

Operating Instructions
thermoIMAGER TIM Connect

Software for thermoIMAGER TIM Infrared camera

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1. Safety

System operation assumes knowledge of the operating instructions.

1.1 Symbols Used

The following symbols are used in these operating instructions.



Indicates a situation that may result in property damage if not avoided.



Indicates a user action.



Indicates a tip for users.

Measure

Indicates hardware or a software button/menu

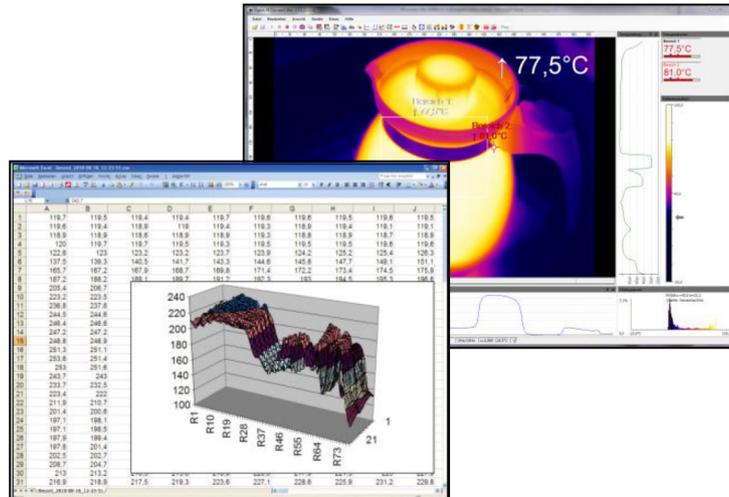
2. Technical Data

2.1 Functional Principle

The thermoIMAGER TIM calculates the surface temperature based on the emitted infrared energy of objects. The two-dimensional detector (FPA - Focal Plain Array) or (CMOS - Complementary metal-oxide-semiconductor) allows a measurement depending on the device max. pixels and will be shown as thermographic image using standardized palettes. The radiometric processing of the picture data enables the user to do a comfortable detailed analysis with the TIM Connect software.

2.2 Functions

- Display of the real time thermal image (up to a max. of 1 kHz) with a wide range of measurement functions
- Recording function (video, radiometric video, snapshot)
- Analysis and post processing of infrared images/ videos
- Complete set up of parameters and remote control of the camera



3. Getting Started

3.1 Software Installation

➡ First install the TIM Connect software from the supplied USB stick.

The CD contains the software application, the specific calibration data of the imager as well as some sample files. These data will be installed automatically.

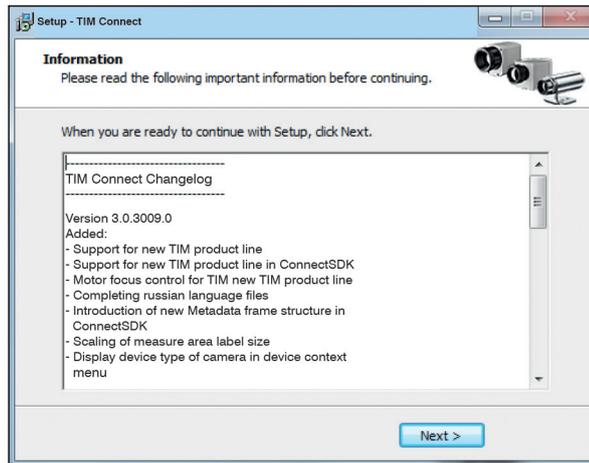
➡ Plug the USB stick into your PC.

If the autorun option is activated the installation wizard will start automatically.

➡ Otherwise please start `setup.exe` from the USB stick.

➡ Follow the instructions of the wizard until the installation is finished.

At the end of the installation, you will get an overview of what has been added, changed and corrected in the current software version. You will find this overview again on the data medium under the document name `Changelog`.

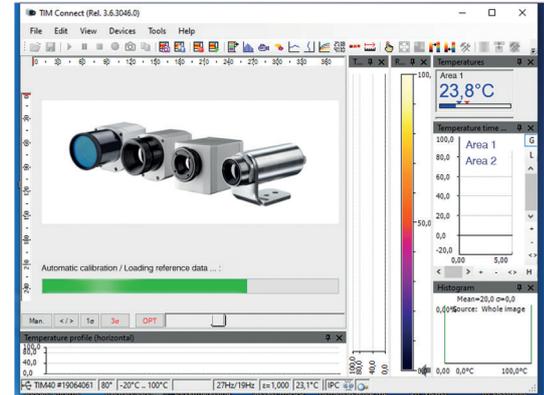


The installation wizard will place a launch icon on the desktop and in the start menu.

➡ Now you can connect the infrared imager into an USB port (USB 2.0 or higher) of your PC.

After the software has been started, you should see the live image from the camera inside a window on your PC screen.

The sharpness of the image can be adjusted by turning the exterior lens ring at the camera (thermoIMAGER TIM) or by using the distance function in the software (thermoMETER TIM 8 / thermoIMAGER TIM 40).



i For installation please be logged in as admin in Windows. When starting the TIM Connect software you should also have admin rights.

➡ Using Windows 10: Go to Windows Settings, click **Privacy** and under **App Permissions**, click on **Camera**. **Activate** Allow apps to access your camera.

➡ Restart TIM Connect and also reconnect the camera.

Further actions:

- Deactivation of firewall and/or virus scanner (especially Kaspersky!).
- Firmware upgrade in TIM Connect (Tools > Extended > Firmware update).
- Reload calibration data (Tools > Extended > Load calibration data/From Internet).

3.2 Choice of Camera

In case you are using more than one TIM simultaneously (e.g. via USB hub) please select the required TIM from the list in the `Devices` menu.

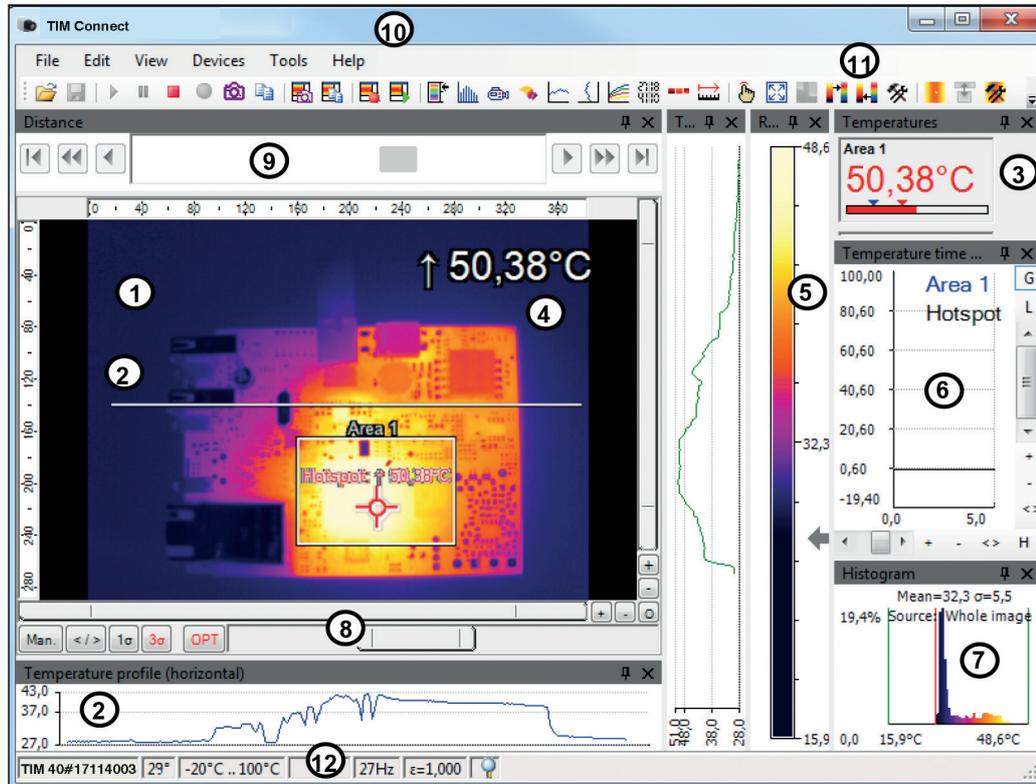
3.3 Choice of Language

In the `Tools` and `Language` menu you can choose from a variety of available languages.

Chinese (People's Republic of China) / 中文(中华人民共和国)
English / English
French (France) / français (France)
German / Deutsch
Italian / italiano
Korean / 한국어
Polish / polski
Russian / русский
Spanish (Spain) / español (España)
Turkish (Turkey) / Türkçe (Türkiye)

i On the USB stick with the software you will find a translation file if you want to translate the software into another language than the available languages.

3.4 Software Window (Example)



1	IR image from the camera
2	Temperature profile: Shows the temperatures along max. 2 lines at any size and position in the image.
3	Control displays: Displays all temperature values in the defined measure areas like Cold Spots, Hot Spots, temperature at cursor, internal temperature and chip temperature. Alarm settings: Bar showing the defined temperature thresholds for low alarm value (blue arrow) and high alarm value (red arrow). The color of numbers within control displays changes to red (when temp. above the high alarm value) and to blue (when temp. below the low alarm value).
4	Temperature of measure area: Analyses the temperature according to the selected shape, e.g. average temperature of the rectangle. The value is shown inside the IR image and the control displays.
5	Reference bar: Shows the scaling of temperature within the color palette.
6	Temperature time diagram: Shows the temperature curves over time for selectable region of interest (ROI)
7	Histogram: Shows the statistic distribution of single temperature values.
8	Automatic / manual scaling of the palette (displayed temperature range): Man., \langle / \rangle (min, max), 1 σ : 1 Sigma, 3 σ : 3 Sigma, OPT: Palette optimization
9	Distance function: Adjustment of the motor focus to focus the IR picture (only thermoMETER TIM 8/thermoIMAGER TIM 40)
10	Menu and Toolbar (Icons)
11	Icon enabling switching between color palettes
12	Status bar: Model and serial number, optic, temperature range, cursor position, device framerate/display framerate, emissivity, ambient temperature, flag status

Under **View** and **User Mode** you can select between two additional display options. In addition to the **Desktop view**, the **Touch view** or the **Tablet view** can also be used here, [see Fig. 1](#).

These additional views are particularly useful when using a touch computer or a tablet. The screen and menu are customized and displayed according to their functions.

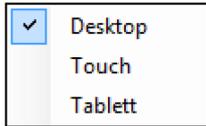


Fig. 1 Screen View - User Mode

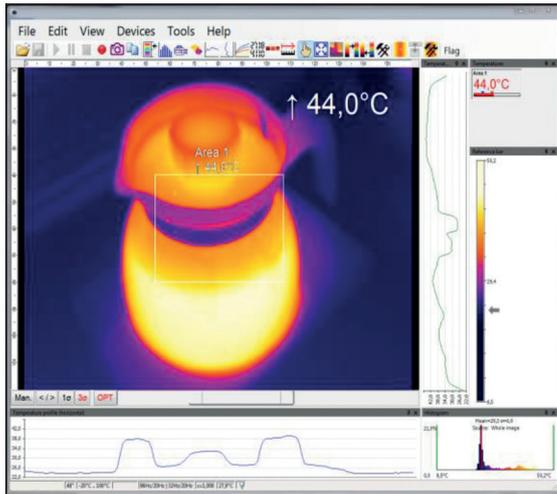


Fig. 2 User Mode Touch

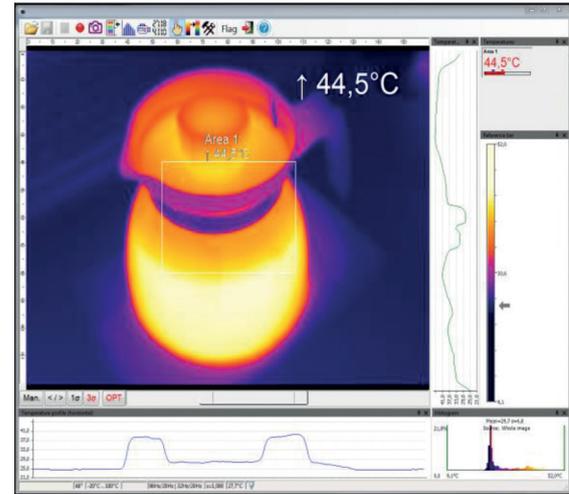


Fig. 3 User Mode Tablett

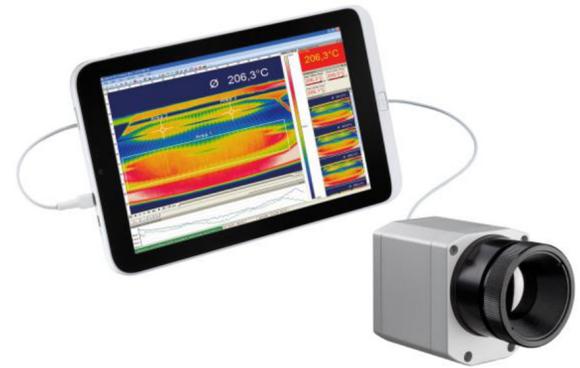


Fig. 4 Configuration window for User Touch and Tablet

i The User Mode Tablet provides only limited functionality.

3.5 Menu and Toolbar (Icons)

3.5.1 Menu

Using the menu you can adjust all software settings. Each feature will be explained in detail in the following chapters of this manual:

File **Edit** **View** **Devices** **Tools** **Help**

Fig. 5 Menu bar

File	Open, save and replay of files; recording; saving temp./time diagram data; snapshot; screenshot; capture screen
Edit	Editing of sequences and layouts
View	Display or fade-out of different software features
Devices	Choice of camera and self-referencing
Tools	Additional settings of camera and software parameters as line scanner mode; layouts; language; extended settings as merged device configuration and updating the firmware
Help	Information about software; documentation; SDK; locking application

3.5.2 Toolbar (Icons)

The most important features of the software can be activated directly via the toolbar. You can redesign the toolbar according to your preferences, see 4.2.2. Available toolbar icons are the following:

 Open	 Visible video	 Enable linescanning
 Save	 3D Chart	 Linescanner view ↔ Sighting view
 Play	 Temperature profile (horizontal)	 Linescanner configuration
 Pause	 Temperature profile (vertical)	 Image subtraction
 Stop	 Temperature time diagram	 Image subtraction from file
 Record	 Digital display group	 Refresh Flag
 Save snapshot to file	 Snapshot history	 Acknowledge Alarm
 Copy snapshot to clipboard	 Distance	 Close all tools
 Save screenshot to file	 Toggle user mode	 Digital display (main measure area)
 Screenshot to clipboard	 Full screen	 Digital display (mouse cursor)
 Capture screen	 IR/Visible Fusion	 Set configuration to device
 Replay captured screen	 Next palette	 Event protocol
 Reference bar	 Previous palette	 Toggle Minimum, Mean Value, Maximum
 Histogram	 Configuration	 Config merged device

	Get configuration from device		About		Secondary view: Event grabber (frozen image)
	Exit				

Fig. 6 Tool bar (Icons)

4. Software Configuration

4.1 General Settings

You can activate all here mentioned features in the Tools, Configuration and General menu (except for color palettes and temperature unit).

4.1.1 Color Palettes

In the Tools, Configuration, Measuring colors and Standard palette menu you can choose from a list of color palettes to achieve ideal displaying of the infrared image and the included temperature information.

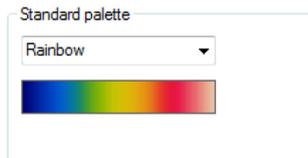
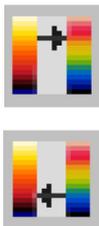


Fig. 7 Icons for color palette selection

Fig. 8 Dropdown menu Standard palette

In the Tools, Configuration, Measuring colors and Standard palette menu, see Fig. 8, you can choose from a list of color palettes to achieve ideal displaying of the infrared image and the included temperature information.

You can also adjust the color palette via the icon on the toolbar or the menu View and Shift palette.

Available color palettes

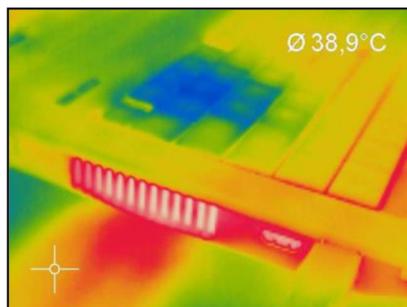
Iron	
Iron Hi	
Rainbow	
Rainbow Hi	
Rainbow Medical	

Fig. 9 Palette selection

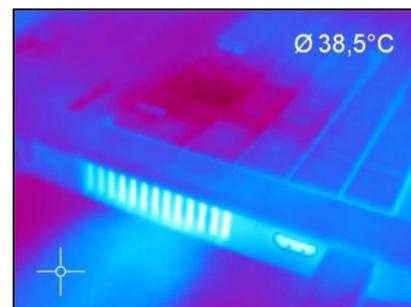
Gray (Black = Cold)	
Gray (White = Cold)	
Alarm Red	
Alarm Green	
Alarm Blue	
Blue Hi	



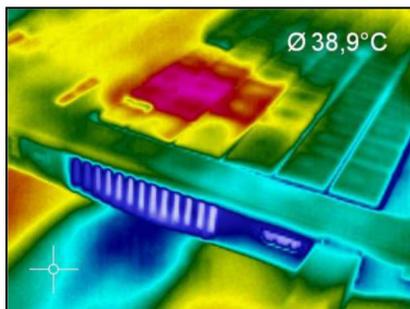
Palette Iron



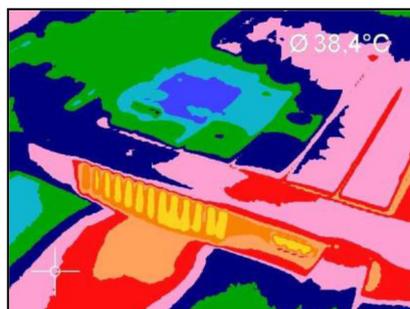
Palette Rainbow



Palette Blue Hi



Palette Rainbow Hi



Palette Rainbow Medical



Palette Gray (Black = Cold)

Fig. 10 Examples of various color palettes

4.1.2 Temperature Unit

The temperature unit can be changed in the menu **Tools, Extended and Options**. When setting the Temperature unit you can choose between **Celsius (°C)** and **Fahrenheit (°F)**, see Fig. 11.



Fig. 11 View Temperature unit

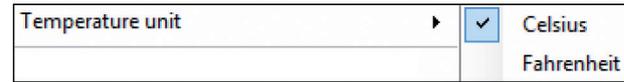


Fig. 12 View Temperature unit

Alternatively, the temperature unit can also be changed by right-clicking in the live IR image.

4.1.3 Temperature Range Scaling of Reference Bar

The temperature scaling can be set in the menu under **Tools > Configuration > General**.

Via the Temperature range scaling settings you can allocate colors to temperature values within the reference bar.

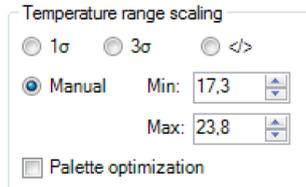


Fig. 13 View temperature range scaling

These are the following options:

Manual	The lower and the upper border (Min/Max) can be determined individually.
</>	The software continuously defines the upper and the lower border based on the hottest and coldest pixel in the image.
1 σ	The mean value of all pixels in the image will be continuously calculated. Based on the mean value one standard deviation (1 sigma) sets the limits of reference bar.
3 σ	The mean value of all pixels in the image will be continuously calculated. Based on the mean value three standard deviations (3 sigma) set the limits of reference bar.
OPT	With OPT a contrast optimization is achieved. This function allows an optimum contrast between very low and very high temperatures.

•
i

Palette optimization OPT is not available for TIM M-1 and TIM M-05.

4.1.4 Displayed Frame Rate

Reduce displayed frames:

Mode:

Display framerate: Hz

Averaging time: % of frame time

Keep device framerate for temp/time diagram, external communication and PIF outputs

Fig. 14 View Reduce Displayed Frames

The option `Reduce displayed frames` defines what frame rate is used to display the image. Typically, the specification is in Hertz (Hz, images per second). The maximum frame rate of the imager depends on the camera model you're using. It is recommended to use the default parameters of 20 Hz.

The camera supplies the software with all images at the whole time. When you using a lower display framerate you have to decide what should happen with the rest of the pictures. Under `Mode` you have several options:

Off	The display frame rate corresponds to the device frame rate of the camera.
Skipping	It skips so many pictures that the set display frame rate results.
Average	The pixels are averaged out of a sequence of images. This weakens the detector noise.
Minimum	From a sequence of images, the smallest value is displayed for each pixel.
Maximum	From a sequence of images, the highest value is displayed for each pixel.
Ext. Averaging	Is a combination of average and skipping and is used at very low display rates. The <code>Averaging time</code> indicates how many percent of the set frame time should be averaged. In the remaining time, the frames are skipped (e.g., if the display frequency is 1 Hz and the averaging time is 10 %, then 100 ms is averaged and 900 ms are skipped).

NOTICE

Therefore, please adjust the displayed frame rate according to your application as well as to the performance of your computer.

> A reduced frame rate means a less loaded computer in terms of data processing.

4.1.5 Change of the Title Bar

The Application title bar option enables the individual setting for an own title name.

The setting `Default` displays the standard software name `TIM Connect`. Using the setting `User defined` you can specify an individual name. The option `Instance name` is important if starting several cameras and software on one computer. The option `Revision name` is disabling the display of software version in the title bar.



Fig. 15 View application title bar

4.1.6 Optimization of Software

The display of the thermal image in the main window of the software can be adjusted according to the performance of the computer. Choosing the option `Quality` the display will be enlarged to the highest resolution, but requires a higher computing power. Using a slow computer, it is recommended to choose the option `Performance`. Is the bar placed in the middle, you get a compromise between quality and performance.



If `Keep Aspect Ratio` is selected the aspect ratio will be maintained.

The option `Prevent screensaver` is suppressing the screensaver functionality of your computer.



4.1.7 Lock / Unlock Application

The software offers the possibility to block or unlock the application by entering a password. This is possible under menu `Help` and `Lock / unlock application`. Enter a password and repeat it. Then press `Lock` and the application is locked, see Fig. 16.



The setting options are now all gray in color and they are no longer able to make changes. Only when you go to `Help` and `Lock / unlock application`, enter the password and click `Unlock`, the software will be unlocked again, see Fig. 17.

`Remove Password` removes the current password and with `Change Password` a new password can be assigned, see Fig. 18.

If the application should be locked again, the current password remains memorized and a repeated entry of the password is no longer necessary.

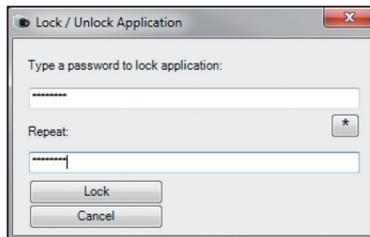


Fig. 16 View 1_Lock

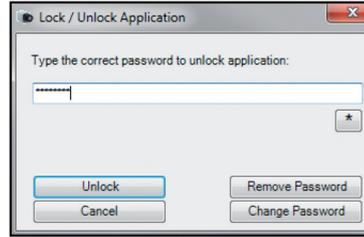


Fig. 17 View 2_Unlock

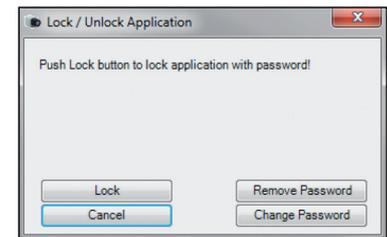


Fig. 18 View 3

4.2 Software Layout

4.2.1 Displayed Windows

You can individually choose the displayed windows and easily change their positions within the desktop area (drag & drop). To add windows please use the menu item `View` and `Windows`.

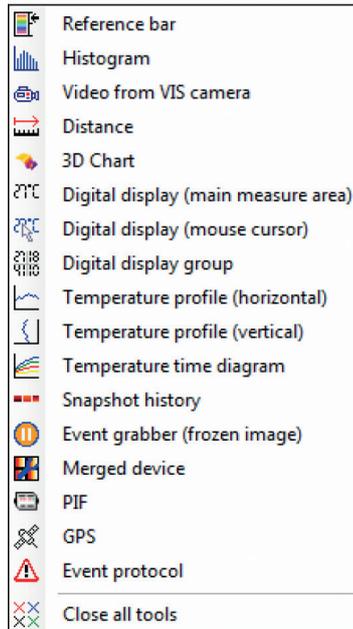


Fig. 19 Tool bar

On the one hand a window can be positioned separately on the screen. On the other hand a window can be set at a fixed position in the software. The location can be determined using the positioning field (mouse over the arrows „above“, „below“, „right“, „left“).

When a window is dragged into another one (mouse has to be placed within title head) both will be merged. You can switch between them using the tab provided.

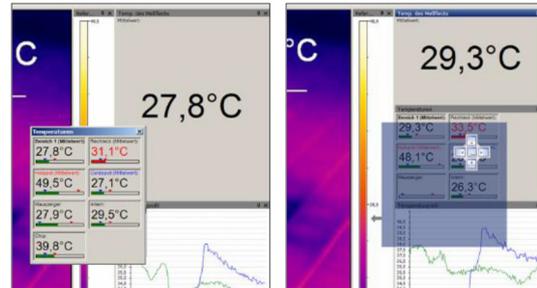


Fig. 20 Separate window and window with positioning field to place it into the software individually

4.2.2 View Bars

For individual display of software you can show or hide single bars in the software window. In the menu under `View` and `View bars`, in addition to selecting individual functions, it is also possible to `Show all bars` or `Hide all bars` with one click.

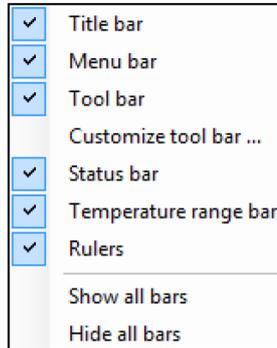


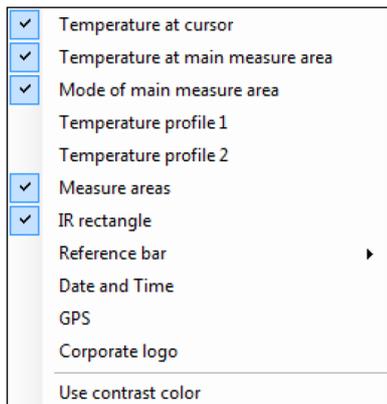
Fig. 21 View bars

i All icons shown on the toolbar can be individually selected via the option `Customize tool bar`, [see 3.5.2](#).

4.2.3 Information within Image

Using the menu `View` and `Image Information` you can decide, which information you would like to see inside the infrared image window.

Via `Reference bar` you can set the position of the temperature scale within the infrared image window.



The menu item `Use contrast color` can be used for highlighting particular information within the IR image.

Fig. 22 View information within image

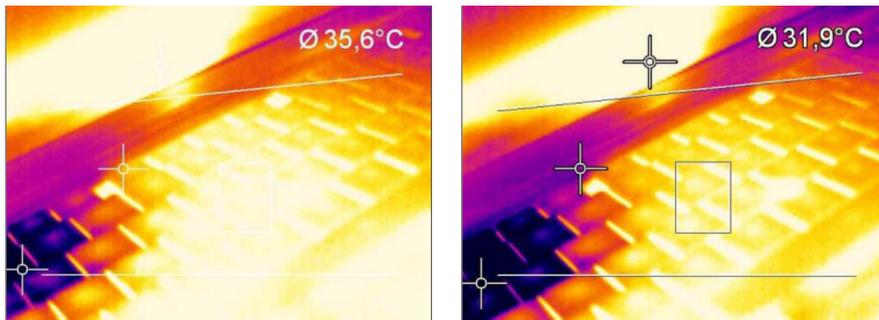


Fig. 23 Display of thermal image without and with contrast colors

4.2.4 Temperatures in Digital Displays

The menu option `View` and `Digital display` group `temperatures` allows the user to define which temperature control displays will be shown in the application window `Temperatures`, see 4.2.1. The shown predefined values can also be displayed in the temperature time diagram. Furthermore, the alarm configuration can be based on these temperatures, see 6.3, see 6.8.

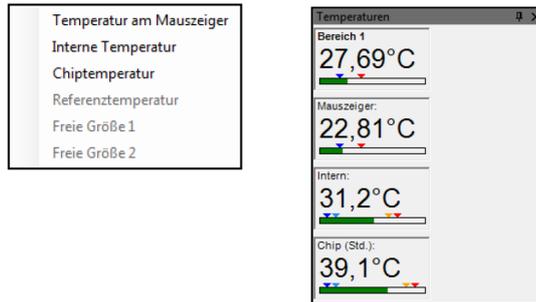


Fig. 24 Temperatures in Digital Displays

4.2.5 Layout Managements

In the menu item **Tools** and **Layout** you can manage pre-designed or your own image layouts. If you want to use an alternative layout you must activate it under **Load layout**. You can save your own layouts with user-defined names.

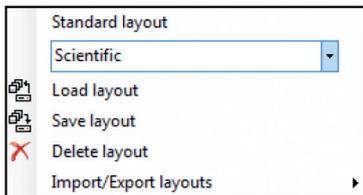


Fig. 25 View layout management

i Before you click **Save layout** you must add new layout name into the field provided, see Fig. 26.

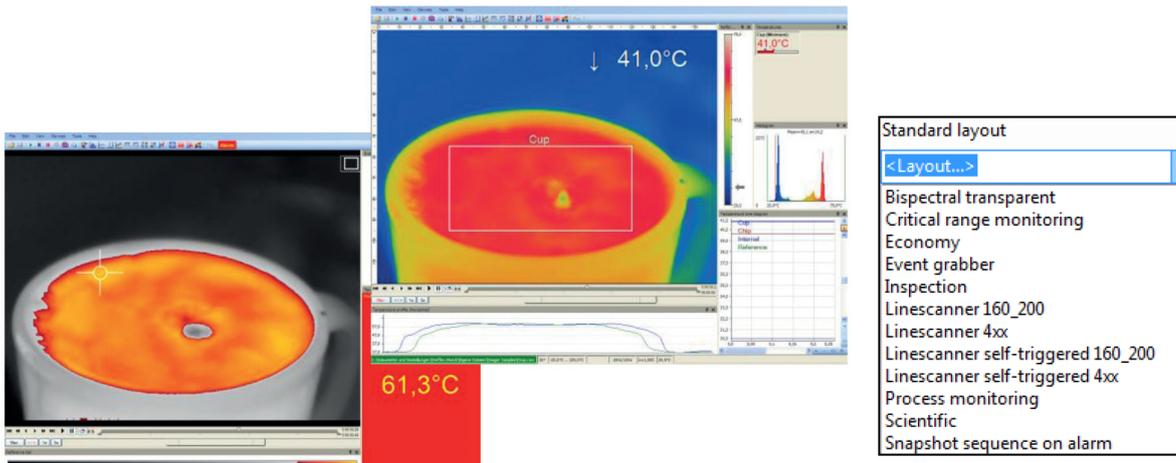


Fig. 26 View layout examples

4.2.6 Assign / Remove Layouts

In the menu item **Edit** and **Assign layout to current file** you can save files with a new layout setting.

Using **Remove layout from current file** it is possible to configure a file in a way that it has no associated layout pattern. When you play it again the layout of the previously played file will be used.

To confirm the changes as explained above you must always save the file.

➡ Please use the menu **File** and **Save** or the icon on the toolbar.



Under **Tools, Configuration** and **Extended Layout**, created layouts can be assigned to specific device types. These layouts are then only visible for the selected device types.

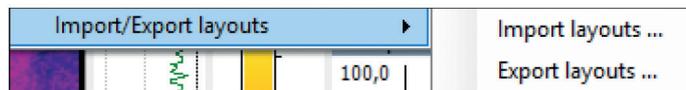
Exclusive Device Types for Layout:



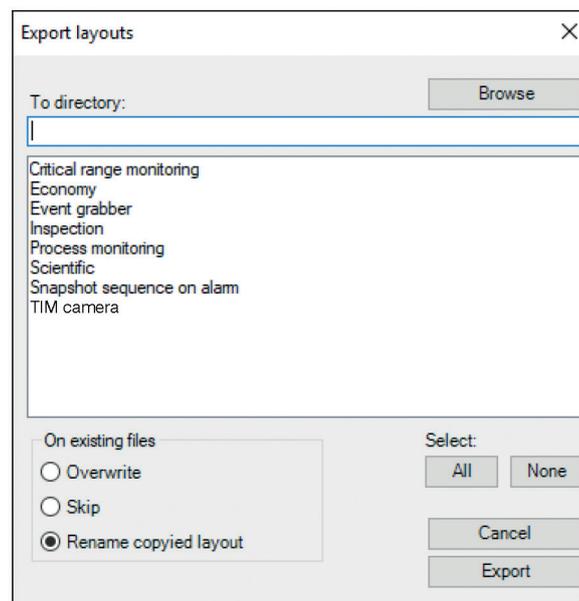
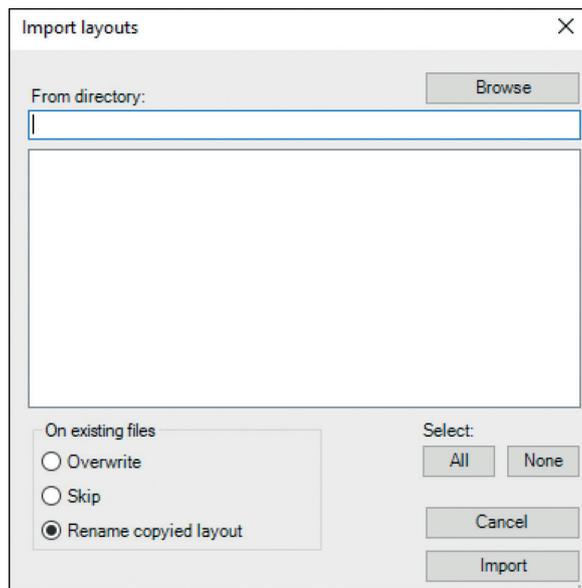
4.2.7 Import / Export Layouts

Layouts can be imported and exported in the software.

➡ To do this, go to the menu **Tools** and **Layouts** on **Import/Export layouts** and select the desired function.



- ➔ To import layouts, go to `Import layouts...` and select the layout in the directory you want to import into the software.
- ➔ Then press `Import`.
- ➔ To export layouts, go to `Export layout...` and choose the directory where you want to export the layout.
- ➔ Select the layout you want to export, then choose `Export`.



i Multiple layouts can be imported / exported simultaneously.

4.2.8 Further Information

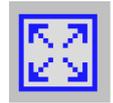
Independent whether other programs are running on your PC the TIM Connect software can always be kept in the foreground.

➡ To activate this feature please use `View and Always on top`.

All other applications will now run in the background.

The thermal image of the main window can be displayed in a full screen mode.

➡ Please use the menu `View and Full screen` or the icon on the toolbar to change the display size.

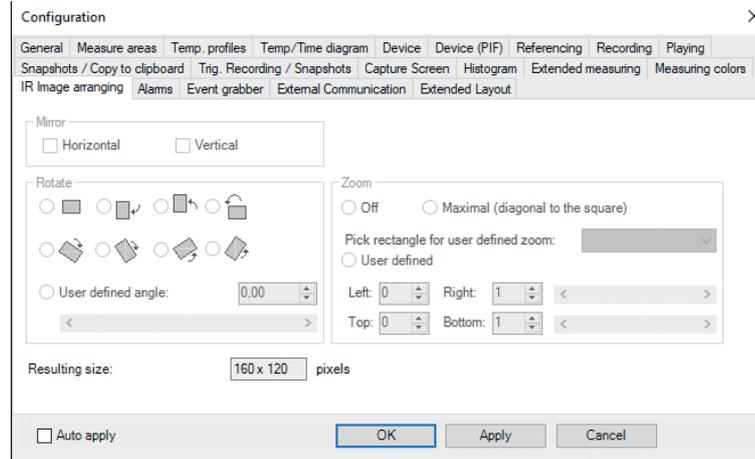


Save current configuration

➡ To save current changes in an open software instance, go to `Tools and Save current configuration` in the menu or press `Ctrl S`.

4.2.9 Arranging of Thermal Image

The thermal image within the main window of the software can be displayed in various ways using the menu Tools, Configuration and IR Image arranging.



4.2.9.1 Mirroring of Displayed Image

Sometimes, depending on the fitting position of the thermoIMAGER TIM, it is useful to Mirror the camera image horizontally or vertically. Either the image will be adjusted by the menu mentioned above or under Tools and Mirror.



Fig. 27 View Mirror

4.2.9.2 Rotating of Displayed Image

By tagging an icon it is possible to Rotate the thermal image into a different position. Alternatively, a manual adjustment can be done by defining a User defined angle.

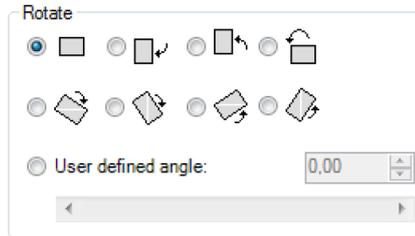


Fig. 28 View Rotate

4.2.9.3 Zooming in Areas of the Displayed Image

Using the **Zoom** option a detail of the image can be enlarged in the main window by the position information. The option can be activated by tagging the **Maximal (diagonal to the square)** field.

Furthermore you can use **Pick rectangle** for user defined zoom.

The corresponding measuring area can be selected. When **User defined** is selected, the coordinates **Left**, **Right**, **Top** and **Bottom** can be entered manually. The **Resulting size** of IR image will be shown below.

Zoom

Off Maximal (diagonal to the square)

Pick rectangle for user defined zoom:

User defined

Left: 40 Right: 120

Top: 30 Bottom: 90

Resulting size: 80 x 60

Fig. 29 View Zoom

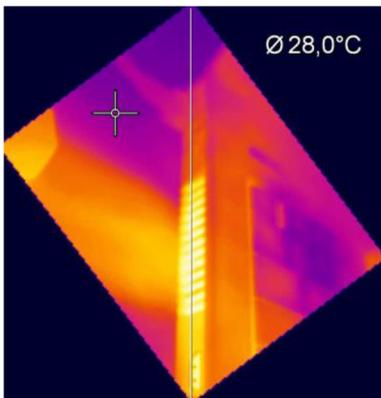


Fig. 30 View resulting size

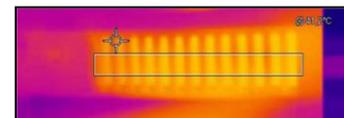
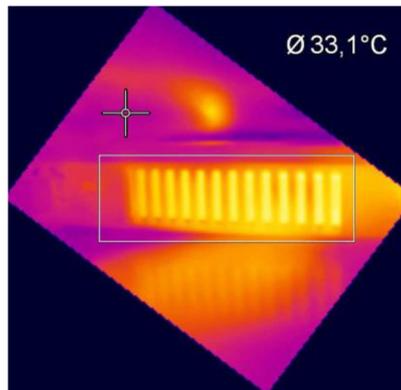


Fig. 31 Rotation and zooming of a defined measure area

4.3 Image Configuration

4.3.1 Calibration Files

The menu `Tools, Extended and Load calibration data` enables to boot the calibration data for the currently connected thermoIMAGER TIM.

4.3.2 Correction of Camera Calibration

Due to the thermal drift of bolometers all measuring IR cameras need an offset correction every few minutes.



This correction is done by a motor driven motion of a blackened metal piece (so called flag) in the front of the image sensor. In this way each image element is referenced with the same temperature. During those offset calibrations thermal cameras do not measure (time is dependent on model and video mode). In order to minimize this disturbing effect the offset correction can be initiated manually or by an external control pin at a suitable point of time.

In the `Devices and Refresh flag` menu or via the icon on the toolbar the Flag (Shutter) can be refreshed manually.

The automatic correction of camera can also be set by defining minimum or maximum intervals via the menu `Tools, Configuration and Device`.

The options `Flag automatic` and `Min. Interval control` that the flag will not be released before a given time period even though it might be required by the thermoIMAGER TIM. If the `Max. Interval` is defined the flag will always be released after a certain time period even if not required by the thermoIMAGER TIM.

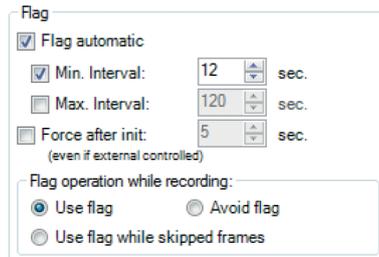


Fig. 32 View Flag

Force after init. means that the flag is pulled when the camera is initialized and the temperature range or video format is changed, even if it is controlled externally. The time delay is set to 5 s by default.

Using the option `Flag operation while recording` and `Use flag` the correction is activated even if the camera is recording. If `Avoid flag` is chosen the camera will not be corrected while recording. The option `Use flag while skipped frames` is suitable at slow data capturing (3 Hz or less) as the correction will take place automatically between two recorded images (correction time app. 250 ms).

i The manual or automatic flag functionality is not available if the flag is externally controlled, e.g. via the Process Interface input, [see 4.5](#).

NOTICE

Use the flag in environments with high-energy radiation (e.g. lasers) to protect the detector from damage!

4.3.3 Detector Heating (Chip Temperature Mode)

The bolometer chip temperature can be set under `Configuration and Device`. `Standard (Floating)` means that the chip heater is off. The chip temperature results from the ambient temperature.

With `Automatic`, a predefined temperature is set. And a fixed chip temperature can be set with `Fixed value`.

Detector heating (Chip temperature mode)

Standard (Floating) Automatic

Fixed value 55 [°C]

i The detector heating (Chip temperature mode) setting is only available for the TIM series because there is no chip heater integrated for the thermoMETER TIM 8 / thermoIMAGER TIM 40 series.

For the G7 models of the TIM series, the detector heating is automatically on and not adjustable.

4.3.4 Emissivity, Transmissivity, Ambient Temperature

Using the menu **Tools, Configuration and Device** the **Emissivity** and the **Transmissivity** (IR-window compensation) can be set.

The transmissivity is referring to the loss of radiation if an object's surface is measured by looking through a suitable window.

Knowing the **Ambient temperature** is inevitable for a correct temperature measurement. The ambient temperature value is delivered by the camera's internal sensor by default. Alternatively, the value can be set as a fixed value.

Fixed radiometric values

Emissivity: 1,000

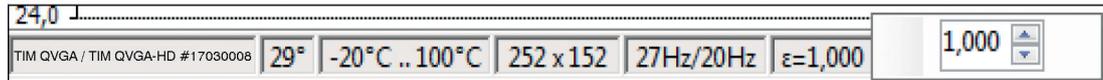
Transmissivity: 1,000
(IR-window compensation)

Ambient temperature: 23,0

Fig. 33 View Fixed radiometric values

Alternatively, the emissivity can also be changed via the status bar in the TIM Connect software window.

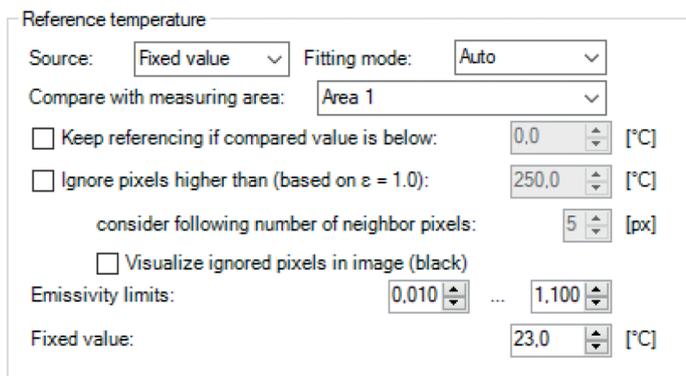
➡ To do this, make a right-click on emissivity.



i In case that the emissivity and / or the ambient temperature values are controlled through the Process Interface (PIF) the here defined values will be ignored, [see 4.4](#). The display of actual values will be shown in the status bar.

4.3.5 Reference Temperature

The detector of the thermal imager has a thermal drift over the time and must be corrected by self referencing. At applications where a high measurement accuracy is needed, the thermal image can be corrected permanently by setting a reference temperature. Using the menu `Tools, Configuration, Device` and `Reference temperature` several options for manual or automatic correction can be set.



The screenshot shows a configuration window titled "Reference temperature". It contains the following settings:

- Source: Fixed value (dropdown)
- Fitting mode: Auto (dropdown)
- Compare with measuring area: Area 1 (dropdown)
- Keep referencing if compared value is below: 0,0 [°C]
- Ignore pixels higher than (based on $\epsilon = 1.0$): 250,0 [°C]
- consider following number of neighbor pixels: 5 [px]
- Visualize ignored pixels in image (black)
- Emissivity limits: 0,010 ... 1,100
- Fixed value: 23,0 [°C]

Fig. 34 View Reference Temperature

If there is an area within a thermal image having a constant temperature value (e.g. black body) the `Source` can be defined as a `Fixed value`. When using the TM-BR20AR-TIM ambient radiator, the `External probe` option must be selected. By the option `Compare with measuring area` the area with constant temperatures can be determined. The known reference value can be set within `Fixed value`. If the temperatures are changing slightly within the defined area due to a thermal drift, the whole image will be corrected by a certain factor.

Alternatively, the correction can be done by an external value (e.g. via connected pyrometer) by choosing the `Process Interface PIF` in, [see 4.4](#).

There are several `Fitting modes` to adjust the thermal image:

Auto	The software is choosing the best way of correcting the image (offset or gain).
Offset	This kind of correction is recommended if there are big temperature differences between the reference temperature value and the thermal image.
Gain	This kind of correction is recommended if there are small temperature differences between the reference temperature value and the thermal image.

Keep referencing if value of reference area is below: x [°C]:

No new reference is made if the reference sensor does not reach the temperature.

Keep referencing if value of reference area is below x [°C]:

No new reference is made if the reference measurement area does not reach the temperature. The setting is required to detect that no material (e.g. glass) is present.

Ignore pixels higher than (based on $\epsilon = 1,0$):

Pixels above a certain blackbody temperature that should not be included in the calculation of the reference measure area can be ignored. This means that hot glass edges are not taken into account for low-emissivity glass. In addition, for each invalid pixel you can specify how many neighboring pixels should also be considered invalid.

Emissivity limits:

A typical emissivity for the process should be specified here.

4.3.6 Changing the Optics (not with thermoMETER TIM 8 / thermoIMAGER TIM 4x)

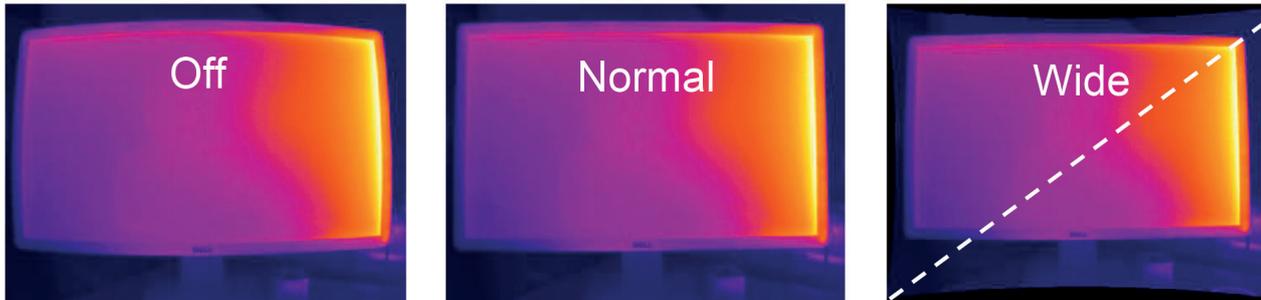
Using the menu `Tools, Configuration and Device` the `Optics` depending on the camera configuration must be chosen. As a standard the camera can be delivered with different type of lenses. If the camera is ordered with several additional lenses the currently used optics must be chosen in this menu (only for TIM series).



Fig. 35 View Optics

With the help of the menu point `Radial Distortion Correction`, the camera image can be corrected in such a way that the image distortion is compensated by the optics (barrel distortion). This distortion occurs especially in wide-angle optics. It can be selected between `Off`, `Normal` and `Wide`.

The `Wide` mode is designed primarily for line scanning applications with scanning on the diagonal. This ensures full use of the optics when the distortion correction is activated.



4.3.7 Changing the Temperature Range

Using the menu `Tools, Configuration and Device` the most suitable `Temperature range` for the process can be set. The thermoIMAGER TIM features different temperature ranges depending on the device.

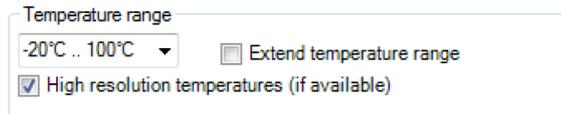
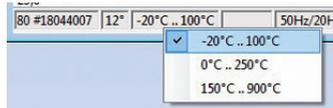


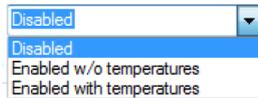
Fig. 36 View Temperature Range

Alternatively, the temperature range can also be changed via the status bar in the TIM Connect software window.

➡ To do this, make a right-click on the temperature range.



A useful function is the adjustable, extended temperature range under `Extended`. The temperature range `150 °C ... 900 °C` can be extended from `20 °C`. The accuracy between `20 °C ... 150 °C` is no longer exact. This function is used to display an IR image with or without temperatures between `20 °C ... 150 °C`. This is especially useful if an IR image is to be displayed between the hot processes.

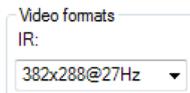


i The extended temperature range is usable for all TIM 160S / TIM QVGA / TIM QVGA-HD / TIM QVGA-G7 / TIM 640 VGA / TIM VGA-G7 cameras, calibrated from March 2017 onwards and for all thermoMETER TIM 8 / thermoIMAGER TIM 40.

With `High resolution temperatures (if available)`, the temperature display has two decimal places instead of one decimal place. This function is only available for certain camera models.

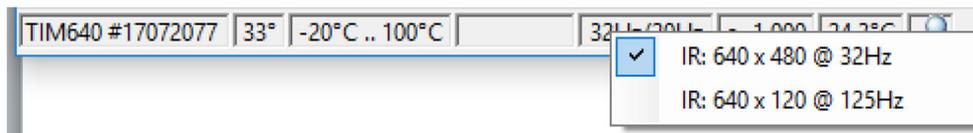
4.3.8 Video Formats (Device Framerate)

The cameras have different framerates. To change this, go to **Tools, Configuration and Device** in the menu.

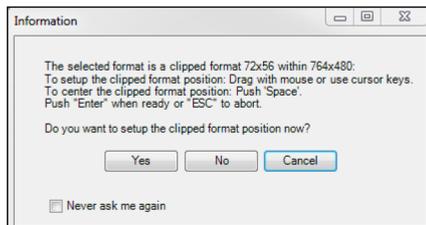


Alternatively, the device framerate can also be changed via the status bar in the TIM Connect software window.

➡ To do this, click on the device framerate with the right mouse button.



With the camera TIM M-1/ M-05, the user has the possibility to choose the 1 kHz mode. If this is selected, a window appears with the information that the clipped format will be changed and the position of the section itself can be set.



4.4 Imager Interfaces for TIM and thermoIMAGER TIM 40 Camera

4.4.1 General

The imager is equipped with a Process Interface (cable with integrated electronics and terminal block), which can be programmed via the software as an Analog Input (AI) and Digital Input (DI) in order to control the camera or as an Analog Output (AO) in order to control the process. The signal level is always 0 - 10 V.

The Process Interface can be activated choosing the following options:

Analog Input (AI)	Emissivity, Ambient temperature, Reference temperature, Uncommitted value, Flag Control, Triggered Snapshots, Triggered Recording, Triggered Linescanner, Triggered event grabber, Reset Peak-/Valley-Hold, Switch temperature range
Analog Output (AO)	Main measure area, Measure area, Internal temperature, Flag Status, Recording Status, Line scan status, Alarm, Frame sync, Fail-safe, External Communication, Center pixel (direct output) ¹
Digital Input (DI)	Flag Control, Triggered Snapshots, Triggered Recording, Triggered Linescanner, Triggered event grabber, Reset Peak-/Valley-Hold, Switch temperature range

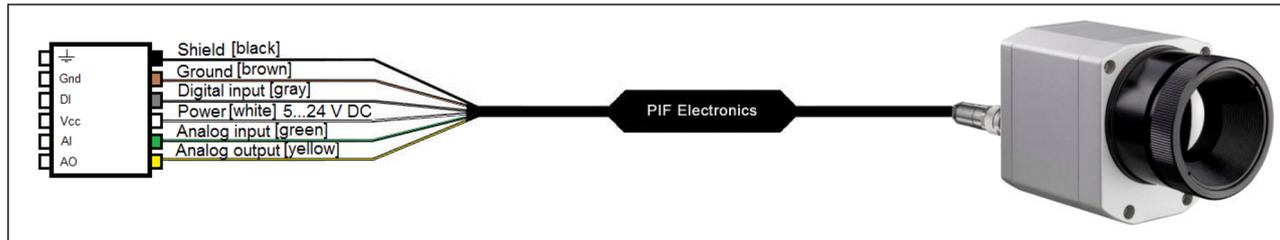


Fig. 37 Configuration Process Interface (PIF)

1) Function only available for models TIM M-1, TIM M-05

Uncommitted value	Here, an external value (e.g. pressure) can be integrated into the software.
Frame synchronization	In this function, a needle pulse is output for synchronization with fast processes at the beginning of each frame.
Center pixel (direct output)	At a frame rate (e.g. 1 kHz), the center pixels of 8x8 pixels of the selected format (e.g. 72x56 pixels) are always used and are available as a direct output. A real-time analog output (1 ms) is realized. The window-operating delay has no influence on the output time. The format section (e.g. 72x56 pixels) can be freely positioned in the entire available FOV. This feature is only available for the PI 1M/ 08M/ 05M models.

4.4.2 Process Interface (PIF) for TIM and thermoIMAGER TIM 40 Camera

Using **Tools**, **Configuration** and **Device PIF** menu you can configure a PIF which is connected to the camera. The number of in- and outputs can vary depending on the connected PIF (Standard-PIF or Industrial PIF). An available in- or output will be marked with a green checkmark ✓. A not available in- or output will be marked with a red x. With **Show all available in-/outputs**, only the available inputs/outputs are displayed. If you configure an analog value an additional window will show up if you press the **Setup** button. In this window you can scale the in- or output:

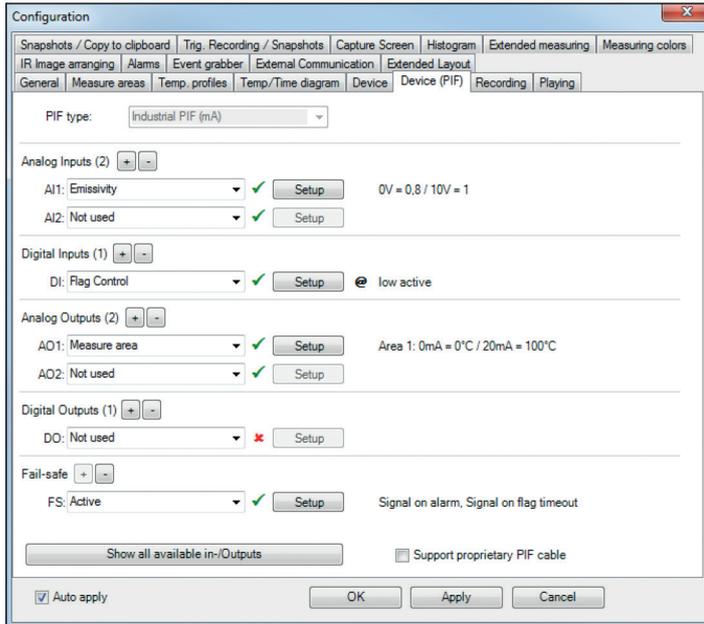


Fig. 38 View configuration

On the analog inputs you can select each function only once (exception: Uncommitted value).

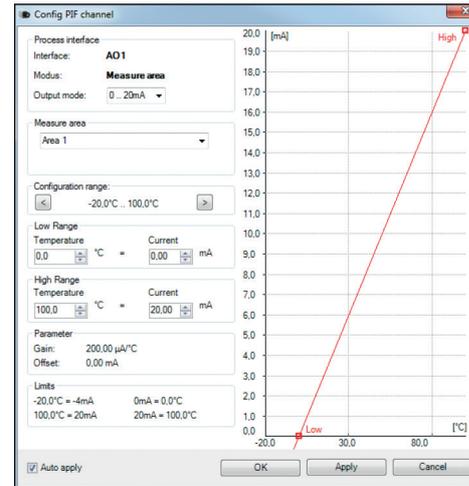


Fig. 39 View Config PIF channel

On the analog outputs also each function can only be selected once (exception: Measurement area; Alarm).

i You can use the analog inputs, outputs and the digital input of the PIF simultaneously.

i The alarm output can be configured as a threshold between 0 - 4 mA for no alarm and between 10 - 20 mA as alarm. For values outside the respective range, the relay does not switch on the DO.

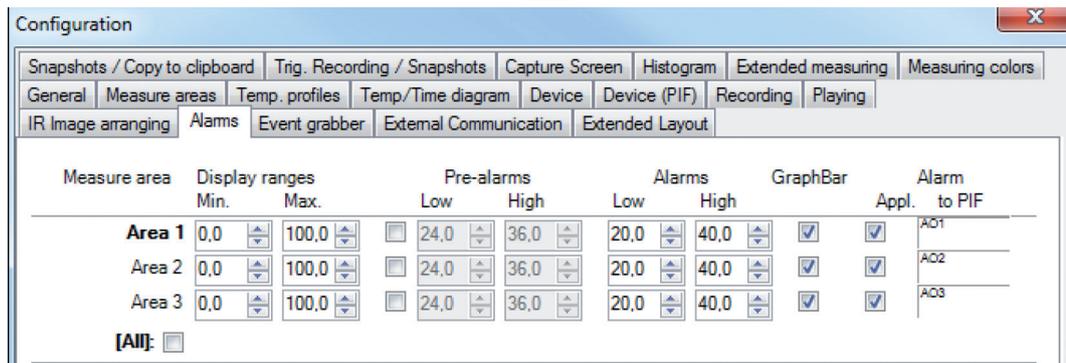


Fig. 40 View configuration

If you activate the function **Alarm** on an analog output you need to assign also in the **Alarms** tab the desired measurement area to the desired PIF output.

The industrial PIF has a maximum of three analog outputs.

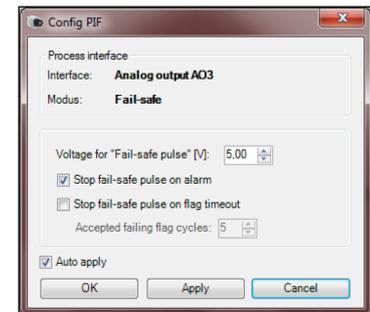
For more information on the settings for alarms, [see 6.8](#).

The Process Interface has an integrated fail-safe mode. This allows to control conditions like interruption of cables, shut-down of the software etc. and to give out these conditions as an alarm. The time constant of the fail-safe is 1.5 seconds.

Controlled conditions on camera and software	Standard Process Interface TM-PIF-TIM	Industrial Process Interface TM-PIF-Cxx-TIM
Controlled USB cable to camera	✓	✓
Interruption data cable camera - PIF	✓	✓
Interruption power supply - PIF	✓	✓
Shut-down of TIM Connect software	✓	✓
Crash of TIM Connect software	-	✓
Fail-Safe output	0 V at analog output (AO)	Open contact (fail-safe-relay) / red LED on

The failsafe function can be activated in the tab `Device (PIF)` under `FS`. The industrial PIF has a separate failsafe relay.

Alternatively you can activate this function also on the analog outputs. The checkbox `Stop fail-safe pulse on alarm` must be activated, if the analog output should be used in addition as an alarm output for a temperature alarm. In case of an alarm the alternating fail-safe pulse signal will stop and the set voltage level will be given out as constant value (Industrial PIF only).



4.5 Software Development Kit (SDK)

4.5.1 Interprocess Communication (IPC)

Tools, Configuration, External Communication and Interprocess Communication (IPC) enables you to embed colors, temperatures or ADU values into other applications via Dynamic Link Library (DLL). In addition, a Timeout can be set when the connection has been interrupted. The Internal buffer size is the size of the queue between TIM Connect and Connect SDK (unit: frames).

Mode

Off Connect SDK (IPC) COM-Port

Connect SDK / Interprocess Communication (IPC)

Mode:

Internal buffer size:

Timeout [sec.]

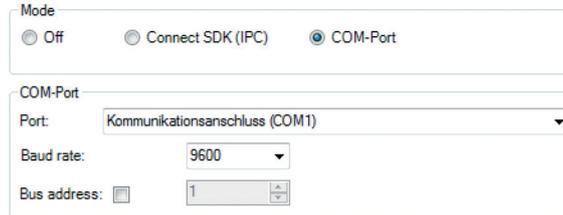
Fig. 41 View Interprocess Communication - IPC

i The command list (Connect SDK Description-xxxx-xx) can be found on the USB stick under Documentation and Manuals.

4.5.2 COM-Port

You can activate the feature in the `Tools, Configuration, External Communication` and `Comport` menu.

If selected the data values sent out by the camera can be transmitted via specified `Port`. The `Baud rate` can be changed (from 1200 to 921600) accordingly. The `Bus address` is used to assign an unique address to each participant.



The screenshot shows a configuration window with two main sections. The top section, labeled 'Mode', contains three radio buttons: 'Off', 'Connect SDK (IPC)', and 'COM-Port'. The 'COM-Port' radio button is selected. The bottom section, labeled 'COM-Port', contains three fields: a 'Port' dropdown menu showing 'Kommunikationsanschluss (COM1)', a 'Baud rate' dropdown menu showing '9600', and a 'Bus address' field with a checkbox and a spinner box showing '1'.

Fig. 42 View Mode - Comport

- Two software development kits are offered: `Connect SDK` (provides a very large range of functions, `TIM Connect` software must run as a background process) and `Direct SDK` (does not require `TIM Connect` software, the library `libirimager` provides a C++ interface for Linux and Windows). You will find more details on using the SDKs on the USB stick provided.
- The command list (`Serial Communication Description-xxx-xx`) can be found on the USB stick under `Documentations and Manuals`.

4.5.3 Web Server

Over Tools, Configuration, External Communication and Web Server the camera image can be transmitted via a corresponding client such as a web browser.

Under Mode you can select which section is to be transferred. The following can be selected:

Fullscreen, Application, IR image only or User Defined.

The screenshot shows the 'Web Server' configuration window. The 'Mode' section has radio buttons for 'Off', 'Connect SDK (IPC)', 'COM-Port', and 'Web Server' (selected). A 'Direct temperature mode' checkbox is present and unchecked. The 'Mode' section below has radio buttons for 'Fullscreen', 'Application' (selected), 'IR Image Only', and 'User Defined'. The 'Server Settings' section includes a 'Port' dropdown set to '8080' and a 'Framerate [Hz]' dropdown set to '20'. The 'Server Status' is 'Server is Stopped' in a red box. The 'Link' is 'http://127.0.0.1:8080' and 'Autostart' is unchecked. 'Start' and 'Stop' buttons are visible. The 'IP-Address for Link' dropdown is set to 'Localhost (127.0.0.1)'.

Under Server Settings the Port and the Framerate can be selected.

In addition, the host must be selected under IP-Address for Link.

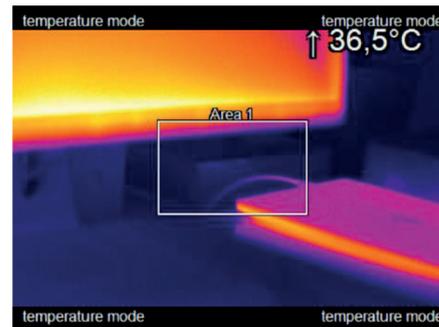
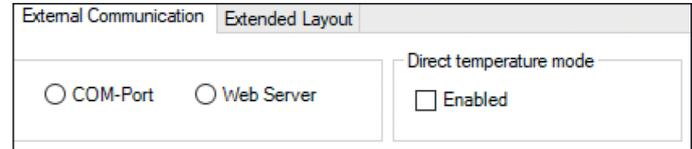
The screenshot shows the 'Web Server' configuration window with the server running. The 'Server Status' is 'Server is running' in a green box. The 'Link' is 'http://192.168.49.180:8080' and 'Autostart' is checked. The 'Start' button is highlighted in blue. The 'IP-Address for Link' dropdown is set to 'Realtek USB GbE Family Controller #4 (192.168.49.180)'. Other settings like Port (8080) and Framerate (20 Hz) remain the same.

To start streaming, the application must be started via Start. If everything has been configured correctly, the message Server is running appears in green. The link with the corresponding port number is displayed and can be selected directly here.

4.5.4 Direct Temperature Mode (only for thermoMETER TIM 8 and thermoIMAGER TIM 4x)

A special feature of the TIM 8 and TIM 41 cameras is that the temperature calculation can be calculated in the device. To activate this special mode, go to Tools, Configuration and External communication to Direct temperature mode.

If the mode has been activated, the mode is marked extra in the IR image with temperature mode.



i A detailed description (Optris Easy Comm via Ethernet) can be found on the USB stick under SDK and Easy Comm. Easy Comm is a small and simple software solution for developers who want to have direct access to temperature data from the infrared cameras. The complex temperature calculation is completely processed in the device and the user of Easy Comm gets the temperature information of all pixels.

4.6 Start Options

4.6.1 Overview of Start Options

TIM Connect software can be started with additional starting parameters using the command line.

- ➔ Please change the linkage in the software settings via the launch icon on the desktop. Behind the command line please add a space character and the required command parameter, e.g. "C:\Program\...\TIM Connect\Imager.exe" /?



Fig. 43 Program icon TIM Connect

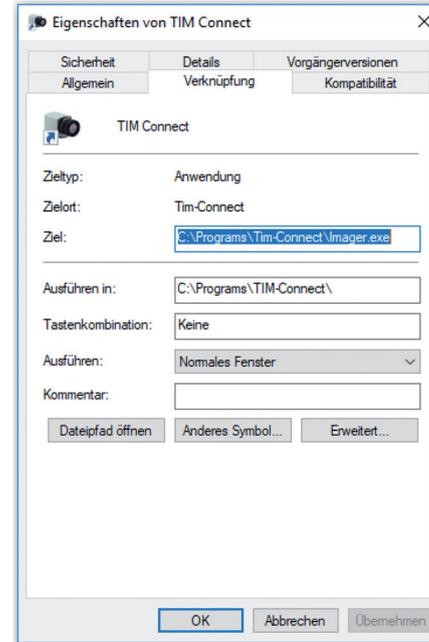
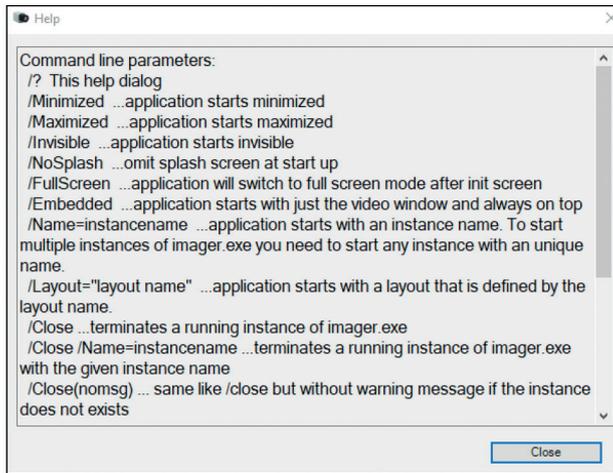


Fig. 44 View TIM Connect Properties

Starting the software via the launch icon you will get an overview of possible commands:

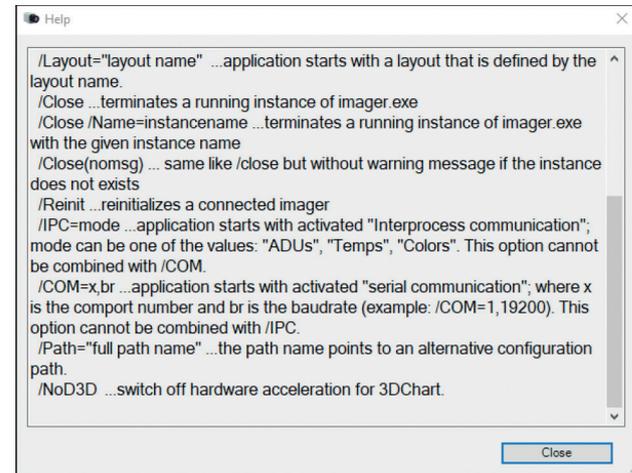


```

Command line parameters:
/? This help dialog
/Minimized ...application starts minimized
/Maximized ...application starts maximized
/Invisible ...application starts invisible
/NoSplash ...omit splash screen at start up
/FullScreen ...application will switch to full screen mode after init screen
/Embedded ...application starts with just the video window and always on top
/Name=instancename ...application starts with an instance name. To start
multiple instances of imager.exe you need to start any instance with a unique
name.
/Layout="layout name" ...application starts with a layout that is defined by the
layout name.
/Close ...terminates a running instance of imager.exe
/Close /Name=instancename ...terminates a running instance of imager.exe
with the given instance name
/Close(nomsg) ... same like /close but without warning message if the instance
does not exists
  
```

Fig. 45 View help dialog

i Using the parameter `Invisible` the software can only be closed via the `Task Manager` and `Processes`.



```

/Layout="layout name" ...application starts with a layout that is defined by the
layout name.
/Close ...terminates a running instance of imager.exe
/Close /Name=instancename ...terminates a running instance of imager.exe
with the given instance name
/Close(nomsg) ... same like /close but without warning message if the instance
does not exists
/Reinit ...reinitializes a connected imager
/IPC=mode ...application starts with activated "Interprocess communication";
mode can be one of the values: "ADUs", "Temps", "Colors". This option cannot
be combined with /COM.
/COM=x,br ...application starts with activated "serial communication"; where x
is the comport number and br is the baudrate (example: /COM=1,19200). This
option cannot be combined with /IPC.
/Path="full path name" ...the path name points to an alternative configuration
path.
/NoD3D ...switch off hardware acceleration for 3DChart.
  
```

4.6.2 Start of Multiple Software / Imager Instances

In case you are using more than one TIM simultaneously each imager can be linked to one software instance. In order to setup further software instance please follow the steps below:

- ➡ Duplicate the software icon at the desktop.
- ➡ Optional: Change the name of the new software icon at the desktop, e.g. Imager1.
- ➡ Make a right click on the new icon, click on **Properties**, go to **Shortcut and Target** and at the end of the line type the new name in: „C:\Programme\...\TIM Connect\Imager.exe“ **/Name=Imager1**, see 4.6.1.

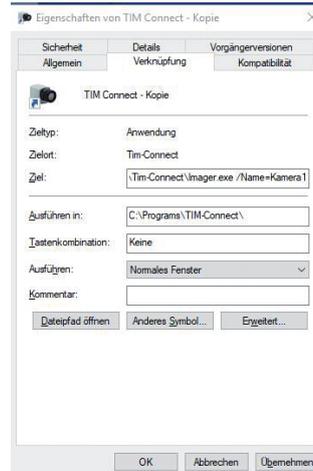


Fig. 46 View Imager 1 Properties

- ➡ Optional: Change the title name using the start parameter in the TIM Connect software, [see 4.1.5](#).
- ➡ Start the software using the new software icon.
- ➡ Link a camera to the new software instance in the TIM Connect software.
- ➡ In order to set up the last step please go to menu `Tools, Configuration and Device` and select in `Application start` the favored imager for the respective software instance.



Fig. 47 View Application start

Starting the software via the new desktop icon the linked imager will be displayed automatically. SN is the serial number of the individual camera.

Note that each camera can only be linked once with a software instance.

•
i

Note that each camera can only be linked once with a software instance.

- ➡ To ensure a smooth configuration, connect one camera first, go through the above steps and then start with the second camera and so on.

5. Data Capturing

5.1 Open Files

Via the menu `File` and `Open` or the Icon on the toolbar you can open all files which can be processed by the software.



i Via the menu `File` and `Reopen` you can easily reopen captured files if the option in is activated, see 5.6.6.

5.2 Replay of Files

5.3 Control Panel

In order to replay a video sequence you can use different options in the `File` menu or at the control panel. The video control panel contains:



Fig. 48 View Control Panel

	Start		End
	Rewind		Play
	Previous image		Pause
	Next image		Play in loop
	Forward		Play selection only

5.4 Replay Options

Via the menu **Tools, Configuration, Playing and Playing options** you can modify the Play rate of recorded video sequences. This feature ensures that you can replay a video of a fast process in slow motion in order to analyze it in more details.

Additionally, you can define to replay a recorded video in a loop (Infinite loop playing) or to Play selection only. To define a selection the position marks on the time bar needs to be set. All mentioned settings can also be changed via the control panels below the main window.



Fig. 49 View Replay Options

i The replay settings only refer to the current file shown in the main window. All definitions, however, can be saved in an individual layout assigned to the file.

The software allows you to change measurement parameters later on. Via the menu **Tools, Configuration, Playing and While playing** use this alternative values and settings you can adjust the parameters **Emissivity, Ambient temperature and Transmissivity** to the measurement conditions. Above that, via **Disable recorded Reference temperature** you can deactivate reference value stored in the file.

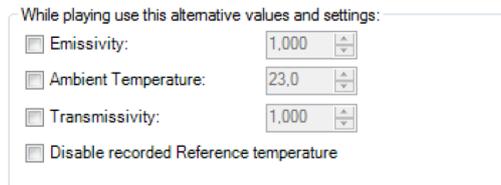
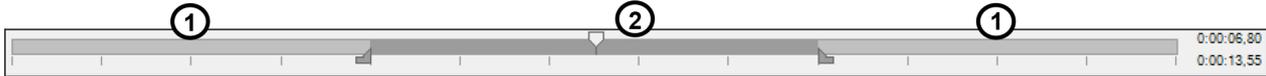


Fig. 50 View Value selection

5.5 Editing Video Sequences

The selected video can be edited by using `Trim to selection` option in the `Edit` menu.

A time bar tool is shown on the bottom of the image. Set the position marks on the time bar to select the beginning and end of the video sequence you want to be edited. The not selected video sequence parts (bright grey) ① will be deleted by choosing `Trim to selection` option. The selected video sequence (dark grey) ② will remain.

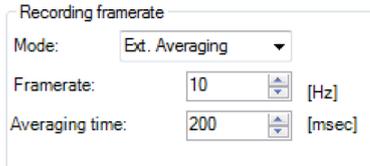


5.6 Saving Files

5.6.1 Setting the Recording Frame Rate

The camera's maximum frame rate depends on the camera model you're using and can be reduced. Using `Tools, Configuration, Recording` and `Recording framerate`, the speed of the data capturing can be set.

Typically, the specification is in Hertz (Hz, images per second).



Recording framerate

Mode: Ext. Averaging

Framerate: 10 [Hz]

Averaging time: 200 [msec]

Fig. 51 View Recording framerate

The software gets the full frame rate from camera. That is why you need to define what to do with the images which are left if choosing a reduced frame rate. There are several alternatives to set in the `Mode` option:

Off	The recording frame rate corresponds to the device frame rate of the camera.
Skipping	It skips so many pictures that the set display frame rate results.
Average	The pixels are averaged out of a sequence of images. This weakens the detector noise.
Minimum	From a sequence of image, the smallest value is displayed for each pixel.
Maximum	From a sequence of image, the highest value is displayed for each pixel.
Ext. Averaging	Is a combination of average and skipping and is used at very low frame rates. The <code>Averaging time</code> indicates how many percent of the set frame time should be averaged. In the remaining time, the frames are skipped (e.g., if the frame rate is 1 Hz and the averaging time is 100 ms, then 100 ms is averaged and 900 ms is skipped).

Fig. 52 Options under Recording framerate - Mode

Example: Recording frame rate of 4 Hz
(output signal of 25 images)

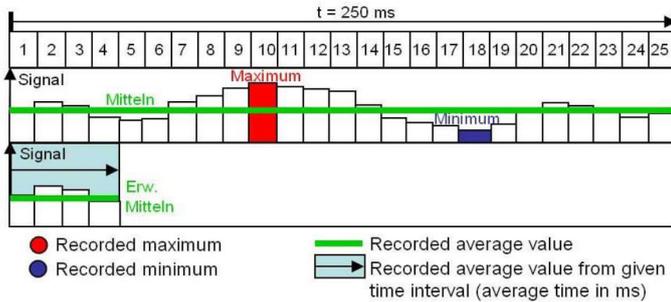


Fig. 53 Example diagram Recording frame rate

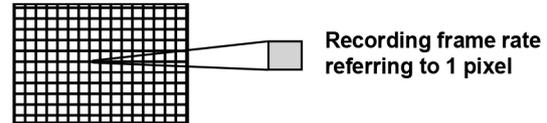
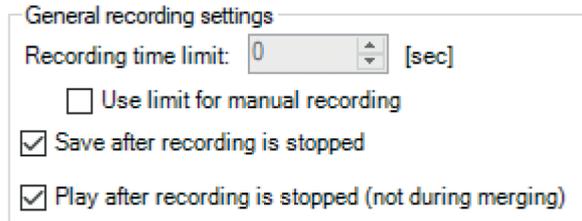


Fig. 54 Recording frame rate referring to 1 pixel

5.6.2 Setting the Recording Modes

If desired the `Recording time limit` sets fixed recording time in seconds (max. 86400 seconds = 24 hours). After reaching the time limit the software stops the recording.

If a manual recording is to be started with a defined time duration, the `Use limit for manual recording` option must be activated.



General recording settings

Recording time limit: [sec]

Use limit for manual recording

Save after recording is stopped

Play after recording is stopped (not during merging)

Fig. 55 View General recording settings

Choosing the option `Save after recording is stopped` the images will be saved without further notice. If the option `Play after recording is stopped` is activated the saved images will be played automatically in the main window. The recording contains radiometric Videos (RAVI file) which allow users to do a detailed post-analysis anytime later. Moreover, new measure areas and alarms can be created in addition to recorded data when doing the analysis. The temperature value of each pixel as well as information on defined measure areas is recorded.

i The status of recording is displayed at the bottom notice bar. The background color will turn RED when recording.



TIMIMAGER #14110023 Aufnahme: 00:00:27 155,8MB

Fig. 56 Bottom notice bar for recording status

By activating the Advanced recording function, the recording is started immediately and without delay.

Advanced recording

Trigger time

Pre-Trigger [sec] Trigger delay

< >

-26 26

A special feature of this function is also the possibility to configure a recording by a `Trigger time` with a `Pre-Trigger` or a `Trigger delay`. This means that it is possible to make a recording in the past. When an alarm condition occurs, it is possible to start the recording a few seconds earlier or later by setting a trigger time. This ensures that the event is recorded completely. The length of the recording can be defined by `Recording time limit`.

5.6.3 Temporary Recording File

➡ Choose the directory for saving your temporarily recorded video file.

Temporary recording file

Estimated file size: 2,1MB/sec; 126,3MB/min; 7,4GB/h

Fig. 57 View Temporary Recording File

The `Estimated file size` is estimated to indicate the amount of megabits needed or consumed. It can be checked whether the available hard disk is sufficient for the desired recording time.



This temporary file will be overwritten with each new recording.

5.6.4 Saving Radiometric Video Sequences

Video sequences can both be saved as a radiometric file (RAVI). RAVI files contain all temperature as well as measure area information.

For recording a video sequence you can use either the menu `File` and `Record` or the available icon on the toolbar.



For stopping a video sequence you can use either the menu `File` and `Stop` or the available icon on the toolbar.



If the video sequence includes the expected content you can save it via the menu `File` and `Save` or the icon on the toolbar.



5.6.5 Saving Image Data as Radiometric Snapshot or Text File

Snapshots are single, radiometric images based on a video sequence, this means they are contain all temperature as well as measure area information. Thus the images can always be analyzed in detail later on.



Snapshots can be captured via the menu `File` and `Snapshot` or via the icon on the toolbar.

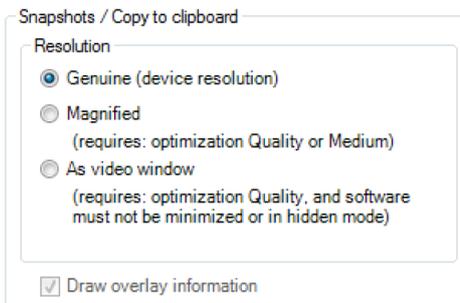


Fig. 58 View Snapshots

Using the settings in the menu `Tools, Configuration and Snapshots / Copy to clipboard` you can define how a snapshot is copied into the clipboard or stored on the computer. Either the snapshot will be saved in the `Genuine (device resolution)` corresponding to the camera's resolution, `Magnified` (Magnification for TIM 160S to four times the resolution, for TIM QVGA, TIM QVGA-HD, TIM QVGA-G7 to double, and for TIM 640 VGA / TIM VGA-G7 and TIM M-1, the original device resolution remains) or using `As video window` (as illustrated video window). The option `Draw overlay information` will display all information, such as measuring area or temperature display and is stored on the image. If the checkmark is not set, only the pure thermal image is stored without values and information.

i The option `Genuine (device resolution)` needs to be chosen if you want to save and display (snapshot history) the identical snapshot. Otherwise, the camera image taken before the snapshot will be displayed in the history.

If the option `Open a file dialog` is tagged you will always be asked about the location, the file name and the file type before saving a snapshot.

Having chosen the option `Generate filename by template` the snapshots location and name will be generated based on the settings in the menu `Tools, Configuration and Trig. Recording / Snapshots`, see 5.6.7.



Fig. 59 View Filename for manual triggered snapshots

In the `Tools, Configuration and Trig. Recording / Snapshots` menu you define the File type for triggered snapshots.



Fig. 60 View File type for triggered snapshots

The option `Max. triggered snapshots` sets the number of displayed snapshots in the separate window `Snapshot history window`, see 4.2.1. If `Ignore last snapshot (if available)` is activated only the latest snapshot will be displayed in the snapshot history window if a new snapshot is captured.

`Show image of VIS camera (if available)` implies that the visible image if available will be saved too.

`Reverse order` implies that the sequence of the pictures will be shown in the snapshot history in reverse order.

Create link in "reopen file" list for triggered video sequences and snapshots implies that the snapshots or triggered videos are listed under File and Reopen.

There are the following options to save image data:

TIFF (*.tiff)	Saving of image (snapshot) as radiometric picture in TIFF format.
Text (Image data) (*.csv)	Saving of image (snapshot) as Text format to edit information in Excel.
Text (Temp. profile data) (*.csv)	Saving of temperature profile data only as Text format to edit information in Excel.

The TIFF files are saved as radiometric files and can be analyzed in detail with the TIM Connect software. Furthermore, they can also be displayed in any standard program like Photoshop showing the color information within the image.

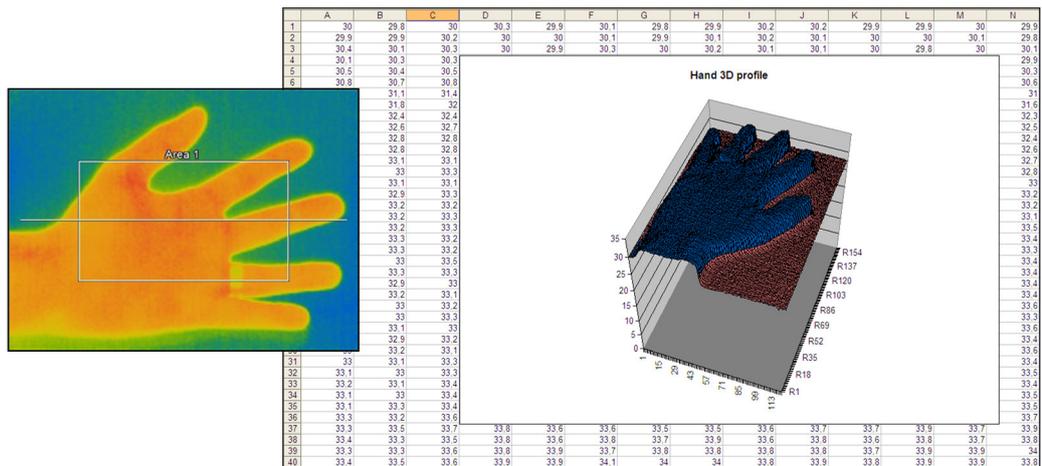


Fig. 61 Analysis of thermal image in Excel via *.csv file export and display of pixel data in 3D

Subdirectory: When creating snapshots, they can be automatically saved in subfolders for a better overview: The following selection is available:

5.6.6 Saving Text File of the Temperature / Time Diagram

Via the menu **File** and **Save Temp/Time diagram data** the data of diagram can be saved in a text file (*.dat) for further analysis.

5.6.7 Location and Filename Templates of Triggered Recordings

In the **Tools, Configuration and Trig. Recording / Snapshots** menu you can define a Prefix for filename. The software is using this prefix if saving a sequence or snapshot.

Fig. 62 View File name template for triggered recording and snapshots

The **Path** defines the storage location of all files and can be changed here. Once recorded the file is saved under name including prefix, current date and time stamp.

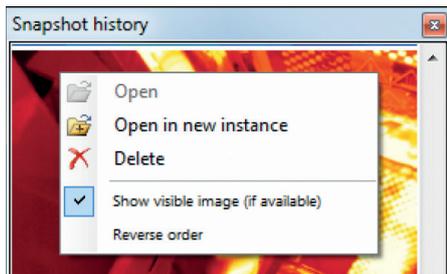
i Using the option **Create link** in "reopen file" list for triggered video sequences and snapshots the files can easily be reopened via the menu **File** and **Reopen**. The data capturing includes all information like measure areas and temperature displays of the main window if the option **Save layout** together with triggered video sequences and snapshots is tagged.

5.6.8 Display of Snapshots in a Separate Window

In the menu `View, Windows` and `Snapshot history` you can activate a window in order to display all triggered snapshots, see 4.2.1. Before you have to choose the option `Generate filename by template` in the menu `Tools, Configuration and Trig. Recording / Snapshots`.



If a shot snapshot is to be opened from the snapshot history, there are several options:



- `Open`: Opens the snapshot in the same instance, see 5.1.
- `Delete`: Snapshot is deleted.

`Show Visible Image (if available)` displays the additional visual image on the TIM 200/230 camera.

`Reverse order`: The snapshot history is displayed in reverse order.

In the configuration dialog in the tab `Trig. Recording / Snapshots` you can set with which layout the snapshot should be opened in the new instance. You can choose between the following settings:

`Layout that was used last time (default setting)`: Layout that was last opened in the viewer instance.

`Current layout from this instance`: Layout that is currently open in the current instance.

`Layout within the file`: Layout that is contained in the file that is to be opened.

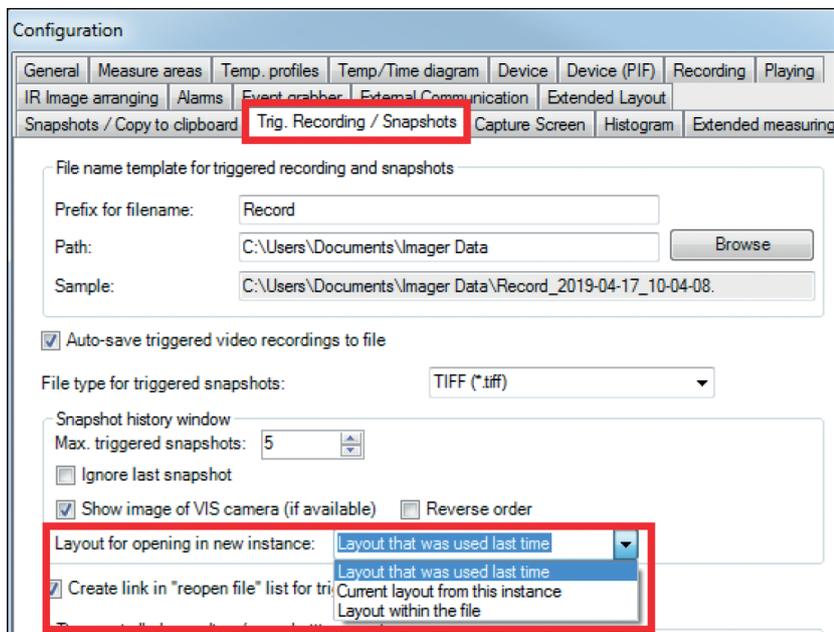


Fig. 63 View Configuration - Snapshots

5.6.9 Saving Images or Screenshots to Clipboard

Using the **File, Snapshot and Copy to clipboard** menu or the icon on the toolbar the image of the main window can be copied to the clipboard in order to paste it into different programs such as MS Word.

Alternatively, you can also copy the whole software window (screenshot) to the clipboard using the **File, Screenshot and Copy to clipboard** menu.

i The whole software window can also be saved using the **File, Screenshot and Save** menu or the icon on the toolbar.

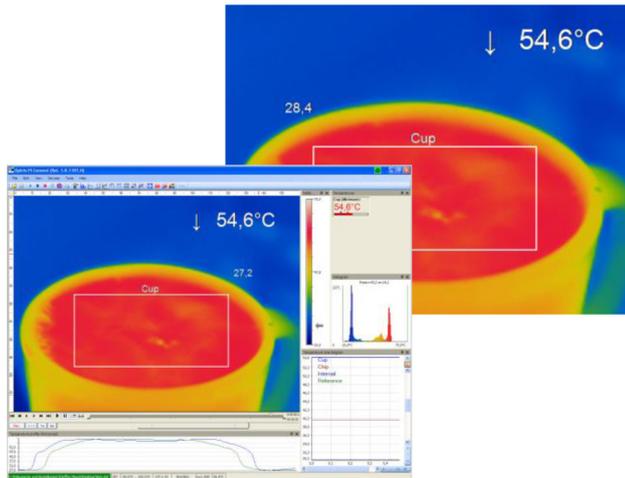


Fig. 64 View Saving Images or Screenshots to Clipboard

5.6.10 Capture Screen

The software offers the possibility to make a screen recording (wmv format). To start a Capture screen, go to `File, Capture screen, and Capture screen`. Alternatively, you can also press the F7 key or the adjacent icon.



The replay of the last Capture screen recording can be started under `File, Capture screen and Replay captured screen`. Alternatively, press the Alt + F7 key or the adjacent icon.



The following setting options can be found in the configuration menu under the tab `Capture screen`.

Under `Capture mode`, you can choose between `Application (TIM Connect window)`, `Fullscreen (whole window of screen)`, and `Imager only (IR screen only)`.

Capture mode

Application
 Fullscreen
 Imager only

At `Capture framerate`, you can enter the `Framerate` at which the recording is to be recorded.

Capture framerate

Framerate: [Hz]

Under `General capture settings`, you can select whether the mouse `Capture Cursor` is to be recorded and what is the `Minimum Duration` of the recording.

General capture settings

Capture Cursor
 Minimum Duration [s]

The `Temporary screen capture file` is stored in the following path:

Temporary screen capture file

C:\Users\AppData\Roaming\Imager\temp.~wmv

Under Filename mode, you can decide how and where to save a recording. You can choose between the following options:

Open a file dialog: After recording, a dialog window will pop up, prompting you to enter a location and a save name.



The screenshot shows a dialog box titled "Filename mode" with three radio button options: "Open a file dialog" (selected), "Generate file name by template", and "Static filename". Below the "Open a file dialog" option, there are three input fields: "Prefix for filename:" with the text "Capture", "Path:" with the text "C:\Users\AppData\Roaming\Imager", and "Sample:" which is empty. Each of these three input fields has a "Browse" button to its right. Below the "Generate file name by template" option, there is a single input field for "Static filename" with the text "C:\Users\AppData\Roaming\Imager\video.wmv" and a "Browse" button to its right.

Open a file dialog: After recording, a dialog window will pop up, prompting you to enter a location and a save name.

Generate file name by template: Here you can enter a Prefix for filename, a Path and a Sample for the recording.

Static filename: Under the name and path entered here, the recording is automatically saved. The file is overwritten with each new recording.

i If during the recording the software window is made smaller or larger, the size remains from the start.

6. Data Processing

6.1 Measure Areas

6.1.1 General Settings

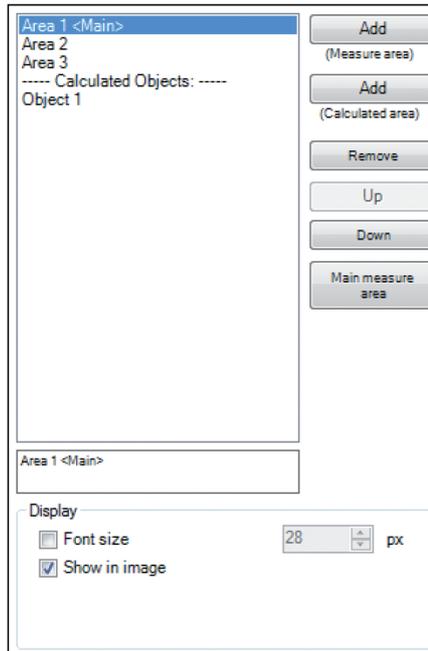


Fig. 65 View General Settings

1) The value can be delayed because it works with a Windows timer.

Measure areas for temperature analysis can be defined, edited and deleted using the menu **Tools, Configuration and Measure areas**. The value of a measuring area is updated every 100 ms⁻¹. This also applies to the output of the analog values on the PIF.

Using **Add (Measure Area) / Add (Calculated area)** buttons you can create a new Measure area / Calculated area. The **Remove** button deletes an existing Measure area / Calculated area.

Press **Up / Down** to position individual measure areas within the list.

One measure area from the list can be appointed as the **Main measure area**. The temperature of the main area can be displayed in the main window or converted into an electrical signal to be transmitted via the Process Interface (PIF)

Under **Display** the **Font size** can be changed for all measuring areas. By selecting **Show in image** measure areas can be displayed in the infrared image.

Available measure area shapes are:

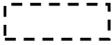
	User defined rectangle
	Measure point (1x1)
	Measure point (2x2)
	Measure point (3x3)
	Measure point (5x5)
	Ellipse
	Polygon
	Polygon Curve (Splines)
	Super area

Fig. 66 View measurement field forms

Measure area

Name:

Shape: ▼

Mode: ▼

Bind to temperature profile

Emissivity: ▼

Show in digital display group

Use in event grabber

Label in image:

Name

Mode

Value

two lines

Location:

Adjust at border

Position

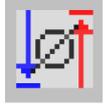
Location: (Center) X: ▼ Hot spot

Y: ▼ Cold spot

Size: Width: ▼

Height: ▼

Any `measure area` can be renamed individually in the `Name` field. Under the field `Shape` the different measuring shapes can be selected. The table above shows the available shapes. The temperature of the main measuring area can also be displayed in the main window. Several measuring areas can be bundled into one measuring area via a `super area`.



The value, which is displayed, is defined over the `Minimum`, `Maximum`, `Mean value` or `Distribution [%]` or `Area within Limits` in the field `Mode` or via the icon in the toolbar.

Minimum	Min. value is shown.
Maximum	Max. value is shown.
Mean value	Mean value is shown.
Distribution [%]	Indicates the percentage distribution between two selected temperatures.
Area within Limits	By specifying the total area of the measuring area and a freely definable unit of measure, the percentage value from the distribution measurement is converted into an area size.

In the `Position` section the exact `Location` and `Size` of the measure area within the main window can be defined. The moving and minimizing or maximizing of the measuring fields can also be realized directly at the measuring field in the main window. By moving the cursor to the edges of the measuring field, the grippers can be used to adjust the size of thermal image (alternatively via mouse wheel/touchpad) or to move the image completely (hold `Ctrl` synchronously). To move several measuring areas simultaneously, the key combination `Ctrl Key`, left mouse button + mouse movement must be used.

If desired the area can represent a `Hot spot` (spot or area with highest mean temperature in the image) or a `Cold spot` (spot or area with lowest mean temperature in the image).

Using `Center` you will be moving the measure area into the middle of the main window, using `Standard size` the rectangle will be set in a predefined size.

Under `Label in image`, you can select whether the `Name`, `Mode` and / or `Value` is to be displayed in the image. `Two-lines` means that the selected labels are displayed one after the other.

Two-lines means that the selected labels are displayed one after the other. At Location the position of the label can be arranged for each created measurement area. Adjust at border prevents the label from disappearing outside the border. Using Bind to temperature profile you can assign each measure area to one of the two temperature profile (Profile 1 / Profile 2).

The position of the measure area and the profile can be determined by the option Location [%]. The size ratio can be defined by the option Min. Size.

Position

Profile 1 Profile 2

Position at Profile:

Location [%]: 50.0

100.0

Min. Size: 5

Fig. 67 View Position

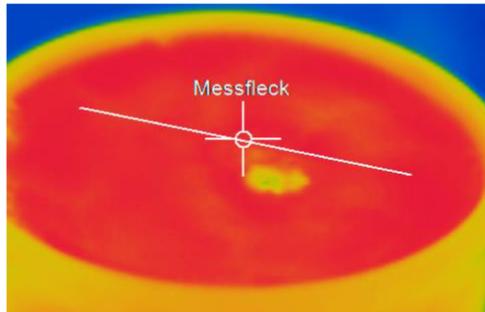


Fig. 68 Measure area assigned to a temperature profile (measure point)

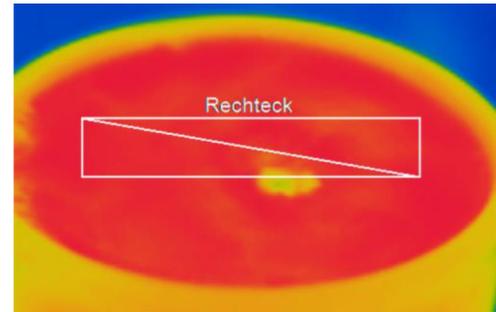


Fig. 69 Measure area assigned to a temperature profile (rectangle)

Under `Emissivity` a different emissivity value can be set for each created measuring area.

In `Show in digital display group`, you can specify which predefined temperature control displays should be displayed in the application window `Temperatures`, see 4.2.1.

With `Use in event grabber`, the selected area will no longer be displayed in the live IR image, but in the event grabber (frozen image) window, see 6.10.

6.1.2 Calculated Objects

Calculated objects allow you to select various operations that offer a signal processing. The name for the created object can be changed in the field `Name`. Furthermore, in the field `Show in digital display group`, you can decide whether the object is to be displayed in the digital display group or not. Under `Operation`, you can choose between the following operations:

Calculation

Name:

Show in digital display group

Operation:

Operand:

Averaging time [sec]:

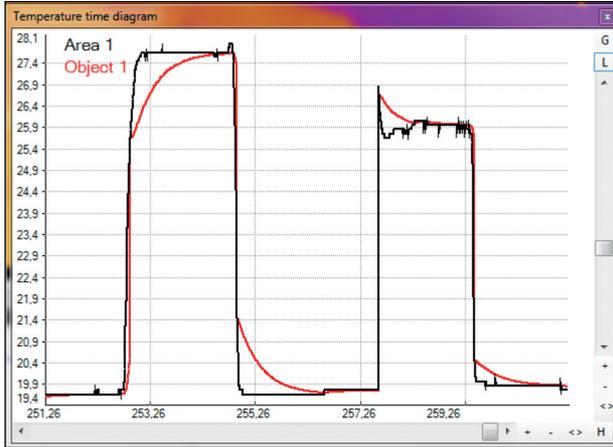
Smart averaging [°C]:

Average (Area 1)

Fig. 70 Calculated Objects

Off	The operation is off.
Difference	Calculates the difference temperature of two selected measuring areas (<code>Operand 1</code> and <code>Operand 2</code>).
Absolute difference	The result is a positive number which results from the formation of the difference between two selected measuring areas (<code>Operand 1</code> and <code>Operand 2</code>).
Average	In this mode an arithmetic algorithm will be performed to smoothen the signal. The <code>Averaging time [sec]</code> is the time constant. This function can be combined with all other post processing functions. If activated (<code>Smart averaging [°C]</code>), a dynamic average adaptation at high signal edges is active.
Peak Hold	This function keeps the respective signal maximum. When the temperature drops, the algorithm keeps the signal level for the set <code>Hold time [sec]</code> . After the hold time the signal will drop down to the second highest value or will descend by 1/8 of the difference between the previous peak and the minimum value during the hold time. This value will be held again for the specified time. After this the signal will drop down with slow time constant and will follow the current object temperature. Therefore, if periodic events will be measured (bottles on a conveyor e.g.) this peak hold function avoids a drop down of the signal to the conveyor temperature in-between 2 events.
Valley Hold	With this function the respective signal minimum is held. If the signal ascends the algorithm maintains the previous signal valley for the specified <code>Hold time [sec]</code> . The definition of the algorithm is according to the peak hold algorithm (inverted).
Adv. Peak Hold	This algorithm searches for local maximum values. Peak values which are lower than their predecessors will only be taken over if the temperature has fallen below the <code>Threshold [°C]</code> value beforehand. If <code>Hysteresis [°C]</code> is activated a peak in addition must decrease by the value of the hysteresis before the algorithm takes it as a new peak value.
Adv. Valley Hold	This function behaves inverted to the extended maximum search. This algorithm searches for local minimum values. Minimum values which are higher than their predecessors will only be taken over if the temperature has exceeded the <code>Threshold [°C]</code> value beforehand. If <code>Hysteresis [°C]</code> is activated a minima in addition must increase by the value of the hysteresis before the algorithm takes it as a new minimum value.

i The hold time for the peak/ valley hold can be set to infinity by entering 999 s.



Area 1 without post processing

Object 1 with averaging time and smart averaging



Area 1 without post processing

Object 1 with averaging time and without smart averaging

6.1.3 Including and Excluding Hot and Cold Spot Areas

With the menu item `Tools, Configuration, Measure areas` you can set in the section `Measure area` which areas should be used for a cold/ hotspot.

You can decide whether a measuring area should be included or excluded.

`Include in Hot/Cold Spot detection`: Here you can include certain areas with existing or possibly occurring hot and/or cold spots in the analysis. This means that hot or cold spots are then searched for in these areas.

Measure area

Name:

Shape:

Mode:

Bind to temperature profile

Emissivity:

Show in digital display group

Use in event grabber

include in exclude in Hot/ Cold Spot detection

Hide this measure area

Label in image:

Name

Mode

Value

two lines

Location:



Adjust at border

`Exclude in Hot/Cold Spot detection`: Here, certain screen areas with existing or possibly occurring hot and/or cold spots can be excluded from the analysis. This means that in these areas the search for hot or cold spots is no longer made.

If you select the option `Visualize excluded range (Hot/ Cold spot)` the areas will be shown in the main window.

They are indicated by a solid line.

Display

Font size px

Show in image

Visualize excluded range (Hot/ Cold spot)

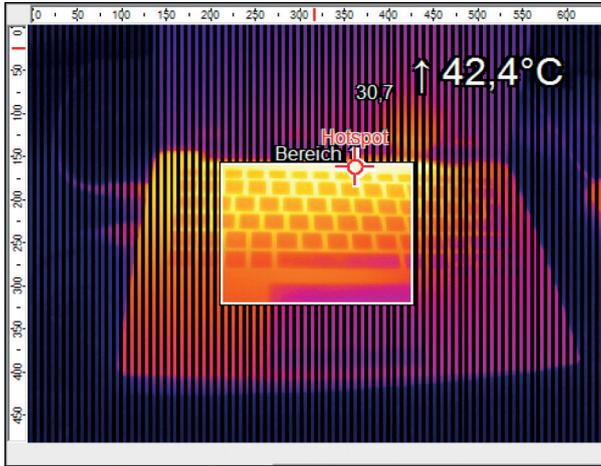


Fig. 71 Include

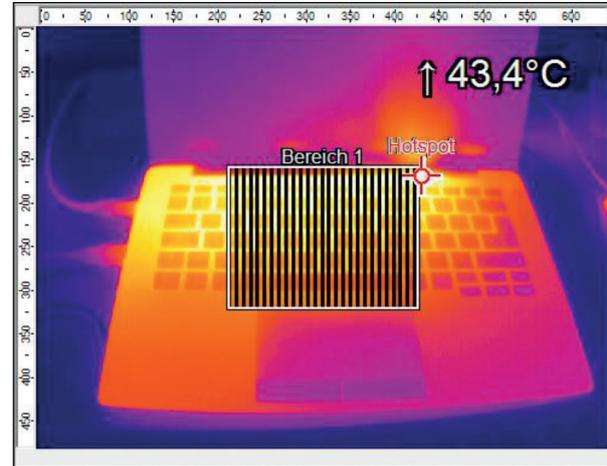


Fig. 72 Exclude

6.1.4 Individual Emissivity Values of Measure Areas

In case of measuring several materials different emissivity values can be set within the image.

Using the menu **Tools, Configuration, Measure areas and Emissivity** the individual emissivity values can be defined.

The display of the changing temperature values within the measure areas will remain linked to the colors of the reference bar.

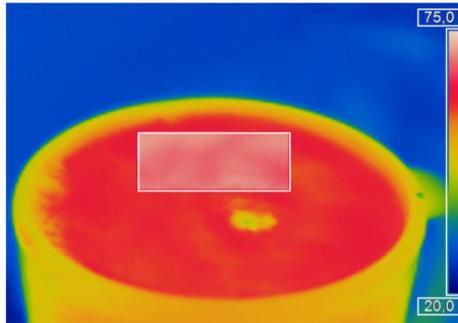


Fig. 73 Example of measure area

Measure area

Name:

Shape:

Mode:

Label in image:

- Name
- Mode
- Value
- two lines

Bind to temperature profile

Emissivity:

Show in digital display group

Position

Location: X: Hot spot
(Center) Y: Cold spot

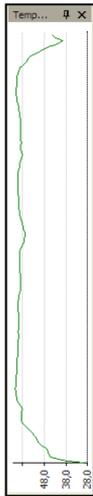
Size: Width:
Height:

Fig. 74 View measure area

6.2 Temperature Profile

Up to 2 temperature profiles which graphically reproduce the temperature development can be generated. Therefore go to **Tools, Configuration and Temp. profiles**. The profiles are labeled as **Profile 1** and **Profile 2**.

The position and size of the profiles can be defined via the coordinates **Start (P1)** and **End (P2)**.



Select **Show in image** if you want the profiles to be displayed in the infrared image in the main window.

Alternatively, this setting can be made by choosing the menu **View and Image information**, see 4.2.3.

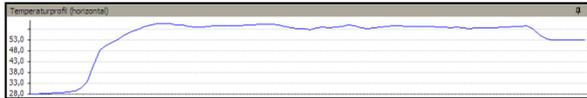


Fig. 75 Views Temperature profiles

		Profile 1:	Profile 2:
Start (P1)	X:	5	191
	Y:	144	5
End (P2)	X:	377	191
	Y:	144	283
Show in image:		<input type="checkbox"/>	<input type="checkbox"/>
Show in horizontal diagram:		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Show in vertical diagram:		<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> Show alarm values of main measure area			
<input type="checkbox"/> Show pre-alarm values of main measure area (if enabled)			
<input type="checkbox"/> Use alarm and pre-alarm colors in diagrams			

The position and size of the profiles can be also defined by dragging the grippers at the end of the lines within the image of the main window. The temperature profiles can be displayed in additional windows, see 4.2.1. Using the options **Show in horizontal diagram**, **Show in vertical diagram**, **Show alarm values of main measure area**, **Show pre-alarm values of main measure area (if enabled)** and **Use alarm and pre-alarm colors in diagrams** the profiles can be assigned to the horizontal and / or vertical diagram window.

The option `Range` allows you to choose between automatic or manual adjustment of the temperature scaling within the diagram. There are two possibilities of displaying the profile `Curve` in the profile diagram. Using the option `Assign to image` the profile curve fills only the parts corresponding with the actual length of the profile in the image.

Using the option `Full range` the profile curve fills the whole profile diagram independent from the size of the profile.

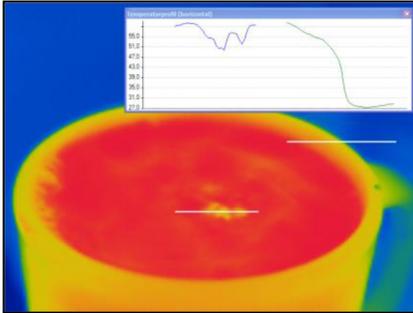


Fig. 76 The profile curve assigned to the image (Display in separate window)

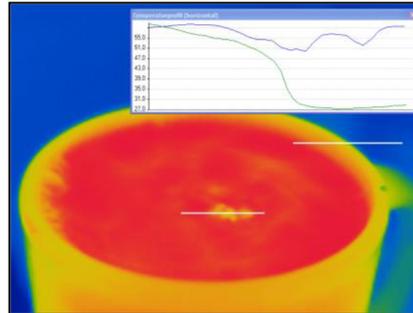


Fig. 77 The profile curve assigned to the full range of the diagram (Display in separate window)

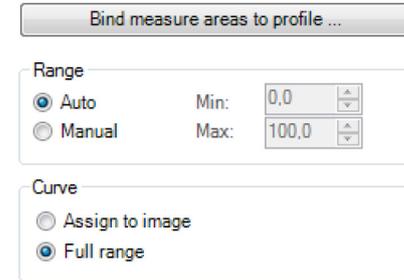


Fig. 78 View Bind measure areas to profile

Use `Bind measure areas to profile` to assign various measure areas to a temperature profile. If the position of the profile is changed all the measure areas will also be moved. The respective profile can be chosen via the option `Assign measure areas to`.

`Prefix for measure area name` enables the individual labeling of measure areas. The measure area type can be defined under the `Mode options`.

Number of measure areas to create as well as the `Width [% of profile length]` and `Minimum height [pixels]` can also be specified.

Via the `Measure mode` you can determine the way of displaying the minimum, maximum or mean temperature in the digital display window, see 4.2.1.

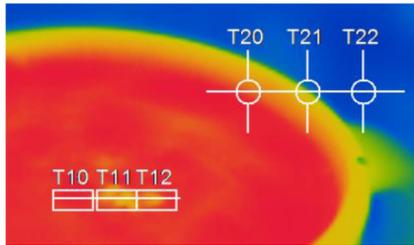


Fig. 79 View 3 Measure areas and 3 measure points are assigned to temperature profile 1 and 2

The option Delete existing measure areas of this temperature profile eliminates the defined settings of a profile.

Save the settings by pressing the Create button.

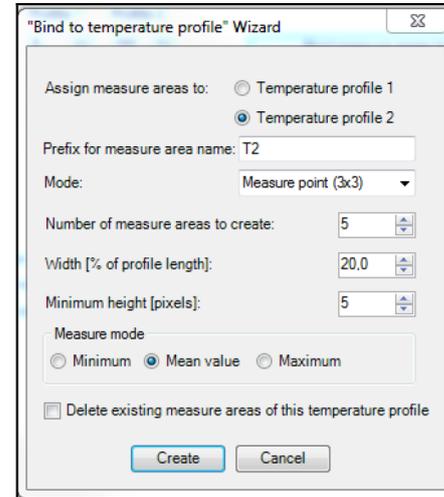


Fig. 80 View Bind to temperature profile Wizard

6.3 Temperature Time Diagram

6.3.1 General Settings

In the **Tools, Configuration and Temp/Time Diagram** menu you can display the temperature over time for each configured measure area as well as for predefined values, see 4.2.4.

The **Show** options define if a certain temperature value is displayed or not. If the **graph** is shown you can decide whether to illustrate the **name** or not.

If activating the option **Auto range** the respective graph is influencing the auto ranging of the diagram.

If the option is not chosen the scaling is based on the other temperature values.

In the menu **Pen**, the **width** of the graph as well as its **color** can be individually configured.

Measure Area	Show		Auto range	Pen	
	graph	name		width	color
Area 1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2	
Chip	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1	
Internal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1	
Reference	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1	
<input type="checkbox"/> [All] :					
Value	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1	 <input type="button" value="Range"/>
Value	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1	 <input type="button" value="Range"/>

Fig. 81 View temperature measure area

A further option is to define the time scaling of the diagram at a minimum [sec.]. If activating **set initial time to fixed value** the time scale will be the length of the initial time chosen. When choosing **set initial time to length of video** the time scaling is adjusted to the length of the stored video sequence loaded into the software. With **set maximal time to length of video** the scaling of the time axis is fixed to the whole recording length.

Initial time: [sec.]

While playing

- set initial time to fixed value
- set initial time to length of video
- set maximal time to length of video

Fig. 82 View initial time

In the Diagram measuring settings you can define the maximum of data (Maximum data count) which is displayed in the diagram. 1.000 x 1.000 results in 1.000.000 (one million) data values; the needed Memory will be calculated automatically. For demonstration purposes with many measuring fields in the diagram, you can make over the option Initially data count, an initial specification of the max. number of data counts (computer memory is reserved). Using the option Auto (device framerate), the Recording time is calculated based on the frame rate of the camera, see 5.6.1.

Independent from the frame rate of the camera you can individually set the number of data. If you choose the option. User defined you can put into the box Diagram resolution the rate of displayed data (time interval). Via the arrows the interval can be increased or decreased.

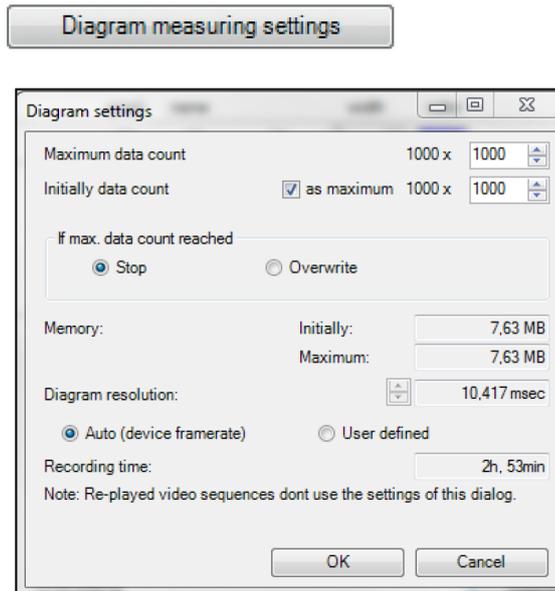


Fig. 83 View Diagram Settings

6.3.2 Scaling of Diagram Axes



Fig. 84 Control elements of the time axis / temperature axis

Control elements of the time axis

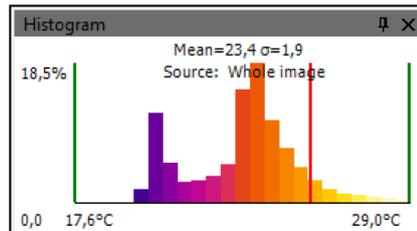
1	Scroll bar to choose time segment
2	Zoom (increase) into the diagram. The temperature axis will remain.
3	Zoom (decrease) into the diagram. The temperature axis will remain.
4	Whole range: Display of whole time axis, e.g. of a stored video sequence.
5	H: Hold/ C: Continue: Any activation of the H control element will stop the further actualization of the measurement graph. The measurement itself continues in the background. To return to the current measurement graph please press the C control element. During the stopped status any parts of the diagram can be selected. With the zoom in-button + these parts can be stretched (enlarged) and with the zoom out-button – clinched (minimized).

Control elements of the temperature axis

6	Global scaling: The temperature range of the diagram will automatically be adapted to the respective peak values. The range will remain as set during the whole measurement.
7	Local scaling: The temperature range of the diagram will be adapted dynamically to the respective peak values. After the respective peak has left the diagram in the further process of the measurement, the range will be readapted. This option enables an optimum display of the temperature graph.
8	Scroll bar to choose temperature segment.
9	Zoom (increase) into the diagram. The time axis will remain.
10	Zoom (decrease) into the diagram. The time axis will remain.
11	Whole range: Display of whole temperature range which is set in the camera.

6.4 Histogram

The Histogram feature shows the distribution of pixel intensity values within a thermal image. The X-axis of the histogram represents the pixel intensity and the Y-axis represents the percent of color count for each pixel intensity value.



In the Tools, Configuration and Histogram menu you can adjust various settings. The given Temperature range and Temperature distribution can be generated by the software or by the user by defining the minimum/maximum temperature range respectively minimum/maximum temperature distribution.

The screenshot shows three main configuration panels:

- Temperature range (x-axis):** Radio buttons for 'Auto' (selected) and 'Manual'. Manual values: Min: 0, Max: 100.
- Temperature distribution (y-axis):** Radio buttons for 'Auto' (selected) and 'Manual'. Manual values: Min: 0,0, Max: 100,0.
- Source:** Radio buttons for 'Whole image' (selected) and 'Measuring area: Area 1'.
- General:**
 - Display:** Checkboxes for 'Current temperature', 'Mean and sigma value', 'Source', 'Values (if enough space)', and 'Use palette colors' (all checked).
 - Step size:** A numeric input field set to 0,5 with a unit of °C.

Fig. 85 View temperature range, Temperature distribution, General

Further options are:

Current temperature	If activated the red line will show the current temperature at the mouse in the graph.
Mean and sigma value	Average temperature and statistical deviation 1σ (1 Sigma) will be displayed.
Source	Shows on what source the histogram is related to.
Values (if enough space)	The current values of the single palette colors are shown, but it needs a certain window size to illustrate them on the graph.
Use palette colors	You can choose between colored or black/white presentation.
Step size	Shows the width of the bar in °C or °F.

Under Source can be decided whether the histogram should refer to the whole image or to a specific selected measuring area.

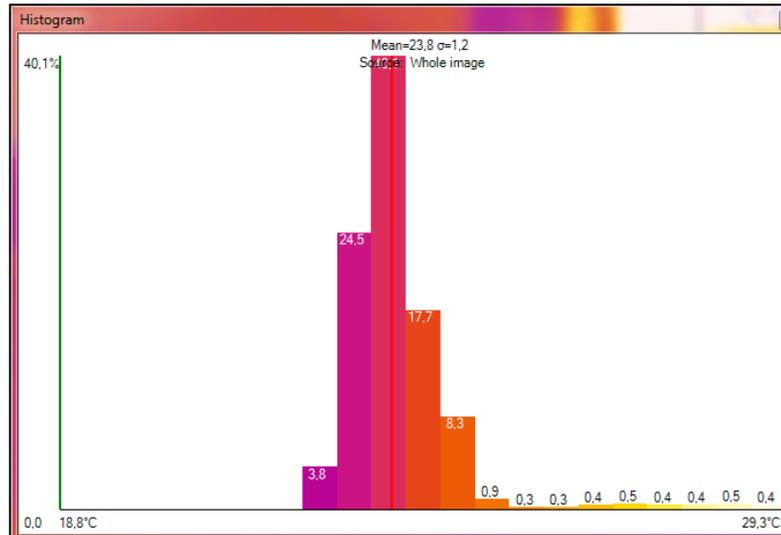


Fig. 86 Histogram with the view of current temperature, mean and sigma values, Source, Values, Use palette colors and step size (here: 0.5 °C)

6.5 Extended Measuring Colors

The Tools, Configuration, Measuring colors and Extended Measuring colors menus offer you the possibility to change the pixel color within the image if the temperature Range reaches predefined low and/or high temperature values. Doing this you can visualize temperature gradients.

Furthermore, the display of isotherms (colored display of temperature group) is possible.

Via the Threshold definition you can set two temperature values. The individual display of pixel located over (High), between (Mid) or below (Low) the thresholds can be defined by specific isotherm (Color) or by an alternative color palette (Alt. Palette).

Using Alt. palette the colors correspond to the temperature borders in the reference bar option. You will see the range of the palette which was defined by the thresholds. With Ext. Alt. Palette you can individually define the start and end point of the extended alternative color palette within the overall reference bar.

Extended measuring colors

Range	Threshold	Mode
High:	30,0	<input type="radio"/> Off <input checked="" type="radio"/> Color <input type="radio"/> Alt. Palette <input type="radio"/> Ext. Alt. Palette
Mid:	20,0	<input checked="" type="radio"/> Off <input type="radio"/> Color <input type="radio"/> Alt. Palette <input type="radio"/> Ext. Alt. Palette
Low:	20,0	<input type="radio"/> Off <input type="radio"/> Color <input type="radio"/> Alt. Palette <input checked="" type="radio"/> Ext. Alt. Palette

Color selection: [Red bar] [Color] [Alarm Blue]

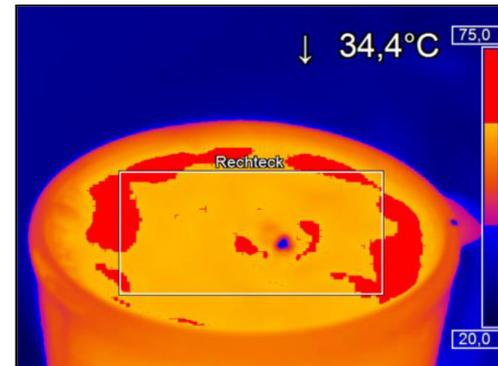


Fig. 87 View Extended measuring colors

6.6 Image Subtraction

Once you have activated the feature by using Image subtraction in the Tools and Extended menu or via the Icon on the toolbar (which must be added manually), an image is saved in the background and a temperature difference is calculated and displayed for all the following images.

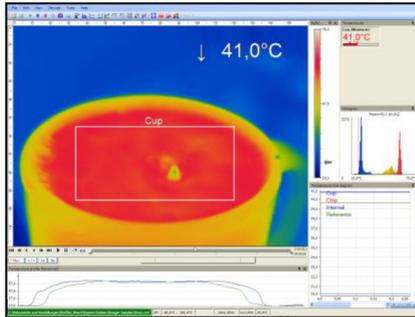


Fig. 88 Image subtraction is not activated. The current averaged temperature of the measure area is displayed in the right top corner.

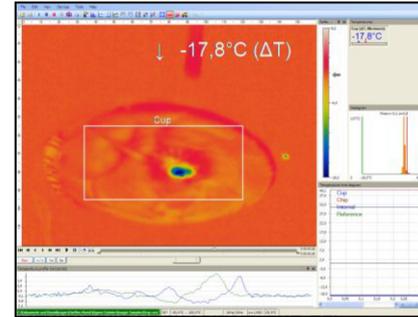
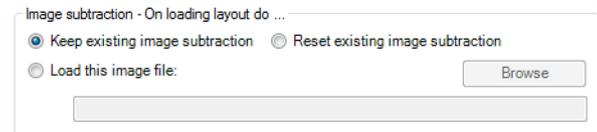


Fig. 89 After activating the image subtraction function the current temperature difference compared to the previous image is displayed.

Alternatively, you can load a previously saved radiometric image (TIFF) using Image subtraction from file in the Tools and Extended menu or via the Icon on the toolbar in order to use it as a template for the image subtraction.



Under Menu Tools, Configuration and Extended Layout you can choose by Image subtraction - On loading layout do **between** Keep existing image subtraction, Reset existing image subtraction and Load this image file.



6.7 Relative Extreme Values

Within the Tools, Configuration and Extended measuring menu it is possible to exclude pixel within the thermal image from data analysis.

Using Ignore pixels with temperatures a temperature can be set as lowest (below) or highest (above) value.

In case of analyzing an image using measure areas (for measure areas) the calculation of e.g. the mean value is not taking values below or above the set limits into account.

For hot/cold spots localization determines that all pixels with the defined values are excluded from search.

For $\langle \rangle$ temperature ranging means that all pixels with the respective temperature do not influence e.g. the automatic scaling of temperature-time-diagram.

Relative extrem values		
Ignore pixels with temperatures	below:	above:
	<input type="text" value="0,0"/>	<input type="text" value="0,0"/>
for measure areas:	<input type="checkbox"/>	<input type="checkbox"/>
for hot/cold spot localization:	<input type="checkbox"/>	<input type="checkbox"/>
for $\langle \rangle$ temperature ranging:	<input type="checkbox"/>	<input type="checkbox"/>

Fig. 90 Relative Extreme values

6.8 Alarms

In the **Tools, Configuration and Alarms** menu you can define an alarm and pre-alarm for each configured measure area as well as for the predefined values, see 4.2.4. Pre-alarms can be useful as an advance warning.



Measure area	Display ranges		Pre-alarms		Alarms		GraphBar	Alarm to PIF	
	Min.	Max.	Low	High	Low	High			
Area 1	0,0	100,0	<input type="checkbox"/>	24,0	36,0	20,0	40,0	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Cursor	0,0	60,0	<input checked="" type="checkbox"/>	10,0	50,0	5,0	55,0	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Chip	0,0	60,0	<input checked="" type="checkbox"/>	10,0	40,0	5,0	45,0	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Internal	0,0	100,0	<input type="checkbox"/>	24,0	36,0	20,0	40,0	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Reference	0,0	100,0	<input type="checkbox"/>	24,0	36,0	20,0	40,0	<input checked="" type="checkbox"/>	<input type="checkbox"/>
[All]	<input type="checkbox"/>								
Value	0,0	100,0	<input type="checkbox"/>	24,0	36,0	20,0	40,0	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Value	0,0	100,0	<input type="checkbox"/>	24,0	36,0	20,0	40,0	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Fig. 91 Table Alarms

The alarm values can be displayed as figures in the digital display or in a graphical way as a bar. For the latter you need to activate the option **GraphBar**. Regarding the bar you can define via **Display ranges** the **Min.** and **Max.** value (temperature borders).

With **Alarms** the **Low** and **High** thresholds can be set which finally defines the displayed color.

If the high alarm value is reached or exceeded the color of bar changes to red, for pre-alarm orange. If the measured temperature reaches or goes below the lower alarm value the color of bar changes to blue, for pre-alarm light blue. Temperatures in between the defined thresholds are displayed green.

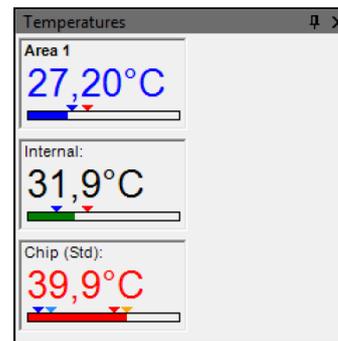
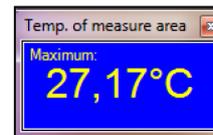


Fig. 92 View Temperatures

i The background color of the window for the digital display of the main measuring field also changes when the alarm value is below or exceeded, in light blue or blue (low alarm) or orange or red (high alarm).



If a temperature value shall be used as an pre-alarm, you need to tag the **Pre-alarms** option. The alarm can also be put out via the **Process Interface (PIF)** using the **Alarm to PIF** option.

i If activating the Alarm Appl., a red alarm button on the toolbar appears. You can deactivate the visual and acoustic alarm by clicking on the alarm button. The alarm will stay deactivate until the alarm value is reached again.



In the Alarm configuration window you can set an Audible alarm.



In the Interval [sec] input box you can specify the time interval the sound appears. Via the Path to sound file you can browse an individual *.wav file. The acoustic alarm signalization can be repeated in defined intervals setting the Interval [sec]. Using the option Recording on alarm, you can specify a Delay [sec]. The recording starts after the delay time is over. In the Duration [sec] box the recording time of the video sequence can be set (max. 86400 seconds = 24 hours).

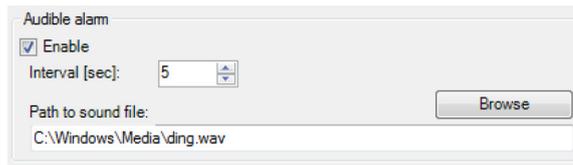


Fig. 93 View Audible Alarm

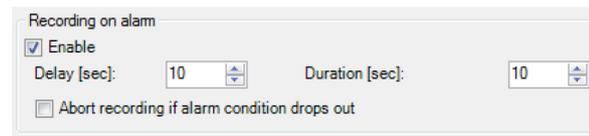


Fig. 94 View Recording on alarm

Furthermore, a recording can be stopped via Abort recording if alarm condition drops out. If this option is not chosen the recording will be finished based on the time in the duration box.

With the Snapshot on alarm option it can be determined whether a snapshot of the thermal image should be taken in case of an alarm condition.

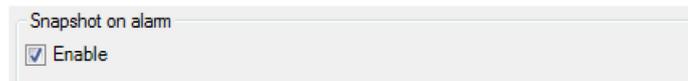


Fig. 95 View Snapshot on alarm

6.9 3D Display of Thermal Image

Thermal images can be displayed in real time as 3 dimensional images. The 3D Chart is displayed in a separate window. To add the software window please use the menu item View, Windows and 3D Chart or the icon on the toolbar.

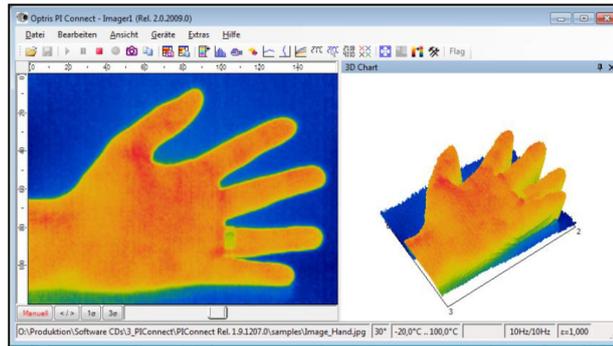


Fig. 96 View 3D display of thermal image

6.10 Event Grabber

Batch processes are easy to handle thanks to the event grabber. In the case of fast-paced recurring processes, a snapshot is created when an alarm condition occurs, in order to be able to analyze critical areas.

The settings can be found under the menu `Tools, Configuration and Event grabber`.

Under `Trigger mode` you can select between `Self-triggered (on alarm of a measure area)` and `External triggered (on PIF)`.

In the case of `Self-triggered (on alarm of a measure area)`, the event is triggered by the set application alarm. At first the `Triggering measure area` has to be selected at which the set alarm condition is to be triggered.

At `External triggered (on PIF)`, the event is triggered by the `Process Interface (PIF)`. For this, a `Trigger input` must first be selected. The available inputs depend on the PIF which is used.

On `trigger hold`, the following items can be selected:

- `3D Chart`: The 3D diagram is held in case of an alarm condition.
- `Temperature Time Diagram`: The Temperature Time Diagram is held in case of an alarm condition.
- `Temperature Profile`: The Temperature Time Diagram is held in case of an alarm condition.
- `Histogram`: The Histogram is held in case of an alarm condition.

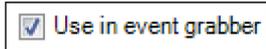
Under `Extended settings`, a `Holdoff time` can be entered. A new alarm condition is not taken into account during this set time.

If the checkmark is enabled by `Allow event grabbing (and alarm) while playing`, the event grabber is considered when playing a Ravi.

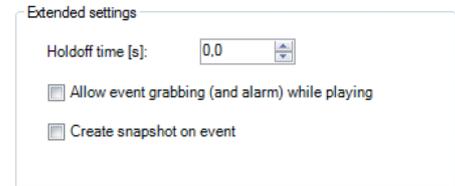
`Create snapshot on event` will create a snapshot after every event which will appear in the snapshot history and in the event grabber (frozen image) window.

The triggered snapshot for the event grabber can be found under menu `View, Windows and Event grabber (frozen Image)`.

Measurement areas can be created and arranged in the live IR image as well as in the event grabber (frozen image). If you want to add an measurement area in the event grabber (frozen image), this must be set under the `Configuration menu and Measure areas`. Under `Measure area`, the check mark `Use in event grabber` must be selected.



As a template for the event grabber, you can use the sample layout `Event grabber`.



6.11 Zoom Function of Snapshots

Captured snapshots can be enlarged when viewed.

➡ To do this, open a saved snapshot (TIFF file), [see 5.1](#).

Use **+** to zoom in and **-** to zoom out or use the bars on the side.

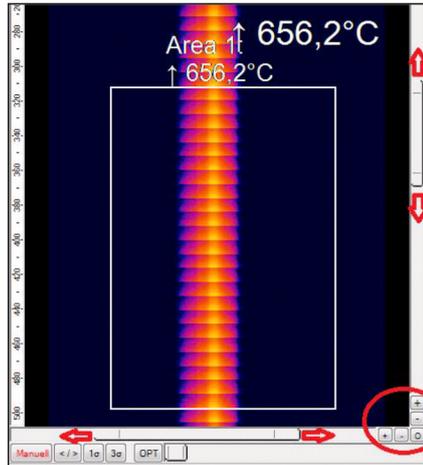


Fig. 97 View Zoom function of snapshots

7. thermoMETER TIM 8 / thermoIMAGER TIM 41

7.1 Focus Setting

The special feature of the thermoMETER TIM 8 and thermoIMAGER TIM 40 is the motorized focus adjustment. This can be found under menu *View*, *Windows* and *Distance*. Here you can change the position of the focus by moving the gray slider. With the arrow keys you can also change the position in different stages. An adjustment to the left leads to the focus setting „near“ and an adjustment to the right to the focus setting „infinite“.

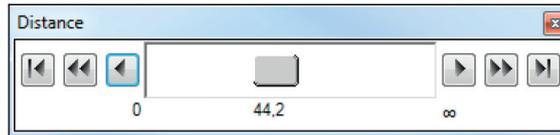


Fig. 98 View Distance

The *Focus motor position* can be saved either in the *Device* or in the *Layout*. This setting is located in the configuration menu under the *Device* tab.



Fig. 99 View Focus motor position

7.2 Imager Interfaces for thermoMETER TIM 8 / thermoIMAGER TIM 41

7.2.1 General

The thermoMETER TIM 8 has a direct analog input (AI) / digital input (DI) for camera control and a direct analog output (AO) for process control. These can be connected to the supplied terminal block, see Fig. 100. In addition, there is an RS485 interface. When using the RS485 interface, the direct outputs and inputs are not available. The signal level is 0 - 10 V for AI and 0/4 - 20 mA for AO.



Fig. 100 thermoIMAGER TIM 8 with terminal block

The interfaces can be set up by the software with the following functionality:

Analog Input (AI)	Emissivity, Ambient temperature, Reference temperature, Uncommitted value, Flag Control, Triggered Snapshots, Triggered Recording, Triggered Linescanner, Triggered event grabber, Reset Peak-/Valley-Hold, Switch temperature range
Analog output (AO)	Main measure area, Measure area, Internal temperature, Flag Status, Recording Status, Line scan status, Alarm, Frame sync, Fail-safe, External Communication

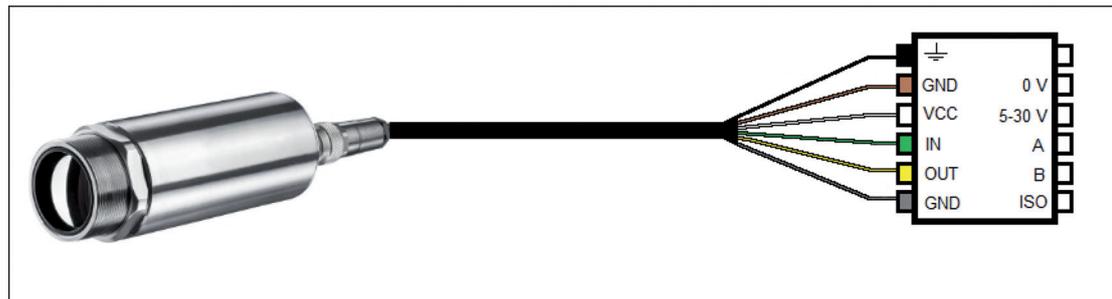
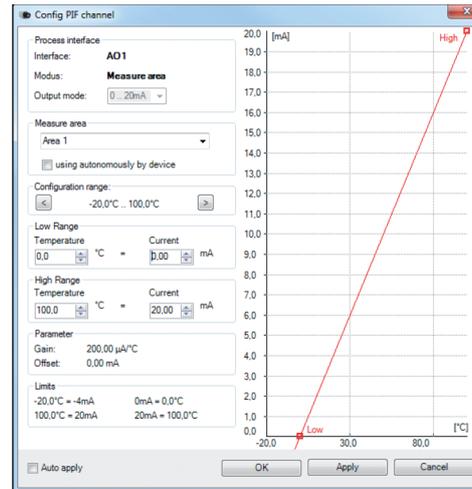
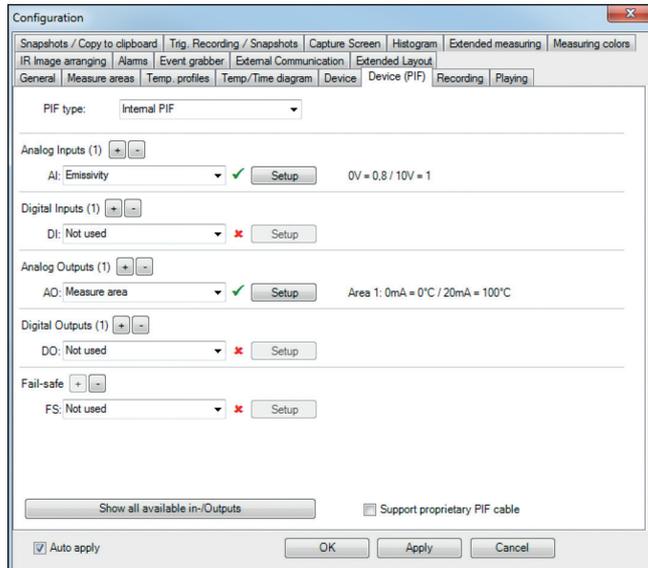


Fig. 101 Configuration Process Interface (PIF) thermoMETER TIM 8 / thermoIMAGER TIM 41

7.2.2 Process Interface (PIF) for thermoMETER TIM 8 / thermoIMAGER TIM 41

Using Tools, Configuration and Device PIF menu you can configure a PIF which is connected to the camera. The number of in- and outputs can vary depending on the connected PIF type (internal PIF or stackable PIF). An available in- or output will be marked with a green checkmark ✓. A not available in- or output will be marked with a red x. With Show all available in-/outputs, only the available inputs/outputs are displayed.

If you configure an analog value an additional window will show up if you press the Setup button. In this window you can scale the in- or output:



The settings for the stackable PIF are similar to those for the internal PIF. Under PIF type, Stackable PIF must first be selected. Furthermore, the number of PIFs used must be specified under Devices, see Fig. 102. The device number must be identical to the RS485 address set on the device, see Fig. 103. Now the existing inputs and outputs can be assigned with corresponding functions.

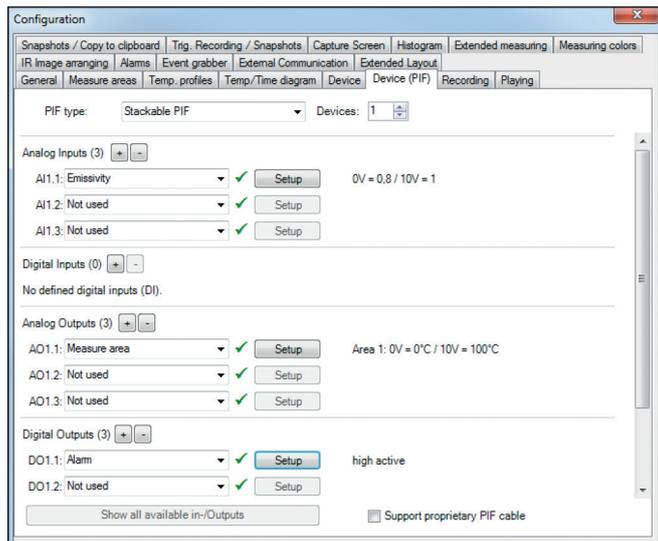


Fig. 102 Configuration of stackable PIF

The numbering of the individual inputs and outputs is structured as follows: The first number refers to the device and the second to the port (for example AI2.3: Analog input from PIF No. 2 and Port No. 3).

On the analog inputs you can select each function only once (exception: Uncommitted value).

On the analog outputs also each function can only be selected once (exception: Measurement area; Alarm).

i You can use the analog inputs, outputs and the digital input of the PIF simultaneously.

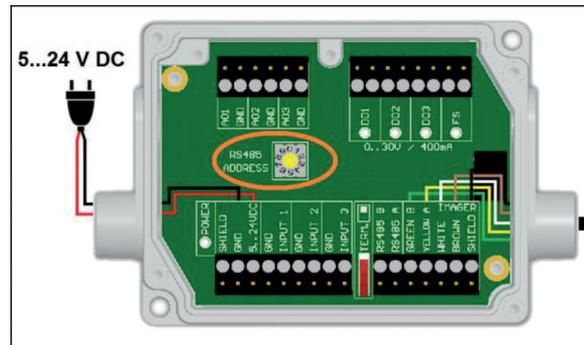


Fig. 103 Setting the RS485 address on the stackable PIF

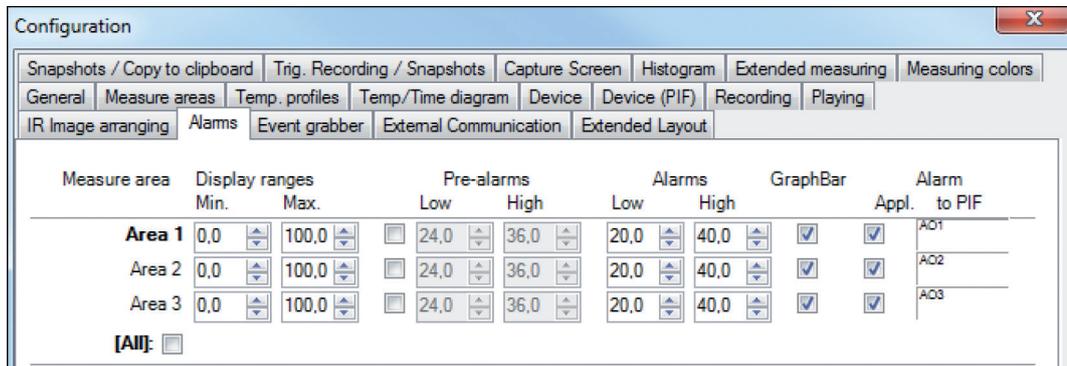


Fig. 104 Alarms view - PIF output

If you activate the function `Alarm` on an analog output you need to assign also in the `Alarms` tab the desired measurement area to the desired PIF output, see Fig. 104.

The industrial PIF has a maximum of three analog outputs. To use more outputs, you can cascade up to three PIFs, allowing you to use up to 9 analog or alarm outputs in total.

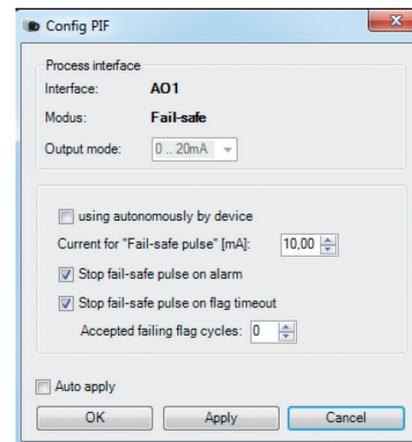
For more information on the settings for alarms, see 6.8.

The Process Interface has an integrated fail-safe mode. This allows to control conditions like interruption of cables, shut-down of the software etc. and to give out these conditions as an alarm. The time constant of the fail-safe is 1.5 seconds.

Controlled conditions on camera and software	Standard Process Interface TM-PIF-TIM8	Industrial Process Interface TM-PIFCBx-TIM8
Interruption USB cable to camera	✓	✓
Interruption data cable camera - PIF	✓	✓
Interruption power supply - PIF	✓	✓
Shut-down of TIM Connect software	✓	✓
Crash of TIM Connect software	-	✓
Fail-safe output	0 mA at analog output (AO)	Open contact (Fail-safe relay)/ green LED off

The failsafe function can be activated in the tab *Device* (PIF) under *FS*. The industrial PIF has a separate failsafe relay.

Alternatively you can activate this function also on the analog outputs. The checkbox *Stop fail-safe pulse on alarm* must be activated, if the analog output should be used in addition as an alarm output for a temperature alarm. In case of an alarm the alternating fail-safe pulse signal will stop and the set voltage level will be given out as constant value (stackable PIF only).



7.3 Autonomous Operation thermoMETER TIM 8 / thermoIMAGER TIM 41

A special feature of the thermoMETER TIM 8 is the autonomous operation. There is no need for a permanent connection to the TIM Connect software. Only a few settings must be set in advance in the software.

➡ Proceed as described, see 7.2.2.

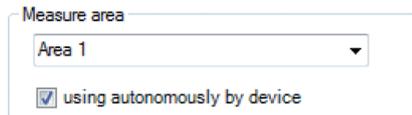
➡ Select an output and press Setup.



Analog Outputs (1) + -

AD: Measure area ✓ Setup

➡ Here you have to put the check in using autonomously by device.



Measure area

Area 1

using autonomously by device

A @ sign will appear next to the output used in the configuration menu Device PIF. Whenever this sign is visible, the function can run in autonomous operation.



Analog Outputs (1) + -

AD: Measure area ✓ Setup @ Area 1: 0mA = 0°C / 20mA = 100°C

i If a hot- or coldspot is to be output in autonomous operation, this does not work by activating the spots. A User defined rectangle must be selected under the tab Measure area of the configuration dialog. In addition, under Mode, you must set whether the Maximum (for hotspot) or Minimum (for coldspot) should be output. For a hot- or coldspot output in the full field of view of the camera, the user defined rectangle must also fill out this size.

Measure area	
Name:	Area 1
Shape:	User def. rectangle ▼
Mode:	Maximum ▼

When using the TIM 41 camera, an important additional setting must be made for autonomous operation. When all the configurations have been made, it is important to write them to the device. This is done in the menu under Devices and Set configuration to device.

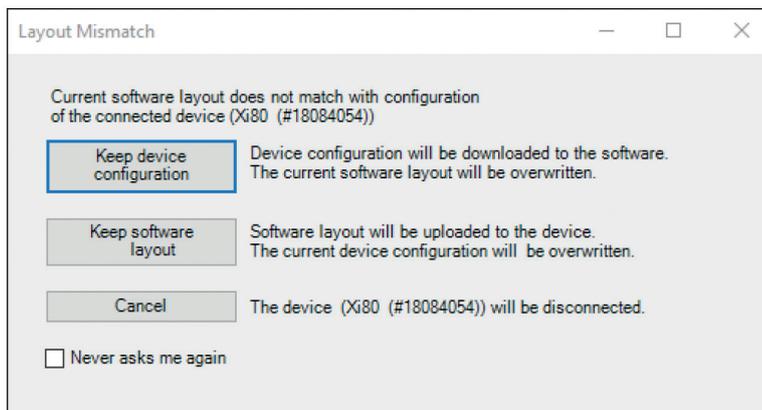
If the device is reconnected to a PC after autonomous operation and the settings are to be transferred from the device to the software, this is done in the menu under Devices and Get configuration from device.

Devices	Tools	Help
	Refresh flag	F5
<input checked="" type="checkbox"/>	Enable Ethernet	
	Ethernet settings (TCP/IP) ...	
	Set configuration to device	
	Get configuration from device	
	TIM 41(#21024284) (192.168.0.101 : 50101)	

i An arrow marked in red  means that the configuration is different between the camera and the software. As soon as the configuration is loaded into the device, the arrow appears blue .

Reconnection to PC with TIM 8

When the unit is reconnected to a PC with the TIM Connect software after autonomous operation and the layout or settings differ between the unit and the software, an information window appears with the following options:

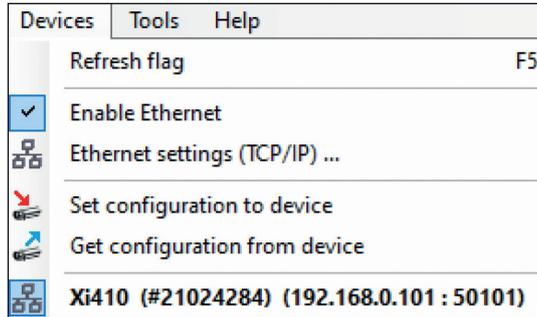


Keep device configuration	Device configuration will be downloaded to the software. The current software layout will be overwritten.
Keep software layout	Software layout will be updated to the device. The current device configuration will be overwritten.
Cancel	The device (xx (#xxxxxxx)) will be disconnected.

This prevents the set layout from being overwritten on the device.

Reconnection to PC with TIM 41

When using the TIM 41, the settings must be transferred manually from the device to the PC if desired. To do this, go to the menu under **Devices** and press **Get configuration from device**.



i An arrow marked in red  means that the configuration is different between the camera and the software. As soon as the configuration is loaded into the device, the arrow appears blue .

7.4 Ethernet thermoMETER TIM 8 / thermoIMAGER TIM 41

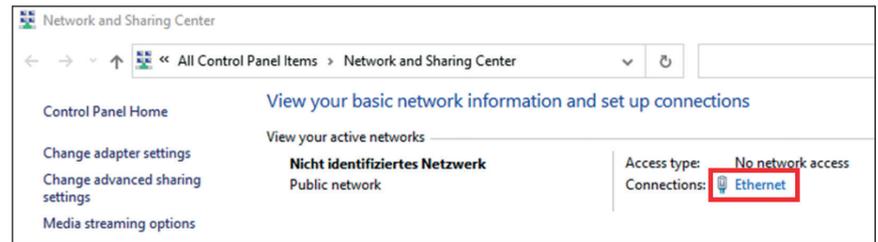
The thermoMETER TIM 8 has a direct Ethernet interface. Using the Ethernet connection, the device must be supplied with power (see thermoIMAGER TIM Operating Instructions).

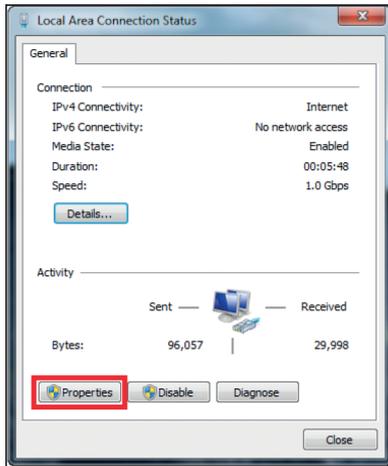
Ethernet Setup (Point-to-Point-Connection)

➡ Before you can make the settings in the software, you must first configure the network settings on the PC.

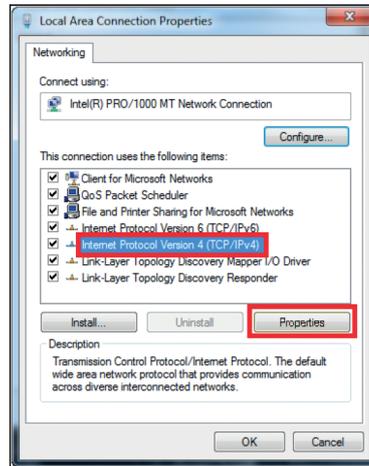
- The devices are delivered with the following factory settings:
 - IP address camera: 192.168.0.101
 - IP address PC: 192.168.0.100
 - Port number: 50101

- ➡ To do this, go to Control Panel and open the Network and Sharing Center.
- ➡ Go on Ethernet.

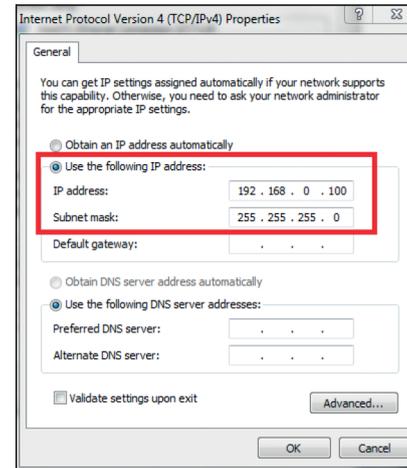




➡ Click on **Properties**.



➡ Mark **Internet protocol Version 4 (TCP/IPv4)** and go to **Properties** again.



➡ In the register card **General** enable the checkbox **Use the following IP address**.

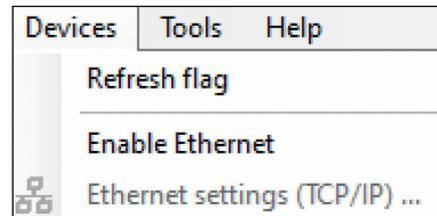
➡ Now enter a user defined IP address for your PC (192.168.0.100).

This must be identical to the address set in the TIM Connect software.

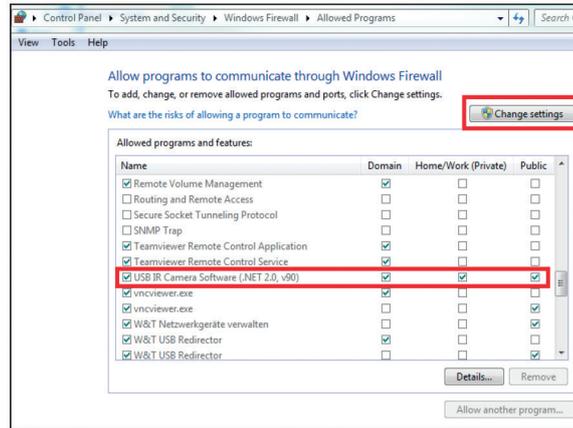
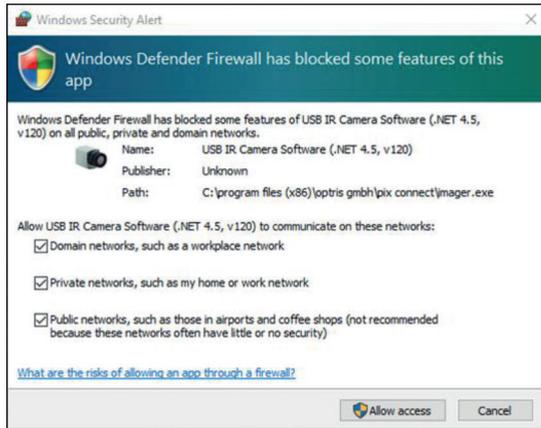
➡ Then close all windows with **OK**.

The network settings on the PC are complete.

➡ Now start the TIM Connect software and activate the Ethernet function. To do this, go to the menu **Devices** and **Enable Ethernet**.

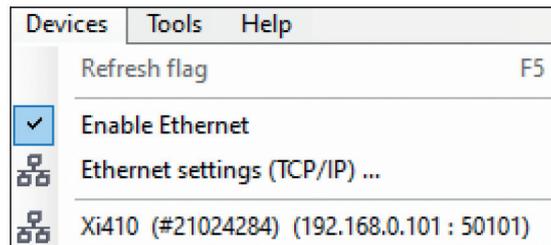


- i Make sure that all three networks (Domain, Private, Public) are allowed in the Windows Firewall window to ensure a connection to the device.



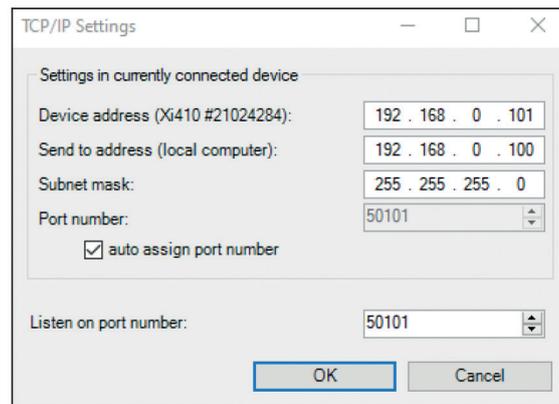
- i The approval of programs can also be activated afterwards in the Windows Firewall settings of the PC (under Windows Firewall and Allow a program or feature through Windows Firewall).

The device is now ready for the Ethernet connection and is listed in the menu under *Devices*. The camera is identified by a network icon and the network address and port number. Select the device. A connection to the device is established and the temperature measurement can begin.



To change the address settings, go to *Device* and *Ethernet Settings (TCP/IP) Settings*. The device is set up via the USB connection of the camera.

The address for the device is assigned under *Device address*. This must have a different address (last block) to the other participant (e.g. PC) (*Send to address*). It is important that the network part (first three blocks) must be identical for both addresses. The address range of the individual blocks can be between 0 and 255.



Additionally, a separate port number must be configured. The selected number can be between 1 and 65535.

The *auto assign port number* option automatically assigns a port number. This is set to 50101 by default. If several cameras with different port numbers are connected and a specific camera is to be communicated with, the corresponding camera can be determined via *Listen on port number*.

8. Line Scanner Mode

8.1 General Information

The TIM Connect software comes with a line scanner function. The line scanner mode is generally used for continuous processes with moving objects under test, such as measurement of rotary kilns or measurement of great lots at conveyor belts (batch process).

Overview of the advantages:

- ① Simple monitoring of process with limited optical access.
- ② Indirect visualization of heat distribution within ovens via camera installation at the oven exit.
- ③ Extension of number of pixel through the use of the picture diagonal (e.g. TIM 640 VGA).
- ④ Very fast data recording of unlimited lines which-in turn can produce thermal images of any resolution.
- ⑤ Huge FOV as a line for detailed process analysis such as at wide conveyor belts (e.g. TIM 640 VGA with an 90° optic).

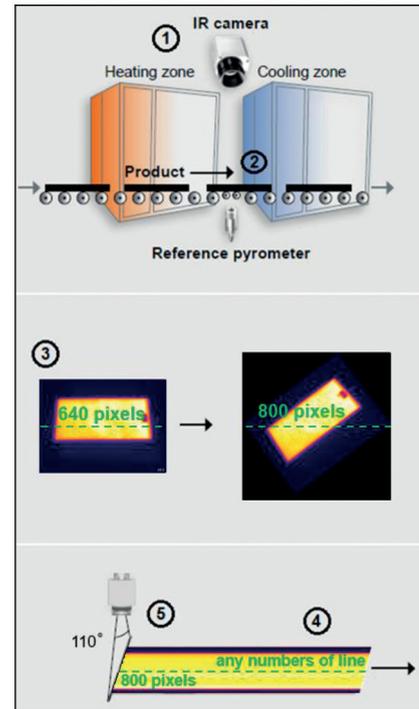


Fig. 105 View line scanner mode

8.2 Basic Settings

8.2.1 Line Scanner Configuration Menu

All the settings related to the line scanner mode can be done through the `Line scanner configuration menu`. You will find the menu under `Tools`, `Line scanner mode` and `Line scanner settings` or as an icon on the tool bar.



8.2.2 Choosing the Layout

Before you configure the Line scanner mode a suitable layout (e.g. alignment of application windows) should be chosen or created, see 4.2.

8.2.3 Rotating of the Image

For some application is it of advantage to increase the number of pixels per line by changing the view angle.

To do so go to `Rotate` menu, see 4.2.9.2.

 Mount the camera under defined angle according to the chosen angle, too.

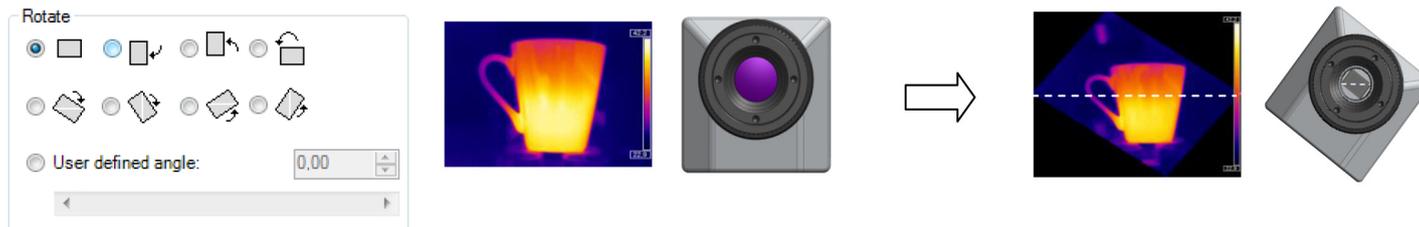


Fig. 106 View Rotate

8.2.4 Activating the Line Scanner

In order to configure the Line scanner it is necessary to activate the Line scanner mode under `Tools, Line scanner mode` and `Enable Linescanner` or using the icon on the tool bar.



- There are two view options available under Line scanner mode. Line scanner sighting view is showing the position of the line and self-trigger area within the infrared image taken by the camera. Line scanner view delivers the resulting infrared image based on temperature readings for selected lines.

8.2.5 Positioning of the Line (Line Scanner Sighting View)

The pre-defined position of the line can be seen in the Line scanner sighting view. To access the view go to `Tools, Line scanner mode` and `Line scanner sighting view` or use the icon provided.



- This icon enables to switch between Line scanner sighting view and Line scanner view.

To define the position of the line within the infrared image, go to `Line scanner configuration` application window, see 8.2.1. in the `Source` menu. In the `Lines taken from source` section using `First row` and `Last row` field, you can specify, how many lines are to be considered during the measurement. Number 1 stands for the first line from the top in the infrared image.

Lines taken from source	
First row:	<input type="text" value="10"/>
Last row:	<input type="text" value="10"/>

Fig. 107 View Lines taken from source

If more than one line should be taken from the source the `Direction` menu enables to choose the direction in which they will be measured and consequently displayed in `Line scanner sighting view mode`. The option `Scan on user defined line` makes it possible to graphically position the scan line through the mouse. It can also be entered by the coordinates (X and Y) in the `Start point (P1)` and `End point (P2)` fields. The number of pixels on the scan line and the angle are displayed in the field `linescanner pixels` and `linescanner angle`. In addition to the start and end point, additional points can be added under `Add`, allowing complex lines to be created. `Lines` or `Splines` can be used.

The image shows two panels from a software interface. The left panel, titled 'Direction', contains six radio button options: 'Scan on user defined line' (selected), 'Scan top-down (rows)', 'Scan bottom-up (rows)', 'Scan left to right (columns)', 'Scan right to left (columns)', 'Scan on auto detected horizontal slit', and 'Scan on auto detected vertical slit'. The right panel, titled 'Points of user defined line', features a grid for defining points with 'X' and 'Y' columns. It includes 'Start point (P1):' (0, 0), 'End point (P2):' (159, 119), and 'Auxillary points:' (0, 0). Below the grid are 'Add' and 'Remove' buttons. A 'Mode:' section has 'Lines' (selected) and 'Splines' options. At the bottom, there are input fields for 'linescanner pixels:' (200) and 'linescanner angle:'.

Fig. 108 View Direction

Fig. 109 View Points of user defined line

In the `Scan on user defined line`, individual points are moved by drag-n-drop.

The entire scan line is moved by touching a point with the `Ctrl` key pressed at the same time.

A rotation is reached when first a point is selected with simultaneous pressing the `Alt` key (this is the pivot point) and then a second point is drawn to rotate the line.

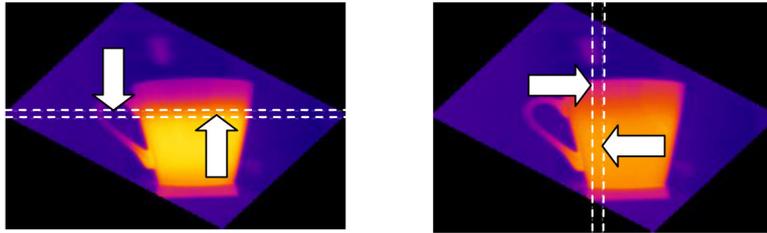


Fig. 110 View - 4 possibilities

The displayed line scanner sighting views visualize the four possibilities how to capture and finally represent multiple lines in the line scanner view.

	<p>Scan line with multiple points as spline</p>
	<p>Scan line with multiple points as lines</p>
	<p>Rotation of the scan line around a pivot point</p>

The other options you can choose from are Scan top-down (rows) where the lines are measured and displayed from the top to the bottom, Scan bottom-up (rows) from bottom to top, Scan left to right (columns) from left to right and Scan right to left (columns) from right to left.

In all direction variants the scan line can be moved by mouse.

Direction Scan on auto detected horizontal slit: With this function the horizontal slit is automatically detected.

Direction Scan on auto detected vertical slit: With this function, the vertical slit is automatically detected.

When using the automatic slit function, a temperature must first be defined from when this function is to be active. This temperature can be above or below a certain limit.

The current width is displayed under Slit width [pixel] in the Current average width field. With Min/Max you can also define the minimum and maximum slit width.

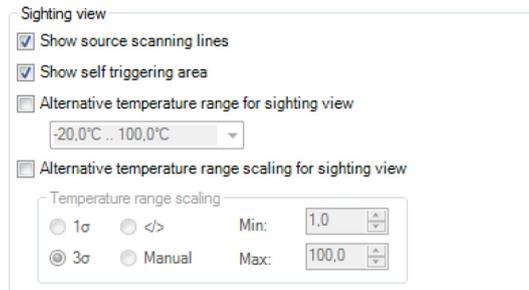
The screenshot shows two panels of settings. The left panel, titled 'Direction', contains a list of radio button options: 'Scan on user defined line', 'Scan top-down (rows)', 'Scan bottom-up (rows)', 'Scan left to right (columns)', 'Scan right to left (columns)', 'Scan on auto detected horizontal slit' (which is selected), and 'Scan on auto detected vertical slit'. The right panel, titled 'Auto detect line within slit', includes a 'Detect' section with radio buttons for 'above' (selected) and 'below', and a temperature input field set to '100.0 °C'. Below this is a 'Slit width [pixel]' section with a 'Current avg. width' field showing '0.0' and a 'Min / Max' range from '1' to '20'. A 'Slit location' section has a 'Limit to:' range from '10' to '10'. At the bottom of the right panel are two buttons: 'Create user defined line' and 'Reset', and a checkbox for 'Auto adjust IR rotation' which is currently unchecked.

There is also the possibility to limit the location of the slot. To do this, the function must be activated and the range must be defined.

If the option Auto adjust IR rotation is activated, the image is automatically rotated vertically or horizontally based on the slit.

8.2.6 Layout Configuration of the Sighting View Mode

You can make further modifications to the Line Scanner Configuration, [see 8.2.1](#), using Tools, Line scanner mode and Line scanner settings. If you go to Sighting view you can define several modifications. The option Show source scanning lines enables you to fade the scanning lines in and out. With Show self triggering area the self triggered area can be faded in and out. Alternative temperature range for sighting view option enables switching to temperature range different from the one used for the measurement. It is sometimes helpful to configure the line scanner when process is stopped using one temperature range where as different temperature range is defined to examine running process. As a further option Alternative temperature range scaling for sighting view you can set up your own temperature range scaling.



The screenshot shows the 'Sighting view' configuration panel. It contains the following options:

- Show source scanning lines
- Show self triggering area
- Alternative temperature range for sighting view
-20,0°C .. 100,0°C
- Alternative temperature range scaling for sighting view

Under the 'Alternative temperature range scaling for sighting view' option, there is a sub-section titled 'Temperature range scaling' with the following controls:

- Radio buttons for 1σ , $</>$, 3σ , and Manual. The 3σ option is selected.
- Input fields for 'Min:' (value: 1,0) and 'Max:' (value: 100,0).

Fig. 111 View Sighting view

8.3 Data Evaluation of the Scanned Line

8.3.1 Line Scanner View

In the line scanner view readings will be displayed as an infrared image. To activate this view mode you can use the icon provided.



i This icon enables to switch between Line scanner sighting view and Line scanner view.

Presentation of the scanned lines can be further defined in `Line scanner configuration` application window, see 8.2.1, under `Presentation`. `Direction` option defines in which direction the scanned lines will be displayed. Scanned lines can be displayed as `Top-down`, `Bottom-up`, `Left to right` or `Right to left`.

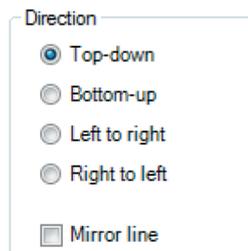


Fig. 112 View Direction

If the line scan has been set up mirror-inverted, activating the `Mirror line` option will mirror the display and it will not be necessary to set it up again.

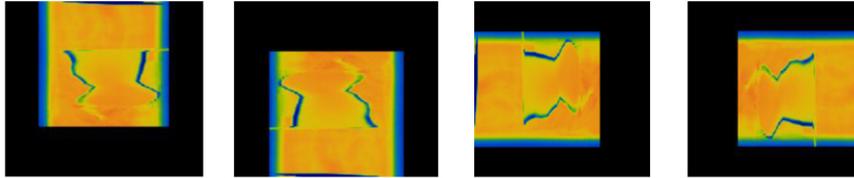


Fig. 113 Presentation of scanned lines in the Line scanner view: Top-down, Bottom-up, Left to right and Right to left

Mode Linecount

In this mode the display of the line scan is done by the scan time and the line count.

In the input field `Scan time` you define the time window in which the lines should be displayed.

The basis for this can be the time of a process cycle.

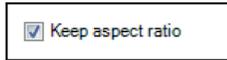
By specifying the `line count` you can enter how many lines will be displayed in the Line scanner view. Number of lines will also define after how many lines the infrared image will be reloaded (Line scan).

Presentation			
Mode:	<input checked="" type="radio"/> Length/Width	<input type="radio"/> Linecount	Unit: <input type="text" value="m"/>
Width (Length of line):	<input type="text" value="3,00"/>	[m]	
Length (of scan):	<input type="text" value="5,00"/>	[m]	
Feed rate:	<input type="text" value="0,500"/>	[m/sec]	
Line count:	<input type="text" value="600"/>	[lines]	
Pre-carriage:	<input type="text" value="0,500"/>	[m]	<input type="text" value="0"/> [lines]
Resulting linerate:	<input type="text" value="50,0"/>	[lines/sec]	
Scan time:	<input type="text" value="10,0"/>	[sec]	
<input type="checkbox"/> User defined time:	<input type="text" value="60,0"/>	[sec]	

In the `Resulting linerate` field, the frequency of each line is automatically calculated. If a higher line frequency is defined than the camera and its scanning actually provide, a red exclamation mark is displayed (!).

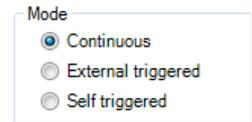
`Pre-carriage lines`: For a better representation of the line scan, it makes sense in some cases to insert a certain number of dummy lines at the beginning.

`Keep aspect ratio` option will adjust width of each line so that all lines will appear within the infrared image.



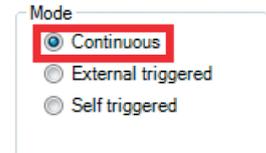
8.3.2 Triggered Display of Lines

Triggering signal can be used to control how the scanned lines will be arranged within the Line scanner view. In the `General` menu under `Line scanner configuration`, see 8.2.1, there are three modes provided.



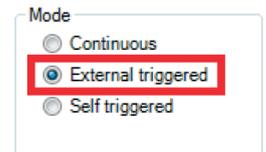
8.3.2.1 Continuous Line Scan

`Continuous` mode will apply predefined values to display the scanned lines. No triggering signal will be used to control the line scanner presentation.



8.3.2.2 External Triggered Line Scan

`External triggered` option enables using an external triggering signal to control arranging of the scanned lines. Number of lines being reloaded after this signal is defined under `Lines und History [sec]`, see 8.3.1.



Further settings can be specified:

In **Flag operation** if you activate **Avoid during scan** refreshing of flag will not be executed during the line scan, [see 4.3.2](#).

Force after scan will execute the flag once given number of scanned lines is provided.

Flag operation

- Avoid during scan**
- Force after scan**

If activated **Avoid re-triggering during scan** will not allow to run a new line scan cycle while a previous cycle trigger by recent signal is not finished.

Trigger options

- Avoid re-triggering during scan**

Using **Avoid temperature analyzing, detecting alarm states and PIF operation during scan**, the three operations mentioned are performed only at the end of the scan. This is very helpful for performance reasons when a very high sampling rate (e.g. 1000 Hz, TIM M-1, TIM M-05) is set.

Analyzing operation

- Avoid temperature analyzing, detecting alarm states and PIF operation during scan**

Using **Correcting operation** and **Avoid all corrections based on internal temperature sensors during scan** can optionally prevent the recalculation of correction values in the triggered line scan.

Correcting operation

- Avoid all corrections based on internal temperature sensors during scan**

i For external triggering it is necessary to do modifications of the standard configuration on the Process Interface (PIF). You will find more details, [see 4.4](#).

8.3.2.3 Self Triggered Line Scan

Using the `Self triggered` option it is possible to use a triggering signal provided by software to control arranging of the scanned lines. Number of lines being reloaded after this signal is defined under `Lines` and `History [sec]`, see 8.3.1.

Mode

Continuous
 External triggered
 Self triggered

Further modifications can be carried out:

First of all `Trigger area` within the infrared image needs to be specified. With the mouse you can make a graphic free positioning of the self trigger area in the sighting view. In the `Set Default` button you can choose between `Top`, `Bottom`, `Left`, `Right`, `Center` and `Full image`.

Trigger area

Left: Right:

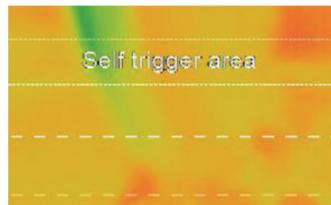
Top: Bottom:

Set Default

Within the trigger area `Trigger thresholds` temperatures can be set to trigger the line scan cycle. With `Trigger if below` count all temperatures below the entered limit, with `Trigger if above` all values above.

Trigger thresholds

Trigger if below
 Trigger if above
 Holdoff time [s]:



`Holdoff time [s]` determines time frame within new signal should be neglected (e. g. if a signal from the heat source in the background is triggered).

Under `Flag operation` and `Avoid during scan` can be set that refreshing of flag will not be executed during the line scan, see 4.3.2.

`Force after scan` will execute the flag once given number of scanned lines is provided.

Using `Correcting operation` and `Avoid all corrections based on internal temperature sensors during scan` can optionally prevent the recalculation of correction values in the triggered line scan.

Flag operation

- `Avoid during scan`
- `Force after scan`

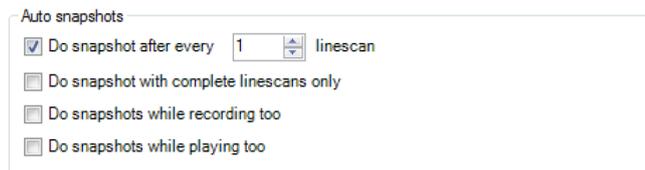
Correcting operation

- `Avoid all corrections based on internal temperature sensors during scan`

8.3.3 Snapshot Configuration

To document the measurement results a complete line scan can be saved as snapshot. You will find the `Auto snapshots` settings options in the `Line scanner configuration`, see 8.2.1.

Using `Auto snapshots` and `Do snapshots any...` you can specify after how many line scans a snapshot should be captured and saved.



Auto snapshots

- Do snapshot after every linescan
- Do snapshot with complete linescans only
- Do snapshots while recording too
- Do snapshots while playing too

Fig. 114 View Snapshot Configuration

If `Do snapshots with complete linescans only` is activated, the snapshot will be delayed with an externally triggered Line scan until the next scan starts. If the checkmark is not set (default), the snapshot will be taken directly at the end of the line scan.

`Do snapshots while recording too` will also take snapshots during a simultaneous line scan recording.

`Do snapshots while playing too` will take snapshots from a video recording during playback.

8.3.4 Zoom Function of Snapshots

Captured snapshots can be enlarged when viewed. To do this, open a saved snapshot (TIFF file), [see 5.1](#). Use **+** to zoom in and **-** to zoom out or use the bars on the side.

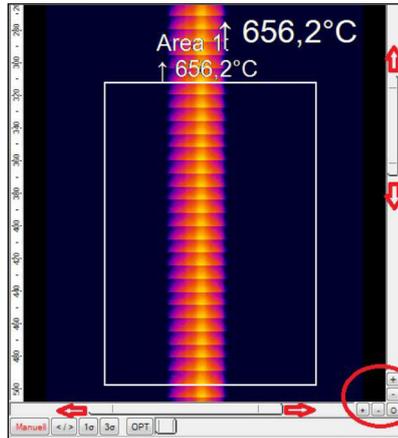


Fig. 115 View Zoom Function of Snapshots

9. Merging

9.1 General Information

A further function in the TIM Connect software is the so-called merging. The merging allows the user to display several cameras in one software instance. This is very useful when whole processes, where several cameras are required, are to be displayed in a single screen.

Generally there are two ways to realize a merging. On the one hand you can connect the cameras directly to your computer via USB Port and on the other hand via the Ethernet network. Using the direct connection, it is really important to have several USB controllers at your PC. You find this information under the windows control panel, device manager and USB controller. One camera should be connected to one USB controller.



Fig. 116 View Camera Merging

Advantage of camera merging

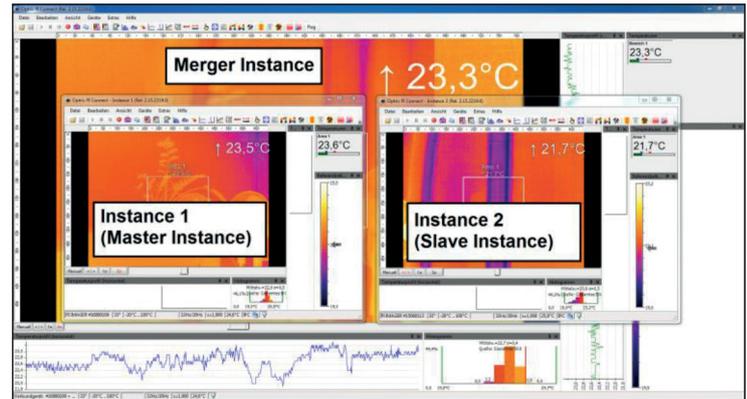
- If pixel size is getting too big, the use of multiple thermoIMAGER TIM cameras is possible.
- Simultaneous flag control and frame synchronization via PIF
- Measurement areas / hot-, coldspots works over whole area.
- Different camera positions allow having various viewing angles for a complete view of a 3D object.
- After the merging setup and the restart of the TIM Connect software, the source instances will open automatically.

I The Merging feature should only be used with cameras that use the same frame rate.
Depending on the number of cameras used, a powerful PC is necessary. Recommended is a PC with at least Intel Core i7, 16 GB RAM and 256 GB SSD.

Using a PIF: The PIF must be connected to the master camera. The configuration takes place in the merger instance.

TIM M-1, TIM M-05 cameras are not supported.

Merging requires several instances. Each camera used gets its own instance. These are automatically generated during setup. The first created instance (Name: Instance 1) is the so-called *Master* instance. The other created instances (Name: Instance 2, Instance 3, etc.) are the so-called *Slave* instances. The final instance is the so-called *Merger* instance in which all cameras are displayed in one instance. The master and slave instances can/should be minimized after setup. Do not close the windows.



9.2 Direct Connection over USB Port

In this variant of connection, the cameras are connected directly via USB to the PC. It is important to connect the individual cameras to different USB controllers because the maximum bandwidth of the USB interfaces is limited.

i We recommend using no more than 3 cameras.

9.3 Configuration

➡ At first connect all the cameras you want to use to your PC and open the TIM Connect software.

➡ Go to the menu `Tools` and `Merger settings`.



A message appears stating that the device is now closed.



Fig. 117 Interrupt merged device

➡ Confirm this message with `OK`, see [Fig. 117](#).

➡ Depending on how many cameras you want to use, click correspondently often the button `Add`, see [Fig. 118](#).

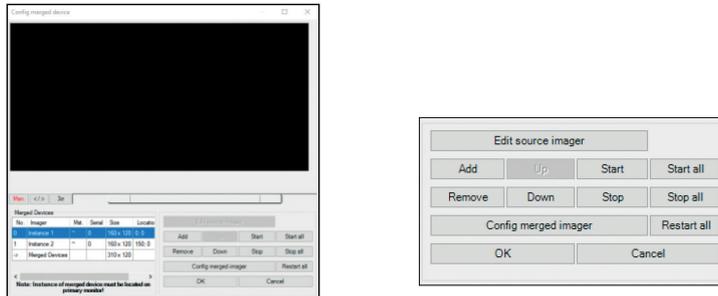


Fig. 118 Add cameras

In this example, two cameras are used.

➡ Afterwards mark each instance one at another and press the *Start* button. The instances will open in a new window, see Fig. 119.

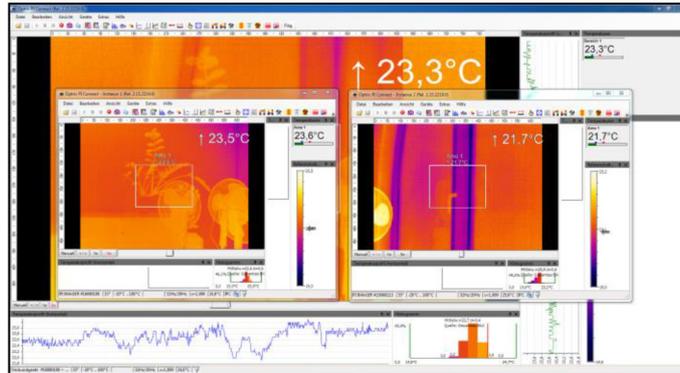


Fig. 119 Instances view - 2 cameras

- Now you have to assign this instance to the first camera. To do that, go to the Instance 1 window to Tools, Configuration and Device.
- Under Application start, see Fig. 120, set a check on Connect to device with SN and press pick current.



Fig. 120 Application start

This instance is now assigned to this camera.

- Repeat the steps for all cameras.

You can assign the different cameras to a specified instance by going to the instance window you want to assign and under menu Devices, select the camera you want to have, see Fig. 121.

- To adjust the pictures, go again over the main window to Config merged device like described before.

Here you can directly select each instance and change the size, the position and the rotation of the imager (starting from software version 2.15.2222.0).

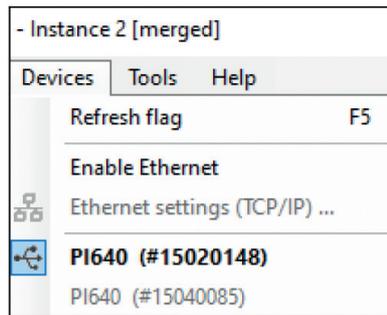
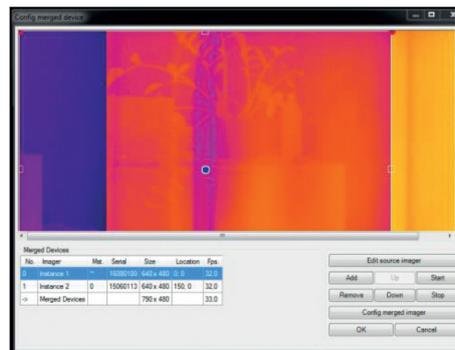


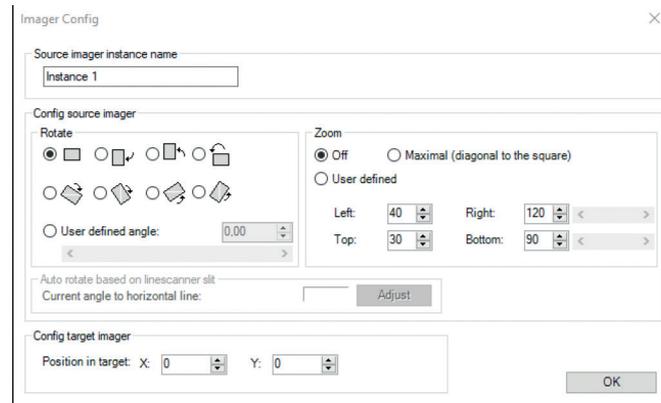
Fig. 121 Device selection view



Another possibility to arrange the images of the different instances is also in the Config merged device window.

➡ Select the first instance (Instance 1) and click on Edit source imager.

Here you make several modifications on your imager. You can change the name, the picture of the camera and the position of the picture. Under Config target imager you can define the exact position of the target. So here you define where the picture should start. Repeat the same with the second instance (Instance 2). You can arrange the picture side by side or on top of each other. The coordinates depends on the camera you're using.



For example if you use two cameras with an optical resolution of 640 x 480 and the picture should be side by side you have to use following values for the whole picture:

e.g. TIM 640 VGA	Position in target X	Position in target Y
Instance 1	0	0
Instance 2	639	0

In this example the picture of the camera of Instance 1 is on the left side and the picture of the camera of Instance 2 begins lightly overlapping next to it.

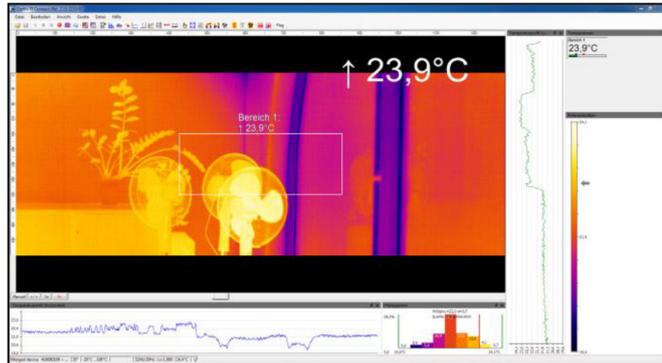


Fig. 122 Overlapping instances view

It is recommended a light overlapping of the pictures (up to 5 pixels) in order to have a smooth transition of the two pictures. The windows of the source instances can be minimized. Do not close the windows because than there will be no measuring in the merger instance. They have to run in the background or in the hidden mode.

- **i** The instance of the merged device must be located on the primary monitor. If this is not the case, the note in the `Config merged device Setup` dialog box is highlighted in bold.

Merged Devices						
No.	Imager	Mst.	Serial	Size	Location	Fps.
0	Instance 1	~	15040085	640 x 480	0; 0	30,1
1	Instance 2	0	15020148	640 x 480	150; 0	31,9
->	Merged Devices			790 x 480		19,1

Note: Instance of merged device must be located on primary monitor!

Fig. 123 Merger configuration note

Under Config merged imager, further settings can be made for all instances.

With Synchronize frames by digital input (DI) of PIF, the frames of the connected cameras are simultaneous synchronized using the PIF. This can be done on rising edge, on falling edge or on both edges.

Mix overlapped edges makes a smooth transition between the singles images. It will be interpolated.

With Adjust secondary imager(s) to master imager, an adaptation of the pixels of the individual slave imagers to the master imager within the set temperature range is performed in the overlapping area.

The set temperature value at maximum adjustment offset indicates the maximum offset adjustment.

If the checkmark is set to `Ignore margin pixels`, the set margin pixel is not taken into account. A fixed number of margin pixels in the overlapping area does not work during line scanning when the gap is very narrow. Then no valid pixels are found.

Under `After flag operation only`, the pixels are adjusted only after a drawn flag and not continuously. `Keep adjustment after restart` ensures that the calculated offset of the secondary imager is preserved for the merging after program end.

`Alarm if adjustment is overdue: Delay for 900 s`, an alarm is output if the adjustment is exceeded after the set time.

Further, you can make settings for the `Start` and `Stop` of the software. You can decide how the pictures of the source instances should be started. You can choose between `Normal`, `Maximized`, `Minimized` and `Hidden`. Also it is possible to close the source instances automatically when closing the `Merger` instance.

With `Delay between start of each instance` you can define the interval at which the individual instances are to be started one after the other. This is helpful when using the cameras via Ethernet to avoid possible communication problems.

Under menu `View, Windows and Merged device` a tool window opens with a view of the available instances of the merged device.

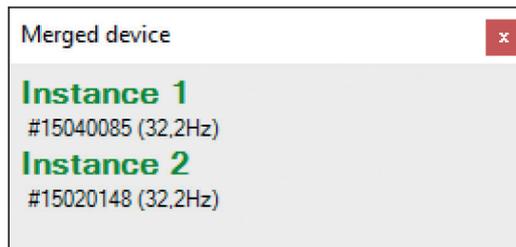


Fig. 124 Merger view

9.4 Connection via the Ethernet Network

The second possibility is a connection via the Ethernet network. Each camera is connected to one individual USB Server Gigabit and those in turn are connected to the Ethernet switch. The switch than is attached to the PC. For the connection via network you can use more than 3 cameras for the merging.

The configuration of the merging is the same as described, [see 9.3](#).

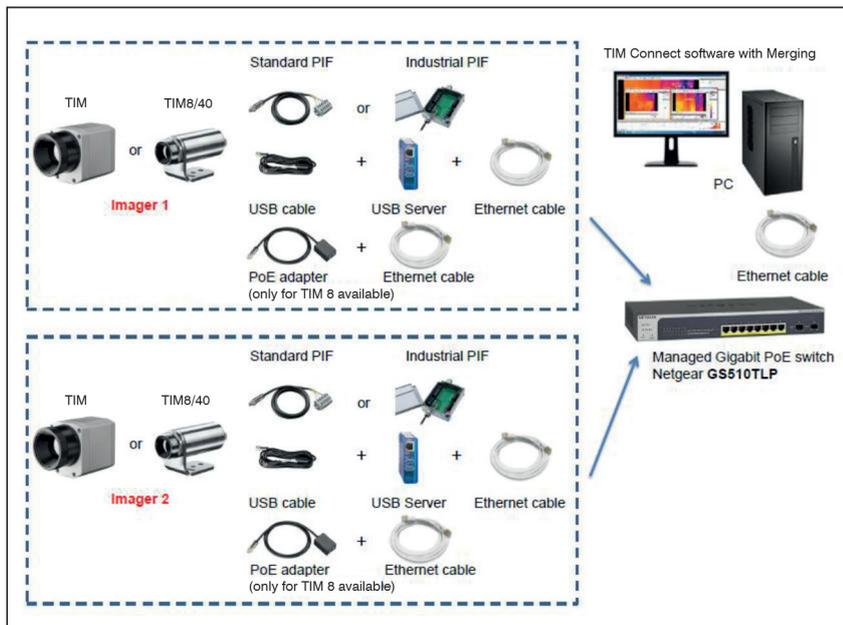


Fig. 125 Connections to Ethernet network

You find a detailed description and procedure for the installation of USB Server Gigabit on the USB stick in the folder Documentation and Manuals.

9.5 Merging with the Use of the PIF

In Merging mode, inputs and outputs can be used as usual via the PIF.

It must be ensured that the PIF must be connected to the master camera (Instance 1).

The settings in the software are made via the merger instance.

The note (on PIF at instance "Instance 1") shows that the PIF is being used by the master camera.

If analog outputs are used in the merger instance, they must be activated in the master instance. For this purpose, the used outputs must be set to External Communication:

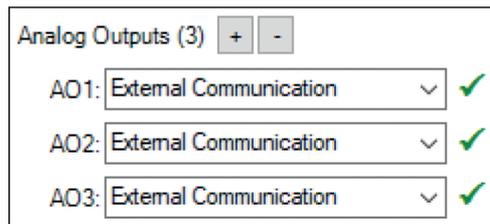


Fig. 126 Analog outputs view

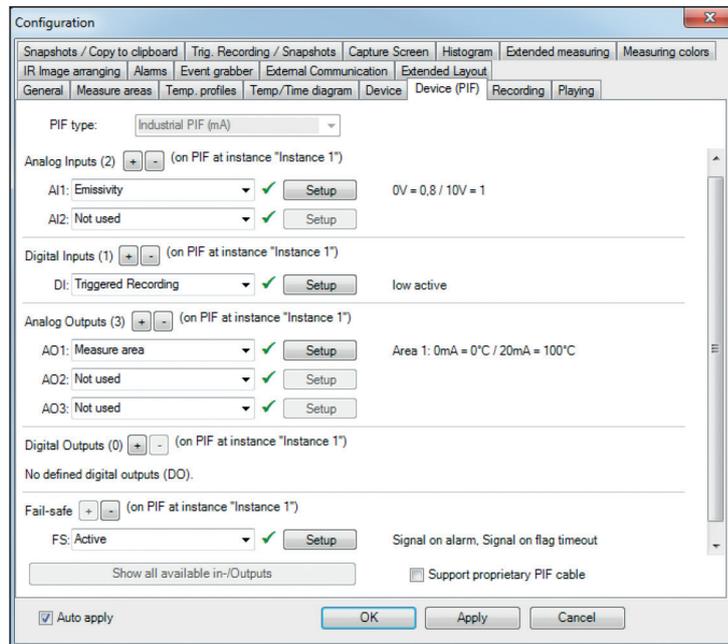


Fig. 127 Configuration dialog of Merger Instance

9.6 Simultaneous Flag Control

In Merging mode, it is important for the synchronization of the image that the flag of the cameras used is drawn at the same time. This feature can be set through the software and does not require additional hardware such as the Process Interface (PIF).

To achieve simultaneous flag control, the flag automatic must be set with the Merger, Master and Slave instances, see Fig. 128.

Flag automation must be enabled for the Merger instance and disabled for the Master and Slave instances.

In the configuration dialog under Device the flag automatic can be activated or deactivated, see Fig. 129.



Flag automatic	
Merger Instance	On
Master Instance	Off
Slave Instance(s)	Off

Fig. 128 Overview of flag automatic settings

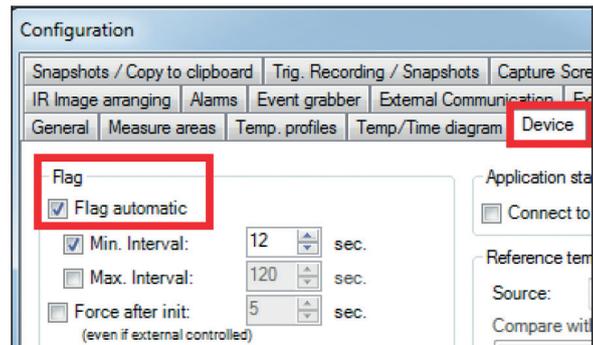


Fig. 129 Flag automatic activation

9.7 Simultaneous Frame Synchronization via PIF

For simultaneous frame synchronization, use the PIF connection from the TIM camera. You can choose between the standard PIF and the industrial PIF depending on how many in- and outputs you want to use.

In this example, standard PIF is used camera will be chosen the master and the others are the slaves. Please connect the digital with the analog output the master PIF and the analog output connect all digital inputs the slaves together.

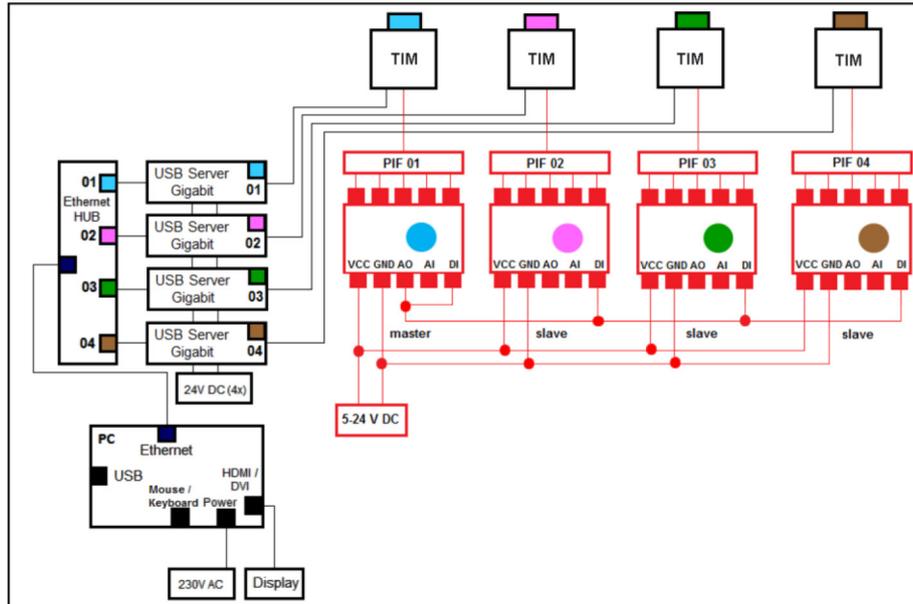


Fig. 130 Model simultaneous frame synchronization via PIF

After you connected all your PIFs together, you need to set up the settings in the TIM Connect software.

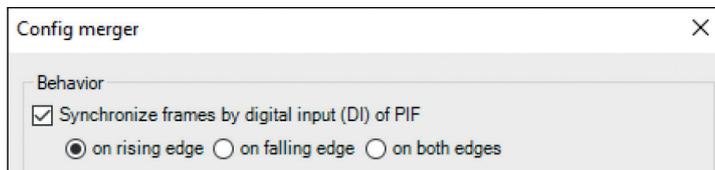
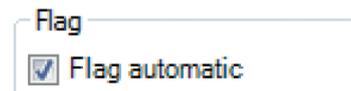


Fig. 131 Merger configuration view

- ➡ Therefore go to menu Tools, Extended and Config merged device.
- ➡ Then click on Config merged imager and enable Synchronize frames by digital input (DI) of PIF.

The flag automatic must be activated for the Merger instance and deactivated for the master and slave instances, see 9.6, see Fig. 132.



	Flag automatic
Merger Instance	On
Master Instance	Off
Slave Instance(s)	Off

Fig. 132 Settings overview for flag automatic

10. Further Information

10.1 Options

Under **Tools**, **Extended** and **Options**, you can make further settings, which are explained in the following.

10.1.1 Activating Software Messages

At some point a warning message will appear when performing an action that would cause changes to software settings.

To prevent unintended changes you can activate or deactivate these messages, [see Fig. 133](#).

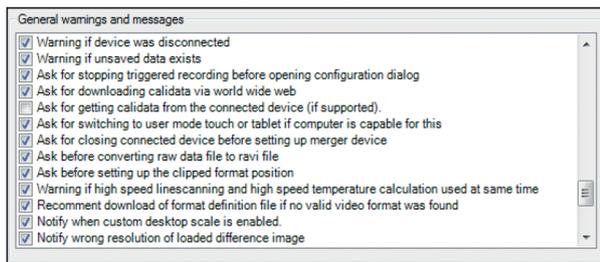


Fig. 133 Enabling / Disabling warnings and messages

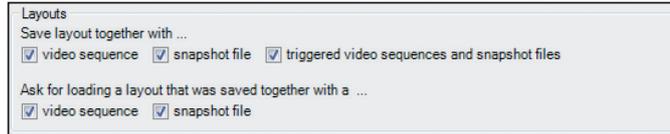
i If a message appears you can disable the window by choosing **Never ask me again**.
Using the menu **Options** you can activate the appearance of the window again.

Important options are:

Warning if device was disconnected	A window tells the user that a device was disconnected.
Warning if unsaved data exists	If activated a reminder will appear to warn you on unsaved data or setups before shutting down the software.
Ask for stopping triggered recordings...	Opening the configuration dialog you will be asked whether to close a triggered data capturing or not. The message intends to prevent changing trigger settings by accident.

10.1.2 Layouts

Under **Layouts** you can choose how a layout should be saved or loaded together. The layouts are independent of the connected device.



10.1.3 Temperature Unit

When setting the **Temperature** unit you can choose between **Celsius (°C)** and **Fahrenheit (°F)**. Alternatively, the temperature unit can also be changed by pressing the right mouse button in the live IR image.



10.1.4 Log Events

Also you can activate **Log** events. If it's selected, messages (for example fail-safe events) will be logged. These can be found under menu **View.Windows** and **Event protocol**.

Date	Time	Count	Source	State	Message
23.08.2017	09:29:25	1	Appl	Info	Started
23.08.2017	09:29:27	1	Dev	Info	Connected: TIMQVGA/QVGA HD
23.08.2017	10:33:10	1	Dev	Error	Flag timeout
23.08.2017	10:41:07	1	Dev	Error	Flag timeout
23.08.2017	11:11:57	2	Dev	Error	Flag timeout

or at: (C:\Users\AppData\Roaming\Imager\Event)(C:\Benutzer\AppData\Roaming\Imager\Event)



10.2 System Requirements

10.2.1 Minimum System Requirements

- Windows 7 and higher
- USB 2.0-interface
- At least 2 GB RAM
- 2,0 GHz processor power

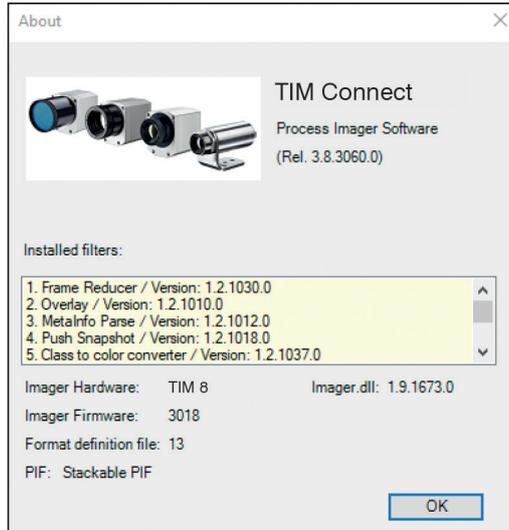
10.2.2 Recommended System Requirements

- Windows 10 and higher
- At least 2 GB hard disk storage for IR videos
- At least 4 GB RAM

i Running the software under embedded systems and server operating systems cannot be guaranteed.

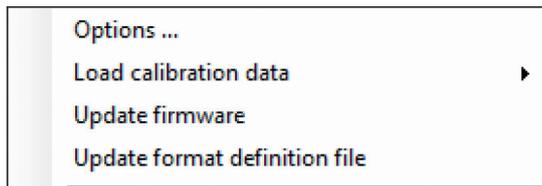
10.3 Information about Software

In the **Help** and **About** submenu you will find the version of TIM Connect software you are currently running, the imager hardware and the imager firmware.



10.4 Extended Configuration

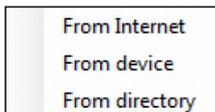
Under `Tools` and `Extended` you can configure different adjustments.



Under `Options` you can choose general warnings and messages, [see 10.1.1](#).

Load calibration data:

- **From Internet:** Will re-download the files via an existing Internet connection.
- **From device:** The calibration files are reloaded from the device (appears only for thermoMETER TIM 8 / TIM 41).
- **From directory:** If there is no Internet connection, the files can also be imported via the supplied data medium (via the directory Calfiles SNxxxxxxx).



The `firmware update` should be checked at regular intervals so that you always have the latest version on your device. The `format definition file update` ensures that the current video formats are supported.

10.5 Overview Shortcuts

F1	Snapshot
Alt+F1	Copy snapshot to clipboard
F2	Record
F3	Stop
Alt+F4	Exit
F5	Refresh flag
F6	Save screenshot
Alt+F6	Copy screenshot to clipboard
F7	Capture screen
Alt+F7	Replay captured screen
F10	Acknowledge alarm
Alt+Enter	Full screen
Alt+C	Configuration
Alt+H	Horizontal mirror
Alt+P	Next palette
Strg+Alt+P	Previous palette
Alt+S	Image subtraction
Strg+Alt+S	Image subtraction from file
Alt+V	Vertical mirror
Strg+L	Line scanner sighting view
Strg+Alt+C	Line scanner settings
Strg+Alt+L	Enable line scanner

11. Disclaimer

All components of the device have been checked and tested for functionality in the factory. However, should any defects occur despite careful quality control, these shall be reported immediately to MICRO-EPSILON or to your distributor / retailer.

MICRO-EPSILON undertakes no liability whatsoever for damage, loss or costs caused by or related in any way to the product, in particular consequential damage, e.g., due to

- non-observance of these instructions/this manual,
- improper use or improper handling (in particular due to improper installation, commissioning, operation and maintenance) of the product,
- repairs or modifications by third parties,
- the use of force or other handling by unqualified persons.

This limitation of liability also applies to defects resulting from normal wear and tear (e.g., to wearing parts) and in the event of non-compliance with the specified maintenance intervals (if applicable).

MICRO-EPSILON is exclusively responsible for repairs. It is not permitted to make unauthorized structural and / or technical modifications or alterations to the product. In the interest of further development, MICRO-EPSILON reserves the right to modify the design.

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For translations into other languages, the German version shall prevail.



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