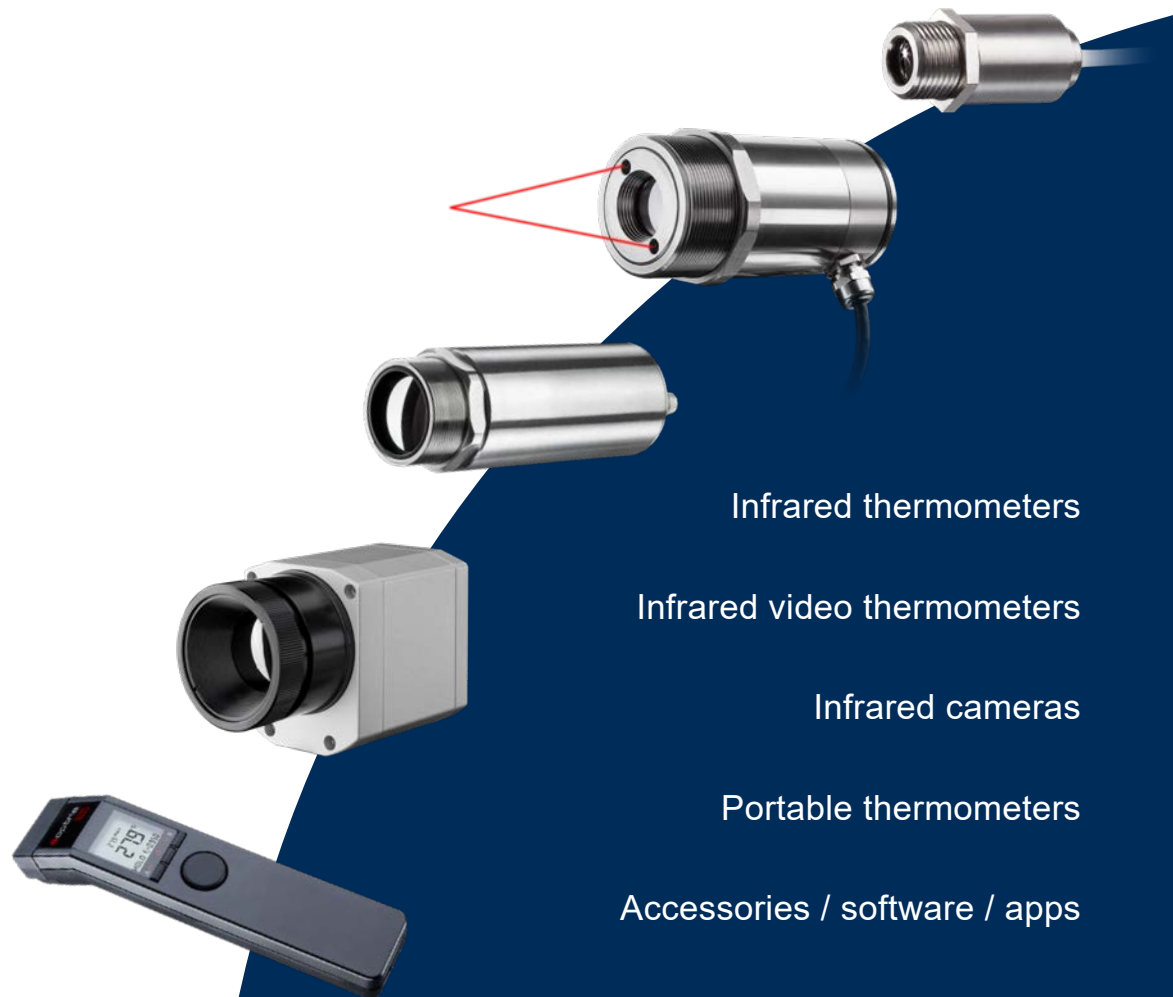




Infrared thermometers

Infrared video thermometers

Infrared cameras

Portable thermometers

Accessories / software / apps

PRODUCT OVERVIEW

Non-contact temperature measurement

Made in Germany

when temperature matters

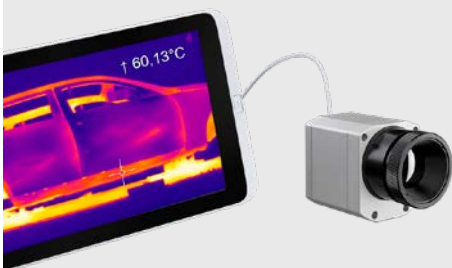
The adequate measurement device

Spot measurement or thermal image?



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.global/pyrometer-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.

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

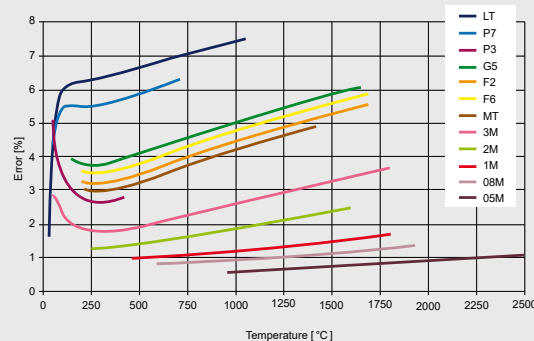
Which object surface?

The condition of the object surface defines the measurement device and wavelength to be used for the application. The **emissivity** ϵ 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; 0.8; 1.0; 1.6; 2.3 μm mainly for liquid metals and metal surfaces (Type of device: 05M; 08M; 1M; 2M; 3M)
- 3.43 μm for thin plastic films like PE, PP and PS (Type of device: P3)
- 3.9; 4.24; 4.64; 7.9 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)

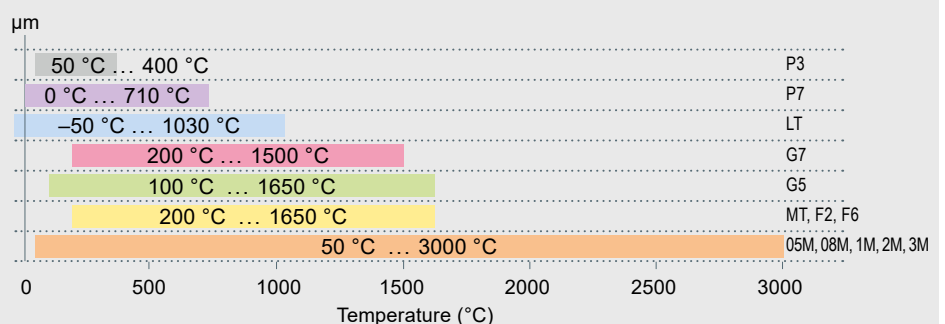


Short wavelengths reduce measurement errors on surfaces with low, unknown or changing emissivity. This occurs mostly with metals. The diagram above shows the measurement errors across different wavelengths if the emissivity is wrongly adjusted by only 10 percent.

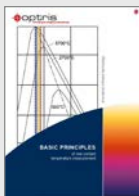
Which temperature range?

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 on basics of IR temperature measurement:

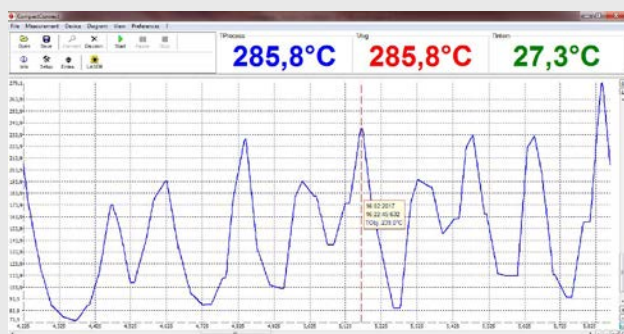
www.optris.global/downloads-compact-series



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**.

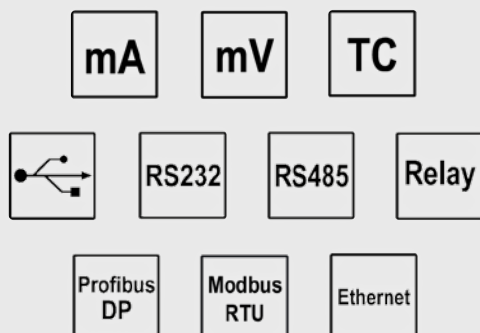
Depending on the device, we offer different analog and digital interfaces for **data evaluation** such as triggering, alerting or saving of data.

Analog Interfaces:

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

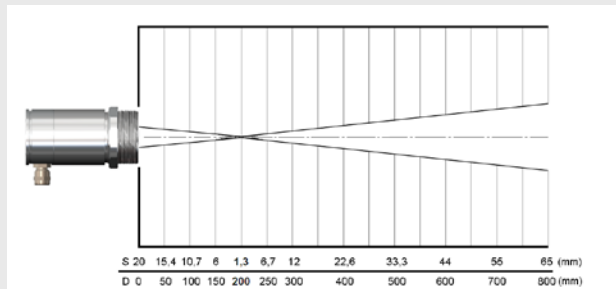
Digital Interfaces:

USB, RS232, RS485, Relay, Profibus DP, Modbus RTU, Ethernet



Object size and measurement distance

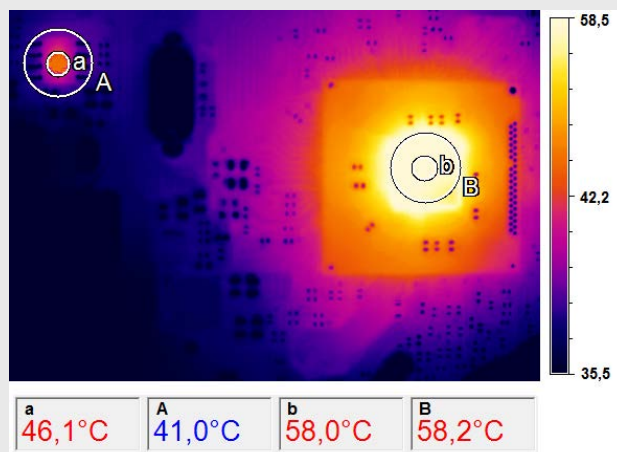
IR thermometers use the radiation signal emitted by the entire measurement spot. The size of the measurement spot (S) largely depends on the device, the optics selected and the distance between the sensor and measurement object plane (D):



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.

optris Compact series

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

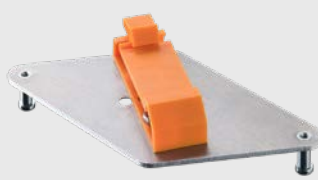
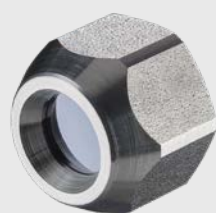


Basic model	CS	CSmicro	CSmicro	CSmicro	CSmicro
Type	LT	LT02 / LT15 (H) / LT 22 H	LT15 HS	2M	3M
Classification / special features	Single-piece sensor with smart LED display (self diagnostics, aiming support, alarm, temperature code)	Single-piece sensor with electronics in cable; smart LED display	Single-piece 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
Detector	Thermopile	Thermopile	Thermopile	InGaAs	Ext. InGaAs
Sensing head exchangeable	–	–	–	–	–
Head cable shortening	■	■ (behind electronics)	■ (behind electronics)	■ (behind electronics)	■ (behind electronics)
Thread (sensing head)	M12x1	M12x1	M18x1	M12x1	M12x1
Spectral range	8–14 µm	8–14 µm	8–14 µm	1.6 µm	2.3 µm
Temperature ranges	–40 ... 1030 °C	–50 ... 1030 °C	–20 ... 150 °C	2ML: 250 ... 800 °C 2MH: 385 ... 1600 °C	3ML: 50 ... 350 °C 3MH: 100 ... 600 °C
Temperature resolution	0.1 K	0.1 K	0.025 K [>20 °C]	0.1 K	0.1 K
Optical resolution	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
Option: CF lens	■	■	■	■	■
Smallest spot (CF optics/add. CF lens)	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
Smallest spot (SF optics)	7 mm	7 mm	7 mm	7 mm	7 mm
Sighting	LED aiming	LED aiming	LED aiming	LED aiming	LED aiming
Response time (90 %)	25 ms	LT: 14 ms / LTH: 150 ms	150 ms	8 ms (mA version: 20 ms)	8 ms (mA version: 20 ms)
Accuracy	±1.5 °C or ±1.5 %	±1 °C or ±1 %	±1 °C or ±1 %	±(0.3 % T _{Meas} + 1 °C)	±(0.3 % T _{Meas} + 1 °C)
Outputs analog: 0–20 mA / 4–20 mA / 0–5 V / 0–10 V / t/c (K/J)	– / – / ■ / ■ / ■	– / – / ■ / ■ / – or – / ■ / – / – / –	– / – / ■ / ■ / – or – / ■ / – / – / –	– / – / ■ / ■ / – or – / ■ / – / – / –	– / – / ■ / ■ / – or – / ■ / – / – / –
Second analog output	–	–	–	–	–
Interfaces: USB / RS232 / RS485 / Profibus / Ethernet / Modbus RTU / Relay	■ / – / – / – / – / – / –	■ / – / – / – / – / – / –	■ / – / – / – / – / – / –	■ / – / – / – / – / – / –	■ / – / – / – / – / – / –
Signal processing: Peak / Valley / AVG / Advanced hold	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■
T _{Amb} Head min.	–20 °C	–20 °C	–20 °C	–20 °C	–20 °C
T _{Amb} Head max.	80 °C	LT02 / LT15: 120 °C LT15 H / LT22 H: 180 °C	75 °C	125 °C	85 °C
T _{Amb} Electronics max.	80 °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)
Functional inputs/number	■ / 1	■ / 1	■ / 1	■ / 1	■ / 1
External emissivity adjustment	■ (via V _{cc} adjust)	■ (mV version)	■ (mV version)	■ (mV version)	■ (mV version)
External background temperature control	■	■ (mV version)	■ (mV version)	■ (mV version)	■ (mV version)
Trigger input for reset of hold functions	■	■	■	■	■
Digital I/O pins/number	–	–	–	–	–
Simultaneous analog and digital output	–	■ (mA version only)	■ (mA version only)	■ (mA version only)	■ (mA version only)
Alarm output as an alternative to analog output	■	■	■	■	■
Additional alarm output/switching output	■	■	■	■	■
Voltage supply	5–30 V DC	5–30 V DC	5–30 V DC	5–30 V DC	5–30 V DC
Standard cable length	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
Cable length options	3 / 8 / 15 m	Options up to 9 m	Options up to 9 m	Options up to 9 m	Options up to 9 m

Spot size calculator: www.optris.global/spot-size-calculator

						
CT	CTfast	CThot	CT	CT	CT	CT
LT02 / LT15 / LT22	LT15F / LT25F	LT02H / LT10H	1M / 2M	3M	G5	P3 / P7
Two-piece sensor with separate electronic box incl. programming keys and display	Two-piece sensor with fast response time and separate electronic box incl. programming keys and display	Two-piece sensor for hot surroundings with separate electronic box incl. programming keys and display	Two-piece sensor for high temp. meas. of metal with separate electronic box incl. progr. keys and display	Two-piece sensor for low temp. meas. of metal with separate electronic box incl. progr. keys and display	Two-piece sensor for temp. meas. of glass with separate electronic box incl. progr. keys and display	Two-piece sensor for temp. meas. on thin plastic film and glass (P7) with separate electronic box incl. progr. keys and display
Thermopile	Thermopile	Thermopile	1M: Si / 2M: InGaAs	Extended InGaAs	Thermopile	Thermopile (P7)
■	–	■	■	■	■	–
■ [–0.1 K/m]	■ [max. 3 m]	■ [–0.1 K/m]	■ [max. 3 m]	■	■ [–0.1 K/m]	–
M12x1	M12x1	M18x1	M12x1	M12x1	M12x1	M18x1
8–14 µm	8–14 µm	8–14 µm	1M: 1.0 µm / 2M: 1.6 µm	2.3 µm	5.0 µm	P3: 3.43 µm / P7: 7.9 µm
LT02: –50 ... 600 °C LT15: –50 ... 600 °C LT22: –50 ... 975 °C	–50 ... 975 °C	–40 ... 975 °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	L: 100 ... 1200 °C H: 250 ... 1650 °C	P3: 50 ... 400 °C P7: 0 ... 710 °C
0.1 K	LT15F: 0.2 K / LT25F: 0.4 K	0.25 K	0.1 K	0.1 K	L: 0.1 K / H: 0.2 K	P3: 0.1 K / P7: 0.5 K
LT02: 2:1 / LT15: 15:1 / LT22: 22:1	LT15F: 15:1 LT25F: 25:1	LT02H: 2:1 LT10H: 10:1	L: 40:1 H: 75:1	L: 22:1 / H: 33:1 / H1–H3: 75:1	L: 10:1 H: 20:1	P3: 15:1 P7: 10:1
■	■	■	■	■	–	–
LT02: 2.5 mm @ 23 mm LT15: 0.8 mm @ 10 mm LT22: 0.6 mm @ 10 mm	0.5 mm @ 8 mm	LT02H: 2.5 mm @ 23 mm LT10H: 1.2 mm @ 10 mm	1.5 mm @ 110 mm	3.4 mm @ 110 mm	–	P7: 1.2 mm @ 10 mm
7 mm	7 mm	7 mm	7 mm	7 mm	7 mm	7 mm
–	–	–	–	–	–	–
150 ms (95%)	LT15F: 9 ms / LT25F: 6 ms	100 ms	1 ms	1 ms	L: 120 ms / H: 80 ms	P3: 100 ms / P7: 150 ms
±1 °C or ±1 %	±2 °C or ±1 %	±1.5 °C or ±1 %	±(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	–20 °C	–20 °C	–20 °C	–20 °C	P3: 0 °C / P7: –20 °C
LT02: 130 °C LT15/LT22: 180 °C	120 °C	250 °C	1M: 100 °C 2M: 125 °C	85 °C	85 °C	P3: 75 °C / P7: 85 °C
85 °C	85 °C	85 °C	85 °C	85 °C	85 °C	P3: 75 °C / P7: 85 °C
■ / 3	■ / 3	■ / 3	■ / 3	■ / 3	■ / 3	■ / 3
■	■	■	■	■	■	■
■	■	■	■	■	■	■
■	■	■	■	■	■	■
–	–	–	–	–	–	–
■	■	■	■	■	■	■
■	■	■	■	■	■	■
■	■	■	■	■	■	■
8–36 V DC	8–36 V DC	8–36 V DC	8–36 V DC	8–36 V DC	8–36 V DC	8–36 V DC
1 m	1 m	3 m	3 m	3 m	3 m	3 m
3 / 8 / 15 m	3 / 8 / 15 m	8 / 15 m	8 / 15 m	–	8 / 15 m	P3: 8 m / P7: 8 m, 15 m

Accessories Compact series

CTex LT + CTex LT hot		Mechanical accessories			
					
OPTCTEX Aluminum housing with mounting device to accommodate the Zener barriers (top-hat rail) and the CT electronics		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 $\geq 10:1$	ACCTKF40B270 / ACCTKF40GE KF40 flange for CT1M, 2M, 3M with B270 window (up to 10^{-7} mbar) / KF40 flange for CTLT with Ge window (up to 10^{-7} mbar)
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)					
		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		ACCTCFE / ACCTPWE CF-lens or protective window (for LT) with external thread for air purge or massive housing ACCTCFHTE / ACCTPWHT for 1M, 2M, 3M		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 $\geq 10:1$		ACCTPA + ACCTST20 20 (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 $\geq 10:1$)	ACCTAPMH Air purge collar for Massive housing (D06)/ CSmicro HS/ CThot/ CT P3/ CT P7	Massive housing of: • compact, brass (D06ACCTMHB) • anodized aluminium (D06ACCTMHA) • stainless steel (D06ACCTMHS)	• 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 Air purge collar, laminar	ACCTMG Mounting fork	Device adjustable in two axes	ACCTFB2 Mounting bracket for sensing head + Sighting tool	D08ACCTLST / ACCTOEMLST OEM Laser-Sightingtool	Sensing head with Laser-Sighting tool
					
ACCTFB Mounting bracket for M12x1 sensing head	ACCTMB Mounting bolt	ACCTAB Device adjustable in two axes	D06ACCTAPMH Massive housing, stainless steel	ACCTAPMH Airpurge, stainless steel	Massive housing with air purge

optris High performance series

Infrared thermometers with highest optical resolution and double laser



Basic model	CSlaser	CSlaser	CSlaser	CTlaser	CTlaser
Type	LT / hs LT	2M	G5	LT / LTF	05M
Classification / special features	Single-piece two-wire sensor with electronics in sensing head	Single-piece two-wire sensor with electronics in sensing head for measurement of metal	Single-piece two-wire infrared thermometer for temperature measurement of glass	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
Detector	Thermopile	InGaAs	Thermopile	Thermopile	Si
Sensing head exchangeable	–	–	–	■	■
Head cable shortening	■	■	■	■ [max. 6 m]	■ [max. 6 m]
Thread (sensing head)	M48x1.5	M48x1.5	M48x1.5	M48x1.5	M48x1.5
Spectral range	8–14 µm	1.6 µm	5.0 µm	8–14 µm	0.525 µm
Temperature ranges	LT: –30 ... 1000 °C hs LT: –20 ... 150 °C	L: 250 ... 800 °C H: 385 ... 1600 °C	HF: 200 ... 1450 °C H1F: 250 ... 1650 °C	–50 ... 975 °C	1000 ... 2000 °C
Temperature resolution	LT: 0.1 K / hs LT: 0.025 K	0.1 K	0.1 K	LT: 0.1 K / LTF: 0.5 K	0.2 K
Optical resolution	50:1	2MH: 300:1 2ML: 150:1	HF / H1F: 45:1	LT: 75:1 LTF: 50:1	150:1
Option: CF lens	–	–	–	–	–
Smallest spot (CF optics/add. CF lens)	1.4 mm @ 70 mm	0.5 mm @ 150 mm	1.6 mm @ 70 mm	LT: 0.9 mm @ 70 mm LTF: 1.4 mm @ 70 mm	–
Smallest spot (SF optics)	24 mm @ 1200 mm	3.7 mm @ 1100 mm	27 mm @ 1200 mm	LT: 16 mm @ 1200 mm LTF: 24 mm @ 1200 mm	7.3 mm @ 1100 mm
Sighting	Double laser	Double laser	Double laser	Double laser	Double laser
Response time (90 %)	150 ms	10 ms	HF / H1F: 30 ms	LT: 120 ms / LTF: 9 ms	1 ms
Accuracy	±1 °C or ±1 %	±(0.3 % T _{Mess} +2 °C)	±1.5 °C oder ±1 %	LT: ±1 °C or ±1 % LTF: ±1.5 °C o. ±1.5 %	±(0.3 % T _{Mess} +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 / Profibus / Ethernet / Modbus RTU / Relay	■ / – / – / – / – / – / –	■ / – / – / – / – / – / –	■ / – / – / – / – / – / –	■ / ■ / ■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■ / ■ / ■
Signal processing: Peak / Valley / AVG / Advanced hold	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■
T _{Amb} Head min.	–20 °C	–20 °C	–20 °C	–20 °C	–20 °C
T _{Amb} Head max.	85 °C	85 °C	85 °C	85 °C	85 °C
T _{Amb} Electronics max.	85 °C	85 °C	85 °C	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	–	–	–	–	–
Simultaneous analog and digital output	■	■	■	■	■
Alarm output as alternative to analog output	■	■	■	■	■
Additional alarm output/ switching output	■	■	■	■	■
Voltage supply	5–30 V DC	5–30 V DC	5–30 V DC	8–36 V DC	8–36 V DC
Standard cable length	3 m	3 m	3 m	3 m	3 m
Cable length options	8 / 15 m	8 / 15 m	8 m / 15 m	8 / 15 m	8 / 15 m

						
CTlaser	CTlaser	CTlaser	CTlaser	CTlaser	CTlaser	CTratio
1M / 2M	3M	MT / F2 / F6	G5	G7	P7	1M / 2M
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	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
1M: Si / 2M: InGaAs	Extended InGaAs	Thermopile	Thermopile	Thermopile	Thermopile	Sandwich
■	■	■	■	■	■	–
■ [max. 6 m]	■ [max. 6 m]	■ [max. 6 m]	■ [max. 6 m]	■ [max. 6 m]	■ [max. 6 m]	–
M48x1.5	M48x1.5	M48x1.5	M48x1.5	M48x1.5	M48x1.5	M18x1
1M: 1.0 µm 2M: 1.6 µm	2.3 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
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	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: 525 ... 1400 °C 1MH: 700 ... 2000 °C 1MH1: 1000 ... 3000 °C 2ML: 275 ... 1000 °C 2MH: 400 ... 1500 °C 2MH1: 550 ... 3000 °C
0.1 K	0.1 K	0.1 K	0.1 K	0.5 K	0.5 K	0.1 K (> 900 °C)
L: 150:1 H: 300:1	L: 60:1 / H: 100:1 / H1-H3: 300:1	45:1	L / HF / H1F: 45:1 H: 70:1	45:1	45:1	1ML/2ML: 38:1, 2MH: 50:1, 1MH/1MH1/2MH1: 100:1
–	–	–	–	–	–	–
0.5 mm @ 150 mm	0.5 mm @ 150 mm	1.6 mm @ 70 mm	1 mm @ 70 mm	1.6 mm @ 70 mm	1.6 mm @ 70 mm	–
3.7 mm @ 1100 mm	11 mm @ 1100 mm	27 mm @ 1200 mm	17 mm @ 1200 mm	27 mm @ 1200 mm	27 mm @ 1200 mm	–
Double laser	Double laser	Double laser	Double laser	Double laser	Double laser	Laser
1 ms	1 ms	10 ms	L: 120 ms / H: 80 ms HF / H1F: 10 ms	150 ms	150 ms	1 ms – 10 s
±(0.3 % T _{Mess} + 2 °C)	±(0.3 % T _{Mess} + 2 °C)	±1 %	±1.5 °C oder ±1 %	±1.5 °C or ±1 %	±1.5 °C or ±1 %	±(0.5 % T _{Mess} + 2 °C)
■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■	■ / ■ / – / – / –
–	–	■	■	■	■	■
■ / ■ / ■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■ / ■ / ■	■ / ■ / ■ / – / – / – / ■
■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■
–20 °C	–20 °C	–20 °C	–20 °C	–20 °C	–20 °C	–20 °C
85 °C	85 °C	85 °C	85 °C	85 °C	85 °C	200 °C (optional: 315 °C)
85 °C	85 °C	85 °C	85 °C	85 °C	85 °C	1M: 60 °C / 2M: 50 °C
■ / 3	■ / 3	■ / 3	■ / 3	■ / 3	■ / 3	– / –
■	■	■	■	■	■	■
■	■	■	■	■	■	■
■	■	■	■	■	■	■ (via I/O-Pins)
–	–	–	–	–	–	■ / 3
■	■	■	■	■	■	■
■	■	■	■	■	■	■
■	■	■	■	■	■	■ (via I/O-Pins)
8–36 V DC	8–36 V DC	8–36 V DC	8–36 V DC	8–36 V DC	8–36 V DC	8–36 V DC
3 m	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	8 / 15 m

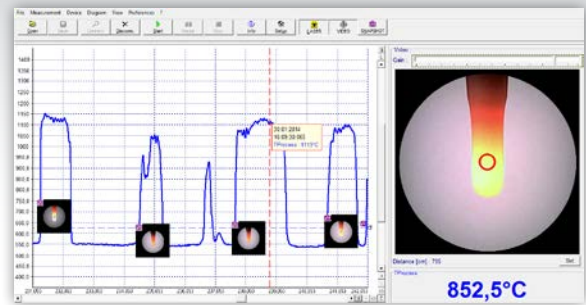
optris infrared video thermometers

Infrared video thermometers with vario focus and patented cross hair laser			
Basic model	CSvideo	CTvideo	CTvideo
Type	2M (L / H)	1M / 2M (L / H)	3M (L / H)
Classification / special features	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	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
Spectral range	1.6 µm	1M: 1.0 µm / 2M: 1.6 µm	2.3 µm
Temperature ranges (scalable via software)	250 °C ... 800 °C (2ML) 385 °C ... 1600 °C (2MH)	485 ... 1050 °C (1ML) 650 ... 1800 °C (1MH) 800 ... 2200 °C (1MH1) 250 ... 800 °C (2ML) 385 ... 1600 °C (2MH) 490 ... 2000 °C (2MH1)	50 ... 400 °C (3ML) 100 ... 600 °C (3MH) 150 ... 1000 °C (3MH1) ¹⁾ 200 ... 1500 °C (3MH2) ¹⁾ 250 ... 1800 °C (3MH3) ¹⁾
Temperature resolution	0.1 K	0.1 K	0.1 K
Optical resolution	2MH: 300:1 / 2ML: 150:1	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	2ML: 0.6 mm @ 90 mm (CF) 2MH: 0.3 mm @ 90 mm (CF)	1ML/2ML: 0.6 mm @ 90 mm (CF) 1MH-H1/ 2MH-H1: 0.3 mm @ 90 mm (CF)	3ML: 1.5 mm @ 90 mm (CF) 3MH: 0.9 mm @ 90 mm (CF) 3MH1–H3: 0.3 mm @ 90 mm (CF)
Smallest spot (SF optics) SF vario optics: focusable from 200 mm to infinity	2ML: 1.3 mm @ 200 mm (SF) 2MH: 0.7 mm @ 200 mm (SF)	1ML/2ML: 1.3 mm @ 200 mm (SF) 1MH-H1/ 2MH-H1: 0.7 mm @ 200 mm (SF)	3MH: 3.3 mm @ 200 mm (SF) 3MH: 2.0 mm @ 200 mm (SF) 3MH1–H3: 0.7 mm @ 200 mm (SF)
Sighting	video camera and cross hair laser	video camera and cross hair laser	video camera and cross hair laser
Response time (90 %)	10 ms	1 ms	1 ms
Accuracy	±(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)	– / ■ / – / – / –	■ / ■ / ■ / ■ / ■	■ / ■ / ■ / ■ / ■
Interfaces: USB / RS232 / RS485 / Profibus / Ethernet	■ / – / – / – / ■	■ / – / – / – / ■	■ / – / – / – / ■
Signal processing: Peak / Valley / AVG / Advanced hold	■ / ■ / ■ / ■	■ / ■ / ■ / ■	■ / ■ / ■ / ■
T _{Amb} Head min.	–20 °C	–20 °C	–20 °C
T _{Amb} Head max.	70 °C	70 °C	70 °C
T _{Amb} Electronics max.	70 °C	85 °C	85 °C
Functional inputs / number	– / –	■ / 3	■ / 3
External emissivity adjustment	–	■	■
External background temperature control	–	■	■
Trigger input for reset of hold functions	–	■	■
Simultaneous analog and digital output	■	■	■
Alarm output as an alternative to analog output	■	■	■
Additional alarm output	0–30 V / 500 mA (open-collector)	24 V / 50 mA (open-collector)	24 V / 50 mA (open-collector)
Voltage supply	5–28 V DC	8–36 V DC	8–36 V DC
Standard cable length	3 m	3 m	3 m
Cable length options	8 / 15 m	5 / 10 m	5 / 10 m

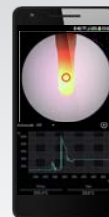
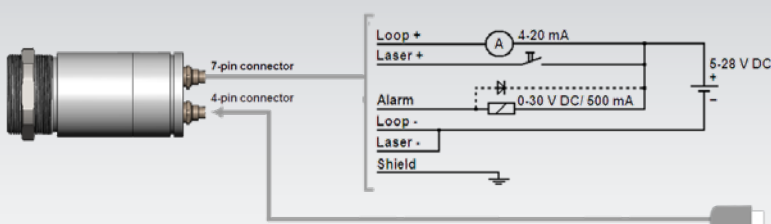
¹⁾ Specifications available for object temperatures ≥ lower measurement range 50 °C

Software Compact Connect for stationary infrared thermometer

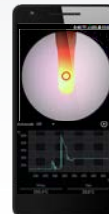
- Suitable for all optris infrared thermometer of the high performance series and compact line
- Automatic snapshots (time or temperature dependent) to control and document the process
- Graphic display and recording of the measurement values
- Setup of sensor parameters and signal processing functions
- 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 thermometers



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

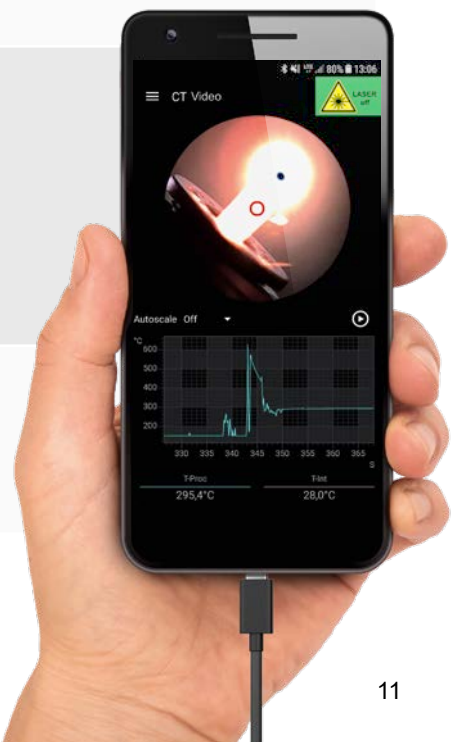


Pyrometer

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

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 high performance series

Mechanical accessories

			
ACCTLFB Mounting bracket, adjustable in one axis	ACCTLAB Mounting bracket, adjustable in two axes	ACHAMA Mounting adapter: Mounting and pipe flange incl. screws	ACCTRAIL Rail mount adapter for CT electronics

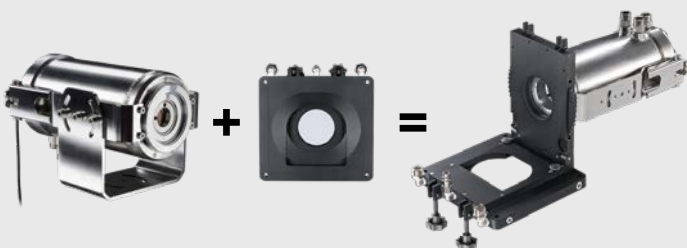
Optical accessories

Combinations

				
ACHAST300 + ACHAPA Sighting tube M48x1,5, 300 mm length + pipe adapter with M48x1,5 internal thread for CoolingJacket	ACCJAFPCTL + ACCJAPWCTLSW Front part + Focussing unit with protective window for CoolingJacket	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 Tamb up to 175 °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

Pyrometer

Infrared cameras

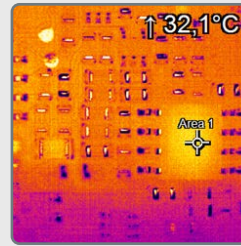
Laminating interior fittings of vehicles



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

Component inspection of circuit boards



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

Recommended devices:
PI 640 microscope optics,
Xi 400 microscope optics

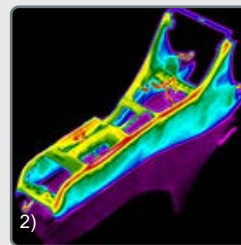
Blown film extrusion



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

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

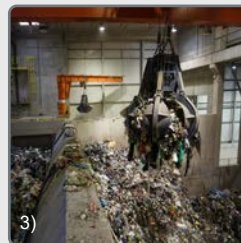
Inductive heat treatment of metals



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

Infrared technology for fire protection



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

Sterilization of glass bottles



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

Recommended devices:
CT G5, CT LT

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

optris Xi infrared cameras – Compact Line

Optics calculator: www.optris.global/optics-calculator

Compact spot finder IR camera for use in harsh industrial environments, autonomous operation possible.



Basic model	Xi 80	Xi 400
Type	IR	IR
Detector	FPA, uncooled (34 μm pitch)	FPA, uncooled (17 μm pitch)
Optical resolution	80 x 80 pixels	382 x 288 pixels
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⁾
Frame rate	50 Hz	80 Hz / 27 Hz
Optics (FOV)	30° (f = 5.1 mm) 12° (f = 12.7 mm) 55° (f = 3.1 mm) 80° (f = 2.3 mm)	29° x 22° (f = 12.7 mm) 18° x 14° (f = 20 mm) 53° x 38° (f = 7.7 mm) 80° x 54° (f = 5.7 mm)
New: Microscope optics	–	18° x 14° (f = 20 mm), smallest measuring spot: 90 μm (IFOV)
Focus	Manual motor focus	Manual motor focus
Optical resolution (D:S)	190:1 (12° optics)	390:1 (18° optics)
Thermal sensitivity (NETD)	100 mK	80 mK
System accuracy (at $T_{\text{Amb}} = 23 \pm 5$ °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 / optional USB to GigE (PoE) interface
Direct in-/outputs / Standard process interface (PIF)	1x 0/4–20 mA output 1x input (analog or digital) Optically isolated	1x 0–10 V input 1x digital input (max. 24 V) 1x 0–10 V output
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; optically isolated	2 x 0–10 V inputs, 1 x digital input (max. 24 V), 3x 0/4–20 mA outputs, 3 x relay (0–30 V / 400 mA), fail-safe relay
Cable length (USB)	USB: 1 m (standard), 3 m, 5 m, 10 m and 20 m Ethernet / RS485: 100 m	USB: 1 m (standard), 3 m, 5 m, 10 m and 20 m
Ambient temperature (T_{Amb})	0 °C ... 50 °C	0 °C ... 50 °C
Size / class	Ø 36 x 90 mm (M30x1 thread) / IP 67 (NEMA 4)	Ø 36 x 100 mm (M30x1 thread) / IP 67 (NEMA 4)
Weight (without mounting bracket)	201 - 210 g (depending on lens)	216 - 220 g (depending on lens)
Shock / Vibration ²⁾	IEC 60068-2	IEC 60068-2
Power supply	USB / PoE / 5-30 VDC	via USB
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 • 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



Microscope optics for the inspection of assembled circuit boards

The new microscope optics for the **optris Xi 400** infrared camera allows reliable temperature measurement on tiny objects from **240 μm (MFOV)**. In combination with a suitable stand, this enables professional measurement of printed circuit boards and components in the electronics industry. The measuring distance between camera and object is variable between 90 and 110 mm. Due to the built-in motor focus, the camera can be easily mounted in the supplied PIX Connect software focus. For measuring even smaller objects we recommend the PI 640 microscope optics, **smallest measuring spot: 28 μm (IFOV)**.

Further information on page 16.

www.optris.global/optris-xi-400-microscope-optics

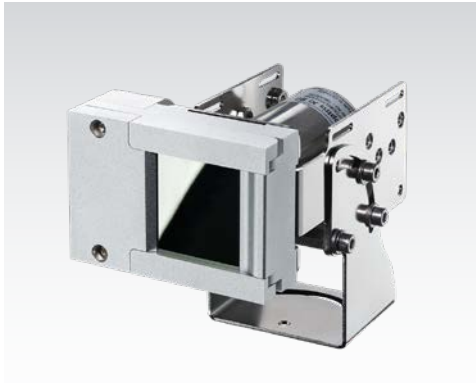
¹⁾ Accuracy effective starting at 150 °C

²⁾ For further details see operator's manual

Accessories Xi infrared cameras

when temperature matters

EXPANSION OPTIONS



Air purge unit

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 reliable temperature measurement

part number: **ACXIAPL + ACXIAPLAB**
(Mounting bracket)



Water cooled housing

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

part number: **ACXIW**



Shutter

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

part number: **ACXISCBxx***

*xx = for different cable lengths



Outdoor protective housing for Xi series

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

part number: **ACXIOPH24**

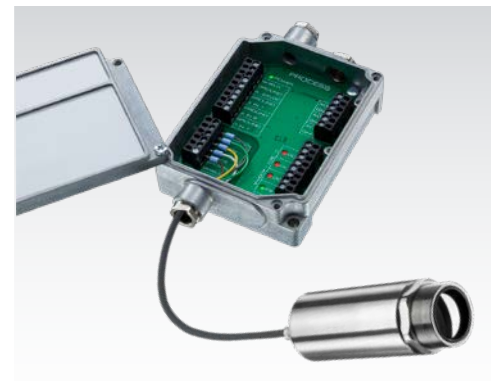


USB server Gigabit 2.0 for Xi 400

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 V DC
- Galvanic isolation 500 V_{RMS} (network connection)
- Remotely configurable via Web Based Management
- Proven technology from Wiesemann & Theis

part number: **ACPIUSBSGB**



Industrial process interface (PIF) for Xi series

Features:

- Industrial process interface for Xi 400 with 3 analog/alarm outputs, 2 analog inputs, 1 digital input, 3 alarm relays
- Industrial process interface for Xi 80 with 3 analog-/alarm outputs, 3 inputs (analog or digital), 3 alarm relays
- 500 VAC_{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: stackable up to 3 PIFs

part number: **Xi 80: ACXIPIFCBx***
part number: **Xi 400: ACPIPIFMACBx***

x* = for different cable lengths

optris PI infrared cameras - Precision Line

Optics calculator: www.optris.global/optics-calculator

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



Basic model		PI 400i / PI 450i	PI 640	PI 640 Microscope optics
Type		IR	IR	IR
Detector		FPA, uncooled (17 µm pitch)	FPA, uncooled (17 µm pitch)	FPA, uncooled (17 µm pitch)
Optical resolution		382 x 288 pixels	640 x 480 pixels VGA	640 x 480 pixels @ 32 Hz 640 x 120 pixels @ 125 Hz
Spectral range		8 – 14 µm	8 – 14 µm	8 – 14 µm
Temperature ranges		–20 ... 100 °C 0 ... 250 °C, (20) 150 ... 900 °C ¹⁾ 200 ... 1500 °C (option)	–20 ... 100 °C 0 ... 250 °C (20) 150 ... 900 °C ¹⁾ 200 ... 1500 °C (option)	–20 ... 100 °C 0 ... 250 °C (20) 150 ... 900 °C ¹⁾ 200 ... 1500 °C (option)
Frame rate		80 Hz / switchable to 27 Hz	32 Hz / 125 Hz in subframe mode (640x120 pixels)	32 Hz / 125 Hz in subframe mode (640 x 120 pixels)
Optics (FOV)		29° x 22° / f = 12.7 mm or 18° x 14° / f = 20 mm or 53° x 38° / f = 7.7 mm or 80° x 54° / f = 5.7 mm	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	12° x 9° (F=1.1) / f = 44 mm Smallest measuring spot: 28 µm
Thermal sensitivity (NETD)		PI 400i: 75 mK with 29°, 53°, 80° FOV PI 450i: 40 mK with 29°, 53°, 80° FOV optics mentioned above: F = 0.9 PI 400i: 0.1 K with 18° FOV / F = 1.1 PI 450i: 60 mK with 18° FOV / F = 1.1	75 mK	120 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
Ambient derating		±0,05 % / K ²⁾	±0,05 % / K ²⁾	±0,05 % / K ²⁾
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
	Industrial PIF (optional)	2x 0–10 V input, 1x digital input (max. 24 V), 3x 0/4–20 mA output, 3x relays (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 relays (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 relays (0–30 V / 400 mA), 1x fail-safe-relay
Ambient temperature (T _{Amb})		PI 400i: 0 ... 50 °C / PI 450i: 0 ... 70 °C	0 ... 50 °C	0 ... 50 °C
Storage temperature		PI 400i: –40 ... 70 °C PI 450i: –40 ... 85 °C	–40 ... 70 °C	–40 ... 70 °C
Relative Humidity		10–95 %, non-condensing	10–95 %, non-condensing	10–95 %, non-condensing
Size / class		46 x 56 x 68 – 77 mm (depending on lens and focus position)/ IP 67 (NEMA 4)	46 x 56 x 76 - 100 mm (depending on lens and focus position)/ IP 67 (NEMA 4)	46 x 56 x 119 - 126 mm (depending on lens and focus position)/ IP 67 (NEMA 4)
Weight		237 - 251 g, depending on lens	269 - 340 g, depending on lens	370 g, incl. lens
Shock / Vibration ³⁾		IEC 60068-2	IEC 60068-2	IEC 60068-2
Tripod mount		1/4 - 20 UNC	1/4 - 20 UNC	1/4 - 20 UNC
Power supply		via USB	via USB	via USB
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	• 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 lens kit (standard lens [PI 640: O33], microscope lens [MO44]) • Microscope stand • Standard USB cable (1 m) • Standard-PIF • Manual • Rugged outdoor case • Software package optris PIX Connect

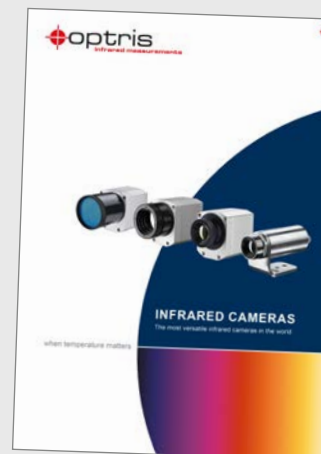
¹⁾ Accuracy effective starting at 150 °C

²⁾ For T_{Amb} 10...50 °C and T_{Obj} ≤ 500 °C; otherwise: ± 0,1 K/K or 0,1%/K (whichever is greater)

³⁾ For further details see operator's manual



PI 450i G7	PI 640 G7
IR	IR
FPA, uncooled (17 µm pitch)	FPA, uncooled (17 µm pitch)
382 x 288 pixels	640 x 480 pixels
7.9 µm	7.9 µm
150 ... 900 °C 200 ... 1500 °C	150 ... 900 °C 200 ... 1500 °C
80 Hz / switchable to 27 Hz	32 Hz / 125 Hz in subframe mode (640x120 pixels)
29° x 22° / f = 12.7 mm or 18° x 14° / f = 20 mm or 53° x 38° / f = 7.7 mm or 80° x 54° / f = 5.7 mm	33° x 25° / f = 18.7 mm or 15° x 11° / f = 42 mm or 60° x 45° / f = 10.5 mm or 90° x 64° / f = 7.7 mm
150 mK 175 mK (with 18 ° FOV)	130 mK 150 mK (with 15 ° FOV)
±2 °C or ±2 %, whichever is greater	±2 °C or ±2 %, whichever is greater
-	-
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
2x 0–10 V input, 1x digital input (max. 24 V), 3x 0/4–20 mA output, 3x relays (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 relays (0–30 V / 400 mA), 1x fail-safe-relay
0 ... 70 °C	0 ... 50 °C
–40 ... 85 °C	–40 ... 70 °C
10–95 %, non-condensing	10–95 %, non-condensing
46 x 56 x 68 – 77 mm (depending on lens and focus position)/ IP 67 (NEMA 4)	46 x 56 x 76 – 100 mm (depending on lens and focus position)/ IP 67 (NEMA 4)
237 - 251 g, depending on lens	269 - 340 g, depending on lens
IEC 60068-2	IEC 60068-2
1/4 - 20 UNC	1/4 - 20 UNC
via USB	via USB
• 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



For further information on our infrared cameras
see our infrared camera brochure:

www.optris.global/downloads-infrared-cameras



optris PI infrared cameras – Precision Line

Optics calculator: www.optris.global/optics-calculator

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



Basic model		PI 05M		PI 08M		PI 1M	
Type		IR		IR		IR	
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 ... 2450 °C (27 Hz mode) 950 ... 2450 °C (32 / 80 Hz mode) 1100 ... 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 Hz and 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)		FOV@ 764 x 480 px: 26° x 16° (f=25 mm)	FOV@ 382 x 288 px: 13° x 10° (f=25 mm)	FOV@ 764 x 480 px: 39° x 25° (f=16 mm) 26° x 16° (f=25 mm)	FOV@ 382 x 288 px: 20° x 15° (f=16 mm) 13° x 10° (f=25 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)
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 zu GigE (PoE) Interface		USB 2.0 / optional USB zu GigE (PoE) Interface		USB 2.0 / optional USB zu 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	
	Industrial PIF (optional)	2x 0 – 10 V inputs, 1x digital input (max. 24 V), 3x 0/4-20 mA outputs, 3x relays (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 relays (0 – 30 V / 400 mA), 1x fail-safe relays		2x 0 – 10 V inputs, 1x digital input (max. 24 V), 3x 0/4-20 mA outputs, 3x relays (0 – 30 V / 400 mA), 1x fail-safe relays	
Ambient temperature (T _{Amb})		5 ... 50 °C		5 ... 50 °C		5 ... 50 °C	
Storage temperature		– 40 ... 70 °C		– 40 ... 70 °C		– 40 ... 70 °C	
Relative Humidity		10 – 95 %, non-condensing		10 – 95 %, non-condensing		10 – 95 %, non-condensing	
Size / class		46 x 56 x 88 – 129 mm with protection tube (depending on lens and focus position) / IP 67 (NEMA 4)		46 x 56 x 88 – 129 mm with protection tube (depending on lens and focus position) / IP 67 (NEMA 4)		46 x 56 x 88 – 129 mm with protection tube (depending on lens and focus position) / IP 67 (NEMA 4)	
Weight		245 - 311 g, depenping on lens		245 - 311 g, depending on lens		245 - 311 g, depending on lens	
Shock / Vibration ⁴⁾		IEC 60068-2		IEC 60068-2		IEC 60068-2	
Tripod mount		1/4-20 UNC		1/4-20 UNC		1/4-20 UNC	
Power supply		via USB		via USB		via USB	
Scope of supply (standard)		• USB camera with 1 lens • Lens tube incl. 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 • Lens tube incl. protective window • USB cable (1 m) • Table tripod • PIF cable with terminal block (1 m) • Manual • Software package optris PIX Connect • Aluminum case • Optional: CoolingJacket, HT cable		• USB camera with 1 lens • Lens tube incl. protective window • USB cable (1 m) • Table tripod • PIF cable with terminal block (1 m) • Manual • Software package optris PIX Connect • Aluminum case • Optional: CoolingJacket, HT cable	

¹⁾ Accuracy effective starting at +75 °C with optics (f = 50 mm and f = 75 mm)

²⁾ Specified NETD value applies to all frequencies

³⁾ For further details see operator's manual

Accessories PI Infrared cameras

EXPANSION OPTIONS



Outdoor protective housing for infrared cameras

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
- Installation of USB Server Gigabit 2.0 and industrial process interface possible for integration into control systems over large outdoor distances

part number: **ACPIOPH**



PI NetBox

Features:

- Miniature PC as an add-on to the PI series for stand-alone system or for cable extension via GigE
- Integrated hardware and software watchdog
- Installation of additional user software possible
- Status LEDs
- Processor: Intel® E3845 Quad Core/ 1.91 GHz, 16 GB SSD, 2 GB RAM
- Connections: 2x USB 2.0, 1x USB 3.0, 1x Mini USB 2.0, Micro HDMI, Ethernet (Gigabit Ethernet), Micro SDHC / SDXC card
- Wide supply voltage range (8–48 V DC) or Power over Ethernet (PoE)
- Can be integrated into CoolingJacket Advanced

part number: **OPTPINBW732G**



USB server Gigabit 2.0 for optris PI cameras

Features:

- Fully USB 2.0 compatible, Data rates: 1.5 / 12 / 480 mbps, USB transfer mode: Isochronous
- Network connection via Gigabit Ethernet
- For optris PI series and Xi 400 as well as CTvideo / CSvideo series
- Full TCP/IP support incl. routing and DNS
- Two independent USB ports
- Supply from PoE or external power supply with 24 – 48 V DC
- Galvanic isolation 500 V_{RMS} (network connection)
- Remotely configurable via Web Based Management
- Proven technology from Wiesemann & Theis

part number: **ACPIUSBSGB**



Industrial process interface (PIF) for optris PI series

Features:

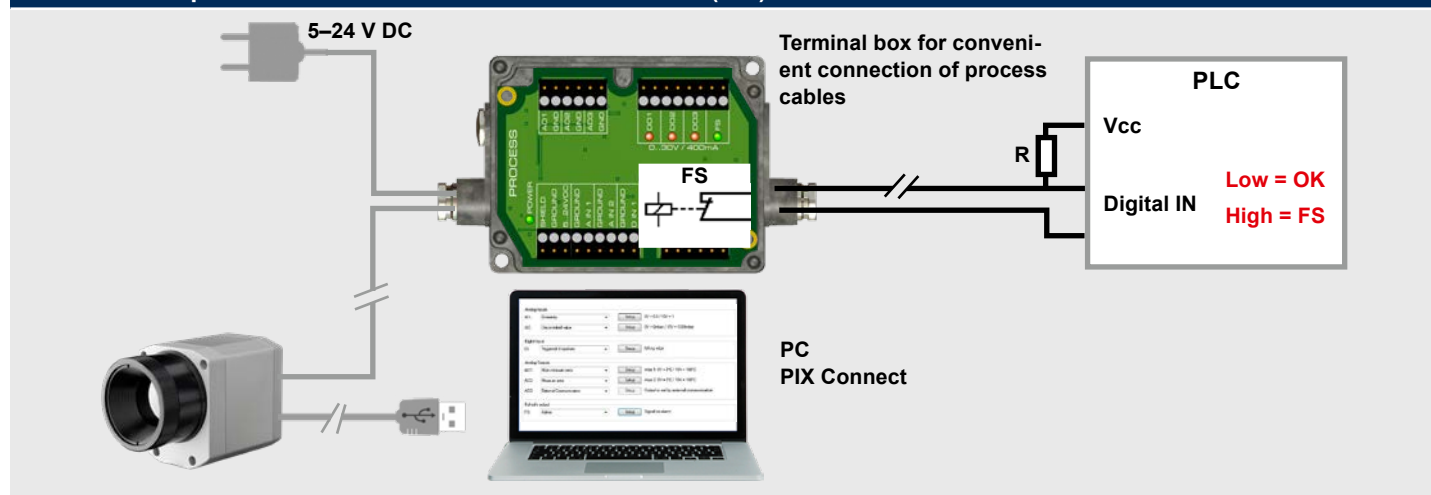
- Industrial process interface for PI series with 3 analog/alarm outputs, 2 analog inputs, 1 digital input, 3 alarm relays
- 500 VAC_{RMS} isolation voltage between camera and process
- Separate fail-safe relay output
- PI hardware including all cable connections and PIX Connect software are permanently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

part number: **ACPIPIFMA**

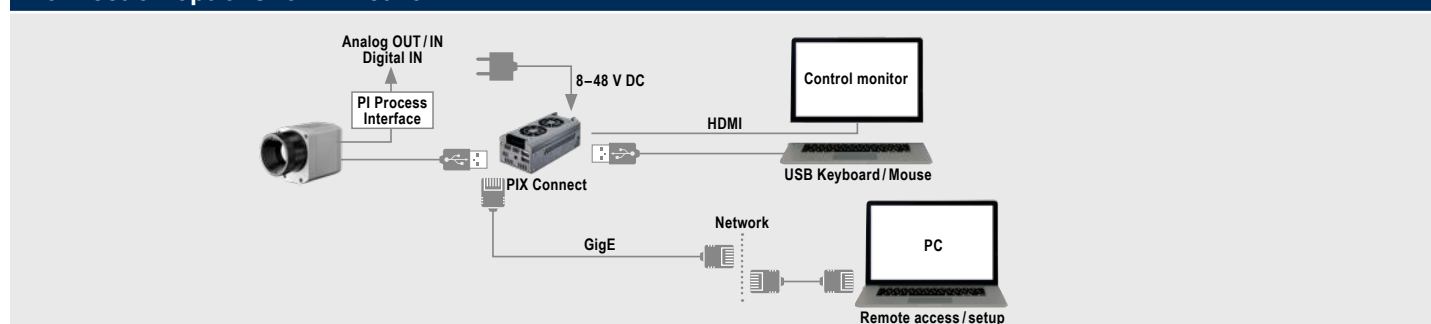
Accessories PI Infrared cameras

EXPANSION OPTIONS

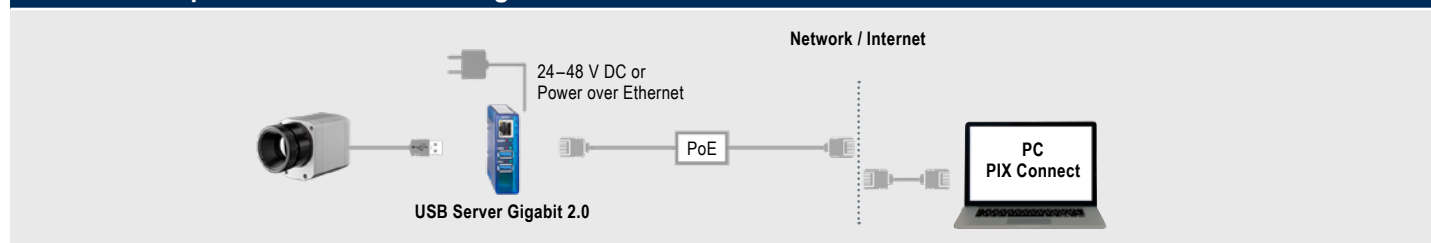
Connection options for the Industrial Process Interface (PIF)



Connection options for PI NetBox



Connection options for USB Server Gigabit 2.0



CoolingJacket Advanced

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

part number: **ACPICJA**



Laminar air purge

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

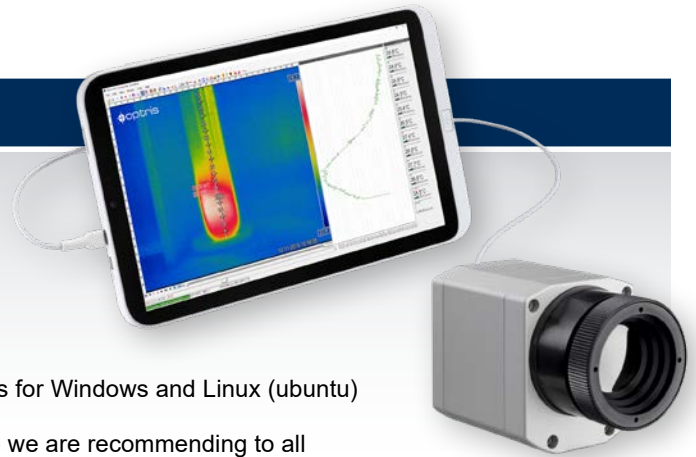
part number: **ACCJAAPLS**

PIX Connect

Comprehensive IR camera software

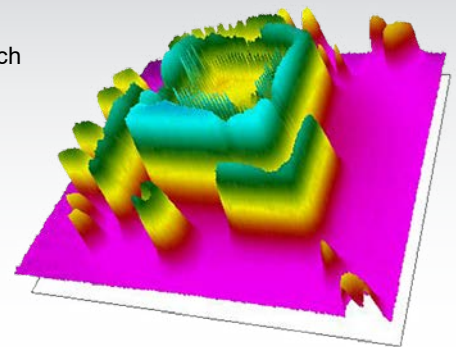
- No licensing restrictions
- Modern software with intuitive user interface
- Display of numerous images in different windows
- Extensive license-free analysis and two software development kits for Windows and Linux (ubuntu)

The **HummingBoard Edge computer** from SolidRun is a hardware we are recommending to all customers who want to integrate our PI and Xi imagers in their Linux based software by using our Direct SDK.



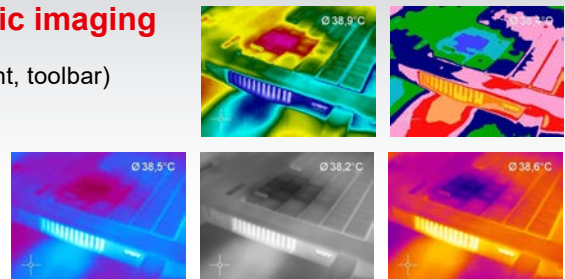
Detailed online and offline data analysis

- Detailed analysis with the help of measurement areas, automatic hot/coldspot 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)



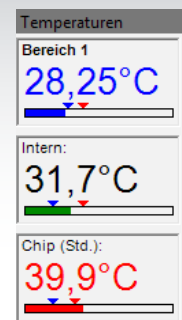
High degree of individualization for customer-specific imaging

- 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



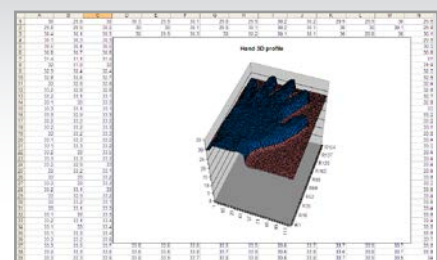
Automatic process control and quality control

- 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)

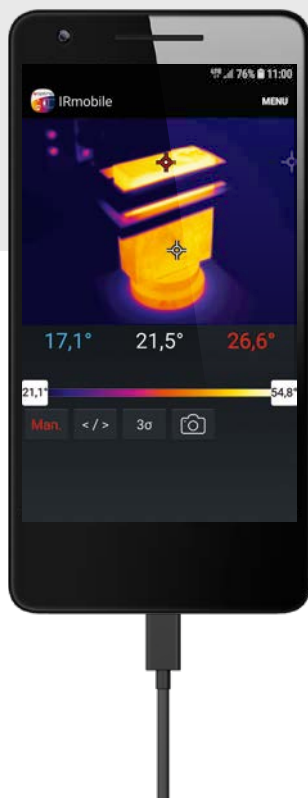




IRmobile



- The setting tool for all IR cameras



Infrared camera features

- Live IR image with automatic hot and cold spot
- 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



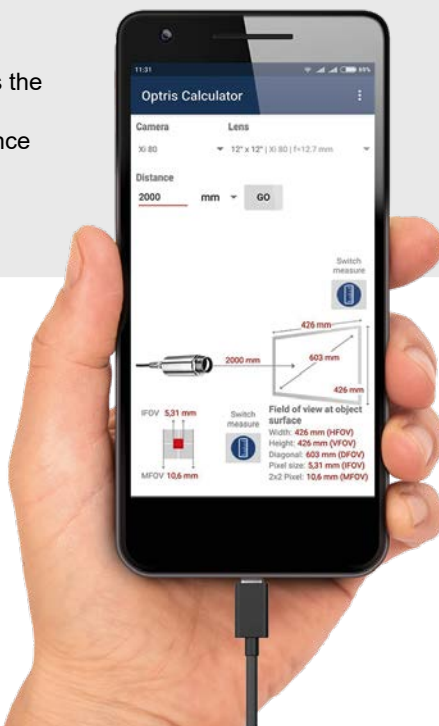
- Combines the measuring spot size calculator of the IR pyrometers and the optics calculator of the IR cameras
- The measuring spot size of the respective device is calculated for each distance

Pyrometers

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

Features

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



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

Supported for

- All android devices (5.0 or higher)



optris Portable thermometers

High-quality infrared thermometers with integrated USB interface

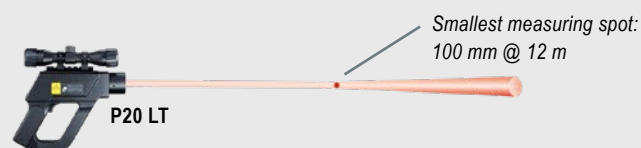


Basic model	P20	P20	MS	MSPlus	MSPro
Type	LT	1M / 2M / 05M	LT	LT	LT
Detector	Thermopile	Si / InGaAs	Thermopile	Thermopile	Thermopile
Spectral range	8 – 14 μm	1M: 1.0 μm 2M: 1.6 μm 05M: 525 nm	8 – 14 μm	8 – 14 μm	8 – 14 μm
Temperature ranges	0 °C ... 1300 °C	1M: 650 °C ... 1800 °C 2M: 385 °C ... 1600 °C 05M: 1000 °C ... 2000 °C	–32 °C ... 420 °C	–32 °C ... 530 °C	–32 °C ... 760 °C
Temperature resolution	1 K	1 K	0.2 K	0.1 K	0.1 K
Optical resolution	120:1	1M / 2M: 300:1 05M: 150:1	20:1	20:1	40:1
Smallest spot (SF optics)	100 mm @ 12 m	1M / 2M: 12 mm @ 3.6 m 05M: 24 mm @ 3.6 m	13 mm @ 140 mm	13 mm @ 140 mm	13 mm @ 260 mm
Sighting	Double laser	Double laser	Laser	Laser	Laser
Response time (90 %)	300 ms	100 ms	300 ms	300 ms	300 ms
Accuracy (at T_{Amb} 23 $\pm$ 5 °C)	$\pm$ 2 °C or $\pm$ 1 %	$\pm$ (0.3 % T_{meas} + 2 °C)	$\pm$ 1 °C or $\pm$ 1 % (20 ... 420 °C)	$\pm$ 1 °C or $\pm$ 1 % (20 ... 530 °C)	$\pm$ 1 °C or $\pm$ 1 % (20 ... 760 °C)
PC interface	USB	USB	USB	USB	USB
Software	■	■	■	■	■
Probe connection (t/c)	–	–	–	–	■
T_{Amb} Min. / Max.	0 °C / 50 °C	0 °C / 50 °C	0 °C / 50 °C	0 °C / 50 °C	0 °C / 50 °C
Display MAX / MIN / HOLD	■	■	■	■	■
HIGH / LOW alarm	■	■	–	■	■
Data logger / capacity	■ / 2000	■ / 2000	–	–	■ / 20
Emissivity	0.100 ... 1.100	0.100 ... 1.100	0.95 fixed	0.100 ... 1.100	0.100 ... 1.100

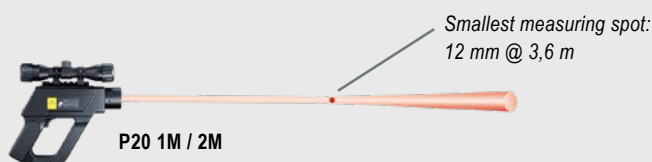
Best optics for portable thermometers

The optics of the portable P20 thermometers are designed for mid-range as well as long distances.

The **optris P20** has a target laser and aiming scope for accurate sighting so that even more distant objects can be measured precisely.



High optical resolution of 120:1 to 300:1



when temperature matters

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