 mA outputs, 3x relais (0 – 30 V / 400 mA), 1x fail-safe relay	2x 0 – 10 V inputs, 1x digital input (max. 24 V), 3x 0 / 4-20 mA outputs, 3x relais (0 – 30 V / 400 mA), 1x fail-safe relay
Ambient temperature (T_{Amb})	5 ... 50 °C	5 ... 50 °C	5 ... 50 °C
Size	46 x 56 x 88 – 129 mm with protection tube (depending on lens and focus position)	46 x 56 x 88 – 129 mm with protection tube (depending on lens and focus position)	46 x 56 x 88 – 129 mm with protection tube (depending on lens and focus position)
Environmental rating	IP 67 (NEMA 4)	IP 67 (NEMA 4)	IP 67 (NEMA 4)
Weight	245 - 311 g, depending on lens	245 - 311 g, depending on lens	245 - 311 g, depending on lens
Power supply	via USB	via USB	via USB
Power consumption (typical values)	2.5 W	2.5 W	2.5 W
Scope of supply (standard)	• USB camera with 1 lens • Optional: Protective window • USB cable (1 m) • Table tripod • PIF cable with terminal block (1 m) • Software package optris PIX Connect • Manual • Aluminum case • Optional: CoolingJacket, HT cable	• USB camera with 1 lens • Optional: Protective window • USB cable (1 m) • Table tripod • PIF cable with terminal block (1 m) • Software package optris PIX Connect • Manual • Aluminum case • Optional: CoolingJacket, HT cable	• USB camera with 1 lens • Optional: Protective window • USB cable (1 m) • Table tripod • PIF cable with terminal block (1 m) • Software package optris PIX Connect • Manual • Aluminum case • Optional: CoolingJacket, HT cable

1) *Lenses with focal lengths f = 50 mm and f = 75 mm have an elevated starting temperature of +75 °C*
2) *Measurement of the noise equivalent temperature difference (NETD) according to VDI 5585 standard, method B; NETD value applies to all frame rates*

Accessories PI series

Outdoor protective housing

part number: **ACPIOPH24xx/ ACPIOPH24xxVIS**

Features

- Environmental rating IP 66
- Additional air purge collar allows for a continuous operation in dusty and humid conditions
- Heating element and built-in fan enable for a 24/7 operation from -40 °C to 50 °C (optional: 60 °C with USB-Server HT)
- Optional with integrated HD video camera with 1280 x 720 pixels for condition monitoring applications
- Installation of USB Server Gigabit 2.0 and industrial process interface possible for integration into control systems over large outdoor distances

CoolingJacket Advanced

part number: **ACPICJA**

Features

- Operation at ambient temperatures up to 315 °C
- Air/ water cooling with integrated air purging and optional protective windows
- Modular concept for easy installation of different devices and optics
- Trouble-free sensor disassembling on site with quick release chassis
- Integration of additional components like PI NetBox, USB Server Gigabit 2.0 and Industrial Process Interface (PIF) in extended version

Laminar air purge

part number: **ACCJAAPLS**

Features

- Protection for rugged environments
- Air and water cooling, flexible laminar air stream for protection from dirt and dust
- Easy maintenance due to folding mechanism
- Focussable from the outside once installed
- Protection window for mechanical protection integrated
- Also available as line scanner version

Industrial Process Interface (PIF)

part number: **ACPIPIFMA**

Features

- Industrial process interface for PI series with 3 analog / alarm outputs, 2 analog inputs, 1 digital input, 3 alarm relais
- 500 V AC_{RMS} isolation voltage between camera and process
- Separate fail-safe relay output
- PI hardware including all cable connections and PIX Connect software are permanently observed during operation

Accessories PI series

Expansion options

USB Server Gigabit 2.0/ USB Server HT

part number: **ACPIUSBSGB/ ACPIUSBSHT**

Features

- Fully USB 2.0 compatible, Data rates: 1.5 / 12 / 480 mbps, USB transfer mode: Isochronous
- For optris PI series, Xi 400 LT USB as well as CTvideo/ CSvideo and CSvision series
- Two independent USB ports
- Operation temperature: 0 °C to 50 °C (USB Server HT: 60 °C in combination with PI 450i and Outdoor protective housing)
- Supply from PoE or external power supply with 24 – 48 VDC
- Galvanic isolation 500 VRMS (network connection)
- Remotely configurable via Web Based Management

PI NetBox

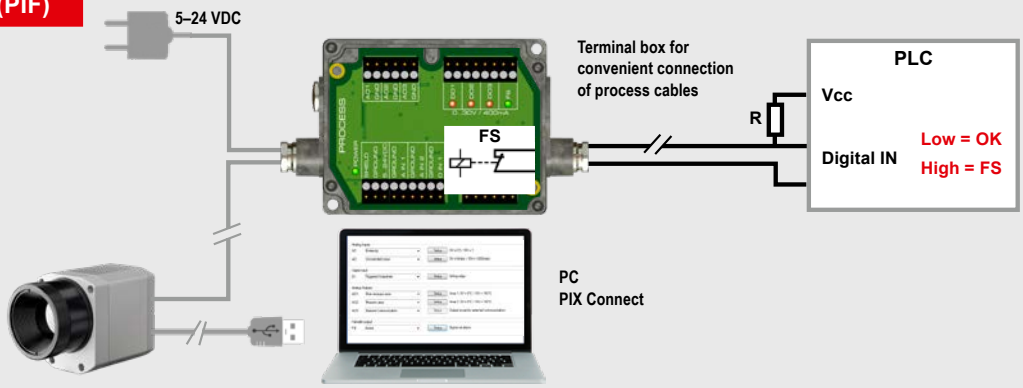
part number: **OPTPINB2W1032G**

Features

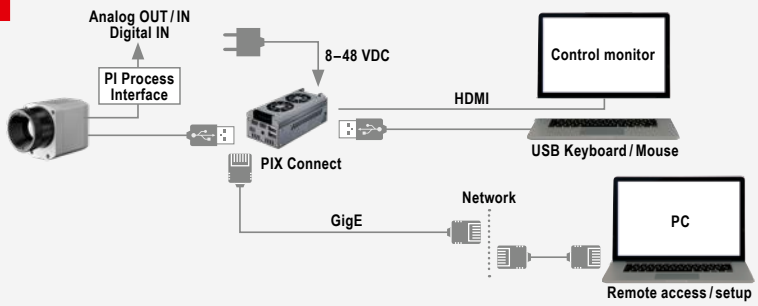
- Miniature PC as an add-on to the PI series for stand-alone system
- Integrated hardware and software watchdog
- Installation of additional user software possible
- Processor: Intel® E3950 Quad Core / 1.6/ 2.0 GHz, 32 GB SSD, 4 GB RAM
- Connections: 3x USB 2.0, 1x Mini USB 2.0, Micro HDMI, Ethernet (Gigabit Ethernet), Micro SDHC / SDXC card
- Wide supply voltage range (8 – 48 VDC) or Power over Ethernet (PoE)
- Can be integrated into CoolingJacket Advanced

Connection options

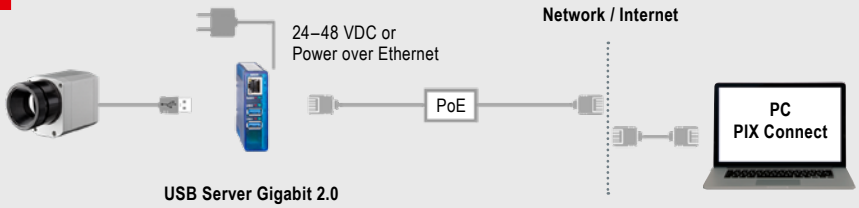
Industrial Process Interface (PIF)



PI NetBox



USB Server Gigabit 2.0



optris PI 640i CM/ 450i CM

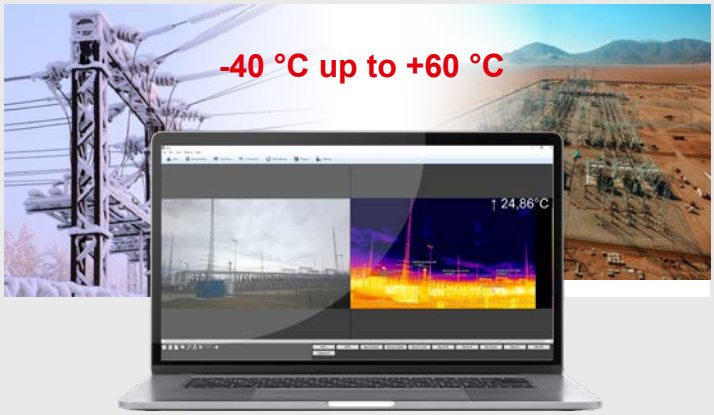
INFRARED CAMERA FOR CONDITION MONITORING AND EARLY FIRE DETECTION

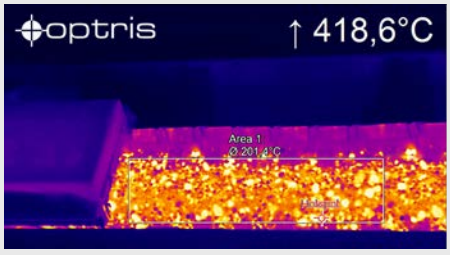
Product package for outdoor condition monitoring and fire detection

New

- Environmental rating IP66 and an integrated air purge ensure reliable 24/7 operation under harsh conditions
- Built-in heater/ fan for an extra wide operating temperature range of - 40 °C up to 60 °C for PI 450i CM and - 40 °C up to 50 °C for PI 640i CM
- IR camera and HD video camera
- USB Server (PoE) for PI 640i CM and USB Server HT (PoE) for PI 450i CM for easy integration of both camera streams (IR + VIS) in video management systems

This new dedicated product package consists of a PI 640i or 450i imager, a VIS camera and the USB Server – all pre-assembled into the Outdoor housing. This package is completed by a wall mount.





Use infrared cameras under harsh environmental conditions

Outdoor housing ensures optimum protection for the sensitive devices. It offers for the first time the possibility to integrate an infrared camera and an HD video camera together in one compact system. A compact USB server is also integrated in the housing.

For further information on our condition monitoring visit our website

PI 450i CM

www. optris.com/products/infrared-application-packages/condition-monitoring-systems/pi-450i-cm

For further information on our condition monitoring visit our website

PI 640i CM

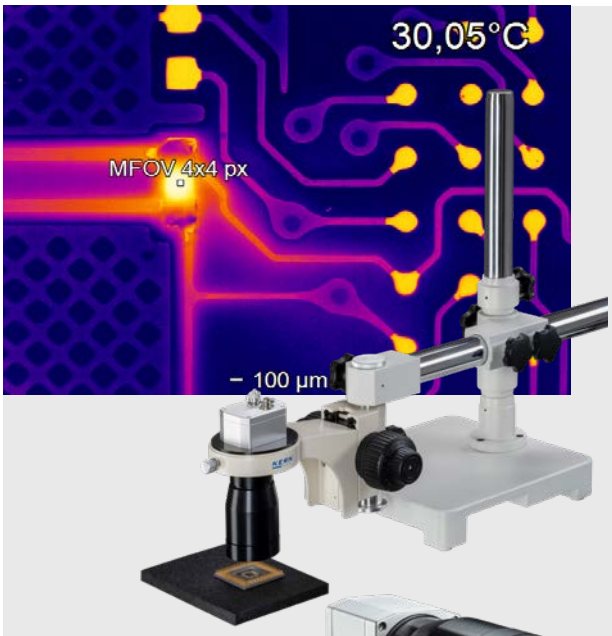
www.optris.com/products/infrared-application-packages/condition-monitoring-systems/pi-640i-cm/

optris PI 640i Microscope optics

THERMAL ANALYSIS OF TINY OBJECTS DOWN TO 8 µm

Microscope optics for inspection of electronic compo-nents or chip-level structures

- Exchangeable, focusable optics for most flexible use of the camera
- Analysis of small chip level components down to 8 µm
- Hands-free operation for simultaneous testing and IR imaging
- Frame rates up to 125 Hz allow inspection of fast processes (like pulsed laser diodes)
- Radiometric video or tiff recording with +/-2 °C measurement accuracy
- License-free analysis software and complete SDK included



Two high-resolution microscope optics for thermal imaging on electronic components or chip-level structures down to 8 µm pixel size

The PI 640i can be equipped with two different microscope optics to measure the temperature on circuit board parts and components or on very tiny structures.

The PI 640i with the standard microscope optics MO44 can resolve thermal variations on targets as small as 28 µm.

The new MO2X microscope optics with 2x magnification offers an instantaneous field of view of 8 µm and can resolve very tiny structures down to chip-level.

The PI 640i offers a superb NETD of 80 mK with both microscope optics to detect the smallest temperature differences.

PI 640i MO2X

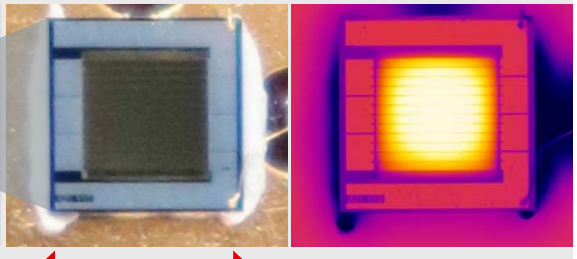
Thermal analysis of tiny chip-level structures down to **8 µm** size

Exact temperature measurement of **34 µm** small structures (**MFOV=4x4 pixels**)

Field of view: **5,4 x 4 mm**
Working distance: **15 mm**

IR Heater - Original size

9,25 mm
3 mm frame



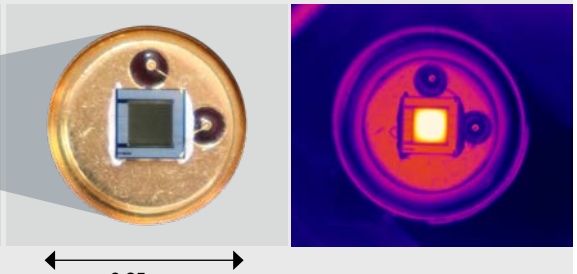
PI 640i MO44

Thermal analysis of small components down to **28 µm** size

Exact temperature measurement of **85 µm** small structures (**MFOV=3x3 pixels**)

Field of view: **23 x 16 mm**
Working distance: **80-100 mm**

9,25 mm



For further information on the electronics applications visit our website

Electronics Applications

www.optris.com/application/electronics

For further information on our microscope optics visit our website

Infrared Microscope Optics

www.optris.com/products/category/infrared-application-packages/ir-microscopes

Application examples for the analysis of electronic boards:

www.optris.com/application/electronics

optris Bottom Up GIS 450i / 640i G7

BOTTOM UP GLASS INSPECTION SYSTEM FOR PROCESS CONTROL IN GLASS TEMPERING MACHINES

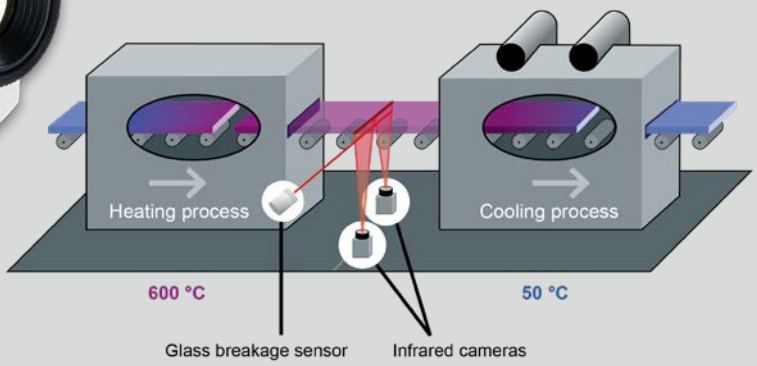
Compact bottom up system for coating independent under-neath measurement

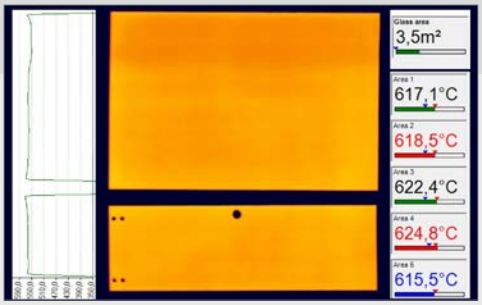
- Integrated ultra-fast glass breakage detection combined with Digitally controlled lens protection system (DCLP)
- No cooling or air purge requirement
- Glass area calculation
- Pre-assembled system for easy installation on glass tempering furnaces

New

Low-E Glass

Coating Independent

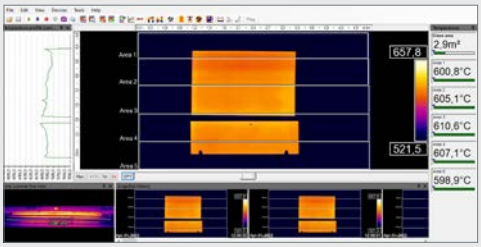




The software provides excellent image quality and manifold analysis features as profiles, measurement areas and alarm indication

Areas of application

The Bottom up glass inspection system solves the problems with temperature measurement of Low-E glass with a new approach. By having two infrared imagers installed underneath the tempering line they always measure the temperature on the non-coated high emissivity side of the glass.
IR technology development resulting in those new compact designed imagers made this underneath installation possible which was not thinkable before with old bulky line scanners.



Exemplary software layout with thermal profile, IR live view, snapshot history, five measurement zones and glass area calculation

For further information on the glass inspection systems visit our website

BUGIS 450i G7

www.optris.com/products/infrared-application-packages/glass-inspection-systems/bottom-up-gis-450i-g7

For further information on the glass inspection systems visit our website

BUGIS 640i G7

www.optris.com/products/infrared-application-packages/glass-inspection-systems/bottom-up-gis-640i-g7

optris Top Down GIS 640 R

Glass inspection system for process control in glass tempering machines

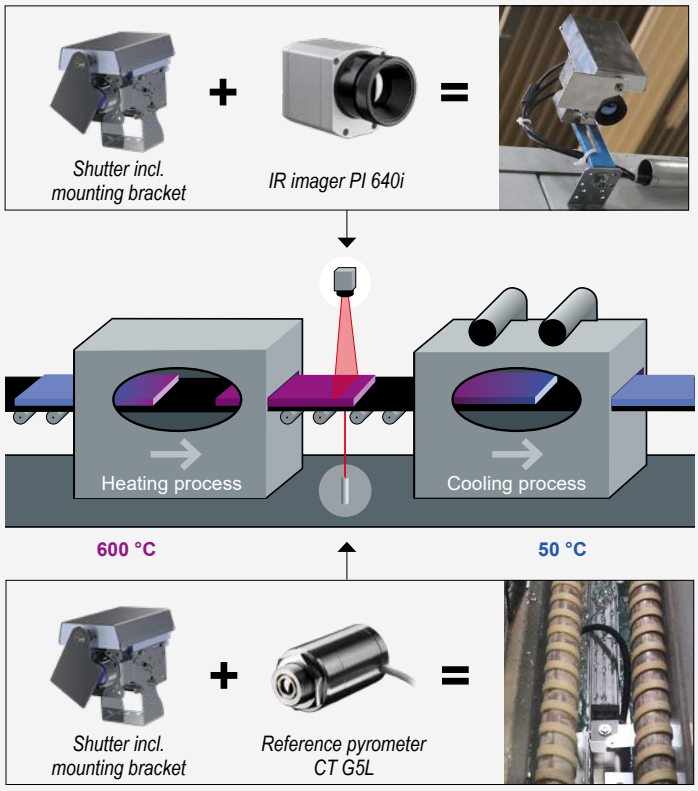
With the new glass inspection system, temperature differences during glass hardening processes can be quickly detected, thus avoiding rejects and providing automatic quality monitoring.

The Top Down GIS 640 R system with temperature referencing by means of a sensor from below as well as automatic emissivity correction for standard and low-E glasses was specially developed for process control in glass tempering machines.

Measurement principle

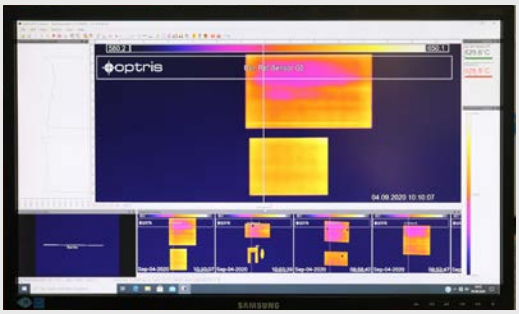
A variety of optics with different field of views allows an optimal mounting of the camera at a larger distance (no cooling needed) and avoids influences by the angle dependent emissivity.

Positioning of IR camera and reference pyrometer in a Top Down Glass Inspection System.



Software PIX Connect

Comprehensive IR camera software without licensing restrictions and with intuitive user interface.



Monitoring temperatures of glass sheets

Important specifications

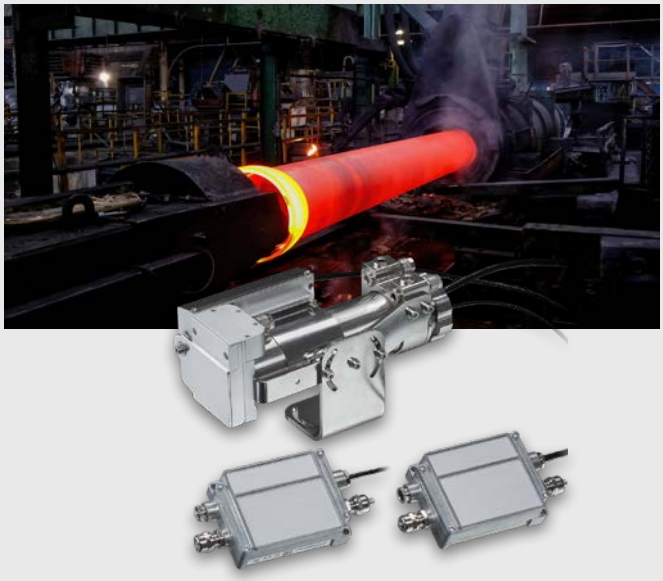
- Top down system with additional reference pyrometer from underneath for automatic emissivity correction
- Digitally controlled lens protection system (DCLP) avoids extra air purging
- Glass area calculation
- Pre-assembled system for easy installation on glasstempering furnaces
- Automatic scan line adjustment – insensitive to distortions

optris Indusrial Packages / Furnace Package

READY TO USE THERMAL IMAGER SYSTEMS

Application packages with water cooled housing for high temperature applications with different options

- Ready to use system, pre-assembled
- Dedicated for harsh industrial environments
- Complete system usable in up to 250 °C ambient temperature
- Process interface for easy signal integration



Industrial Packages

The Industrial Packages are designed for harsh conditions in high temperature industrial environments. They are based on a Xi thermal imager, optimally protected by the water-cooled housing with air purge and shutter, keeping the optics clean under conditions with dust, smoke or fumes. It can operate in ambient temperatures up to 250 °C. The Industrial Packages are pre-assembled and ready to use.

Furnace Package

The Furnace Package has been designed for use under harsh conditions. It is a combination of the short-wavelength Xi 1M thermal imager with water-cooled housing and air purge flange laminar. The whole system can operate in ambient temperatures up to 250 °C. The Air purge flange laminar allows an easy mounting directly on furnace walls and with the integrated protective window it gives optimal protection for the imager optics. The Furnace Package is pre-assembled and ready to use.

For further information on the industrial packages visit our website

Industrial Packages

www.optris.com/products/category/infrared-application-packages/industrial-packages/

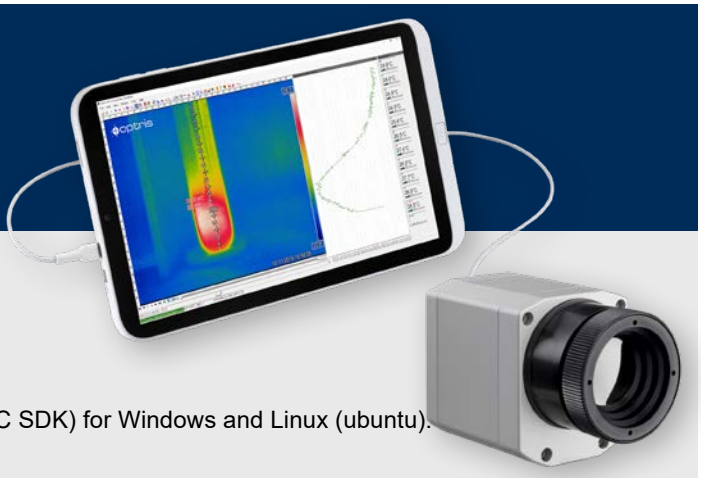
For further information on the furnace package visit our website

Furnace Package

www. optris.com/products/category/infrared-application-packages/furnace-package/

Software IR cameras

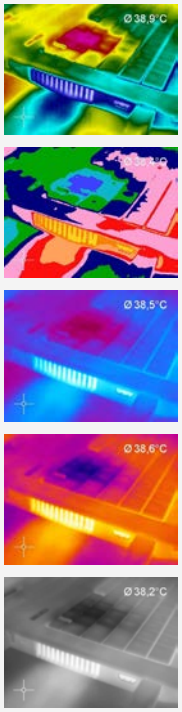
PIX Connect
Comprehensive IR camera software



- No licensing restrictions
- Modern software with intuitive user interface
- Display of numerous images in different windows
- Extensive analysis features and software development kit (OTC SDK) for Windows and Linux (ubuntu).

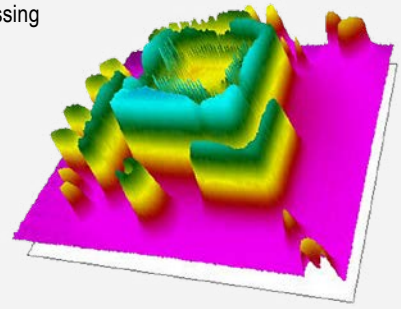
High degree of individualization for customer-specific imaging

- Various layout options for individual customization (window arrangement, toolbar)
- Temperature display in °C or °F
- Choice of individual measurement parameters tailored to the respective application



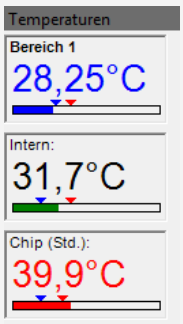
Detailed online and offline data analysis

- Detailed analysis with the help of measurement areas, automatic hot / cold spot search
- Logical linking of temperature information (measurement areas discrepancy, image subtraction)
- Slow-motion replay of radiometric datasets and analysis even without camera
- Editing of sequences, e.g. cut and save individual images
- Various color palettes to highlight thermal contrasts
- Adjustable signal processing (Max, Min, Average)



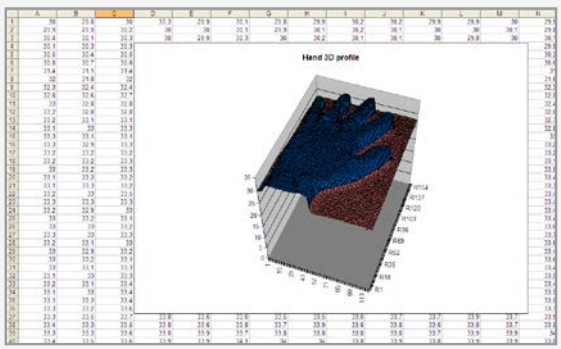
Automatic process control and quality control

- Individual setting of alarm thresholds depending on the process
- External communication of software via COM-ports, DLL
- Adjustment of thermal image via reference values
- Definition of visual or acoustic alarms and analog data output



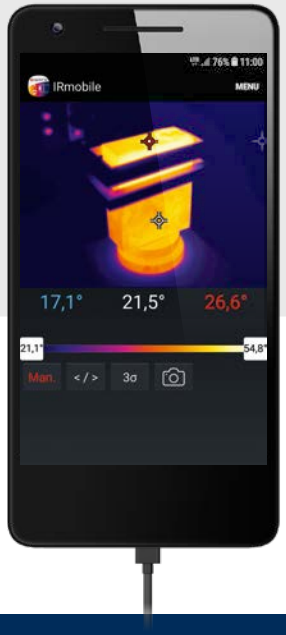
Video recording and snapshot function

- Manually or triggered data gathering
- Radiometric video sequences (*.ravi)
- Radiometric snapshots (*.tiff, *.csv for analysis in Excel)



IRmobile

The setting tool
for all IR cameras



Infrared camera features

- Live IR image with automatic hot and cold spot search
- Adjustable camera features like temperature measuring range, frame rate and selectable color palettes
- Changing the temperature unit: Celsius or Fahrenheit
- Creating snapshots
- Integrated simulator

Supported for

- PI and Xi series and all pyrometers
- For android devices from version 5.0 or higher with micro-USB or USB-C connectors that support USB OTG

Optris calculator

Combines the measuring spot size calculator of the IR pyrometers and the optics calculator of the IR cameras

The measuring spot size of the respective device is calculated for each distance

Pyrometers

- The spot size calculator determines the exact spot size for all sensor / optics combinations for any entered distance
- For reliable measurements

IR cameras

- Based on camera / lens combination and the distance to the object, the measuring field dimensions and pixel size are calculated precisely.
- Ensures an optimal positioning of the camera and the avoidance of measuring errors

Features

- Calculates for each distance the measuring spot size of the respective device
- Always the current software and features through regular updates

Supported for

- All android devices (5.0 or higher)
- iOS devices

Available on the App Store

GET IT ON Google Play

Optris Thermal Camera SDK

The OTC SDK, the Optris Thermal Camera Software Development Kit, is a library of functions that enable software developers to create custom software applications for Optris Thermal Imaging Cameras.

It is a digital toolbox that includes everything needed to connect and work with Optris thermal cameras, such as sample programs in different software languages, useful code libraries, searchable documentation, an FAQ, and clear instructions on where to start.

Get the Optris OTC SDK:
https://github.com/Optris/otcsdk_downloads

linkedin.com/company/optris
youtube.com/@Optris
x.com/optris
facebook.com/optris.official
instagram.com/optris.official

when temperature matters

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