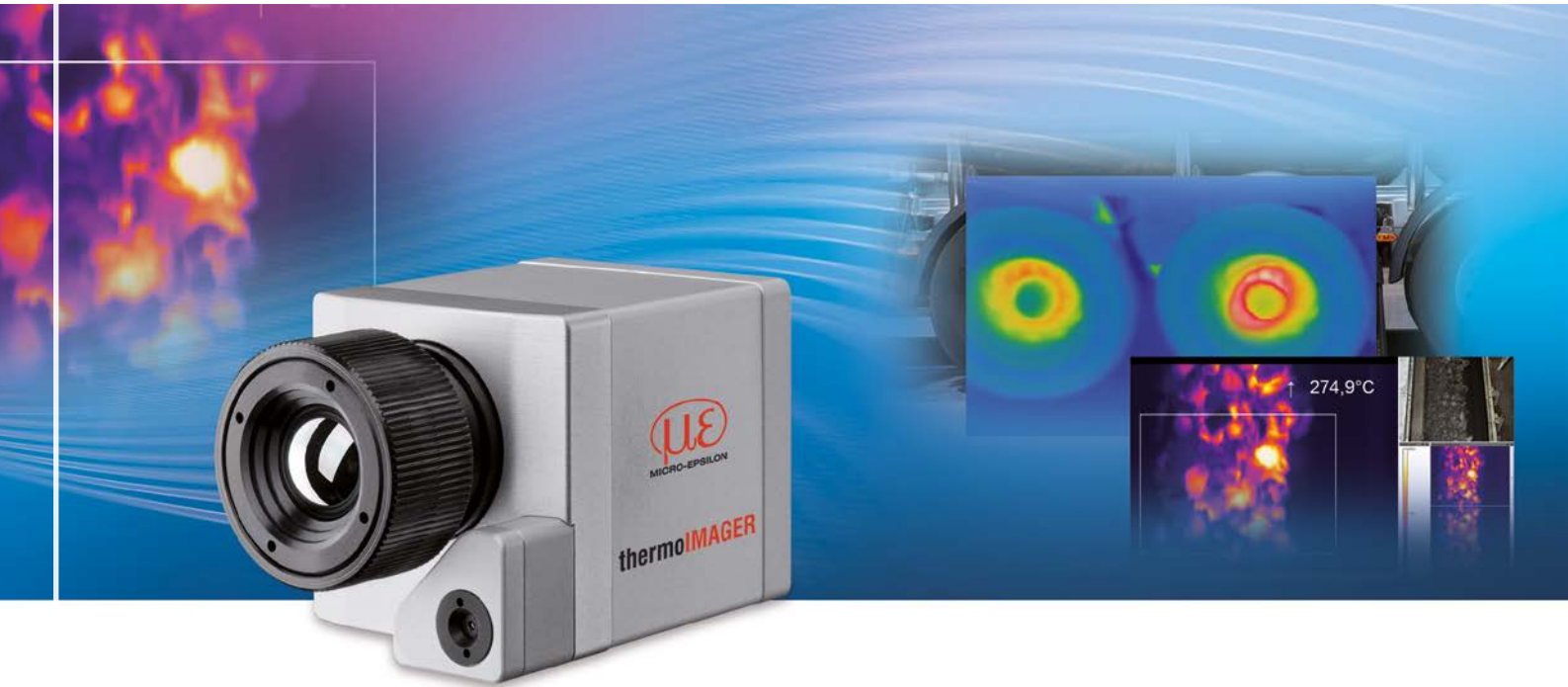




# More Precision

**thermoIMAGER TIM** // Compact thermal imaging cameras





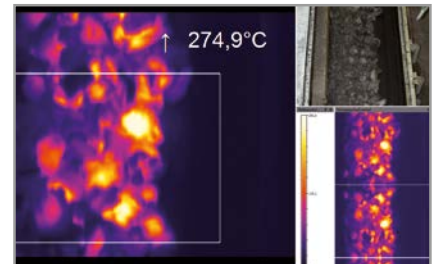
### thermoIMAGER TIM 200/230

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 0.08K
- Exchangeable lenses 6°/23°/48°FOV or 72°FOV
- Real-time thermography with 128Hz frame rate via USB 2.0 interface
- Time synchronous, real-time image recording (VIS) with 32Hz (640 x 480 pixels)
- Power supply and operation via USB interface
- Extremely lightweight (215g) and robust (IP67)
- Extremely compact dimensions 45x45x62mm
- Analog input and output, trigger interface
- Software Developer Kit and LabVIEW examples included

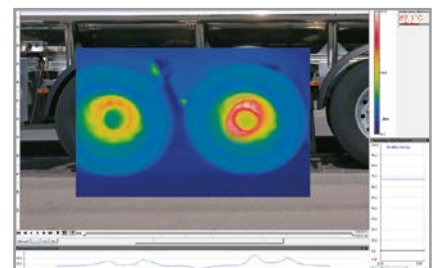
### Software

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



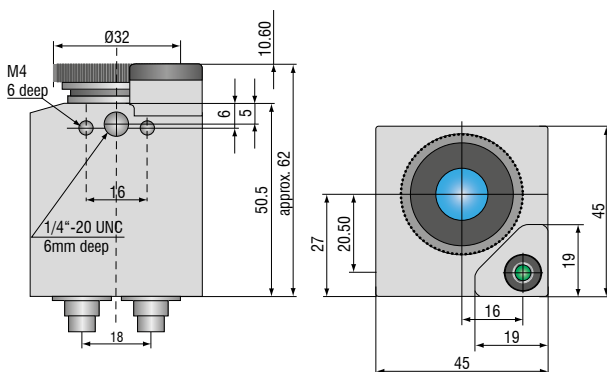
#### Monitoring modus

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: 32Hz  |                       |
|   | Lens (FOV): 54° x 40°   | Lens (FOV): 30° x 23° |
| Optical resolution (IR)                   | 160 x 120 pixels  |                       |
| Temperature ranges                        | -20°C to 100°C / 0°C to 250°C / 150°C to 900°C additional range: 200°C to 1500°C (option)   |                       |
| Spectral range                            | 7.5 to 13µm   |                       |
| Frame rate                                | 128Hz   |                       |
| System accuracy                           | ±2°C or ±2%, whichever is greater   |                       |
| Resolution (Display)                      | 0.1 °C  |                       |
| Lenses                                    | 72° / f = 3.3mm (min. distance 20mm); 48° / f = 5.7mm (min. distance 20mm);<br>23° / f = 10mm (min. distance 20mm); 6° / f = 35.5mm (min. distance 500mm) |                       |
| Emissivity                                | 0.10 to 1.00 adjustable   |                       |
| Thermal sensitivity (NETD)                | 0.1K with 48° FOV and 72° FOV <sup>1)</sup> / 0.08K with 23° FOV <sup>1)</sup> / 0.3K with 6° FOV <sup>2)</sup>   |                       |
| Detector                                  | Focal Plane Array (FPA) - uncooled micro bolometer 25x25µm <sup>2</sup>   |                       |
| 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) | 0-10V output, 0-10V input, trigger input  |                       |
| Digital communication                     | via RS232 of PC / DLL interface used  |                       |
| Cable length                              | 1m (standard), 5m, 10 m, 20m  |                       |
| Power supply                              | USB powered   |                       |
| Tripod mount                              | ¼-20 UNC  |                       |
| Protection class                          | IP67  |                       |
| Ambient temperature range                 | 0°C to 50°C (up to 315°C with cooling jacket)   |                       |
| Storage temperature                       | -40°C to 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 (25g and 50g)  |                       |
| Weight                                    | 215g, incl. lens  |                       |

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

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

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

## Scope of supply

### TIM 200/230

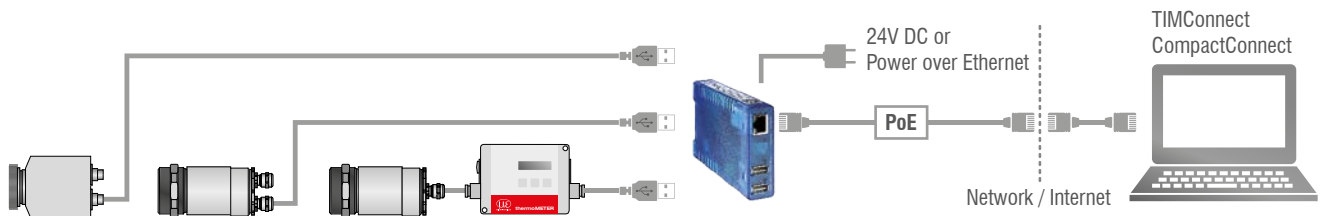
- TIM process camera  
incl. a selectable lens
- Instruction Manual
- USB cable 1m
- Software for real-time processing  
and analyzing thermal images
- Tripod mount
- PIF cable 1m
- Aluminum case

### TIM 200/DK

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

**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/ 480Mbps,  
USB transfer modes: Control, Bulk, Interrupt, Isochronous
- For all models in the thermoIMAGER TIM series 1x TIM640, 1x TIM4xx, 2x TIM160, 1x TIM200
- Full TCP/IP support incl. routing and DNS
- Two independent USB ports
- Galvanic isolation 500V<sub>RMS</sub> (network connection)
- Remote configuration via web-based management



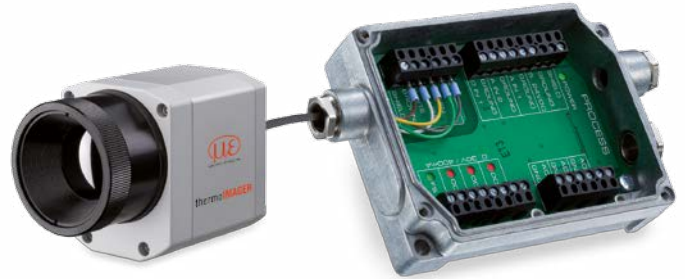
| Model                                   | TIM USB Server Gigabit  |
|---|---|
| USB ports                               | Two independent USB ports   |
| USB speed                               | 480Mbit/s   |
| Network                                 | 10/100/1000 BaseT (max. 1000Mbit/s)   |
| Power supply                            | Power over Ethernet (PoE) class 3 (6.49 - 12.95W) or via screw terminal DC 24V ... 48V ( $\pm 10\%$ )                                     |
| Power consumption                       | External power supply (24V DC) without USB devices: typ. 120mA<br>External power supply (24V DC) with 2 USB devices each 2.5W: typ. 420mA |
| Ambient temperature range               | Storage: -40 ... 85°C<br>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 22mm   |
| Weight                                  | 200g  |
| Scope of supply                         | 1 x USB Server Gigabit<br>24V DC power supply unit<br>Quick guide <sup>1)</sup>   |
| USB protocols                           | USB 1.0 / 1.1 / 2.0 Control / Bulk / Interrupt / Isochronous  |
| Protocols for direct network connection | TCP/IP: Socket<br>Auxiliary protocols: ARP, DHCP, HTTP, PING Inventory keeping, group management  |

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

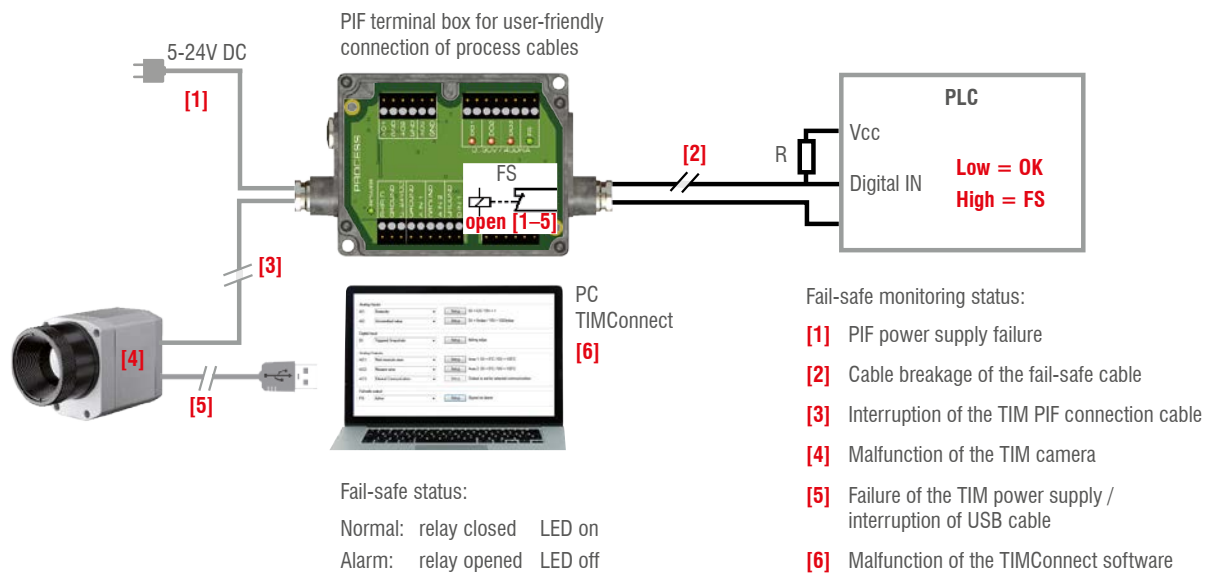
**Industrial process interface**

**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
- 500V AC<sub>RMS</sub> galvanic isolation between TIM camera und 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 range | -30°C to 85°C   |
| Storage temperature       | -30°C to 85°C   |
| Relative humidity         | 10 to 95%, non-condensing   |
| Vibration resistance      | IEC 60068-2-6 (non-condensing)/ IEC 60068-2-64 (broadband noise)  |
| Shock                     | IEC 60068-2-27 (25g and 50g)  |
| Weight                    | 610g (with 5m cable)  |
| Cable length              | 5m, optional 10m and 20m or HT cable (180°C or 250°C)   |
| Power supply              | 5 to 24VDC  |
| LED indicators            | 2 green LEDs for voltage and fail safe / 3 red LEDs for alarm relay status  |
| Insulation                | 500V AC <sub>RMS</sub> between TIM camera und process   |
| Outputs                   | 3 analog / alarm outputs   3 alarm relays <sup>1)</sup>   |
| Inputs                    | 2 analog inputs   1 digital input   |
| Ranges                    | 0 – 10V (for AO 1 – 3) <sup>2)</sup>   0 – 30V / 400mA (for alarm relays DO1 – 3)   0 – 10V (for AI 1 – 2)   24V (for DI)   |
| Analog inputs             | Emissivity setting   Ambient temperature compensation   Reference temperature   Uncommitted value<br>Flag control   Triggered snapshots, triggered recordings, triggered line scan camera |
| Digital input             | Flag control   Triggered snapshots, triggered recordings, triggered line scan camera  |
| Analog outputs            | Main measuring range   Measuring range   Internal temperature   Flag status<br>Alarm   Frame synchronization   Fail safe   External communication   |

<sup>1)</sup> active when AO1, 2 or 3 is / are programmed as alarm output <sup>2)</sup> depends on supply voltage

### thermoIMAGER TIM NetPC / NetPCQ PC solution for thermoIMAGER TIM applications

TIM NetPC is a professional, embedded industrial PC solution with passive cooling (fanless) for thermoIMAGER applications and is suitable for top hat rail mounting. The NetPC and the TIM camera 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 NetPC where customer-specific software can also be installed. A recovery-stick is included in the scope of delivery.

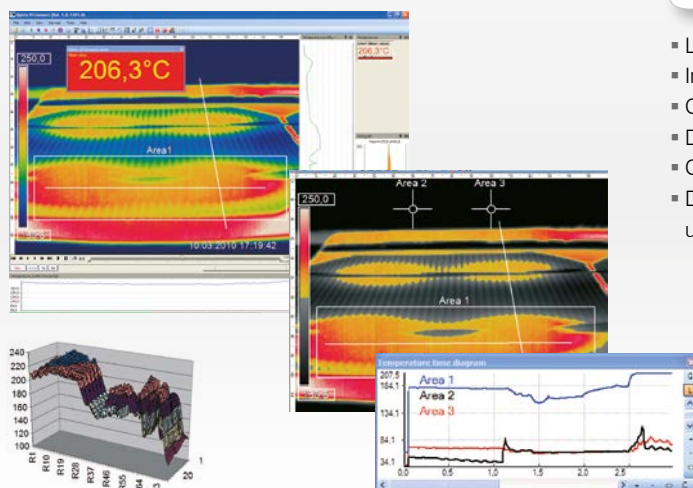
- Supports all thermoIMAGER TIM models
- Supports 120Hz (TIM 160), up to 80Hz (TIM 4x0), up to 32Hz (TIM 640) frame rates
- Including TIMConnect software
- Monitor via VGA (analog)
- Integrated watchdog feature
- Optional: up to 20m USB cable, high temperature USB cable, extendable up to 100m Ethernet cable (PoE)



thermoIMAGER TIM NetPC

| Model                     | TIM NetPC                                    | TIM NetPCQ   |
|---------------------------|--|--|
| Ambient temperature range |  | 0 to 50°C  |
| Storage temperature       |  | -20 to 60°C  |
| Relative humidity         |  | 10 to 95%, non-condensing                              |
| Dimensions                |  | 165 x 65 x 130mm (W x H x D)                           |
| Material (housing)        |  | Anodized aluminum                                      |
| Weight                    |  | 1000g  |
| Vibration                 |  | IEC-2-6: 3G, 11 - 200Hz, each axis                     |
| Shock                     |  | IEC-2-27: 50G, 11ms, each axis                         |
| Operating system          |  | Windows 7 embedded                                     |
| Power supply              |  | 12 - 24V DC  |
| Power consumption         |  | approx. 9.5W without TIM [0.76 A with 12V]             |
| Cooling                   |  | passive cooling (fanless)                              |
| Processor                 | Intel® Atom™ 2600 @ 2x1.6GHz Dual            | Intel® Atom™ J1900 @ 4x2.4GHz                          |
| Hard drive                |  | integrated 64GB SSD                                    |
| RAM                       |  | 2GB DDR3 RAM 800MHz                                    |
| Ports                     | 1Gbit/s (GigE), 2 x RS 232, 4 x USB 2.0, VGA | 1 GigE, 2 x RS232 / 485, 3 x USB 2.0, 1 x USB 3.0, VGA |
| Additional functions      |  | 1x status LED  |

## TIMConnect SOFTWARE FEATURES



### Comprehensive IR camera software

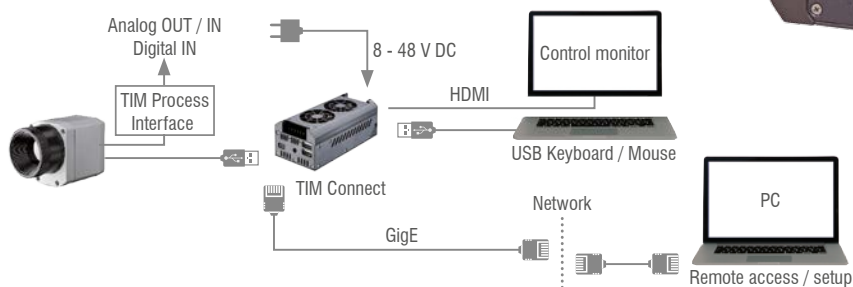
- License-free analysis software and complete SDK included
- Intuitive user interface
- Camera remote control via software
- Displays several camera images in different windows
- Compatible with Windows 7, 8 and 10 and Linux (Ubuntu)
- Data output via PIF hardware interface using up to 3 analog channels



## thermoIMAGER TIM NetBox

### Miniature PC for thermoIMAGER TIM series

- Can be integrated into CoolingJacket Advanced Extended
- Miniature PC for TIM 160/ 4x0 standalone mode for cable extension
- Supports 120Hz (TIM 160 up to 70Hz (TIM 4x0) frame rate, 32Hz (TIM 640)
- Integrated hardware and software watchdog
- Optional: up to 20m USB cable, high temperature USB cable, extendable up to 100m Ethernet cable (PoE)

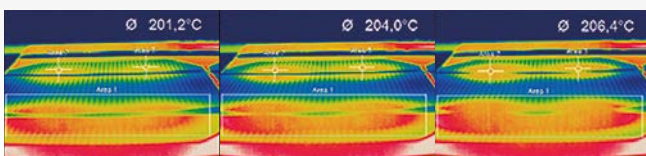


thermoIMAGER TIM NetBox

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

#### 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 color palettes to highlight thermal contrasts



#### 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

#### Temperature data analysis and documentation

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

| TIM 400 / 450 / G7                 | 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                              |  |
| 382 x 288 px                       |                   |                               |                               |   |      |                                |                             |                             |                             |                             |                             |                              |                               |                              |                              |                                  |  |
| 29° Standard lens                  | 18.7              | 29°<br>22°<br>37°<br>1.34mrad | 0.2m                          | HFOV [m]<br>VFOV [m]<br>DFOV [m]<br>IFOV [mm] |      | 0.060<br>0.045<br>0.074<br>0.1 | 0.11<br>0.08<br>0.14<br>0.3 | 0.16<br>0.12<br>0.20<br>0.4 | 0.27<br>0.20<br>0.33<br>0.7 | 0.53<br>0.40<br>0.66<br>1.3 | 1.0<br>0.78<br>1.3<br>2.7   | 2.1<br>1.6<br>2.6<br>5.4     | 3.1<br>2.3<br>3.9<br>8.0      | 5.2<br>3.9<br>6.5<br>13.4    | 15.6<br>11.7<br>19.5<br>40.1 | 52.1<br>39.0<br>65.1<br>133.7    |  |
| 13° Telephoto lens (except for G7) | 41                | 13°<br>10°<br>17°<br>0.61mrad | 0.5m                          | HFOV [m]<br>VFOV [m]<br>DFOV [m]<br>IFOV [mm] |      |                                |                             |                             | 0.12<br>0.09<br>0.15<br>0.3 | 0.23<br>0.17<br>0.29<br>0.6 | 0.47<br>0.35<br>0.58<br>1.2 | 0.94<br>0.70<br>1.17<br>2.5  | 1.40<br>1.05<br>1.75<br>3.7   | 2.3<br>1.7<br>2.9<br>6.1     | 7.0<br>5.2<br>8.8<br>18.4    | 23.4<br>17.5<br>29.2<br>61.2     |  |
| 53° Wide angle lens                | 10.5              | 53°<br>40°<br>66°<br>2.38mrad | 0.2m                          | HFOV [m]<br>VFOV [m]<br>DFOV [m]<br>IFOV [mm] |      | 0.11<br>0.08<br>0.14<br>0.2    | 0.21<br>0.15<br>0.26<br>0.5 | 0.31<br>0.23<br>0.38<br>0.7 | 0.51<br>0.37<br>0.63<br>1.2 | 1.0<br>0.73<br>1.2<br>2.4   | 2.0<br>1.4<br>2.5<br>4.8    | 4.0<br>2.9<br>4.9<br>9.5     | 6.0<br>4.3<br>7.4<br>14.3     | 9.9<br>7.2<br>12.2<br>23.8   | 29.7<br>21.6<br>36.7<br>71.5 | 99.0<br>71.9<br>122.3<br>238.4   |  |
| 80° Wide angle lens                | 7.7               | 80°<br>56°<br>97°<br>3.25mrad | 0.2m                          | HFOV [m]<br>VFOV [m]<br>DFOV [m]<br>IFOV [mm] |      | 0.182<br>0.119<br>0.218<br>0.3 | 0.35<br>0.23<br>0.41<br>0.7 | 0.84<br>0.55<br>1.00<br>1.6 | 0.84<br>0.54<br>1.00<br>1.6 | 1.65<br>1.08<br>1.97<br>3.3 | 3.29<br>2.14<br>3.92<br>6.5 | 6.55<br>4.28<br>7.83<br>13.0 | 9.82<br>6.41<br>11.73<br>19.5 | 16.4<br>10.7<br>19.5<br>32.5 | 49.0<br>32.0<br>58.5<br>97.4 | 163.4<br>106.6<br>195.1<br>324.7 |  |



| TIM 640<br>640 x 480 px         | Focal length<br>[mm] | Angle                          | Minimum<br>measurement<br>distance* | Distance to measurement object [m] |       |      |      |      |      |      |      |       |      |      |       |
|---------------------------------|----------------------|--------------------------------|-------------------------------------|------------------------------------|-------|------|------|------|------|------|------|-------|------|------|-------|
|                                 |                      |                                |                                     |                                    | 0.1   | 0.2  | 0.3  | 0.5  | 1    | 2    | 4    | 6     | 10   | 30   | 100   |
| 33°<br>Standard lens            | 18.7                 | 33°<br>25°<br>41°<br>0.91mrad  | 0.2m                                | 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°<br>Telephoto lens           | 41.5                 | 15°<br>11°<br>19°<br>0.41mrad  | 0.5m                                | 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°<br>Wide angle lens          | 10.5                 | 60°<br>45°<br>75°<br>1.62mrad  | 0.2m                                | 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°<br>Super<br>wide angle lens | 7.7                  | 90°<br>64°<br>111°<br>2.21mrad | 0.2m                                | 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 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](http://www.micro-epsilon.com/optikkalkulator).

| TIM M1 /<br>TIM M05 <sup>1)</sup> | Focal length<br>[mm] | Angle                         | Minimum<br>measurement<br>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                      | 16                   | 20°<br>15°<br>25°<br>0.94mrad | 0.2m                                | HFOV [m]                           |       | 0.07 | 0.11 | 0.18 | 0.36 | 0.72 | 1.43 | 2.15 | 3.6 | 10.7 | 35.8 |
|                                   |                      |                               |                                     | VFOV [m]                           |       | 0.05 | 0.08 | 0.14 | 0.27 | 0.54 | 1.08 | 1.62 | 2.7 | 8.1  | 27.0 |
|                                   |                      |                               |                                     | DFOV [m]                           |       | 0.09 | 0.13 | 0.22 | 0.45 | 0.90 | 1.79 | 2.69 | 4.5 | 13.5 | 44.9 |
|                                   |                      |                               |                                     | IFOV [mm]                          |       | 0.2  | 0.3  | 0.5  | 0.9  | 1.9  | 3.8  | 5.6  | 9.4 | 28.1 | 93.8 |
|                                   |                      |                               |                                     |                                    |       |      |      |      |      |      |      |      |     |      |      |
| f=25mm<br>standard lens           | 25                   | 13°<br>10°<br>16°<br>0.60mrad | 0.5m                                | HFOV [m]                           | 0.023 | 0.05 | 0.07 | 0.11 | 0.23 | 0.46 | 0.92 | 1.38 | 2.3 | 6.9  | 22.9 |
|                                   |                      |                               |                                     | VFOV [m]                           | 0.017 | 0.03 | 0.05 | 0.09 | 0.17 | 0.35 | 0.69 | 1.04 | 1.7 | 5.2  | 17.3 |
|                                   |                      |                               |                                     | DFOV [m]                           | 0.029 | 0.06 | 0.09 | 0.14 | 0.29 | 0.57 | 1.15 | 1.72 | 2.9 | 8.6  | 28.7 |
|                                   |                      |                               |                                     | IFOV [mm]                          | 0.1   | 0.1  | 0.2  | 0.3  | 0.6  | 1.2  | 2.4  | 3.6  | 6.0 | 18.0 | 60.0 |
|                                   |                      |                               |                                     |                                    |       |      |      |      |      |      |      |      |     |      |      |
| f=50mm<br>telephoto lens          | 50                   | 7°<br>5°<br>8°<br>0.30mrad    | 1.5m                                | HFOV [m]                           |       |      |      | 0.06 | 0.11 | 0.23 | 0.46 | 0.69 | 1.1 | 3.4  | 11.5 |
|                                   |                      |                               |                                     | VFOV [m]                           |       |      |      | 0.04 | 0.09 | 0.17 | 0.35 | 0.52 | 0.9 | 2.6  | 8.6  |
|                                   |                      |                               |                                     | DFOV [m]                           |       |      |      | 0.07 | 0.14 | 0.29 | 0.57 | 0.86 | 1.4 | 4.3  | 14.4 |
|                                   |                      |                               |                                     | IFOV [mm]                          |       |      |      | 0.2  | 0.3  | 0.6  | 1.2  | 1.8  | 3.0 | 9.0  | 30.0 |
|                                   |                      |                               |                                     |                                    |       |      |      |      |      |      |      |      |     |      |      |
| f=75mm<br>Super<br>telephoto lens | 75                   | 4°<br>3°<br>5°<br>0.20mrad    | 2.0m                                | HFOV [m]                           |       |      |      |      | 0.08 | 0.15 | 0.31 | 0.46 | 0.8 | 2.3  | 7.6  |
|                                   |                      |                               |                                     | VFOV [m]                           |       |      |      |      | 0.06 | 0.12 | 0.23 | 0.35 | 0.6 | 1.7  | 5.8  |
|                                   |                      |                               |                                     | DFOV [m]                           |       |      |      |      | 0.10 | 0.19 | 0.38 | 0.57 | 1.0 | 2.9  | 9.6  |
|                                   |                      |                               |                                     | IFOV [mm]                          |       |      |      |      | 0.2  | 0.4  | 0.8  | 1.2  | 2.0 | 6.0  | 20.0 |
|                                   |                      |                               |                                     |                                    |       |      |      |      |      |      |      |      |     |      |      |

<sup>1)</sup> TIM M05 only available with OF25 lens | Please note: the camera provides 382 x 288 px in the 80Hz mode

| TIM M1 / M05<br>with VGA <sup>1)</sup><br>Resolution | Focal length<br>[mm] | Angle                         | Minimum<br>measurement<br>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   | 16                   | 39°<br>25°<br>46°<br>0.94mrad | 0.2m                                | HFOV [m]                           |       | 0.14 | 0.21 | 0.36 | 0.72 | 1.43 | 2.87 | 4.30 | 7.2 | 21.5 | 71.6 |
|  |                      |                               |                                     | VFOV [m]                           |       | 0.09 | 0.14 | 0.23 | 0.45 | 0.90 | 1.80 | 2.70 | 4.5 | 13.5 | 45.0 |
|  |                      |                               |                                     | DFOV [m]                           |       | 0.17 | 0.25 | 0.42 | 0.85 | 1.69 | 3.38 | 5.08 | 8.5 | 25.4 | 84.6 |
|  |                      |                               |                                     | IFOV [mm]                          |       | 0.2  | 0.3  | 0.5  | 0.9  | 1.9  | 3.8  | 5.6  | 9.4 | 28.1 | 93.8 |
|  |                      |                               |                                     |                                    |       |      |      |      |      |      |      |      |     |      |      |
| f=25mm<br>standard lens                              | 25                   | 26°<br>16°<br>30°<br>0.60mrad | 0.5m                                | HFOV [m]                           | 0.046 | 0.09 | 0.14 | 0.23 | 0.46 | 0.92 | 1.83 | 2.75 | 4.6 | 13.8 | 45.8 |
|  |                      |                               |                                     | VFOV [m]                           | 0.029 | 0.06 | 0.09 | 0.14 | 0.29 | 0.58 | 1.15 | 1.73 | 2.9 | 8.6  | 28.8 |
|  |                      |                               |                                     | DFOV [m]                           | 0.054 | 0.11 | 0.16 | 0.27 | 0.54 | 1.08 | 2.17 | 3.25 | 5.4 | 16.2 | 54.1 |
|  |                      |                               |                                     | IFOV [mm]                          | 0.1   | 0.1  | 0.2  | 0.3  | 0.6  | 1.2  | 2.4  | 3.6  | 6.0 | 18.0 | 60.0 |
|  |                      |                               |                                     |                                    |       |      |      |      |      |      |      |      |     |      |      |
| f=50 mm<br>telephoto lens                            | 50                   | 13°<br>8°<br>15°<br>0.30mrad  | 1.5m                                | HFOV [m]                           |       |      |      | 0.11 | 0.23 | 0.46 | 0.92 | 1.38 | 2.3 | 6.9  | 22.9 |
|  |                      |                               |                                     | VFOV [m]                           |       |      |      | 0.07 | 0.14 | 0.29 | 0.58 | 0.86 | 1.4 | 4.3  | 14.4 |
|  |                      |                               |                                     | DFOV [m]                           |       |      |      | 0.14 | 0.27 | 0.54 | 1.08 | 1.62 | 2.7 | 8.1  | 27.1 |
|  |                      |                               |                                     | IFOV [mm]                          |       |      |      | 0.2  | 0.3  | 0.6  | 1.2  | 1.8  | 3.0 | 9.0  | 30.0 |
|  |                      |                               |                                     |                                    |       |      |      |      |      |      |      |      |     |      |      |
| f=75 mm<br>Super<br>telephoto lens                   | 75                   | 9°<br>5°<br>10°<br>0.20mrad   | 2.0m                                | HFOV [m]                           |       |      |      |      | 0.15 | 0.31 | 0.61 | 0.92 | 1.5 | 4.6  | 15.3 |
|  |                      |                               |                                     | VFOV [m]                           |       |      |      |      | 0.10 | 0.19 | 0.38 | 0.58 | 1.0 | 2.9  | 9.6  |
|  |                      |                               |                                     | DFOV [m]                           |       |      |      |      | 0.18 | 0.36 | 0.72 | 1.08 | 1.8 | 5.4  | 18.0 |
|  |                      |                               |                                     | IFOV [mm]                          |       |      |      |      | 0.2  | 0.4  | 0.8  | 1.2  | 2.0 | 6.0  | 20.0 |
|  |                      |                               |                                     |                                    |       |      |      |      |      |      |      |      |     |      |      |

<sup>1)</sup> TIM M05 is only available with OF25 lens | Please note: the camera provides 764 x 480 px in the 32Hz mode