MICRO-EPSILON

More Precision

thermoIMAGER TIM // Compact thermal imaging cameras

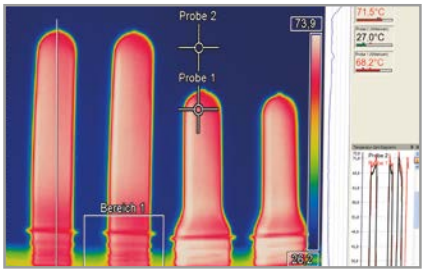
thermoIMAGER TIM QVGA

Thermal imaging camera with high resolution and sensitivity

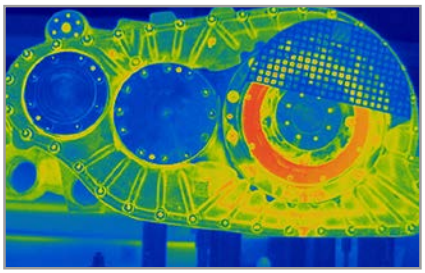
- Detector with 382 x 288 pixels
- Measuring range from -20 °C to 900 °C (special model up to 1500 °C)
- Fast, real-time thermal imager with up to 80 Hz
- Very high thermal sensitivity with 75 mK (TIM QVGA) and 40 mK (TIM QVGA-HD)
- Compact design (46 mm x 56 mm x 68 - 77 mm)
- Lightweight (320 g incl. lens)
- Exchangeable lenses & industrial accessories
- TIMConnect software delivered with Software Developer Kit

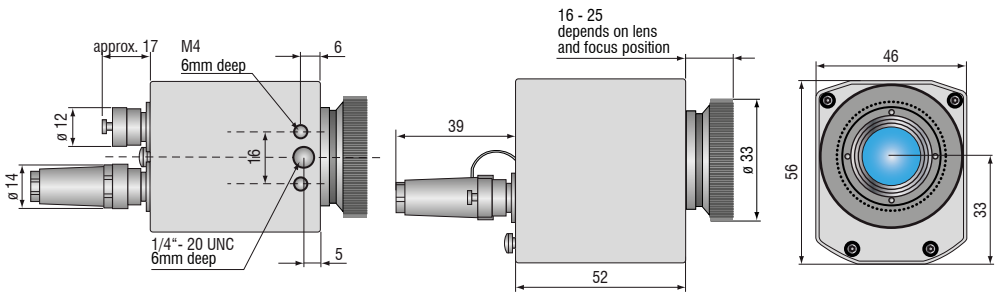
Software

- Display of the thermal image in real time (80 Hz) with recording function (video, snapshot)
- Complete set up of parameters and remote control of the camera
- Detailed analysis of fast, thermodynamic processes
- Output of analog temperature or alarm values via the process interface
- Digital communication via RS232 or DLL for software integration



80 Hz imaging with full pixel resolution
Thermal image shots of preforms in PET bottle production





Model	TIM QVGA	TIM QVGA-HD
Optical resolution	382 x 288 pixels	
Temperature ranges	-20 ... 100 °C, 0 ... 250 °C, (20) 150 ... 900 °C [1] additional temperature range: 200 ... 1500 °C	
Spectral range	8 to 14 µm	
Frame rate	switchable 80 Hz or 27 Hz	
System accuracy	±2 °C or ±2 %, whichever is greater	
Lenses	18° x 14° FOV / f =20 mm or 29° x 22° FOV / f =12.7 mm or 53° x 38° FOV / f =7.7 mm or 80° x 54° FOV / f = 5.7 mm	
Thermal sensitivity (NETD) [2]	75 mK with 29° x 22° FOV / F = 0.9 75 mK with 53° x 38° FOV / F = 0.9 75 mK with 80° x 54° FOV / F = 0.9 100 mK with 18° x 14° FOV / F = 1.1	40 mK with 29° x 22° FOV / F = 0.9 40 mK with 53° x 38° FOV / F = 0.9 40 mK with 80° x 54° FOV / F = 0.9 60 mk with 18° x 14° FOV / F = 1.1
Detector	FPA, uncooled (17 µm x 17 µm)	
Outputs/digital	USB 2.0 / optional interface USB to GigE (PoE)	
Standard process interface (PIF)	0 - 10 V input, digital input (max. 24 V), 0 - 10 V output	
Industry process interface (PIF)	2x 0 - 10 V inputs, digital input (max. 24 V), 3x 0/4 - 20 mA outputs, 3x relays (0 - 30 V/ 400 mA), fail-safe relay	
Cable length (USB)	1 m (standard), 5 m, 10 m, 20 m 5 m and 10 m also available as high temperature USB cable (180 °C or 250 °C)	
Power supply	USB powered	
Tripod mount	¼-20 UNC	
Protection class	IP67	
Ambient temperature	0 ... 50 °C	0 ... 70 °C
Storage temperature	-40 ... 70 °C	-40 ... 85 °C
Relative humidity	20 to 80 %, non-condensing	
Vibration [3]	IEC 60068-2-6 (sinus-shaped) / IEC 60068-2-64 (broadband noise)	
Shock [3]	IEC 60068-2-27 (25 g and 50 g)	
Housing (size) [3]	46 mm x 56 mm x 68 - 77 mm (depending on lens and focus position)	
Weight	320 g, incl. lens	

[1] For the range (20)150 up to 900 °C, the accuracy specification applies from 150 °C
[2] Values apply with 40 Hz and 25 °C room temperature
[3] For more information see operating instructions

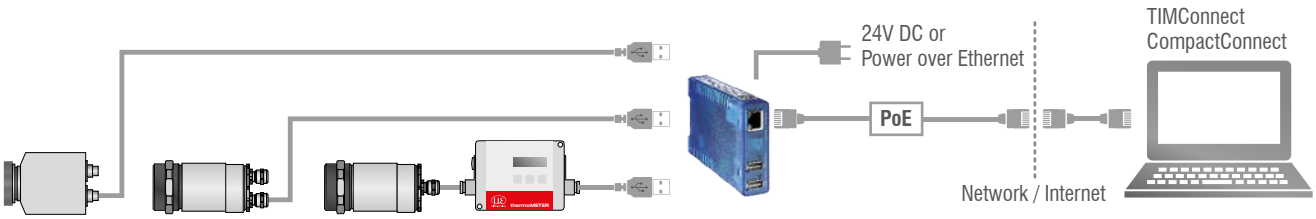
Scope of supply

TIM QVGA

- TIM process camera
  incl. a selectable lens
- Operating instructions
- USB cable 1 m
- Software for real-time processing
  and analyzing thermal images
- Tripod mount
- PIF cable 1 m
- Transport case
- Test certificate

thermoIMAGER TIM USB Server Gigabit
Simple cable extension for the thermoIMAGER TIM series and pyrometers

- Fully compatible with USB 2.0, data transfer rate 1.5 / 12 / 480 mbps, USB transfer modes: Control, Bulk, Interrupt, Isochronous
- For all models in the thermoIMAGER TIM series 1x TIM640, 1x TIMQVGA, 2x TIM160, 1x TIM200
- Full TCP/IP support incl. routing and DNS
- 2x independent USB ports
- Galvanic isolation 500 V_{RMS} (network connection)
- Remote configuration via web-based management

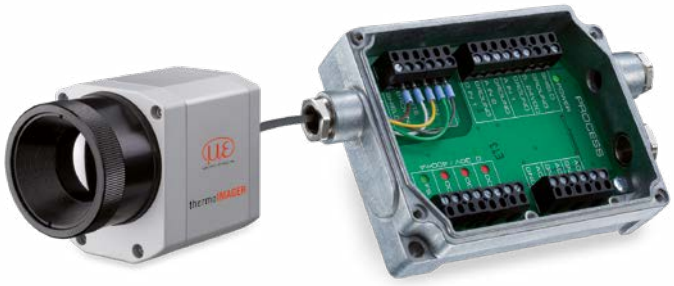


Model	TIM USB Server Gigabit
USB ports	2x independent USB ports
USB speed	480 Mbit/s
Network	10/100/1000 BaseT (max. 1000Mbit/s)
Power supply	Power over Ethernet (PoE) class 3 (6.49 - 12.95 W) or via screw terminal DC 24 V ... 48 V (±10 %)
Power consumption	External power supply (24 V DC) without USB devices: typ. 120 mA External power supply (24 V DC) with 2 USB devices each 2.5 W: typ. 420 mA
Ambient temperature	Storage: -40 ... 85 °C In operation, individually assembled: 0 ... 50 °C
Permissible relative humidity	0 - 95 % (non-condensing)
Housing	Compact plastic housing for DIN rail mount, 105 x 75 x 22 mm
Weight	200 g
Scope of supply	1 x USB Server Gigabit 24 V DC power supply unit Quick guide [1)]
USB protocols	USB 1.0 / 1.1 / 2.0 Control / Bulk / Interrupt / Isochronous
Protocols for direct network connection	TCP/IP: Socket Auxiliary protocols: ARP, DHCP, HTTP, PING Inventory keeping, group management

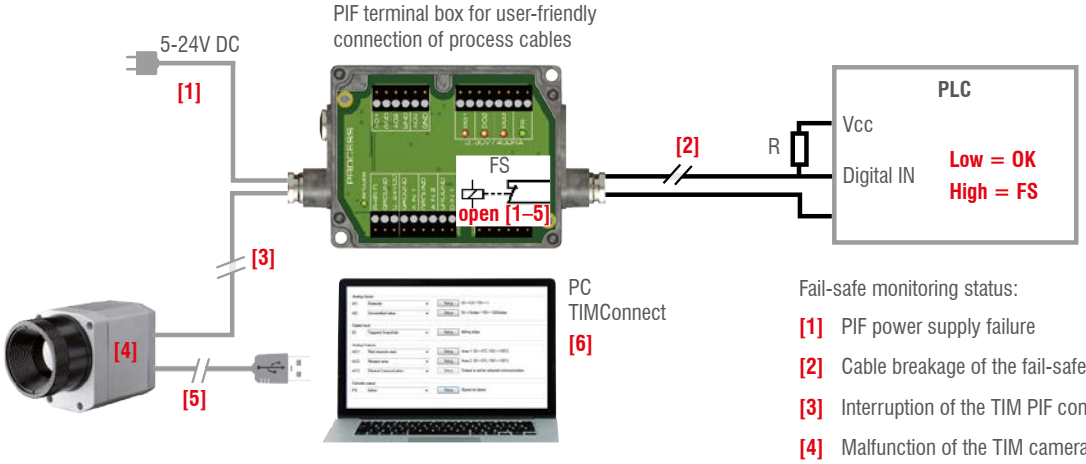
[1)] TIMConnect CD or Compact Connect CD: USB redirector | WuTility Management Tool | Operating instructions (DE/EN)

Industrial process interface
Camera and process control for use in industrial environments

- Industrial process interface with 3 analog / alarm outputs, 2 analog inputs, 1 digital input, 3 alarm relays
- 500 V AC_{RMS} galvanic isolation between TIM camera and process
- Separate fail-safe relay output
- TIM hardware with all cable connections and the TIMConnect software are permanently monitored during operation



Exemplary fail-safe monitoring of the TIM camera with connected PLC



Fail-safe status:

Normal: relay closed LED on
Alarm: relay opened LED off

Fail-safe monitoring status:

[1] PIF power supply failure
[2] Cable breakage of the fail-safe cable
[3] Interruption of the TIM PIF connection cable
[4] Malfunction of the TIM camera
[5] Failure of the TIM power supply / interruption of USB cable
[6] Malfunction of the TIMConnect software

Model	Industrial process interface
Protection class	IP65 (NEMA-4)
Ambient temperature	-30 ... 85 °C
Storage temperature	-30 ... 85 °C
Relative humidity	10 to 95 %, non-condensing
Vibration resistance	IEC 60068-2-6 (non-condensing)/ IEC 60068-2-64 (broadband noise)
Shock resistance	IEC 60068-2-27 (25 g and 50 g)
Weight	610 g (with 5 m cable)
Cable lengths	5 m, optional 10 m and 20 m or HT cable (180 °C or 250 °C)
Power supply	5 to 24 V DC
LED indicators	2 green LEDs for voltage and fail safe / 3 red LEDs for alarm relay status
Insulation	500 V AC_{RMS} between TIM camera and process
Outputs	3 analog / alarm outputs | 3 alarm relays [1]
Inputs	2 analog inputs | 1 digital input
Ranges	0/4-20 mA (for AO 1 – 3) | 0 – 30 V / 400 mA (for alarm relays DO1 – 3) | 0 – 10 V (for AI 1 – 2) | 24 V (for DI)
Analog inputs	Emissivity setting | Ambient temperature compensation | Reference temperature | Uncommitted value | Flag control triggered snapshots, triggered recordings, triggered line scan camera, triggered event grabber | Reset max./min. search
Digital input	Flag control | Triggered snapshots, triggered recordings, triggered line scan camera, triggered event grabber | Reset max./min. search
Analog Outputs	Main measuring range | Measuring range | Internal temperature | Flag status | Alarm | Frame synchronization | Fail safe External communication | Central pixel (direct output) [2]

[1] active if AO1, 2 or 3 is/are programmed as alarm output. [2] Function only available for TIM M-1 / TIM M-05 models

thermoIMAGER TIM NetPCQ
PC solution for thermoIMAGER TIM applications

TIM NetPCQ is a professional, embedded industrial PC solution with passive cooling (fanless) for thermoIMAGER applications and is suitable for top hat rail mounting. The NetPCQ and TIM cameras can be operated in combination as stand-alone system. Remote maintenance via Ethernet is possible. Data provided by the TIM camera can be stored directly on the NetPCQ where customer-specific software can also be installed. A recovery-stick is included in the scope of delivery.

thermoIMAGER TIM NetPCQ

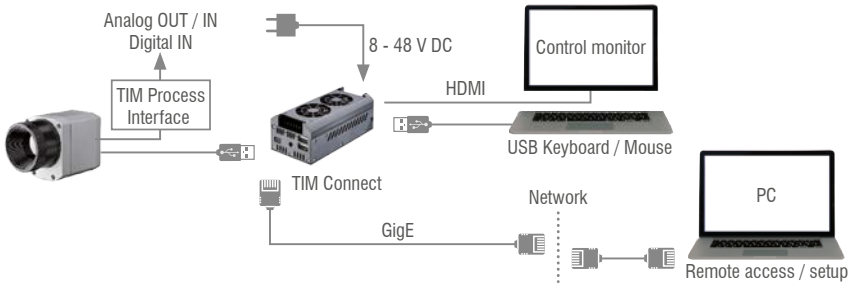
- Supports all thermoIMAGER TIM models
- Supports 120 Hz (TIM 160), up to 80 Hz (TIM QVGA), up to 32 Hz (TIM 640) frame rates
- TIMConnect software included
- Monitor via VGA (analog)
- Integrated watchdog feature
- Optional: up to 20 m USB cable, high temperature USB cable, extendable up to 100 m Ethernet cable

Model	TIM NetPCQ
Ambient temperature	0 ... 50 °C
Storage temperature	-20 ... 60 °C
Relative humidity	10 to 95 %, non-condensing
Dimensions	165 x 65 x 130 mm (W x H x D)
Material (housing)	Anodized aluminum
Weight	1000 g
Vibration	IEC-2-6: 3G, 11 - 200Hz, each axis
Shock	IEC-2-27: 50G, 11 ms, each axis
Operating system	Windows 7 embedded / Windows 10 IOT
Power supply	12 - 24 V DC
Power consumption	approx. 9.5 W without TIM [0.76 A with 12 V]
Cooling	passive cooling (fanless)
Processor	Intel® Atom™ J1900 @ 4x2.4 GHz
Hard drive	integrated 64 GB SSD
RAM	2 GB DDR3 RAM 800 MHz
Connections	1 GigE, 2 x RS232 / 485, 3 x USB 2.0, 1 x USB 3.0, VGA
Additional functions	1x status LED

thermoIMAGER TIM NetBox
Miniature PC for thermoIMAGER TIM series

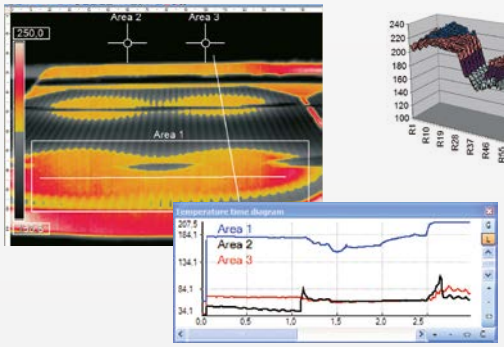
- Can be integrated into CoolingJacket Advanced Extended
- Miniature PC for TIM 160 / QVGA standalone mode for cable extension
- Supports 120 Hz (TIM 160) up to 70 Hz (TIM QVGA) frame rate, 32 Hz (TIM 640)
- Integrated hardware and software watchdog
- Optional: up to 20 m USB cable, high temperature USB cable, extendable up to 100 m Ethernet cable (PoE)

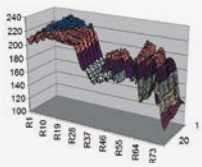
thermoIMAGER TIM NetBox



Model	TIM NetBox
Operating temperature	0 ... 50 °C
Storage temperature	-20 ... 75 °C
Relative humidity	10 to 95 %, non-condensing
Material (housing)	Anodized aluminum
Dimensions	113 x 57 x 47 mm
Weight	385 g
Vibration	IEC 60068-2-6 (sinus-shaped) / IEC 60068-2-64 (broadband noise)
Shock	IEC 60068-2-27 (25 g and 50 g)
Operating system	Windows 7 Professional
Power supply	8 ... 48 V DC or Power over Ethernet (PoE/ 1000BASE-T)
Power consumption	7.5 W (+ additional 2.5 W for TIM camera)
Cooling	Active via two integrated fans
Board	COM Express® mini embedded board
Processor	Intel® E3845 Quad Core, 1.91 GHz
Hard drive	16 GB SSD
RAM	2 GB (DDR2, 533 MHz)
Connections	2x USB 2.0, 1x USB 3.0, 1x Mini-USB 2.0, Micro-HDMI, Ethernet (Gigabit Ethernet)
Extensions	micro SDHC/ SDXC card
Additional functions	4x status LEDs

TIMConnect SOFTWARE FEATURES





Comprehensive IR camera software

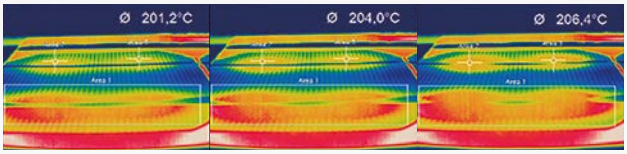
- License-free analysis software and complete SDK included
- Intuitive user interface
- Camera remote control via software
- Displays several camera images in different windows
- Compatible with Windows 7, 8 and 10 and Linux (Ubuntu)
- Data output via PIF hardware interface using up to 3 analog channels

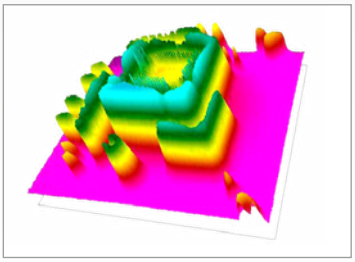
Windows 7

Windows 10

Video recording and snapshot feature (IR or BI-SPECTRAL)

- Recording of video sequences and individual images for later analysis or documentation
- Adjustable frame rate to reduce data volume
- Display of snapshot process for direct analysis





Online and offline data analysis

- Real-time temperature information (°C or °F) in main window, as digital display or graphic display
- Detailed analysis using measuring fields, automatic hotspot/coldspot search
- Logical linking of temperature information
- Slow-motion replay without connected camera
- Various layout functions and color palettes to highlight thermal contrasts

Temperature data analysis and documentation

- Triggered data collection
- Radiometric video sequences (*.ravi) and snapshots (*.tiff)
- Thermal images as *.tiff or *.csv, *.dat text files incl. complete temperature information
- Data transfer in real time to other software programs via DLL or COM port interfaces

TIM 160 / 200 160 x 120 px	Focal length [mm]	Angle	Minimum measurement distance*	Distance to measurement object [m]												
					0.02	0.1	0.2	0.3	0.5	1	2	4	6	10	30	100
23° Standard lens	10	23° 17° 29° 2.48 mrad	0.2 m	HFOV [m] VFOV [m] DFOV [m] IFOV [mm]	0.012 0.009 0.015 0.1	0.043 0.032 0.054 0.3	0.08 0.06 0.10 0.5	0.12 0.09 0.16 0.8	0.21 0.15 0.26 1.3	0.41 0.30 0.51 2.5	0.81 0.60 1.01 5.0	1.62 1.21 2.02 9.9	2.44 1.81 3.03 14.9	4.1 3.0 5.1 24.8	12.2 9.0 15.2 74.4	40.6 30.1 50.5 248.0
6° Telephoto lens	35.5	6° 5° 8° 0.70 mrad	0.5 m	HFOV [m] VFOV [m] DFOV [m] IFOV [mm]					0.06 0.04 0.07 0.4	0.11 0.09 0.14 0.7	0.23 0.17 0.28 1.4	0.45 0.34 0.57 2.8	0.68 0.51 0.85 4.2	1.1 0.8 1.4 7.0	3.4 2.5 4.2 21.1	11.3 8.5 14.2 70.4
48° Wide angle lens	5.7	41° 31° 51° 4.39 mrad	0.2 m	HFOV [m] VFOV [m] DFOV [m] IFOV [mm]	0.022 0.016 0.027 0.1	0.082 0.059 0.101 0.4	0.16 0.11 0.19 0.9	0.23 0.17 0.29 1.3	0.38 0.28 0.47 2.2	0.76 0.55 0.94 4.4	1.51 1.10 1.86 8.8	3.00 2.19 3.72 17.5	4.50 3.28 5.57 26.3	7.5 5.5 9.3 43.9	22.5 16.4 27.8 131.6	74.9 54.5 92.7 438.6
72° Wide angle lens	3.3	72° 52° 89° 7.51 mrad	0.2 m	HFOV [m] VFOV [m] DFOV [m] IFOV [mm]	0.039 0.027 0.048 0.2	0.152 0.106 0.186 0.8	0.29 0.20 0.36 1.5	0.43 0.30 0.53 2.3	0.72 0.50 0.87 3.8	1.42 0.99 1.74 7.5	2.84 1.98 3.46 15.0	5.66 3.95 6.91 30.0	8.49 5.92 10.35 45.0	14.1 9.9 17.2 75.1	42.4 29.6 51.7 225.2	141.4 98.6 172.3 750.8

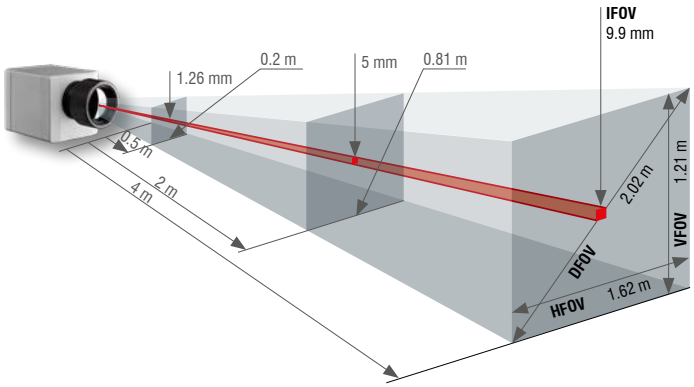
TIM QVGA / QVGA-HD / QVGA-G7 382 x 288 px	Focal length [mm]	Angle	Minimum measurement distance*	Distance to measurement object [m]												
					0.05	0.1	0.2	0.3	0.5	1	2	4	6	10	30	100
29° Standard lens	13	29° 22° 37° 1.3 mrad	0.35 m	HFOV [m] VFOV [m] DFOV [m] IFOV [mm]		0.057 0.042 0.071 0.1	0.111 0.081 0.137 0.3	0.16 0.12 0.20 0.4	0.27 0.20 0.34 0.7	0.53 0.40 0.67 1.3	1.06 0.80 1.32 2.7	2.1 1.6 2.6 5.4	3.2 2.4 4.0 8.0	5.3 4.0 6.6 13.4	15.7 11.9 19.7 40.2	52.5 39.6 65.7 133.9
18° Telephoto lens	20	18° 14° 23° 0.9 mrad	0.45 m	HFOV [m] VFOV [m] DFOV [m] IFOV [mm]			0.066 0.050 0.083 0.2	0.099 0.075 0.124 0.3	0.16 0.12 0.20 0.4	0.33 0.25 0.41 0.9	0.65 0.49 0.82 1.7	1.3 1.0 1.6 3.5	1.9 1.5 2.4 5.2	3.2 2.5 4.1 8.6	9.7 7.4 12.2 25.9	32.4 24.6 40.7 86.3
53° Wide angle lens	8	53° 38° 66° 2.2 mrad	0.25 m	HFOV [m] VFOV [m] DFOV [m] IFOV [mm]		0.103 0.073 0.127 0.2	0.20 0.14 0.25 0.4	0.30 0.21 0.37 0.7	0.50 0.35 0.61 1.1	1.0 0.70 1.22 2.2	2.0 1.4 2.4 4.4	4.0 2.8 4.8 8.8	5.9 4.1 7.2 13.2	9.9 6.9 12.0 21.9	29.6 20.7 36.1 65.8	98.6 68.9 120.3 219.4
80° Super wide angle lens	6	80° 54° 96° 3.0 mrad	0.2 m	HFOV [m] VFOV [m] DFOV [m] IFOV [mm]	0.087 0.056 0.103 0.2	0.17 0.11 0.20 0.3	0.33 0.21 0.39 0.6	0.49 0.31 0.58 0.9	0.82 0.51 0.97 1.5	1.7 1.0 2.0 3.0	3.3 2.0 3.9 6.0	6.7 4.1 7.8 12.0	10.0 6.1 11.7 18.1	16.6 10.2 19.5 30.1	49.9 30.6 58.5 90.3	166.4 101.9 195.1 300.9

FOV: Horizontal expansion of the total measuring field at the object level; VFOV: Vertical expansion of the total measuring field at the object level;
DFOV = Diagonal expansion of the total measuring field at the object level; IFOV: Size of the individual pixels at the object level
* Please note: The measurement accuracy of the camera may lie outside of the specifications for distances below the defined minimum measurement distance.

TIM 640 VGA / TIM VGA-G7 640 x 480 px	Focal length [mm]	Angle	Minimum measurement distance*	Distance to measurement object [m]											
					0.1	0.2	0.3	0.5	1	2	4	6	10	30	100
33° Standard lens	18.7	33° 25° 41° 0.91 mrad	0.2 m	HFOV [m] VFOV [m] DFOV [m] IFOV [mm]	0.068 0.051 0.085 0.1	0.13 0.09 0.16 0.2	0.19 0.14 0.23 0.3	0.31 0.23 0.38 0.5	0.60 0.45 0.75 0.9	1.20 0.89 1.49 1.8	2.38 1.77 2.97 3.6	3.57 2.65 4.45 5.5	5.9 4.4 7.4 9.1	17.8 13.2 22.2 27.3	59.3 44.2 74.0 90.9
15° Telephoto lens	41.5	15° 11° 19° 0.41 mrad	0.5 m	HFOV [m] VFOV [m] DFOV [m] IFOV [mm]				0.13 0.10 0.17 0.2	0.26 0.20 0.33 0.4	0.52 0.39 0.66 0.8	1.05 0.79 1.31 1.6	1.57 1.18 1.96 2.5	2.6 2.0 3.3 4.1	7.8 5.9 9.8 12.3	26.1 19.6 32.7 41.0
60° Wide angle lens	10.5	60° 45° 75° 1.62 mrad	0.2 m	HFOV [m] VFOV [m] DFOV [m] IFOV [mm]	0.128 0.091 0.157 0.2	0.25 0.18 0.30 0.3	0.36 0.26 0.44 0.5	0.59 0.42 0.72 0.8	1.17 0.83 1.43 1.6	2.32 1.66 2.85 3.2	4.63 3.31 5.69 6.5	6.94 4.96 8.52 9.7	11.6 8.3 14.2 16.2	34.6 24.7 42.6 48.6	115.4 82.4 141.8 161.9
90° Super wide angle lens	7.7	90° 64° 111° 2.21 mrad	0.2 m	HFOV [m] VFOV [m] DFOV [m] IFOV [mm]	0.220 0.138 0.260 0.2	0.43 0.27 0.50 0.4	0.63 0.39 0.73 0.7	1.03 0.64 1.21 1.1	2.03 1.27 2.39 2.2	4.04 2.53 4.76 4.4	8.06 5.05 9.50 8.8	12.07 7.57 14.24 13.2	20.1 12.6 23.7 22.1	60.3 37.8 71.1 66.2	200.8 125.9 237.0 220.8

FOV = Field of view; HFOV = Horizontal field of view; VFOV = Vertical field of view; DFOV = Diagonal dimension of the total measuring field at the object level; IFOV = Indicated field of view
Table with examples showing which measuring field sizes and pixel sizes are reached at which distance. Various lenses are available for optimal configuration of the camera.
Wide angle lenses have radial distortion due to the angle of their aperture. The TIMConnect software has an algorithm which corrects this distortion.

* Please note: The measurement accuracy of the camera may lie outside of the specifications for distances below the defined minimum measurement distance.



- Standard-, telephoto- and wide angle lenses for optimal adaptation to different applications
- High quality germanium lenses and special anti-reflective coating for excellent optics
- Factory-calibrated lenses for easy exchange of optical system without recalibration

Measuring field sizes can be calculated online at www.micro-epsilon.com/optikkalkulator.

Sensors and Systems from Micro-Epsilon

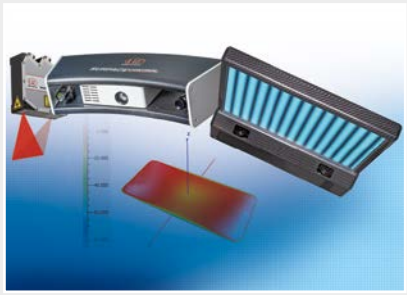
Sensors and systems for displacement, distance and position

Sensors and measurement devices for non-contact temperature measurement

Measuring and inspection systems for metal strips, plastics and rubber

Optical micrometers and fiber optics, measuring and test amplifiers

Color recognition sensors, LED analyzers and inline color spectrometers



3D measurement technology for dimensional testing and surface inspection

MICRO-EPSILON

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