



More Precision

thermoIMAGER TIM // Compact thermal imaging cameras





- Temperature range from -20 °C to 2450 °C
- Compact cameras ideal for OEM applications
- Up to 1 kHz for fast processes
- Resolution up to 764 x 480 pixels
- License-free analysis software and complete SDK included

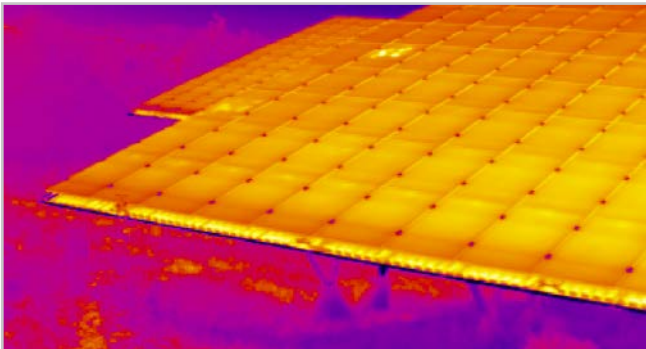
thermoIMAGER TIM - compact USB thermal imaging cameras for precise thermography

Non-contact measurements of temperature distribution using thermal imaging cameras enable to efficiently monitor and control temperature-critical processes in various fields of application. The thermoIMAGER infrared cameras are renowned for stationary thermography providing an excellent price/performance ratio. They are connected via USB 2.0 to a computer and promptly ready for use. The license-free TIMConnect software visualizes and records the detected temperature data as thermal images. Additionally, the software provides set up and configuration and enables to control the infrared cameras.

Functioning principle of Micro-Epsilon thermal imaging cameras

Thermal imaging cameras from Micro-Epsilon are designed to measure surface temperatures from -20 °C to 2450 °C. The infrared radiation emitted by a body is used for the measurement. As this measurement is a non-contact technology, the devices perform wear-free and can therefore be reliably used in the long term. Selectable models and optical systems enable to install the cameras in different distances from the surface. This allows for the target to be measured from a safe distance in critical applications.

| Page | Model | Description |
|---------|--|---|
| 4 - 5 | TIM 160 | Miniature thermal imaging camera with USB interface |
| 6 - 7 | TIM 200 / 230 | Thermal imager with BI-SPECTRAL technology |
| 8 - 9 | TIM QVGA / QVGA-HD | Thermal imaging camera with high resolution and sensitivity |
| 10 - 11 | TIM 640 VGA | Worldwide smallest VGA thermal imaging camera |
| 12 - 13 | TIM QVGA-G7 / VGA-G7 | Thermal imaging camera with line scan for the glass industry |
| 14 - 15 | TIM M-1 | Thermal imaging camera for hot metal surfaces |
| 16 - 17 | TIM M-1 Special models / Protection housings | Thermal imaging cameras with blocking filter and cooling enclosure for hot metal surfaces |
| 18 - 19 | TIM M-05 | Thermal imaging camera for molten metal and metal surfaces |
| 20 - 21 | USB Server Gigabit / Process interface | Simple cable extension and industrial process interface |
| 22 - 23 | TIM NetPCQ / NetBox | PC solution for applications and miniature PC |
| 24 - 25 | Software features / Lenses | Software TIMConnect / Suitable lenses for every application |
| 26 - 27 | Lenses | Suitable lenses for every application |



Fast temperature measurement even on large surfaces

Due to this non-contact technology, measurement objects can be detected precisely and wear-free. Large surfaces can be measured accurately at millisecond intervals. The camera can be operated in the line monitoring mode in order to continuously monitor the process.



Compact design for mobile and stationary use

The thermolMAGER cameras close the previous gap between portable infrared snapshot cameras and devices for stationary use.

Exemplary fields of applications:

- Process automation
- Test stations
- Research & Development
- Mobile measurement tasks

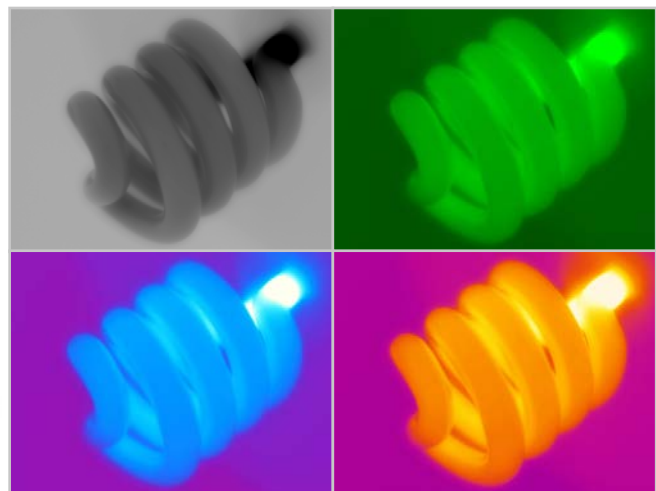


License-free software

- Automatic process and quality control
- Individual alarm threshold settings depending on the respective process
- Analog and digital signal input
- External communication of software via COM ports, DLL and LabVIEW driver
- Compatible with Windows 7/10

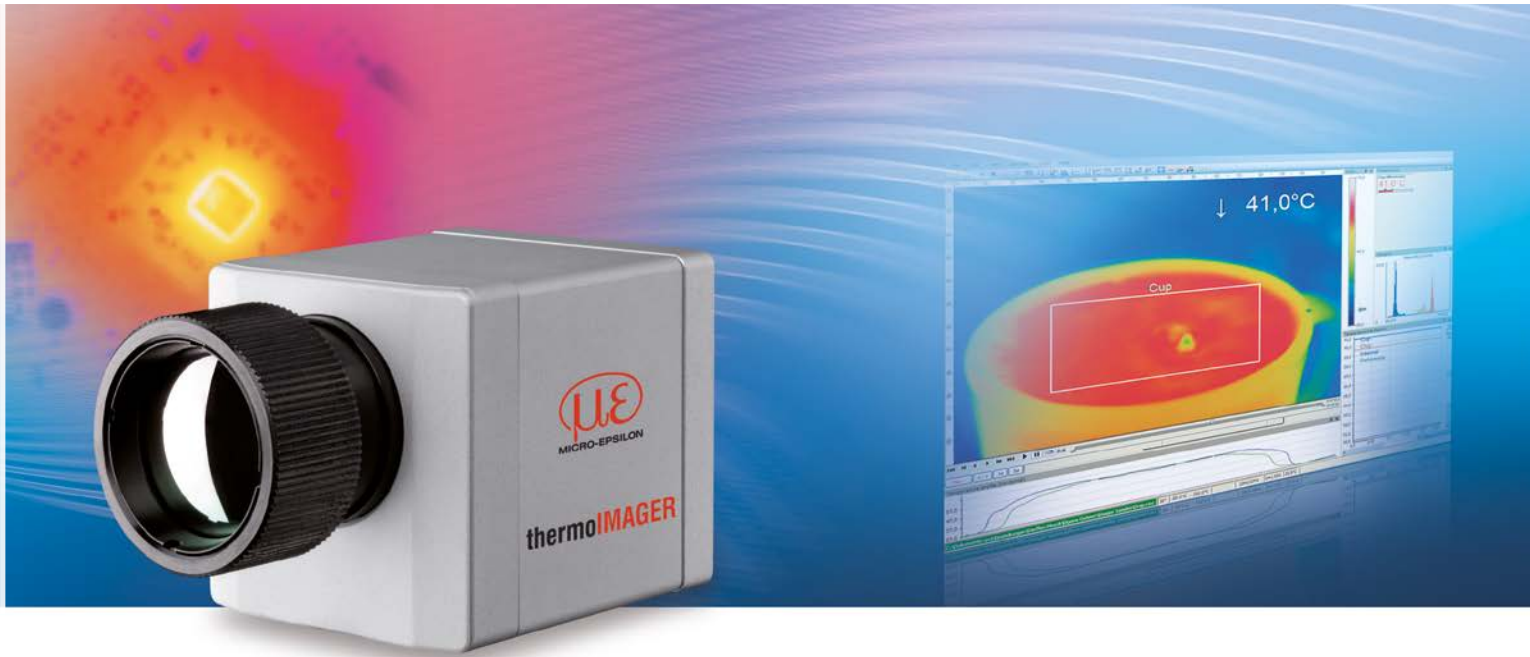
Easy process integration via advanced interfaces

- USB cable extension up to 100 m (Ethernet)
- Process interface (PIF) as analog or digital input/output
- Serial data communication via RS232



Large temperature measuring range

Thermal imaging cameras from Micro-Epsilon are suitable for use across a wide measuring range - from low temperatures prevalent in cooling chains or laboratories, to the highest temperatures in metal processing applications.



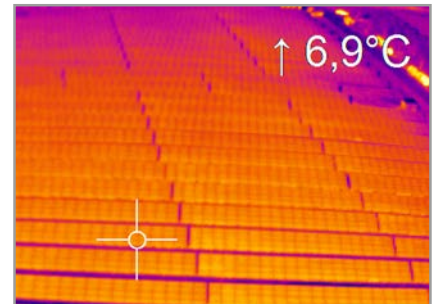
thermoIMAGER TIM 160

Miniature thermal imaging camera with USB interface

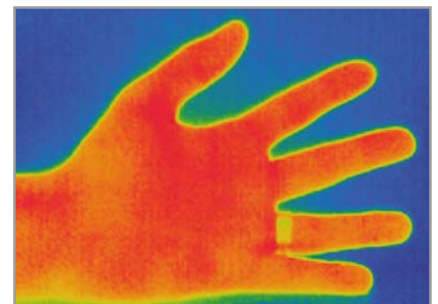
- Measuring range from -20 °C to 900 °C (special model up to 1500 °C)
- Excellent thermal sensitivity (NEDT) of 0.08 K
- Exchangeable lenses 6°, 23°, 48°, 72° FOV
- Real-time thermography with 120 Hz frame rate via USB 2.0 interface
- Power supply and data transfer via USB interface
- Extremely lightweight (195 g) and robust (IP67)
- Extremely compact dimensions (45 mm x 45 mm x 62 mm)
- Analog input and output, trigger interface
- TIMConnect software delivered with Software Developer Kit

Software

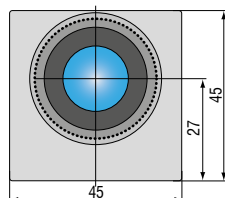
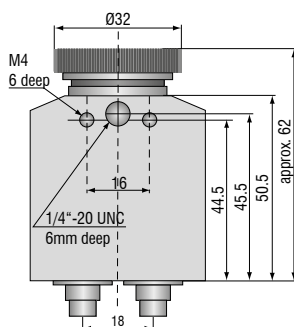
- Display of the thermal image in real time (120 Hz) with recording function (video, snapshot)
- Complete set up of parameters and remote control of the camera
- Detailed analysis of fast, thermodynamic processes
- Output of analog temperature or alarm values via the process interface
- Digital communication via RS232 or DLL for software integration



Surface measurements in industrial applications



Suitable lenses for every measurement distance



| Model | TIM 160 |
|---|---|
| Optical resolution | 160 x 120 pixels |
| Temperature ranges | -20 ... 100 °C, 0 ... 250 °C, 150 ... 900 °C additional temperature range: 200 ... 1500 °C (optional) |
| Spectral range | 7.5 to 13 μm |
| Frame rate | 120 Hz |
| System accuracy | ± 2 °C or ± 2 %, whichever is greater |
| Resolution (Display) | 0.1 °C |
| Lenses | 72° / f = 3.3 mm (min. distance 20 mm); 48° / f = 5.7 mm (min. distance 20 mm); 23° / f = 10 mm (min. distance 20 mm); 6° / f = 35.5 mm (min. distance 500 mm) |
| Emissivity | 0.10 to 1.00 adjustable |
| Thermal sensitivity (NETD) | 0.1 K with 48° FOV and 72° FOV ¹⁾ 0.08 K with 23° FOV ¹⁾ 0.3 K with 6° FOV ²⁾ |
| Detector | Focal Plane Array (FPA) - uncooled micro bolometer 25x25 μm^2 |
| Measurement mode | Flexible spot with crosshair marking, measuring field with automatic display of maximum-, minimum- or average value |
| Color palettes | Iron, rainbow, black-white, black-white inverted etc. |
| Operation and set up (via menu) | Measurement modes fully automatic or manual, color palettes, emissivity, file management, date/time, °C/°F, language |
| Outputs/digital | USB 2.0 / optional GigE |
| Process interface (electrically isolated) | 0 - 10 V output, 0 - 10 V input |
| Digital communication | via RS232 of PC / DLL interface used |
| Cable length | 1 m (standard), 5 m, 10 m, 20 m |
| Power supply | USB powered |
| Tripod mount | ¼-20 UNC |
| Protection class | IP67 |
| Ambient temperature | 0 ... 50 °C (up to 315 °C with cooling jacket) |
| Storage temperature | -40 ... 70 °C |
| Relative humidity | 20 to 80 %, non-condensing |
| Vibration | IEC 60068-2-6 (sinus-shaped) / IEC 60068-2-64 (broadband noise) |
| Shock | IEC 60068-2-27 (25 g and 50 g) |
| Weight | 195 g, incl. lens |

¹⁾ Please note: measurement accuracy can be out of specification with distances below 200 mm

²⁾ Please note: measurement accuracy can be out of specification with distances below 500 mm

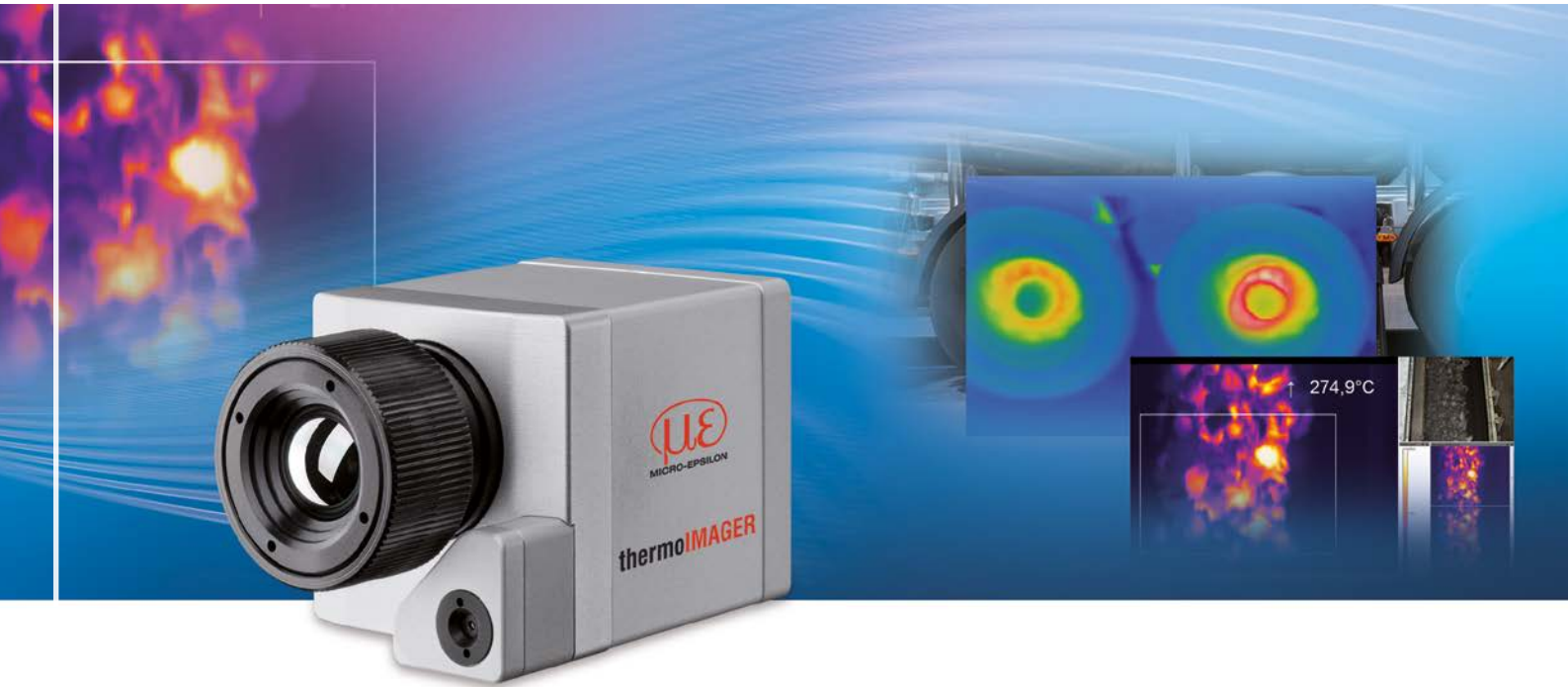
Scope of supply

TIM 160

- 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

TIM 160/DK

- TIM process camera
incl. three lenses 6°, 23°, 48°
- Certificate of calibration, adjusted to
the included lenses
- Tripod mount 200 to 1000 mm
- Transport case
- Operating instructions
- USB cable 1 m and 10 m
- Software for real-time processing
and analyzing thermal images
- PIF cable 1 m
- Test certificate



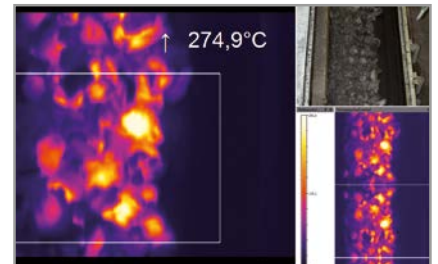
thermoIMAGER TIM 200/230

Thermal imager with BI-SPECTRAL technology

- Parallel detection in the IR field and the visual field
- Measuring range from -20 °C to 900 °C (special model up to 1500 °C)
- Excellent thermal sensitivity (NEDT) of 0.08 K
- Exchangeable lenses 6°, 23°, 48°, 72° FOV
- Real-time thermography with 128 Hz frame rate via USB 2.0 interface
- Time synchronous, real-time image recording (VIS) with 32 Hz (640 x 480 pixels)
- Power supply and operation via USB interface
- Extremely lightweight (215 g) and robust (IP67)
- Extremely compact dimensions (45 mm x 45 mm x 62 mm)
- Analog input and output, trigger interface
- TIMConnect software delivered with Software Developer Kit

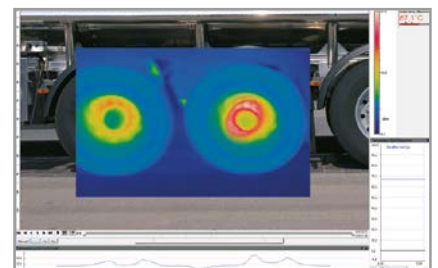
Software

- Display of the thermal image (128 Hz) and the real-time image (32 Hz) in real time 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



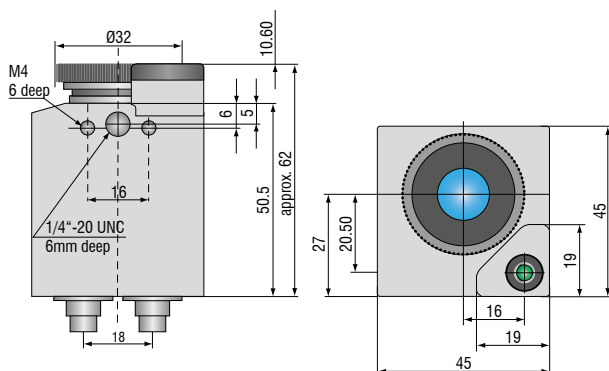
Monitoring modus

Monitoring a coal conveyor belt



Cross-fading modus

Highlighting brake temperature by cross-fading



| Model | TIM 200 | TIM 230 |
|---|---|-----------------------|
| Visual camera | Optical resolution: 640 x 480 pixels; frame rate: 32 Hz | |
| | Lens (FOV): 54° x 40° | Lens (FOV): 30° x 23° |
| Optical resolution (IR) | 160 x 120 pixels | |
| Temperature ranges | -20 ... 100 °C, 0 ... 250 °C, 150 ... 900 °C additional temperature range: 200 ... 1500 °C (optional) | |
| Spectral range | 7.5 to 13 μm | |
| Frame rate | 128 Hz | |
| System accuracy | ±2 °C or ±2 %, whichever is greater | |
| Resolution (Display) | 0.1 °C | |
| Lenses | 72° / f = 3.3 mm (min. distance 20 mm); 48° / f = 5.7 mm (min. distance 20 mm); 23° / f = 10 mm (min. distance 20 mm); 6° / f = 35.5 mm (min. distance 500 mm) | |
| Emissivity | 0.10 to 1.00 adjustable | |
| Thermal sensitivity (NETD) | 0.1 K with 48° FOV and 72° FOV ¹⁾ 0.08 K with 23° FOV ¹⁾ 0.3 K with 6° FOV ²⁾ | |
| Detector | Focal Plane Array (FPA) - uncooled micro bolometer 25x25 μm ² | |
| Measurement mode | Flexible spot with crosshair marking, measuring field with automatic display of maximum-, minimum- or average value | |
| Color palettes | Iron, rainbow, black-white, black-white inverted etc. | |
| Operation and set up (via menu) | Measurement modes fully automatic or manual, color palettes, emissivity, file management, date/time, °C/°F, language | |
| Outputs/digital | USB 2.0 / optional GigE | |
| Process interface (electrically isolated) | 0 - 10 V output, 0 - 10 V input, trigger input | |
| Digital communication | via RS232 of PC / DLL interface used | |
| Cable length | 1 m (standard), 5 m, 10 m, 20 m | |
| Power supply | USB powered | |
| Tripod mount | ¼-20 UNC | |
| Protection class | IP67 | |
| Ambient temperature | 0 ... 50 °C (up to 315 °C with cooling jacket) | |
| Storage temperature | -40 ... 70 °C | |
| Relative humidity | 20 to 80 %, non-condensing | |
| Vibration | IEC 60068-2-6 (sinus-shaped) / IEC 60068-2-64 (broadband noise) | |
| Shock | IEC 60068-2-27 (25 g and 50 g) | |
| Weight | 215 g, incl. lens | |

¹⁾ Please note: measurement accuracy can be out of specification with distances below 200 mm

²⁾ Please note: measurement accuracy can be out of specification with distances below 500 mm

Scope of supply

TIM 200/230

- 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

TIM 200/DK

- TIM process camera
incl. three lenses 6°, 23°, 48°
- Certificate of calibration, adjusted to
the included lenses
- Tripod mount 200 to 1000 mm
- Transport case
- Operating instructions
- USB cable 1 m and 10 m
- Software for real-time processing
and analyzing thermal images
- PIF cable 1 m
- Test certificate



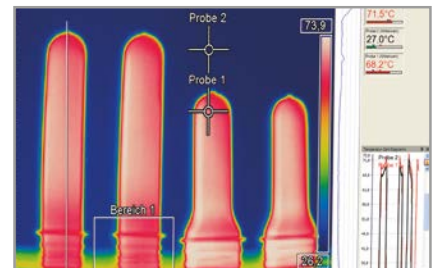
thermoIMAGER TIM QVGA

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

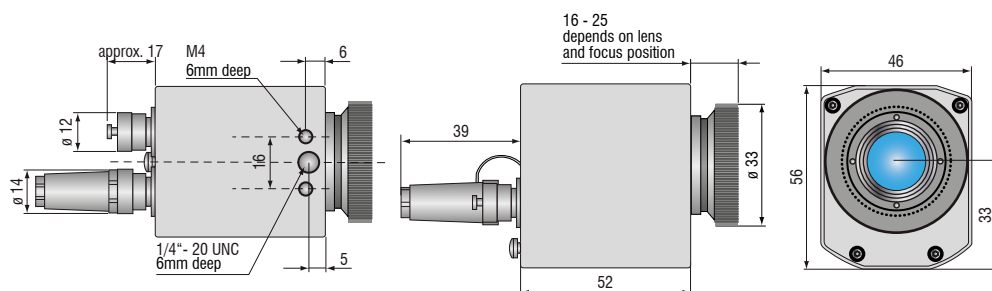
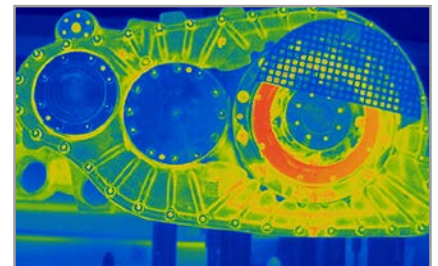
Software

- 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 | 1/4-20 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

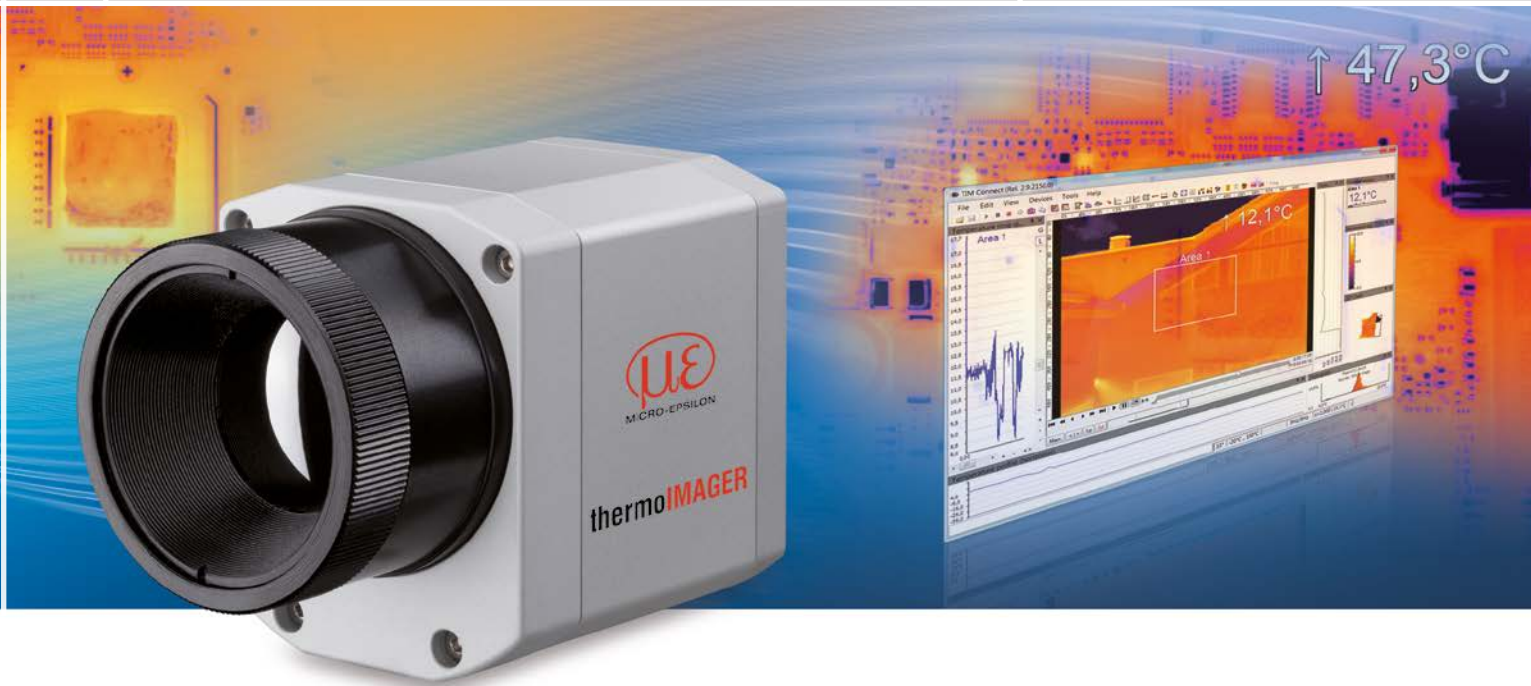
²⁾ Values apply with 40 Hz and 25 °C room temperature

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



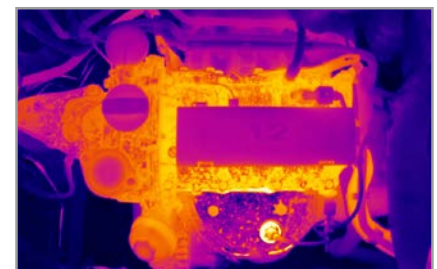
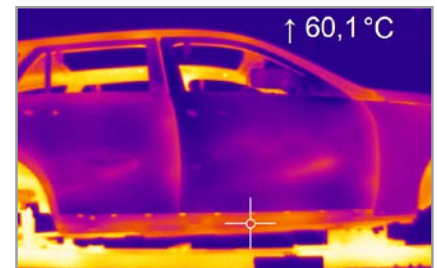
thermoIMAGER TIM 640 VGA

Miniature infrared camera with VGA resolutions

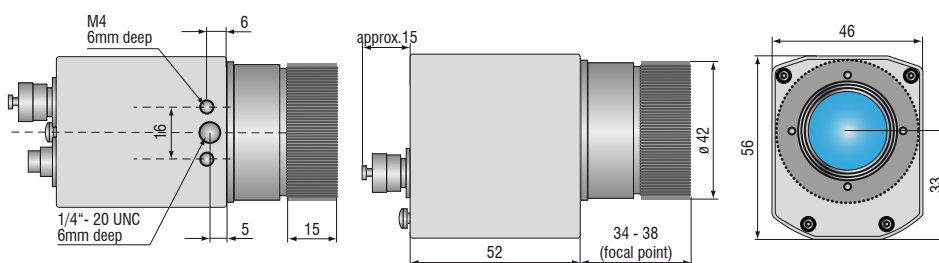
- Thermography in VGA resolution
- 640 x 480 pixels
- Measuring range from -20 °C to 900 °C (special model up to 1500 °C)
- Radiometric video recording with 32 Hz, 125 Hz in the subframe mode (640x120 pixels)
- Compact design (46 mm x 56 mm x 76 - 100 mm) with USB interface
- Lightweight (320 g incl. lens)
- Exchangeable lenses & industrial accessories
- TIMConnect software delivered with Software Developer Kit

Software

- Display of the thermal image in real time (32 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



Razor-sharp infrared pictures and videos for process optimization, e.g., in the automotive industry



| Model | TIM 640 VGA |
|----------------------------------|--|
| Optical resolution | 640 x 480 pixels |
| Temperature ranges | -20 ... 100 °C, 0 ... 250 °C, (20) 150 ... 900 °C ¹⁾ additional temperature range: 200 ... 1500 °C (optional) |
| Spectral range | 7.5 to 13 μm |
| Frame rate | 32 Hz / 125 Hz in the subframe mode (640x120 pixels) |
| System accuracy | ±2 °C or ±2 %, whichever is greater |
| Lenses | 15° x 11° FOV / f = 41.5 mm or 33° x 25° FOV / f = 18.7 mm or 60° x 45° FOV / f = 10.5 mm or 90° x 64° FOV / f = 7.7 mm |
| Thermal sensitivity (NETD) | 75 mK with 33°, 60° and 90° 85 mK with 15° |
| 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 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 |
| Storage temperature | -40 ... 70 °C |
| Relative humidity | 20 to 80 %, non-condensing |
| Vibration ²⁾ | IEC 60068-2-6 (sinus-shaped) / IEC 60068-2-64 (broadband noise) |
| Shock ²⁾ | IEC 60068-2-27 (25 g and 50 g) |
| Housing (size) ²⁾ | 46 mm x 56 mm x 76 - 100 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⁾ For more information see operating instructions

Scope of supply

TIM 640 VGA

- 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 incl. terminal block (1 m)
- Transport case
- Test certificate



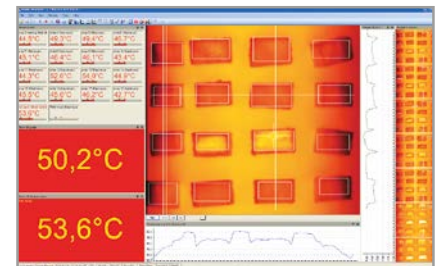
thermoIMAGER TIM QVGA-G7 / VGA-G7

Thermal imaging camera with line scan feature for the glass industry

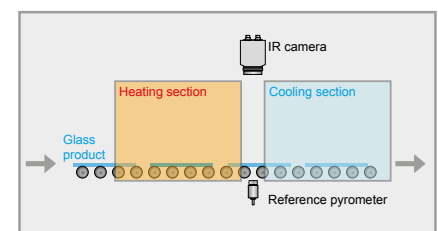
- Line scan feature via license-free TIMConnect analysis software
- Frame rate up to 125 Hz
- Robust against ambient temperatures up to 70 °C without requiring additional cooling, up to 315 °C with cooling jacket
- Optional integration of a reference pyrometer for glass with a reflection coating
- Compact design (46 mm x 56 mm x 68 - 77 mm) with USB interface
- Lightweight (320 g incl. lens)
- Exchangeable lenses & industrial accessories
- TIMConnect software delivered with Software Developer Kit

Software

- Line scan feature
- 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



Exact temperature measurement on moving glass surfaces due to line scan feature



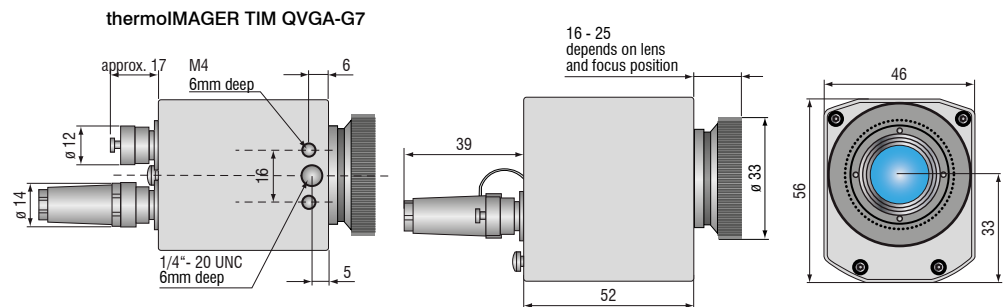
Line scan camera feature measures the temperature distribution between the heating zone and the cooling zone e.g. when toughened or tempered safety glass is heat-treated.

| Model | TIM QVGA-G7 ¹⁾ | TIM VGA-G7 |
|----------------------------------|---|--|
| Optical resolution | 382 x 288 pixels | 640 x 480 pixels |
| Temperature ranges | 200 ... 1500 °C (sighting range without measurement: 0 ... 250 °C) | |
| Spectral range | 7.9 μm | |
| Frame rate | switchable 80 Hz or 27 Hz | 32 Hz / 125 Hz in the subframe mode (640 x 120 pixels) |
| 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 | 15° x 11° FOV / f = 41.5 mm or 33° x 25° FOV / f = 18.7 mm or 60° x 45° FOV / f = 10.5 mm or 90° x 64° FOV / f = 7.7 mm |
| Thermal sensitivity (NETD) | 130 mK (T _{obj} = 650 °C) | |
| 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 5 m and 10 m also available as high temperature USB cable (180° C or 250 °C) | |
| Power supply | USB powered | |
| Tripod mount | 1/4-20 UNC | |
| Protection class | IP67 | |
| Ambient temperature | 0 ... 70 °C | 0 ... 50 °C |
| Storage temperature | -40 ... 85 °C | -40 ... 70 °C |
| Relative humidity | 20 to 80 %, non-condensing | |
| Vibration ²⁾ | IEC 60068-2-6 (sinus-shaped) / IEC 60068-2-64 (broadband noise) | |
| Shock ²⁾ | IEC 60068-2-27 (25 g and 50 g) | |
| Housing (size) ²⁾ | 46 mm x 56 mm x 68 - 77 mm ³⁾ | 46 mm x 56 mm x 76 - 100 mm ³⁾ |
| Weight | 320 g, incl. lens | |

¹⁾ Please note: Availability scheduled for spring 2020

²⁾ For more information see operating instructions

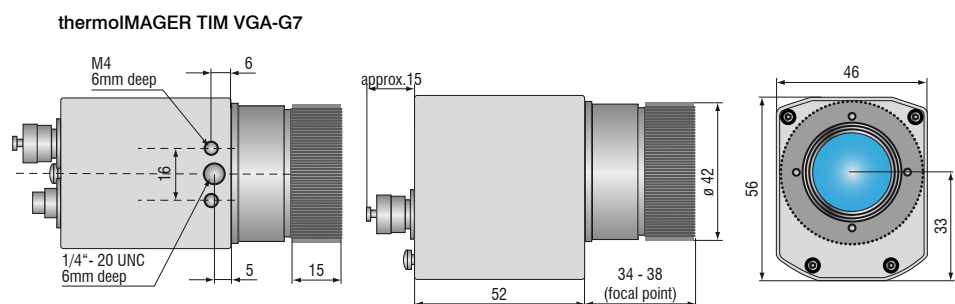
³⁾ Depending on lens and focus position

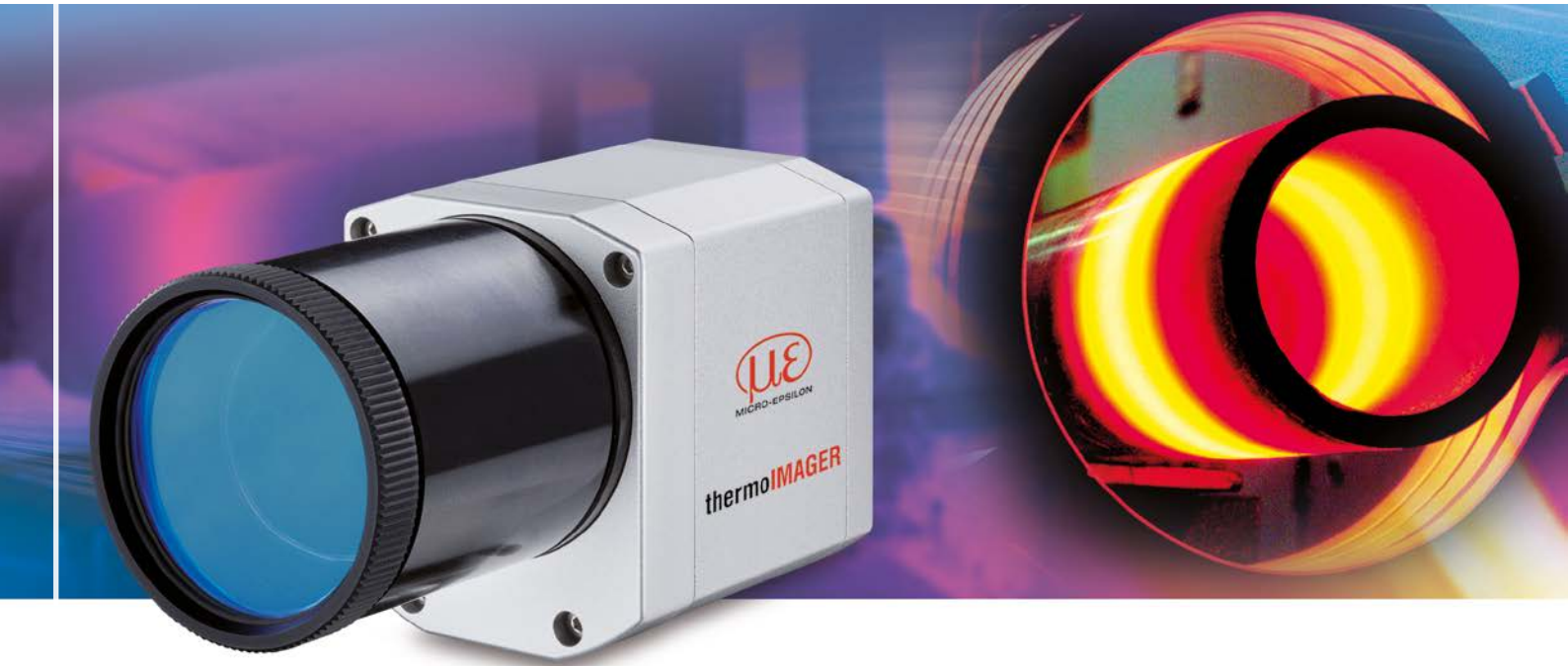


Scope of supply

TIM QVGA-G7 / VGA-G7

- 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 incl. terminal block (1 m)
- Transport case
- Test certificate





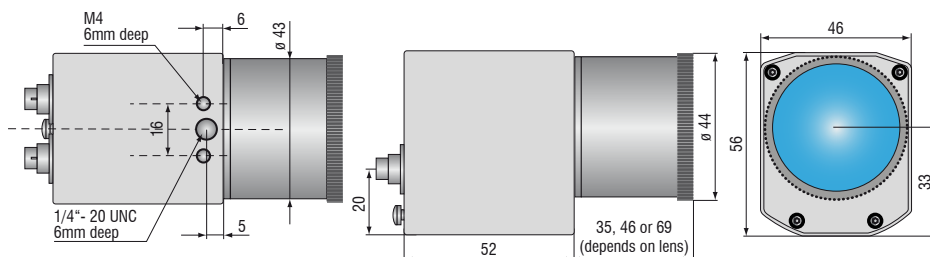
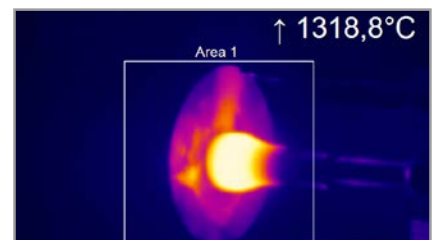
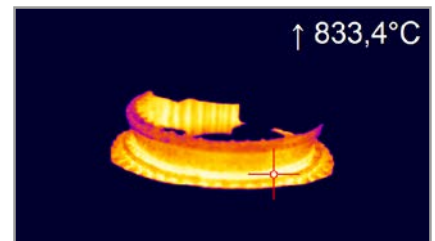
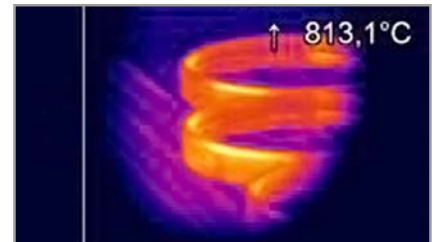
thermoIMAGER TIM M-1

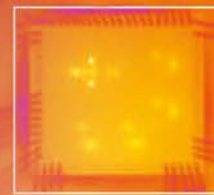
Compact infrared camera for short wavelengths in non-contact temperature measurements of metal surfaces

- Highly dynamic CMOS detector with optical resolution up to 764 x 480 pixels
- Very large temperature measuring range (without sub-ranges) from 450 °C to 1800 °C
- Frame rates up to 1 kHz for fast processes
- Real time output of the center pixel up to 1 kHz via process interface (PIF)
- License-free analysis software and complete SDK included

Software

- Display of the thermal image in real time 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





| Model | TIM M-1 | |
|----------------------------------|---|--|
| 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) | |
| Temperature ranges | 450 ⁵⁾ ... 1800 °C (27 Hz mode) 500 ⁵⁾ ... 1800 °C (80 Hz and 32 Hz mode) 600 ⁵⁾ ... 1800 °C (1 kHz modus) | |
| Spectral range | 0.85 to 1.1 μm | |
| Frame rate | up to 1 kHz / 1 ms real-time analog output (0 - 10 V) from 8 x 8 pixels (freely selectable) | |
| System accuracy | ±1 % of reading (object temperature < 1400 °C) | |
| Lenses | FOV @ 764 x 480 px: 39° x 25° (f = 16 mm) ¹⁾ 26° x 16° (f = 25 mm) ²⁾ 13° x 8° (f = 50 mm) ³⁾ 9° x 5° (f = 75 mm) ⁴⁾ | FOV @ 382 x 288 px: 20° x 15° (f = 16 mm) ¹⁾ 13° x 10° (f = 25 mm) ²⁾ 7° x 5° (f = 50 mm) ³⁾ 4° x 3° (f = 75 mm) ⁴⁾ |
| Thermal sensitivity (NETD) | < 1 K (700 °C) < 2 K (1000 °C) | |
| Detector | CMOS (15 μm x 15 μm) | |
| Outputs/digital | USB 2.0 / optional GigE | |
| 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 5 m and 10 m also available as high temperature USB cable (180 °C) | |
| Power supply | USB powered | |
| Tripod mount | ¼-20 UNC | |
| Protection class | IP67 | |
| Ambient temperature | 5 ... 50 °C | |
| Storage temperature | -40 ... 70 °C | |
| Relative humidity | 20 to 80 %, non-condensing | |
| Vibration | IEC 60068-2-6 (sinus-shaped) / IEC 60068-2-64 (broadband noise) | |
| Shock | IEC 60068-2-27 (25 g and 50 g) | |
| Housing (size) | 46 mm x 56 mm x 90 mm | |
| Weight | 320 g, incl. lens | |

¹⁾ Please note: measurement accuracy can be out of specification with distances below 200 mm

²⁾ Please note: measurement accuracy can be out of specification with distances below 500 mm

³⁾ Please note: measurement accuracy can be out of specification with distances below 1500 mm

⁴⁾ Please note: measurement accuracy can be out of specification with distances below 2000 mm

⁵⁾ +75 °C higher initial temperature with lenses providing a focal length of f=50 mm and f=75 mm

Scope of supply

TIM M-1

- TIM process camera
incl. a selectable lens
- Lens cap incl. protective window
- Operating instructions
- USB cable 1 m
- Software for real-time processing
and analyzing thermal images
- Tripod mount
- PIF cable incl. terminal block (1 m)
- Transport case
- Optional:
Cooling Jacket, high temperature cable

thermoIMAGER TIM M-1-N1064

Special model with laser blocking filter at a wavelength of 1064 nm
(only 16 mm or 25 mm focal length)

- Measurement during active laser (neodymium-YAG laser)
- High measurement speeds up to 1 kHz

thermoIMAGER TIM M-1-B880

Special model with blocking filter from 1000 nm to 1200 nm (focal length of only 25 mm)

- For neodymium-YAG laser types and diode laser types

| Model | TIM M-1-N1064 | TIM M-1-B880 |
|----------------------------------|--|--|
| 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) | |
| Temperature ranges | 450 ²⁾ ... 1800 °C (27 Hz mode) 500 ²⁾ ... 1800 °C (32 Hz mode) 500 ²⁾ ... 1800 °C (80 Hz mode) 700 ²⁾ ... 1800 °C (1 kHz mode) | 525 ²⁾ ... 1800 °C (27 Hz mode) 600 ²⁾ ... 1800 °C (32 Hz mode) 550 ²⁾ ... 1800 °C (80 Hz mode) 625 ²⁾ ... 1800 °C (1 kHz mode) |
| Spectral range | 0.92 - 1.1 μ m with blocking filter at 1064 nm / FWHM = 44 nm | 0.92 - 1.1 μ m with blocking filter at 1000-1200 nm bandpass filter: CWL = 880 \pm 8 nm, FWHM = 70 \pm 8 nm |
| Frame rate | up to 1 kHz / 1 ms real-time analog output (0 - 10 V) from 8 x 8 pixels (freely selectable) | |
| System accuracy | \pm 1 % of reading (object temperature < 1400 °C) | |
| Lenses | FOV @ 764 x 480 px: 26° x 16° (f = 25 mm) ¹⁾ FOV @ 382 x 288 px: 13° x 10° (f = 25 mm) ¹⁾ | |
| Thermal sensitivity (NETD) | < 1 K (700 °C) < 2 K (1000 °C) | |
| Detector | CMOS (15 μ m x 15 μ m) | |
| Outputs/digital | USB 2.0 / optional GigE | |
| 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 5 m and 10 m also available as high temperature USB cable (180 °C) | |
| Power supply | USB powered | |
| Tripod mount | ¼-20 UNC | |
| Protection class | IP67 | |
| Ambient temperature | 0 ... 50 °C | 5 ... 50 °C |
| Storage temperature | -40 ... 70 °C | |
| Relative humidity | 20 to 80 %, non-condensing | |
| Vibration | IEC 60068-2-6 (sinus-shaped) / IEC 60068-2-64 (broadband noise) | |
| Shock | IEC 60068-2-27 (25 g and 50 g) | |
| Housing (size) | 46 mm x 56 mm x 90 mm | |
| Weight | 320 g, incl. lens | |

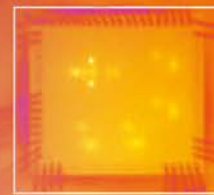
PC requirements: minimum 1.5 GHz, 1 GB RAM, Windows XP SP 2 or Windows 7 & 10

¹⁾ Please note: measurement accuracy can be out of specification with distances below 500 mm

²⁾ +75 °C higher initial temperature with lenses providing a focal length of f=50 mm and f=75 mm

Scope of supply**TIM M-1**

- TIM process camera
- incl. a selectable lens
- Lens cap incl. protective window
- Operating instructions
- USB cable 1 m
- Software for real-time processing and analyzing thermal images
- Tripod mount
- PIF cable incl. terminal block (1 m)
- Transport case
- Optional: Cooling Jacket, high temperature cable



Cooling Jacket and Cooling Jacket Advanced Universal cooling housing for infrared cameras up to 315 °C

- Ambient operating temperatures up to 315 °C
- Also available with protection housing and cooling function up to 180 °C
- Air/Water cooling with integrated air purging and optional protective windows
- Modular design for easy fitting of different devices and lenses
- Easy sensor removal on site due to quick-release chassis
- Integration of additional components such as TIM NetBox, USB Server Gigabit and Industrial Process Interface (PIF) in the extended version

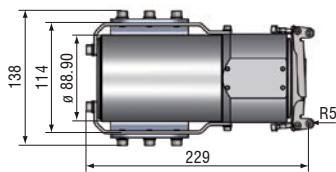


| Model | Cooling Jacket | Cooling Jacket Advanced Standard | Cooling Jacket Advanced Extended |
|------------------------|---|--|--|
| Protection class | IP65 | IP65 | IP65 |
| Ambient temperature | up to 180 °C | up to 315 °C ¹⁾ | up to 315 °C ¹⁾ |
| Relative humidity | 10 to 95 %, non-condensing | 10 to 95 %, non-condensing | 10 to 95 %, non-condensing |
| Material (housing) | V2A | V2A | V2A |
| Dimensions | 237 mm x 117 mm x 138 mm | 271 mm x 166 mm x 182 mm | 426 mm x 166 mm x 182 mm |
| Weight | 4.5 kg | 5.7 kg | 7.8 kg |
| Air purge collar | G1/4" internal thread G3/8" external thread | G1/4" internal thread G3/8" external thread | G1/4" internal thread G3/8" external thread |
| Cooling water fittings | G1/4" internal thread G3/8" external thread | G1/4" internal thread G3/8" external thread | G1/4" internal thread G3/8" external thread |
| Cooling water pressure | max. 15 bar (217 psi) | max. 15 bar (217 psi) | max. 15 bar (217 psi) |
| Scope of supply | <ul style="list-style-type: none"> ▪ Cooling Jacket, consisting of housing and chassis | <ul style="list-style-type: none"> ▪ Cooling Jacket Advanced, consisting of housing with mounting angle, chassis ▪ Assembly instructions | <ul style="list-style-type: none"> ▪ Cooling Jacket Advanced, consisting of housing with mounting angle, chassis ▪ Mounting accessories for TIM NetBox or USB Server Gigabit and Industry PIF ▪ Assembly instructions |
| | | <ul style="list-style-type: none"> ▪ Focusing unit or front attachment ²⁾ | <ul style="list-style-type: none"> ▪ Focusing unit or front attachment ²⁾ |

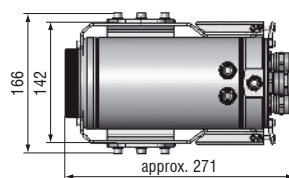
¹⁾ Cable up to 250 °C ambient temperature and cable cooling up to 315 °C available.

²⁾ Must be ordered separately.

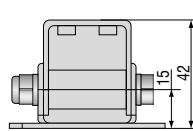
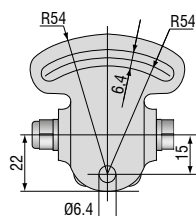
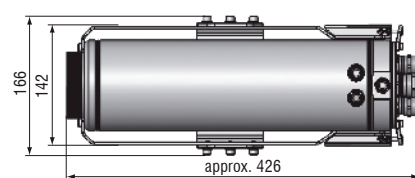
Cooling Jacket



Cooling Jacket Advanced – Standard version



Cooling Jacket Advanced – Extended version



TM-MB-TIM adjustable mounting foot

TM-PH-TIM protection housing incl. mounting foot



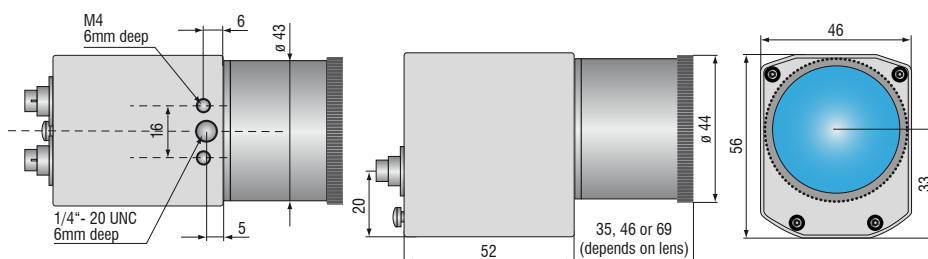
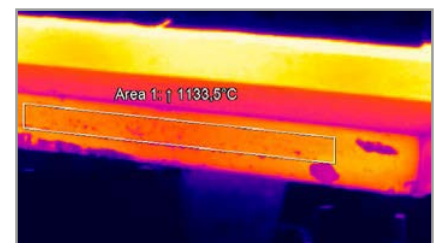
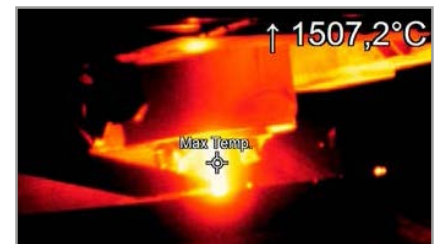
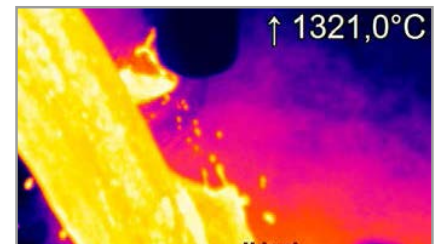
thermoIMAGER TIM M-05

Compact infrared camera for the short-wave range for non-contact temperature measurement of molten metal and metallic surfaces from 900 °C to 2450 °C

- Highly dynamic CMOS detector with resolution up to 764 x 480 pixels
- Special wavelength range from 500 nm to 540 nm minimizes errors caused by unknown emissivity
- Wide measuring range from 900 °C to 2450 °C (without sub-ranges)
- Frame rates up to 1 kHz for fast processes
- Real-time analog output with 1 ms response time
- Comprehensive software package and SDK
- Ideally suitable for laser processing applications as radiation > 540 nm is perfectly blocked

Software

- Display of the thermal image in real time 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



| Model | TIM M-05 | |
|--|--|---|
| Optical resolution | 764 x 480 pixels @ 32 Hz 382 x 288 pixels @ 80 Hz (switchable to 27 Hz) 72 x 56 pixels @ 1 kHz ¹⁾ 764 x 8 pixels @ 1 kHz (fast line-scan mode) ¹⁾ | |
| Temperature ranges | 900 ... 2450 °C (27 Hz mode, 950 ... 2450 °C (80 Hz and 32 Hz mode), 1100 ... 2450 °C (1 kHz mode) | |
| Spectral range | 500 to 540 nm | |
| Frame rate | up to 1 kHz / 1 ms real-time analog output (0 - 10 V) from 8 x 8 pixels (freely selectable) | |
| System accuracy | ± 1 % of reading (< 2000 °C) / ± 1.5 % of reading (> 2000 °C) ²⁾ | |
| Lenses | FOV @ 764 x 480 px: 26° x 16° (f = 25 mm) ³⁾ | FOV @ 382 x 288 px: 13° x 10° (f = 25 mm) ³⁾ |
| Thermal sensitivity (NETD) ³⁾ | < 2 K (< 1400 °C / 27 Hz up to 1 kHz) ⁴⁾ | |
| Detector | CMOS (15 µm x 15 µm) | |
| Outputs/digital | USB 2.0 / optional interface USB to GigE (PoE) | |
| High-speed analog output (@ 1 kHz mode) | 1 ms real-time analog output (0 - 10 V) from 8 x 8 pixels (freely selectable) | |
| 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 ⁵⁾ | |
| Ambient temperature | 5 ... 50 °C | |
| Storage temperature | -40 ... 70 °C | |
| Relative humidity | 20 to 80 %, non-condensing | |
| Vibration ⁶⁾ | IEC 60068-2-6 (sinus-shaped) / IEC 60068-2-64 (broadband noise) | |
| Shock ⁶⁾ | IEC 60068-2-27 (25 g and 50 g) | |
| Housing (size) ⁶⁾ | 46 mm x 56 mm x 88 - 129 mm (depending on lens and focus position) | |
| Weight | 320 g, incl. lens | |

¹⁾ Can be placed anywhere within the FOV

²⁾ For 1 kHz mode: ± 1.5 % FSO (< 2000 °C) / ± 2 % FSO (> 2000 °C)

³⁾ Please note: measurement accuracy can be out of specification with distances below 500 mm

⁴⁾ < 4 K (> 1400 °C / 27 Hz to 1 kHz)

⁵⁾ Only applies when lens protection tube is used

⁶⁾ For more information see operating instructions

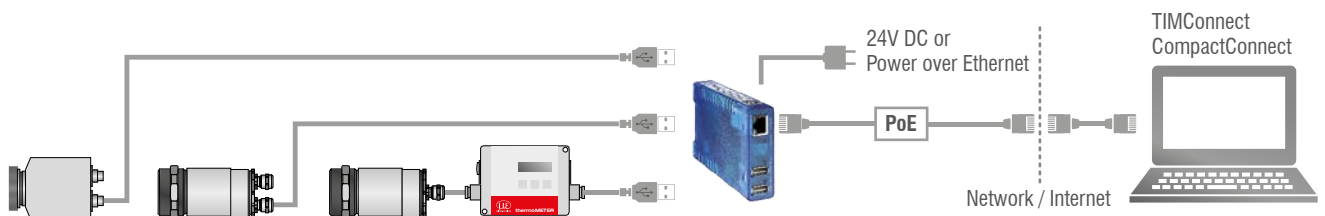
Scope of supply

TIM M-05

- TIM process camera
incl. a selectable lens
- Lens cap incl. protective window
- Operating instructions
- USB cable 1 m
- Software for real-time processing
and analyzing thermal images
- Tripod mount
- PIF cable incl. terminal block (1 m)
- Transport case
- Optional:
Cooling Jacket, high temperature cable

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



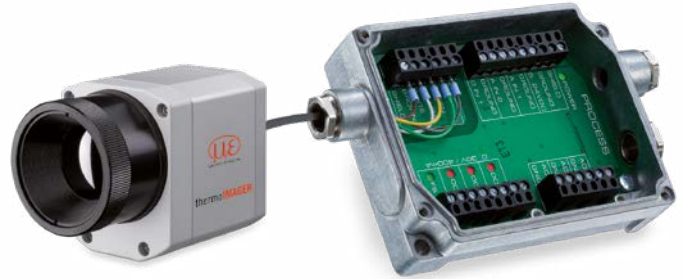
| Model | TIM USB Server Gigabit |
|---|--|
| USB ports | 2x independent USB ports |
| USB speed | 480 Mbit/s |
| Network | 10/100/1000 BaseT (max. 1000Mbit/s) |
| Power supply | Power over Ethernet (PoE) class 3 (6.49 - 12.95 W) or via screw terminal DC 24 V ... 48 V (±10 %) |
| Power consumption | 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)

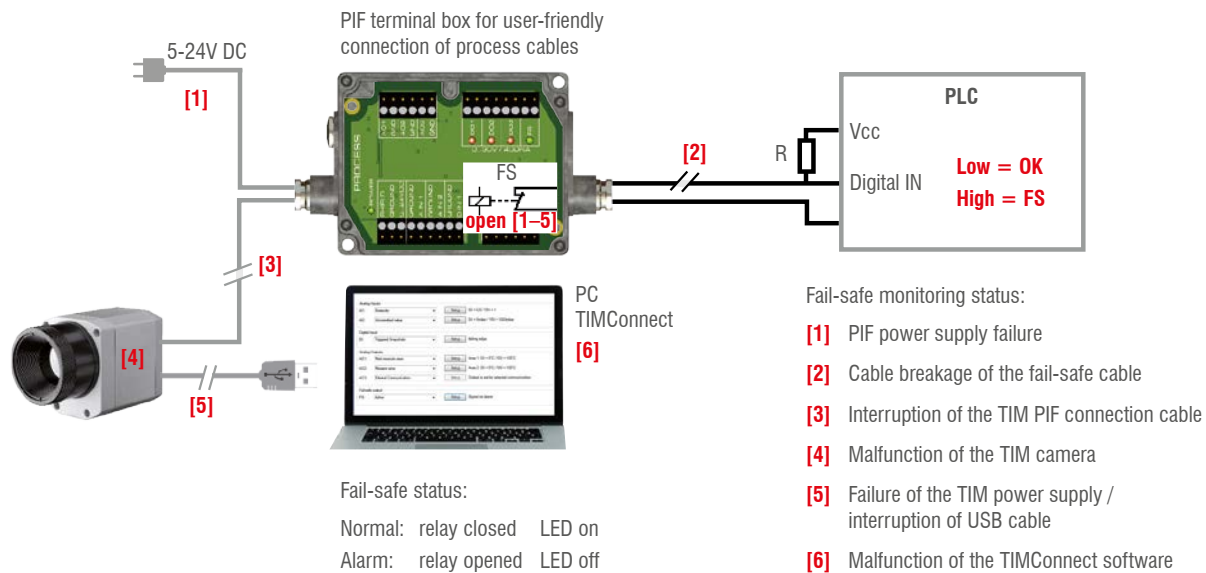
Industrial process interface

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



| 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.

- 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



thermoIMAGER TIM NetPCQ

| 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 |

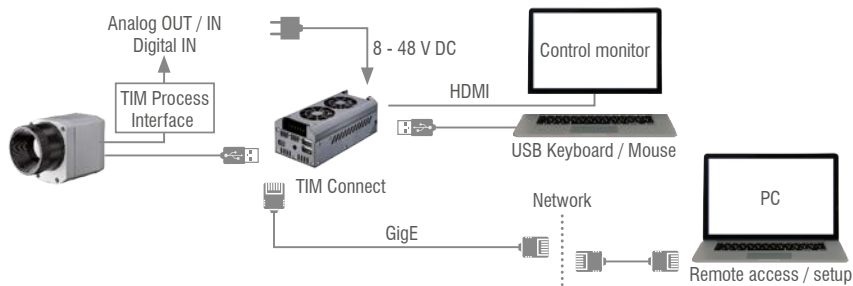
thermoIMAGER TIM NetBox

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)

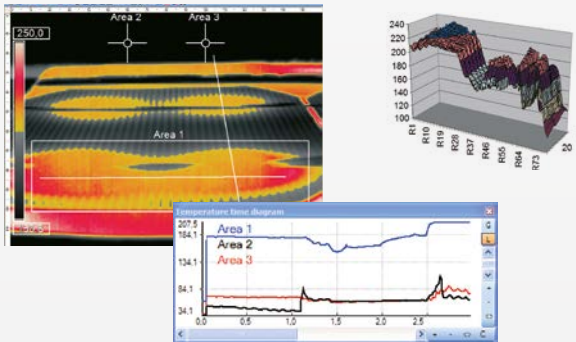


thermoIMAGER TIM NetBox



| 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

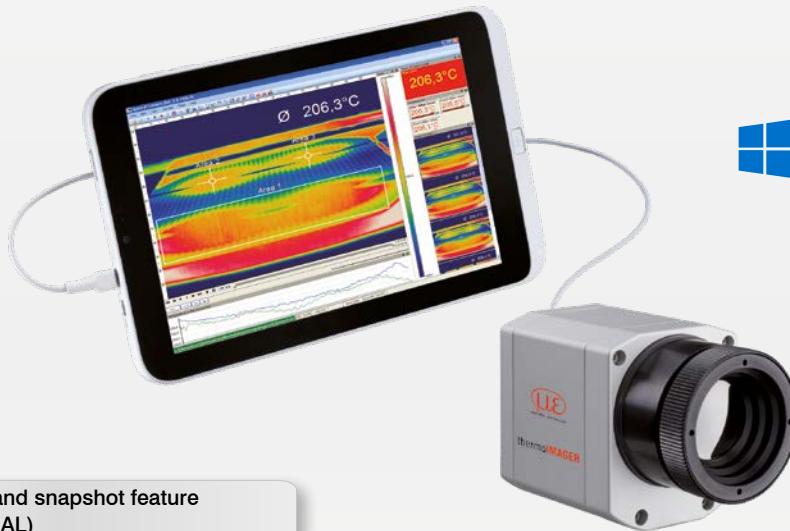
- License-free analysis software and complete SDK included
- Intuitive user interface
- Camera remote control via software
- Displays several camera images in different windows
- Compatible with Windows 7, 8 and 10 and Linux (Ubuntu)
- Data output via PIF hardware interface using up to 3 analog channels



Windows 7

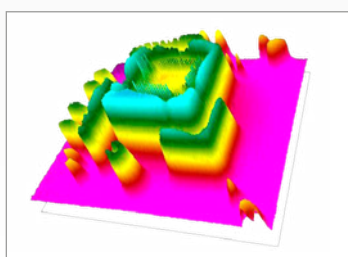
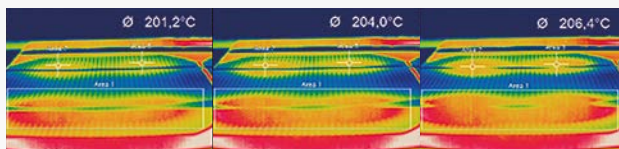


Windows 10



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

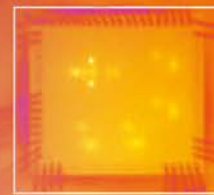


Online and offline data analysis

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

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

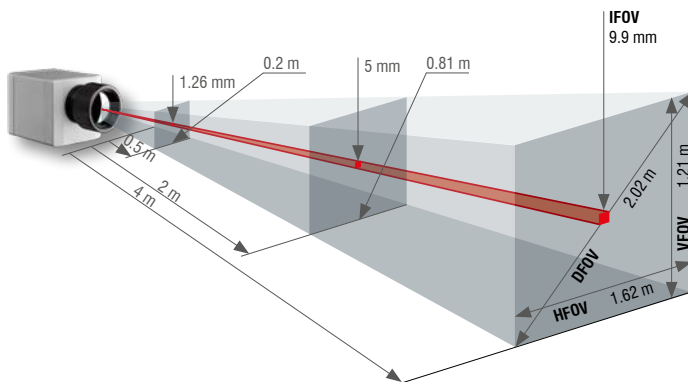
DFOV = Diagonal expansion of the total measuring field at the object level; IIFOV: Size of the individual pixels at the object level

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

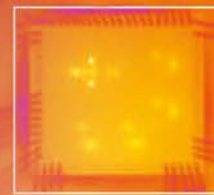
FOV = Field of view; HFOV = Horizontal field of view; VFOV = Vertical field of view; DFOV = Diagonal dimension of the total measuring field at the object level; IFOV = Indicated field of view
Table with examples showing which measuring field sizes and pixel sizes are reached at which distance. Various 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.



| TIM M-1 / TIM M-05 ¹⁾ | 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 | | |
| 382 x 288 px | | | | | | | | | | | | | | | | | |
| f=16 mm Wide angle lens | 16 | 20° 15° 25° 0.94 mrad | 0.2 m | HFOV [m] VFOV [m] DFOV [m] IFOV [mm] | | 0.07 0.05 0.09 0.2 | 0.11 0.08 0.13 0.3 | 0.18 0.14 0.22 0.5 | 0.36 0.27 0.45 0.9 | 0.72 0.54 0.90 1.9 | 1.43 1.08 1.79 3.8 | 2.15 1.62 2.69 5.6 | 3.6 2.7 4.5 9.4 | 10.7 8.1 13.5 28.1 | 35.8 27.0 44.9 93.8 | | |
| f=25 mm Standard lens | 25 | 13° 10° 16° 0.60 mrad | 0.5 m | HFOV [m] VFOV [m] DFOV [m] IFOV [mm] | 0.023 0.017 0.029 0.1 | 0.05 0.03 0.06 0.1 | 0.07 0.05 0.09 0.2 | 0.11 0.09 0.14 0.3 | 0.23 0.17 0.29 0.6 | 0.46 0.35 0.57 1.2 | 0.92 0.69 1.15 2.4 | 1.38 1.04 1.72 3.6 | 2.3 1.7 2.9 6.0 | 6.9 5.2 8.6 18.0 | 22.9 17.3 28.7 60.0 | | |
| f=50 mm Telephoto lens | 50 | 7° 5° 8° 0.30 mrad | 1.5 m | HFOV [m] VFOV [m] DFOV [m] IFOV [mm] | | | | 0.06 0.04 0.07 0.2 | 0.11 0.09 0.14 0.3 | 0.23 0.17 0.29 0.6 | 0.46 0.35 0.57 1.2 | 0.69 0.52 0.86 1.8 | 1.1 0.9 1.4 3.0 | 3.4 2.6 4.3 9.0 | 11.5 8.6 14.4 30.0 | | |
| f=75 mm Super telephoto lens | 75 | 4° 3° 5° 0.20 mrad | 2.0 m | HFOV [m] VFOV [m] DFOV [m] IFOV [mm] | | | | | 0.08 0.06 0.10 0.2 | 0.15 0.12 0.19 0.4 | 0.31 0.23 0.38 0.8 | 0.46 0.35 0.57 1.2 | 0.8 0.6 1.0 2.0 | 2.3 1.7 2.9 6.0 | 7.6 5.8 9.6 20.0 | | |

¹⁾ TIM M-05 only available with OF25 lens | Please note: the camera provides 382 x 288 px in the 80 Hz mode

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

| TIM M-1 / M-05 with VGA ¹⁾ Resolution | 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 | | |
| 764 x 480 px | | | | | | | | | | | | | | | | | |
| f=16 mm Wide angle lens | 16 | 39° 25° 46° 0.94 mrad | 0.2 m | HFOV [m] VFOV [m] DFOV [m] IFOV [mm] | | 0.14 0.09 0.17 0.2 | 0.21 0.14 0.25 0.3 | 0.36 0.23 0.42 0.5 | 0.72 0.45 0.85 0.9 | 1.43 0.90 1.69 1.9 | 2.87 1.80 3.38 3.8 | 4.30 2.70 5.08 5.6 | 7.2 4.5 8.5 9.4 | 21.5 13.5 25.4 28.1 | 71.6 45.0 84.6 93.8 | | |
| f=25 mm Standard lens | 25 | 26° 16° 30° 0.60 mrad | 0.5 m | HFOV [m] VFOV [m] DFOV [m] IFOV [mm] | 0.046 0.029 0.054 0.1 | 0.09 0.06 0.11 0.1 | 0.14 0.09 0.16 0.2 | 0.23 0.14 0.27 0.3 | 0.46 0.29 0.54 0.6 | 0.92 0.58 1.08 1.2 | 1.83 1.15 2.17 2.4 | 2.75 1.73 3.25 3.6 | 4.6 2.9 5.4 6.0 | 13.8 8.6 16.2 18.0 | 45.8 28.8 54.1 60.0 | | |
| f=50 mm Telephoto lens | 50 | 13° 8° 15° 0.30 mrad | 1.5 m | HFOV [m] VFOV [m] DFOV [m] IFOV [mm] | | | | 0.11 0.07 0.14 0.2 | 0.23 0.14 0.27 0.3 | 0.46 0.29 0.54 0.6 | 0.92 0.58 1.08 1.2 | 1.38 0.86 1.62 1.8 | 2.3 1.4 2.7 3.0 | 6.9 4.3 8.1 9.0 | 22.9 14.4 27.1 30.0 | | |
| f=75 mm Super telephoto lens | 75 | 9° 5° 10° 0.20 mrad | 2.0 m | HFOV [m] VFOV [m] DFOV [m] IFOV [mm] | | | | | 0.15 0.10 0.18 0.2 | 0.31 0.19 0.36 0.4 | 0.61 0.38 0.72 0.8 | 0.92 0.58 1.08 1.2 | 1.5 1.0 1.8 2.0 | 4.6 2.9 5.4 6.0 | 15.3 9.6 18.0 20.0 | | |

¹⁾ TIM M-05 only available with OF25 lens | Please note: the camera provides 764 x 480 in the 32 Hz mode

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

Sensors and Systems from Micro-Epsilon



Sensors and systems for displacement, distance and position



Sensors and measurement devices for non-contact temperature measurement



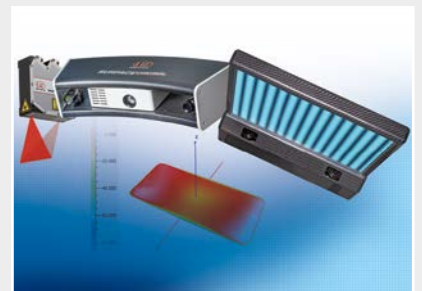
Measuring and inspection systems for metal strips, plastics and rubber



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