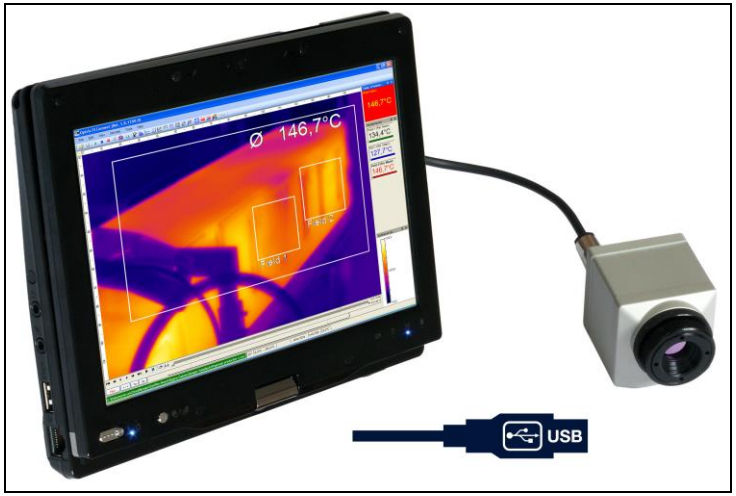
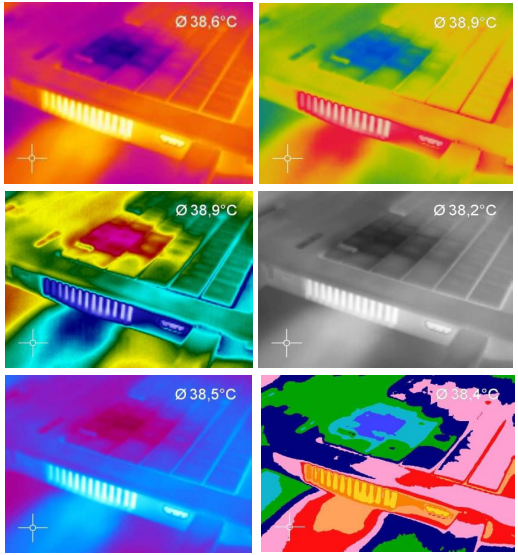
optris PI Connect

Software for Thermal Imager





Operators manual

optris
infrared thermometers

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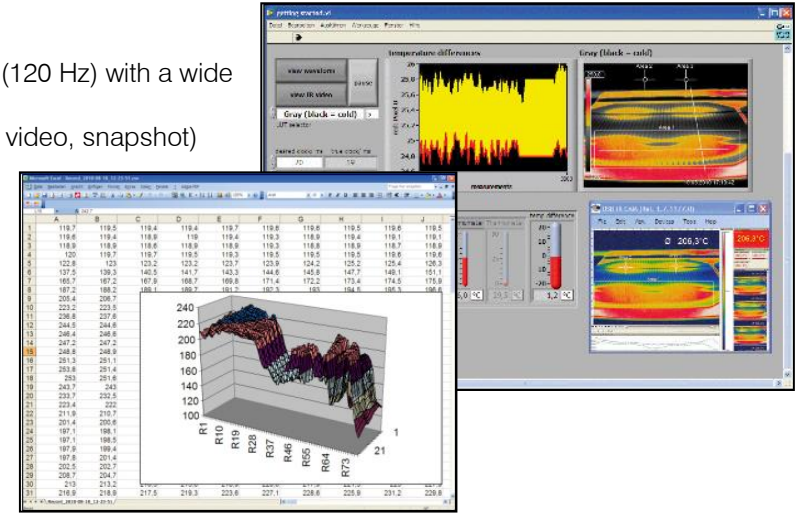
Welcome!

Thank you for choosing the optris PI Connect software!

The optris PI calculates the surface temperature based on the emitted infrared energy of objects **[► Basics of Infrared Thermometry]**. The two-dimensional detector (FPA - focal plain array) allows a measurement of 160 x 120 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 using the software PI Connect.

Main features of PI Connect software:

- Display of the real time thermal image (120 Hz) 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



Legal disclaimer

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All products are warranted against defective materials and workmanship for a period of two (2) years from the delivery date of the original purchase, provided such products have been under normal storage, use and service, and in accordance with the instruction. This warranty expires in case of inappropriate use of all delivered components.
All products not manufactured by us included in systems delivered by us to the original purchaser carry the warranty, if any, of the particular supplier only and we have no responsibility whatsoever for such products.
The manufacturer is not liable for any use of the software PI Connect including data recording. The manufacturer does not carry liability for error-free operation of the software in any hardware and operating system.
The warranty is not expressed for possible quality changes, errors when presenting the software, occurring defects during operation or insufficiencies in certain applications. The user is liable for any defects or data processing insufficiencies when in using the software.
The manufacturer has no other liability inside the scope of supply other than mentioned above. The manufacturer shall not be liable for any business loss or claim for compensation, loss of the computer software, possible loss of data, additional costs for replacement software, claims of third parties or other occurring costs or failures and deficits.
The software is protected by copyright and is not allowed to be changed or sold to third parties.

Note
Read the manual carefully before you start the device. The manufacturer reserves the right to change the herein described specifications in case of technical advance of the product.

1. Getting started

1.1. Software installation

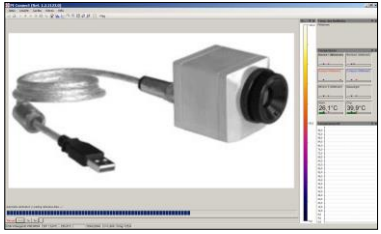
Please install at first the software PI Connect from the CD. The CD contains the software application, the specific calibration data of the imager as well as some sample files. These data will be installed automatically.

Note
Before installing the new software please uninstall earlier versions of the PI Connect. If you want to uninstall the software from your system please use the **uninstall icon** in the start menu.

Insert the installation CD into the according drive on your computer. If the autorun option is activated the installation wizard will start automatically. Otherwise please start **setup.exe** from the CD-ROM. Follow the instructions of the wizard until the installation is finished.

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) 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.

1.2. Choice of camera

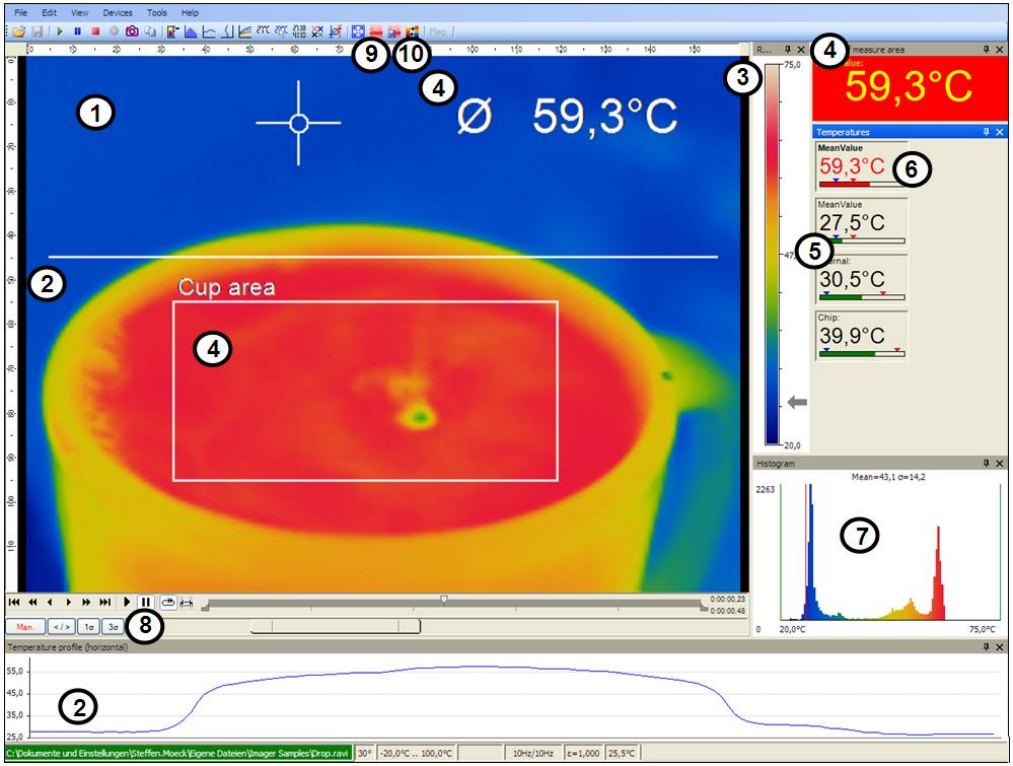
In case you are using more than one PI simultaneously (e.g. via USB hub) please select the required PI from the list in the **Devices** menu.

1.3. Choice of language

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

Note
In case your language is not provided you will find a translation tool on the software CD delivered with the camera.

1.4. 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	Reference bar: Shows the scaling of temperature within the color palette.
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	Control displays: Displays all temperature values in the defined measure areas like Cold Spots, Hot Spots, temperature at cursor, internal temperature and chip temperature.
6	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 temperature above the high alarm value) and to blue (when temperature below the low alarm value).
7	Histogram: Shows the statistic distribution of single temperature values.
8	Automatic / manual scaling of the palette (displayed temperature range): Man., </> (min, max), 1**σ** : 1 Sigma, 3**σ** : 3 Sigma
9	Icon for quick access to Image Subtraction function
10	Icon enabling switching between color palettes

1.5. Menu and Toolbar (Icons)

1.5.1. 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

File	Open, save and replay of files
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
Help	Information about software

1.5.2. 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 section **2.2.2**). Available toolbar icons are following:

	Configuration
	Open
	Save
	Play
	Pause
	Stop
	Record
	Copy snapshot to clipboard
	Save snapshot
	Copy screenshot to clipboard
	Save screenshot
	Full screen

	Previous palette
	Next palette
	Reference bar
	Histogram
	Temperature profile (horizontal)
	Temperature profile (vertical)
	Temperature time diagram
	Digital display (main measure area)
	Digital display (mouse cursor)
	Digital display group
	Close all tools
	Toggle between min, mean, max

	Snapshot history
Sub	Image subtraction
	Image subtraction from file
	Enable linescanner
	Linescanner view ⇔ Sighting view
	Linescanner configuration
Flag	Flag
Alarm	Alarm
	3D Chart
	Visible Video
	IR/Visible Fusion

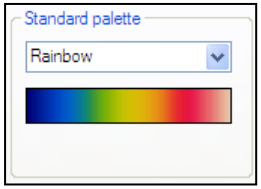
2. Software configuration

2.1. General settings

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

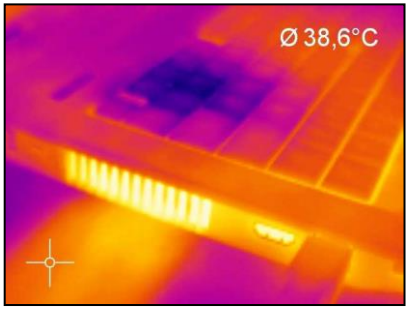
2.1.1. Color palettes

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.

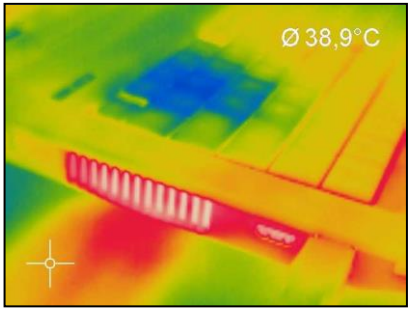


You can also adjust the color palette via the **Icon** on the toolbar or the menu **View** and **Shift palette**.

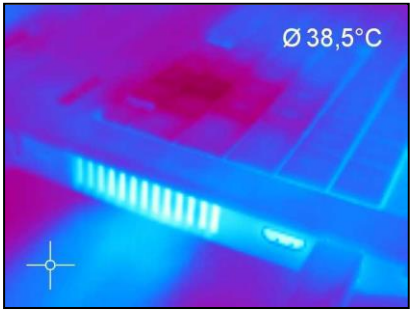
Examples of various color palettes:



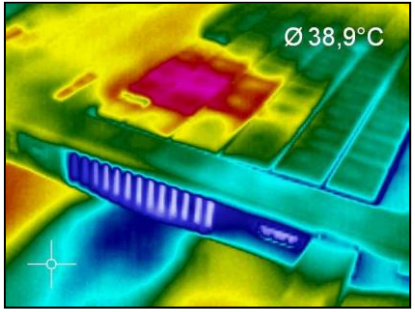
Palette Iron



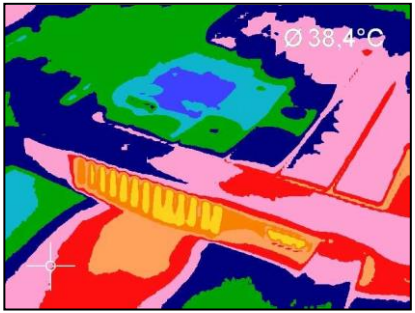
Palette Rainbow



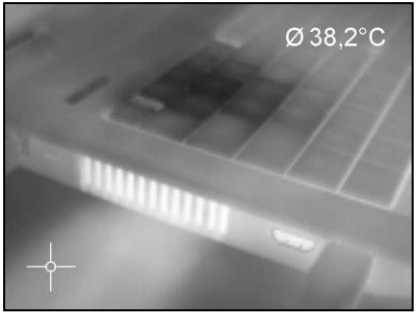
Palette Blue Hi



Palette Rainbow Hi

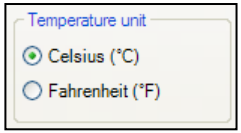


Palette Rainbow Medical



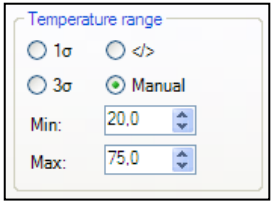
Palette Gray (Black = Cold)

2.1.2. Temperature unit



When setting the **Temperature unit** you can choose between **Celsius (°C)** and **Fahrenheit (°F)**.

2.1.3. Temperature range of reference bar



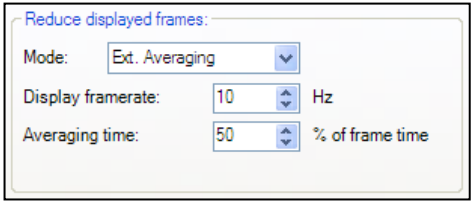
Via **Min.** and **Max.** settings you can allocate colors to temperature values within the reference bar .

These are the following options:

Manual	The upper and the lower border 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.

2.1.4. Displayed frame rate

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 is 120 Hz.



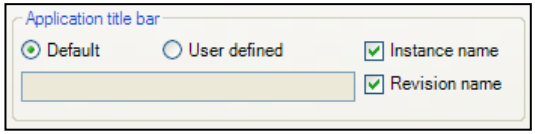
The camera supplies the software all images all the time. Reducing frame rate means that some images will not be considered. The specified algorithm defines which images will be displayed or not:

Off	The displayed frame rate will be 120 Hz.
Skipping	The remaining images will be skipped by the defined frame rate, which means at 10 Hz that every 10th image will be displayed.
Average	The images will be averaged by the defined frame rate, which means at 10 Hz that 10 images result in one averaged image.
Minimum	E.g. at 10 Hz 10 single images compose one image where only lowest value pixels will be considered.
Maximum	E.g. at 10 Hz 10 single images compose one image where only highest value pixels will be considered.
Ext. Averaging	The images will be averaged by the defined frame rate as well as the **averaging time**, which means at 10 Hz and 50% of frame time that just 50% of 10 images (thus 5 images) will compose a new averaged image.

Note

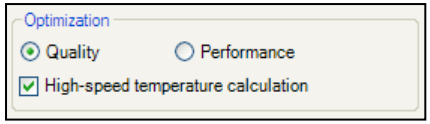
A reduced frame rate means a less loaded computer in terms of data processing. Therefore, please adjust the displayed frame rate according to your application as well as to the performance of your computer.

2.1.5. Change of title bar

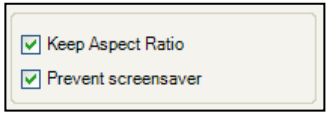


The **Application title bar** option enables the individual setting of title bar.
The setting **Default** displays the standard software name „PI Connect“. Using the setting **User defined** you can specify an individual name. The option **Instance name** is important if starting several cameras and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

2.1.6. Optimization of software

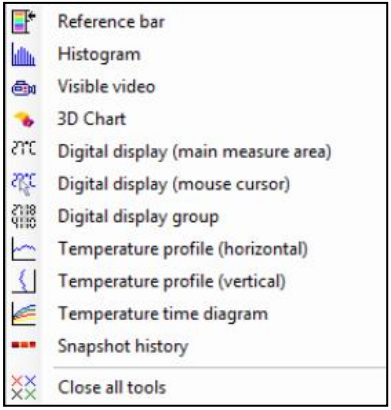


The display of the thermal image in the main window of the software can be adjusted according to the performance of the computer. Using a slow computer it is recommended to choose the option **Performance** and to deactivate all other options (display will be enlarged from 160 x 120 pixels to only 320 x 240 pixels). Choosing the option **Quality** and **High-speed temperature calculation** the display will be enlarged from 160 x 120 pixels to 640 x 480 pixels.
If **Keep aspect ratio** is selected the aspect ratio will be maintained.
The option **Prevent screensaver** is suppressing the screensaver functionality of your computer.



2.2. Software layout

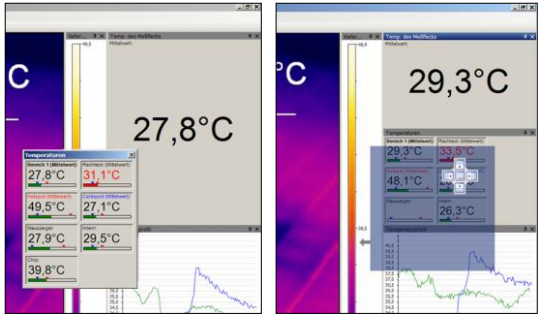
2.2.1. Displayed windows



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**.

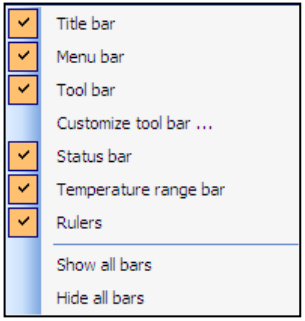
On the one hand a window can be positioned separately on the screen. On the other hand a window can be set at a fixed position in the software. The location can be determined using the positioning field (mouse over the arrows „above“, „below“, „right“, „left“).
When a window is dragged into another one (mouse has to be placed within title head) both will be merged. You can switch between them using the tab provided.

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



2.2.2. View bars

For individual display of software you can show or hide single bars in the software window.
There is the possibility to **Show all bars** or **Hide all bars** by one click.

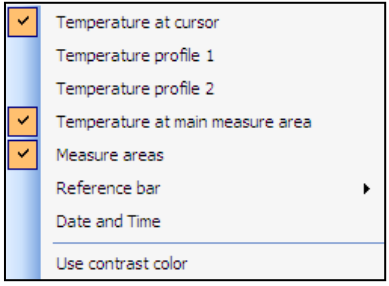


Note
All icons shown on the toolbar can be individually selected via the option **Customize tool bar…** (Please see also **1.5.2**).

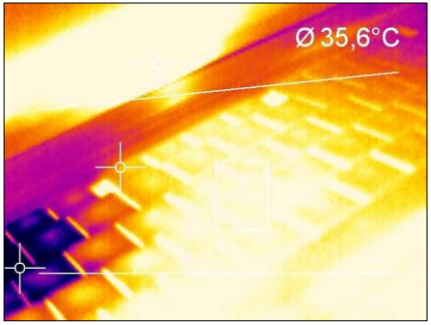
2.2.3. Information within image

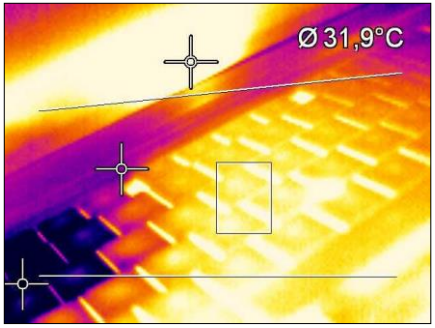
Using the menu **View** and **Image Information** you can decide, which information you would like to see inside the infrared image window.

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.

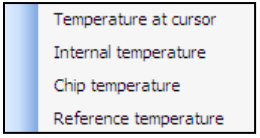


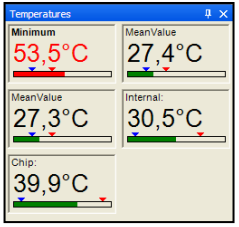


Display of thermal image without and with contrast colors

2.2.4. Temperatures in digital displays

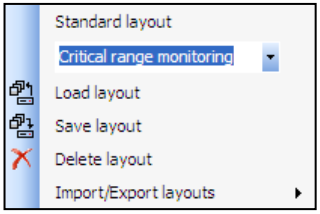
The menu option **View** and **Digital display group temperatures** allows the user to define which temperature control displays will be shown in the application window **Temperatures** (see section **2.2.1**). The shown pre-defined values can also be displayed in the temperature time diagram (see section **4.3**).
Furthermore, the alarm configuration can be based on these temperatures (see section **4.8**)



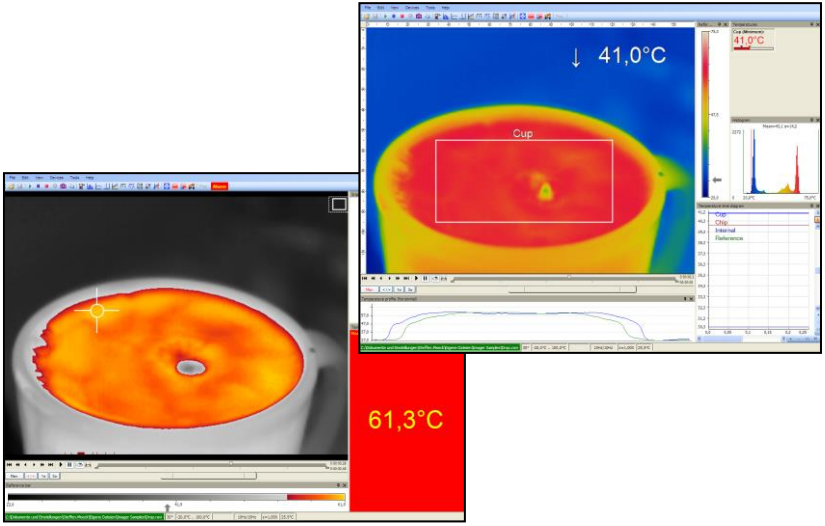


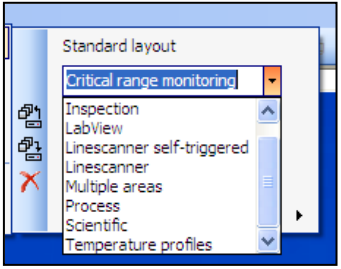
2.2.5. Layout management

In the menu item **View** and **Layouts** 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.



Note
Before you click **Save layout** you must add new layout name into the field provided.





2.2.6. 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.

Note
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.

2.2.7. Further information

Independent whether other programs are running on your PC the PI 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 **File** and **Full screen** or the **Icon** on the toolbar to change the display size.

2.3. Arranging of thermal image

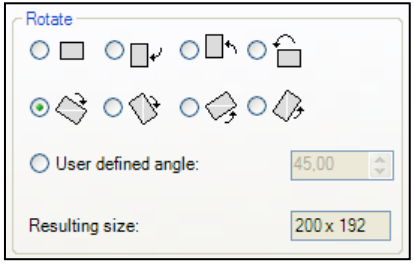
The thermal image within the main window of the software can be displayed in various ways using the menu **Tools**, **Configuration** and **IR Image arranging**.

2.3.1. Mirroring of displayed image

Sometimes, depending on the fitting position of the PI, 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**.

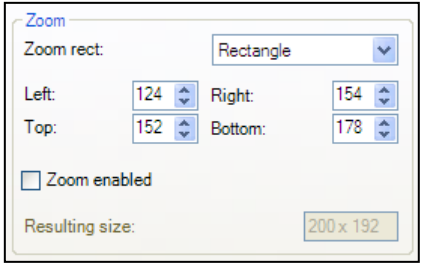
2.3.2. Rotation of displayed image

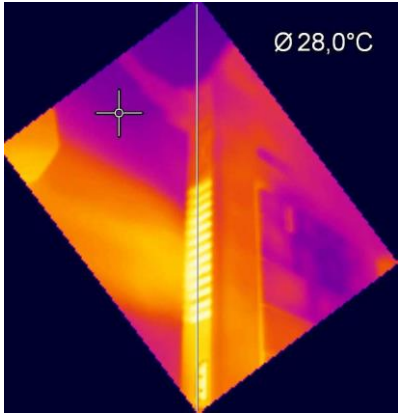
By tagging an icon it is possible to **Rotate** the thermal image into a different position. Alternatively, a manual adjustment can be done by defining a **User defined angle**. The **Resulting size** of thermal image will be shown below.

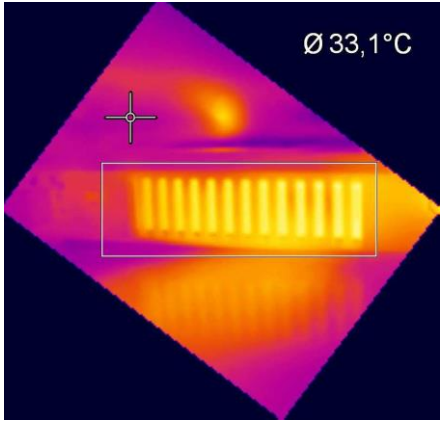


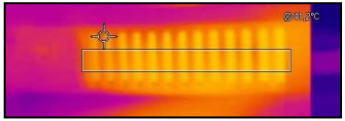
2.3.3. Zooming in areas of the displayed image

Using the **Zoom** option a defined measure area within the image can be enlarged in the main window. The option can be activated by tagging **Zoom enabled**. The **Resulting size** of thermal image will be shown below.









Rotation and zooming of a defined measure area.

2.4. Imager configuration

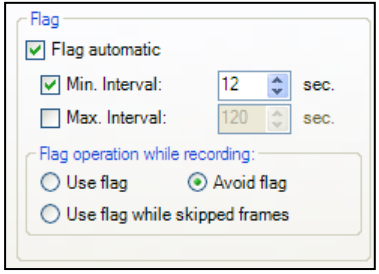
2.4.1. Calibration files

The menu **Tools**, **Extended** and **Reimport calibration files** enables to boot the calibration data for the currently connected PI.

2.4.2. 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 (self referencing within 250 ms). 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 imager. If the **Max. Interval** is defined the flag will always be released after a certain time period even if not required by the imager.

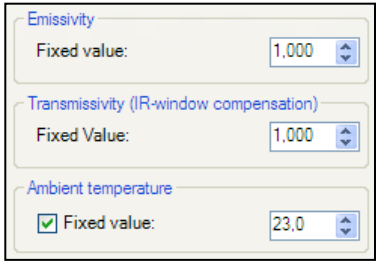
Using the option **Flag operation while recording** and **Use flag** the correction is activated even if the camera is recording. If **Avoid flag** is chosen the camera will not be corrected while recording. The option **Use flag while skipped frames** is suitable at slow data capturing (3 Hz or less)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

Note
The manual or automatic flag functionality is not available if the flag is externally controlled, e.g. via the process interface input (please also see **2.5**).

Note
The flag can be also used to protect the detector from potentially dangerous radiation (for example laser radiation).

2.4.3. Emissivity, transmissivity, ambient temperature

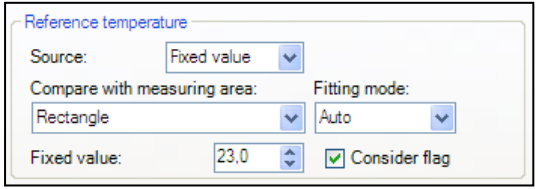
Using the menu **Tools**, **Configuration** and **Device** the **Emissivity** and the **Transmissivity (IR-window compensation)** can be set. The transmissivity is referring to the loss of radiation if an object's surface is measured by looking through a suitable window.
Knowing the **Ambient temperature** 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.



Note

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 (please also see **2.5**). The display of actual values will be shown in the status bar.

2.4.4. 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.

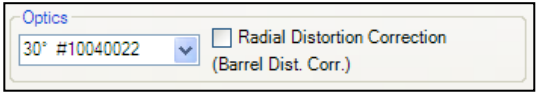
If there is an area within a thermal image having a constant temperature value (e.g. black body) the **Source** can be defined as a **Fixed value**. By the option **Compare with measuring area** the area with constant temperatures can be determined. The known reference value can be set within **Fixed 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** (please also see **2.5**).

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.

The option **Consider flag** is decreasing the influence of the camera's correction (high temperature steps) onto the display of the reference temperature. It is recommended to activate this option.

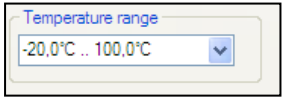
2.4.5. Changing the optics



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 a 23°, 6° or 48° lens. If the camera is ordered with several additional lenses the currently used optics must be chosen in this menu.

The option **Radial Distortion Correction** enables the alteration of the original shape of the image delivered by the PI (barrel distortion correction). If the camera features a 48° lens the option is activated by default, the other lenses generally do not need to be corrected.

2.4.6. Changing the temperature range



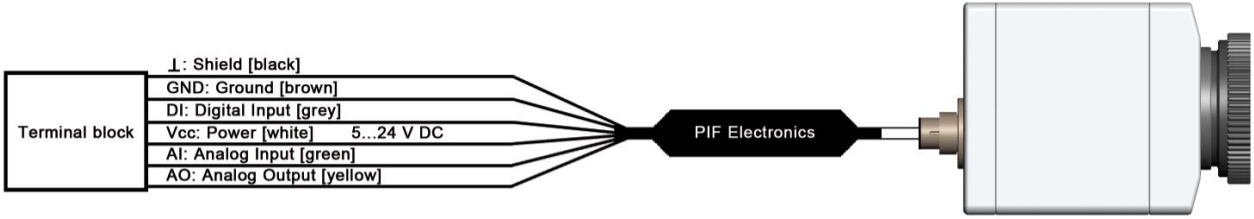
Using the menu **Tools**, **Configuration** and **Device** the most suitable **Temperature range** for the process can be set. The PI features temperature range from 20°C to 100°C, from 0°C to 250°C and from 150°C to 900°C.

2.5. Imager interfaces

2.5.1. General

The PI 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:

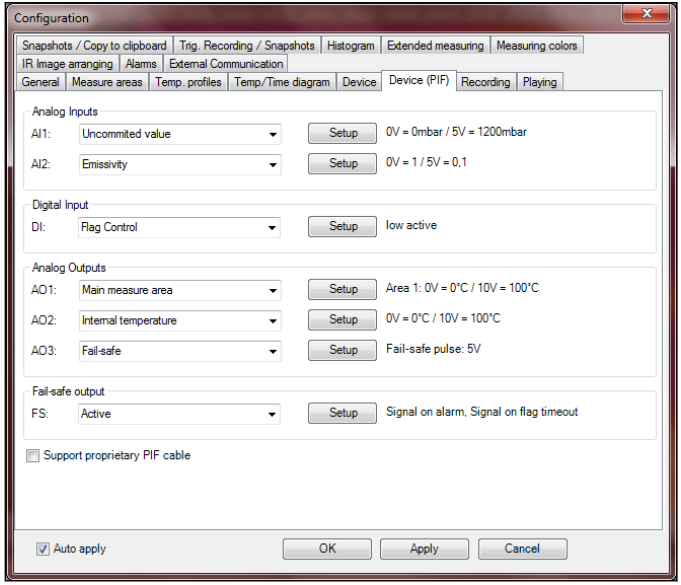
Analog Input **(AI)**:	Emissivity, ambient temperature, reference temperature, flag control, triggered recording, triggered snapshots, triggered linescanner, uncommitted value
Analog Output **(AO)**:	Main area temperature, internal temperature, flag status, alarm, failsafe
Digital Input **(DI)**:	flag control, triggered recording, triggered snapshots, triggered linescanner



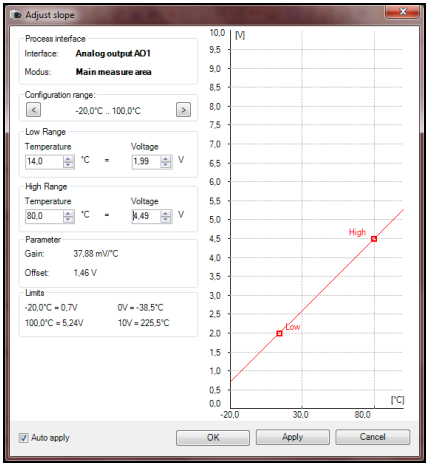
Configuration Process Interface (PIF)

2.5.2. Process interface (PIF)

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). A not available in- or output will be marked with a red exclamation mark (!).

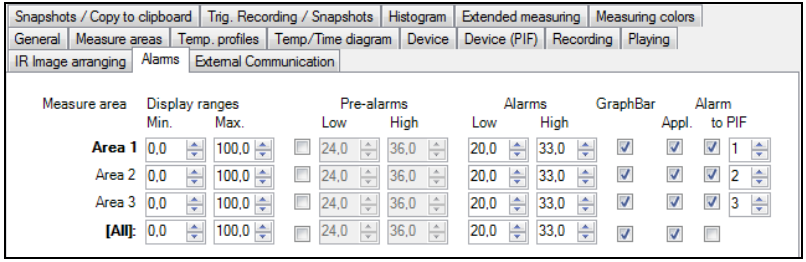


If you configure an analog value an additional window will show up if you press the **Setup** button. In this window you can scale the in- or output:



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).

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

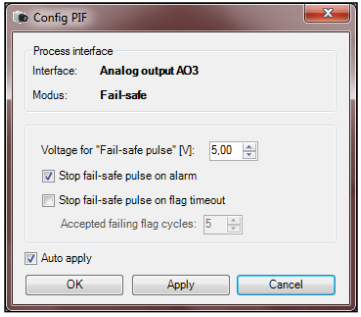


If you activate the function Alarm on an analog output you need to assign also in the Alarms tab the desired measurement area to the desired PIF output.

The 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.

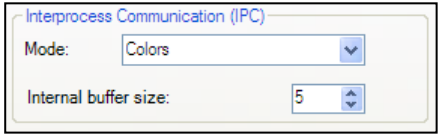
Controlled conditions on camera and software	**Standard Process interface ACPIPIF**	**Industrial Process interface ACPIPIF500V2CBxx**
Interruption USB cable to camera	√	√
Interruption data cable camera - PIF	√	√
Interruption power supply PIF	√	√
Shut-down of PIConnect software	√	√
Crash of PIConnect software	-	√
Fail-Safe output	0V 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 (Industrial PIF only).



2.6. Software Development Kit (SDK)

2.6.1. 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).

2.6.2. Comport

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 accordingly.

Note
You will find more details on using the SDK on the CD provided.

2.7. Start options

2.7.1. Overview of start options

PI 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\...\PI Connect\Imager.exe" /?

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

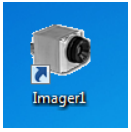
```
Command line parameters:
/?  This help dialog
/Minimized  ...application starts minimized
/Maximized  ...application starts maximized
/Invisible  ...application starts invisible
/FullScreen  ...application will switch to full screen mode after init screen
/Embedded  ...application starts with just 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 an 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
/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.
```

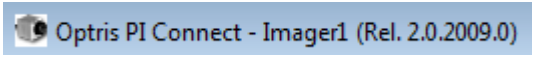
Note
Using the parameter **Invisible** the software can only be closed via the **Task Manager** and **Processes**.

2.7.2. Start of multiple software / imager instances

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

1.) Duplicate the software icon at the desktop
2.) Change the name of the new software icon at the desktop, e.g. „Imager1“
3.) Option: Change the instance name using the start parameter
"C:\Programme\...\PI Connect\Imager.exe" /Name=Imager1
(please see section **2.1.5**)
4.) Start the imager using the new software instance





In order to set up the last step please use the menu **Tools**, **Configuration** and **Device** and select in **Application start** the favoured imager for the respective software instance. Starting the software via the new desktop icon the linked imager will be displayed automatically.

Note
Each imager can be linked to a **one** software instance only.

3. Data capturing

3.1. 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.

Note
Via the menu **File** and **Reopen** you can easily reopen captured files if the option in **3.4.6** is activated.

3.2. Replay of files

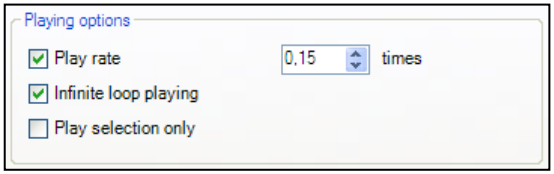
3.2.1. Control panel

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:

	Start
	Rewind
	Previous image
	Next image
	Forward

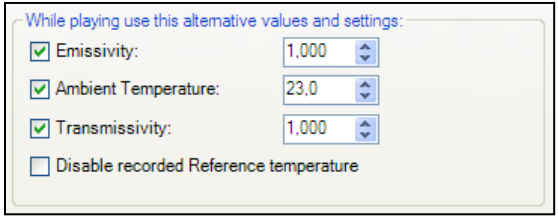
	End
	Play
	Pause
	Play in loop
	Play selection only

3.2.2. 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 (**Infinitive 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.

Note
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.

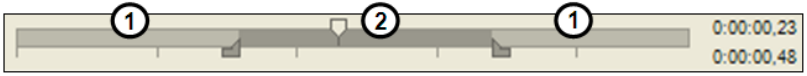


The software allows to change measurement parameters later on. Via the menu Tools, Configuration, Playing and **While playing use this alternative values and settings** you can adjust the parameters **Emissivity**, **Ambient temperature** and **Transmissivity** to the measurement conditions. Above that,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

3.3. Editing video sequences

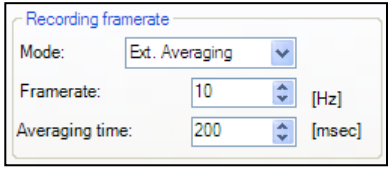
The selected video can be edited by using Trim to selection option in the Edit menu.

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) will be deleted by choosing Trim to selection option. The selected video sequence (dark grey) will remain.



3.4. Saving files

3.4.1. Setting the recording frame rate



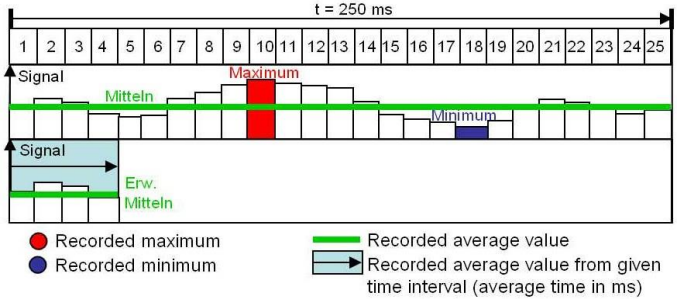
The camera's maximum frame rate of 120 Hz can be reduced. Using **Tools**, **Configuration**, **Recording** and **Recording frame rate** the speed of the data capturing can be set. Typically, the specification is in Hertz (Hz, images per second).

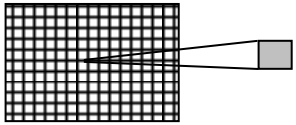
The software gets the full frame rate from camera. That is why you need to define what to do with the images which are left if choosing a reduced frame rate. There are several alternatives to set in the **Mode** option:

Off	The recording frame rate will be 120 Hz.
Skipping	The remaining images will be skipped by the defined frame rate, which means that at 10 Hz every 10th image will be recorded.
Average	The images will be averaged by the defined frame rate, which means at 10 Hz that 10 images result in one averaged image.
Minimum	E.g. at 10 Hz 10 single images compose one image where only lowest value pixels will be considered.
Maximum	E.g. at 10 Hz 10 single images compose one image where only highest value pixels will be considered.

Ext. Averaging	The images will be averaged by the defined frame rate as well as the **averaging time**, which means at 10 Hz and 200 ms that just the first 2 images out of 10 images will compose a new averaged image.

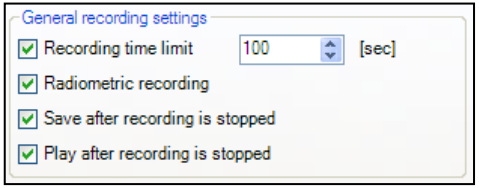
Example: Recording frame rate of 4 Hz
(output signal of 25 images)





Recording frame rate referring to 1 pixel

3.4.2. Setting the recording modes



If desired the **Recording time limit** sets fixed recording time in seconds. After reaching the time limit the software stops the recording.
If activating **Radiometric recording** the temperature value of each pixel as well as information on defined measure areas are recorded. Videos containing these data (RAVI files) 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.

Note
If Radiometric Recording is not activated the images will be saved as standard AVI file only containing color information. A later conversion of a RAVI file into an AVI file and vice versa is not possible.

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.

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

3.4.3. Temporary recording file

Choose the directory for saving your temporarily recorded video file.

Note
Every new record will overwrite the previous one.

3.4.4. Saving radiometric video sequences or AVI files

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

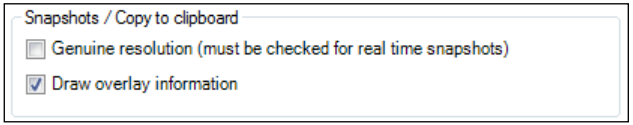
Note
If Radiometric Recording (please see section **3.4.2**) is not activated the images will be saved as standard AVI file only containing color information. A later conversion of a RAVI file into an AVI file and vice versa is not possible.

For saving a video sequence you can use either the menu **File** and **Record** / **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.

3.4.5. Saving image data as radiometric snapshot or text file

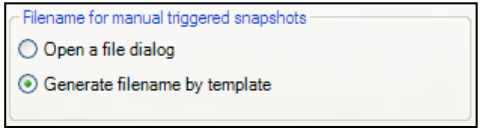
Snapshots are single, radiometric images based on a video sequence, this means they are contain all temperature as well as measure area information. Thus the images can always be analyzed in detail later on. Snapshots can be captured via the menu **File** and **Snapshot** or via the **Icon** on the toolbar.



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 resolution** corresponding to the camera's resolution of 160 x 120 pixels (small image) or using **Draw overlay information** the software saves the snapshot including all information shown in the main window. The resolution of the image is based on the defined size within the main window (please see section **2.1.6)**.

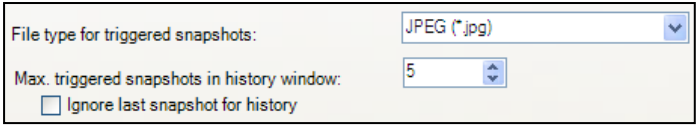
Note

The option **Genuine resolution (must be checked for real time snapshots)** 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** (please see section **3.4.6**).

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

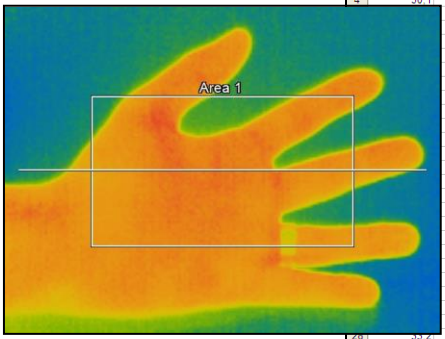


The option **Max. triggered snapshots in history window** sets the number of displayed snapshots in the separate window Snapshot history (please see section **2.2.1**). If **Ignore last snapshot for history** is activated only the latest snapshot will be displayed in the Snapshot history window if a new snapshot is captured.

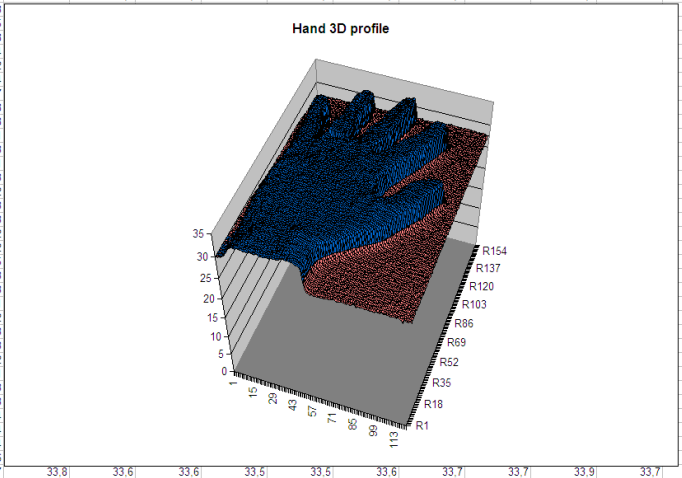
There are the following options to save image data

JPEG (*.jpg)	Saving of image (snapshot) as radiometric picture in JPEG format.
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.

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



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	30	29,8	30	30,3	29,9	30,1	29,8	29,9	30,2	30,2	29,9	29,9	30	29,9
2	29,9	29,9	30,2	30	30	30,1	29,9	30,1	30,2	30,1	30	30	30,1	29,8
3	30,4	30,1	30,3	30	29,9	30,3	30	30,2	30,1	30,1	30	29,8	30	30,1
4	30,1	30,3	30,3											29,9
		30,4	30,5											30,3
		30,7	30,8											30,6
		31,1	31,4											31
		31,8	32											31,6
		32,4	32,4											32,3
		32,6	32,7											32,5
		32,8	32,8											32,4
		32,8	32,8											32,6
		33,1	33,1											32,7
		33	33,3											32,8
		33,1	33,1											33
		32,9	33,3											33,2
		33,2	33,2											33,2
		33,2	33,3											33,1
		33,2	33,3											33,5
		33,3	33,2											33,4
		33,3	33,2											33,3
		33	33,5											33,4
		33,3	33,3											33,4
		32,9	33											33,4
		33,2	33,1											33,4
		33	33,2											33,6
		33	33,3											33,3
	33,2	33,1	33											33,6
29	33	32,9	33,2											33,4
30	33	33,2	33,1											33,6
31	33	33,1	33,3											33,4
32	33,1	33	33,3											33,5
33	33,2	33,1	33,4											33,4
34	33,1	33	33,4											33,5
35	33,1	33,3	33,4											33,5
36	33,3	33,2	33,6											33,7
37	33,3	33,5	33,7	33,8	33,6	33,6	33,5	33,5	33,6	33,7	33,7	33,9	33,7	33,9
38	33,4	33,3	33,5	33,8	33,6	33,8	33,7	33,9	33,6	33,8	33,6	33,8	33,7	33,8
39	33,3	33,3	33,6	33,8	33,9	33,7	33,8	33,8	33,8	33,8	33,7	33,9	33,9	34
40	33,4	33,5	33,6	33,9	33,9	34,1	34	34	33,8	33,9	33,8	33,9	33,9	33,8

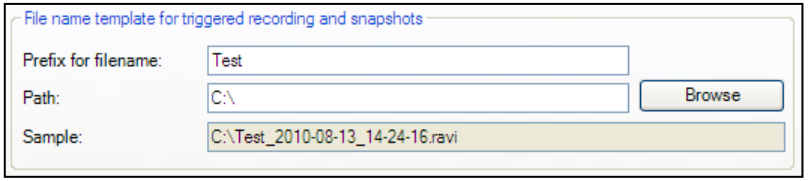


Analysis of thermal image in Excel via *.csv file export and display of pixel data in 3D

3.4.6. Saving text file of the temperature / time diagram

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

3.4.7. 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.
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.

Note
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.

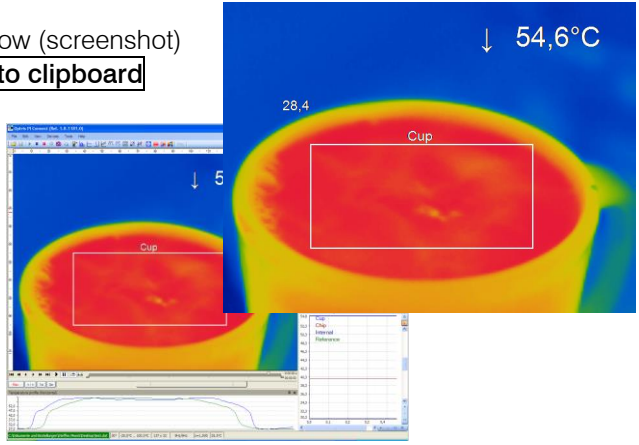
3.4.8. Display of snapshots in a separate window

In the menu **View**, **Windows** and **Snapshot history** you can activate a window in order to display all triggered snapshots (please also see section **2.2.1**). Before you have to choose the option **Generate filename by template** in the menu **Tools**, **Configuration** and **Trig. Recording / Snapshots** (please see section **3.4.5**).

3.4.9. Saving images or screenshots to clipboard

Using the **File** 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.



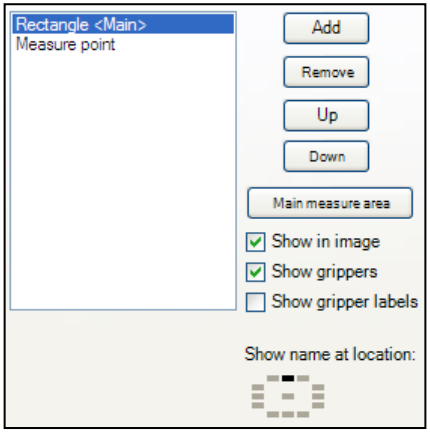
Note
The whole software window can also be saved using the **File**, **Screenshot** and **Save** menu or the **Icon** on the toolbar.

4. Data processing

4.1. Measure areas

4.1.1. General settings

Measure areas for temperature analysis can be defined, edited and deleted using the menu **Tools**, **Configuration** and **Measure areas**.



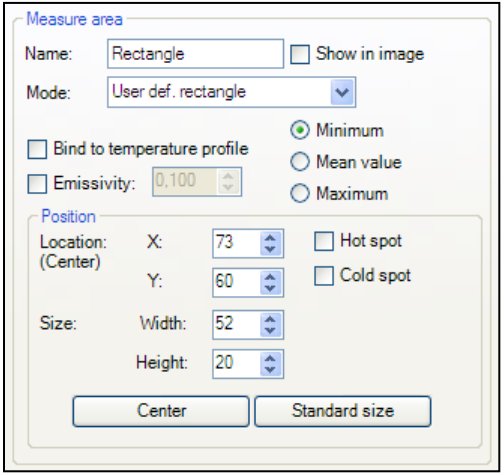
Using **New** / **Delete** buttons you can create a new measure area (measure point / rectangle) or delete existing measure areas.
Press **Up** / **Down** to position individual measure areas within the list.
1 measure area from the list can be appointed as the **Main measure area**. The temperature 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)

By selecting **Show in image** measure areas can be displayed in the infrared image.
Ticking the **Show grippers** / **Show gripper labels** enables you to change the position or the size of defined measure areas by using the mouse.

Selecting the option **Show name at location** you can define the position of the name attached to particularly measure area (set the position in the drawing).

Available measure areas (modes) are:

Position (X, Y)	User defined rectangle
	Measure point (1x1)
	Measure point (3x3)
	Measure point (5x5)
	Ellipse

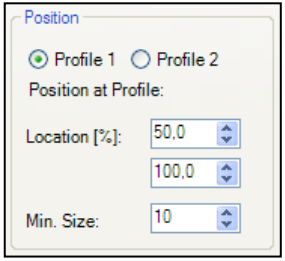


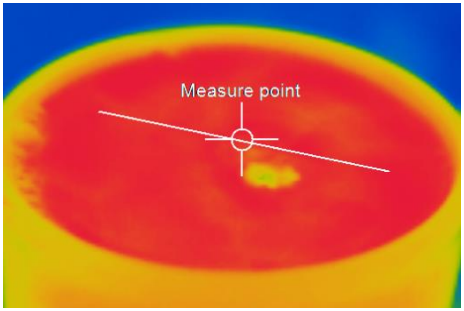
Any measure area can be renamed individually in the **Name** field. The **Mode** option allows you to define the type of area as measure point or rectangle. The temperature of the main measure area can be displayed in the main window. Available value types are **Minimum, Mean value** or **Maximum**. It is also possible to use the **Icon** on the toolbar.

In the **Position** section the exact position of the measure area within the main window can be defined. 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.

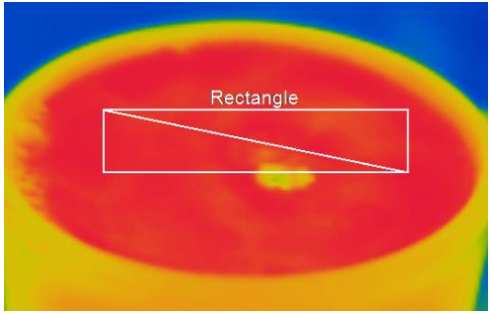
Using **Bind to temperature profile** you can assign each measure area to one of the two temperature profile (**Profile 1** / **Profile 2**).

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**.



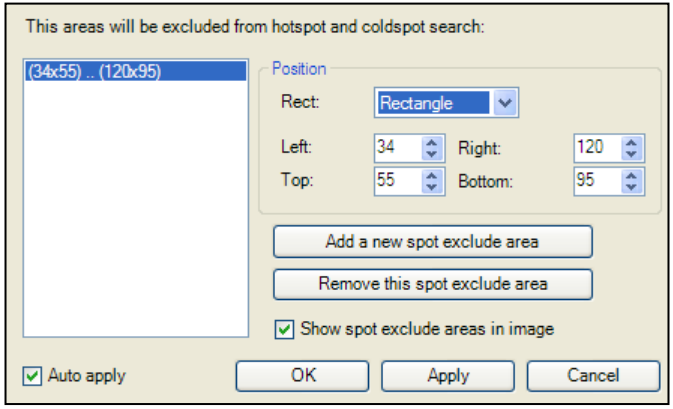


Measure area assigned to a temperature profile (measure point)



Measure area assigned to a temperature profile (rectangle)

4.1.2. Excluding hot and cold spot areas



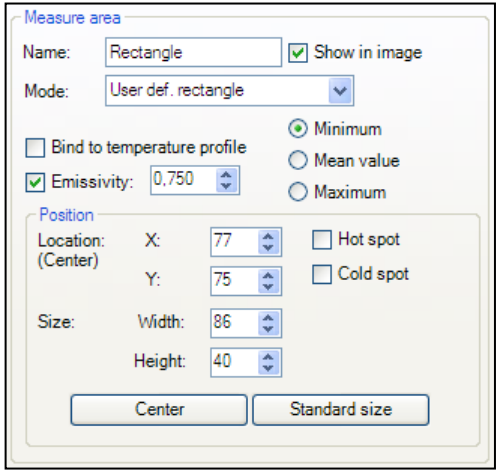
Using the menu **Tools**, **Configuration**, **Measure areas** and **Edit excluded areas of hotspots/coldspots** you can exclude existing or potential hot or cold spots from data analysis. Within the user defined areas of the image the spots will not be taken into consideration. A new area can be edited via the button **Add a new spot exclude area** or deleted via the button **Remove this spot exclude area**. The excluded area can be selected from already existing user defined areas in the drop down list or can be defined using coordinates.
If you select the option **Show spot exclude areas in image** the areas will be shown in the main window.

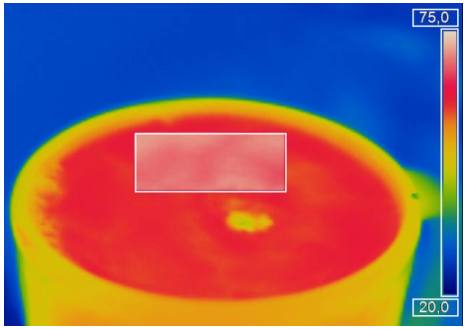
4.1.3. Individual emissivity values of measure areas

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.

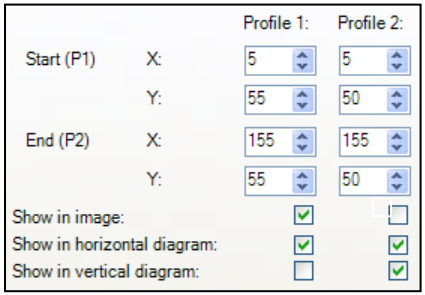
The display of the changing temperature values within the measure areas will remain linked to the colors of the reference bar.

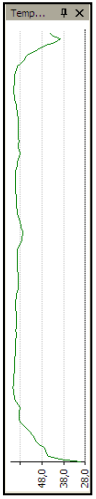




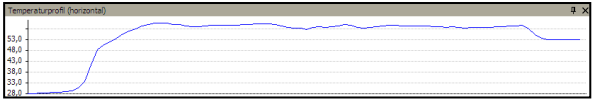
4.2. Temperature profile

Up to 2 temperature profiles which graphically reproduce the temperature development can be generated. The profiles are labeled as **Profile 1** and **Profile 2**.
The position and size of the profiles can be defined via the coordinates **Begin (P1)** and **End (P2).**

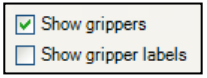




Select **Show in image** if you want the profiles to be displayed in the infrared image in the main window. Alternatively, this setting can be made by choosing the menu **View** and **Image information** (please see section **2.2.3**).



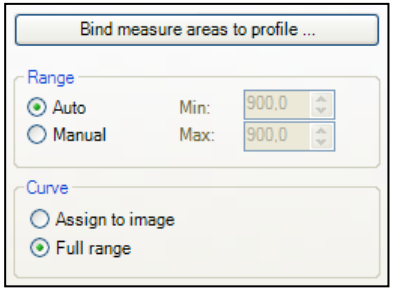
The position and size of the profiles can be also defined by dragging the grippers at the end of the lines within the image of the main window. To do that the option **Show grippers** must be chosen. **Show gripper labels** display coordinate labels (start point P1 and end point P2).

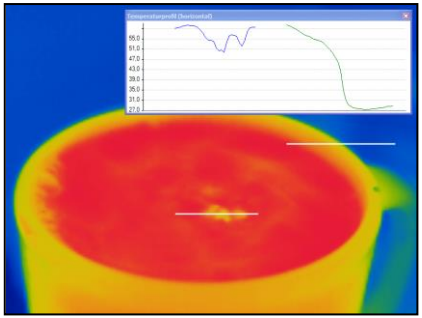


The temperature profiles can be displayed in additional windows (please see section **2.2.1**). Using the options **Show in horizontal diagram** and **Show in vertical diagram** the profiles can be assigned to the horizontal and / or vertical diagram window.

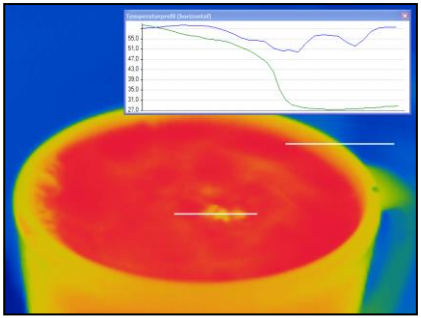
The option **Range** allows you to choose between automatic or manual adjustment of the temperature scaling within the diagram.

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.





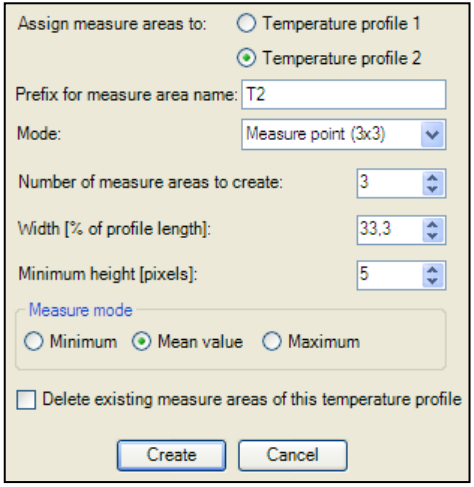
The profile curve assigned to the image (Display in separate window)

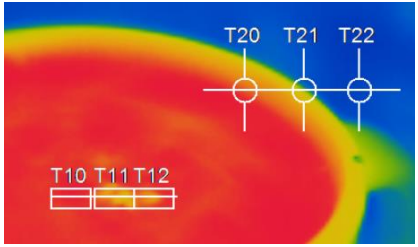


The profile curve assigned to the full range of the diagram (Display in separate window)

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 (please see section **2.2.1**).





3 rectangles and 3 measure points are assigned to temperature profile 1 and 2.

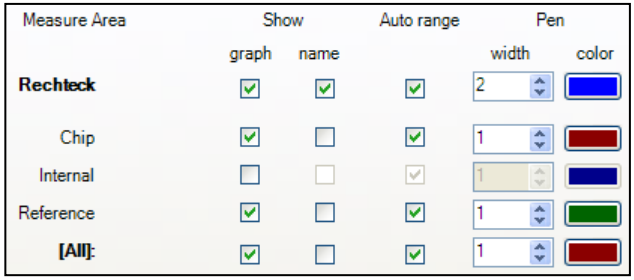
The option **Delete existing measure areas of this temperature profile** eliminates the defined settings of a profile.

Save the settings by pressing the **Create** button.

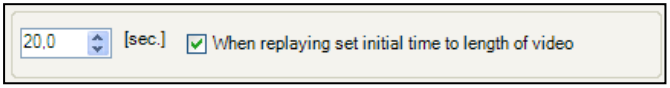
4.3. Temperature Time Diagram

4.3.1. General settings

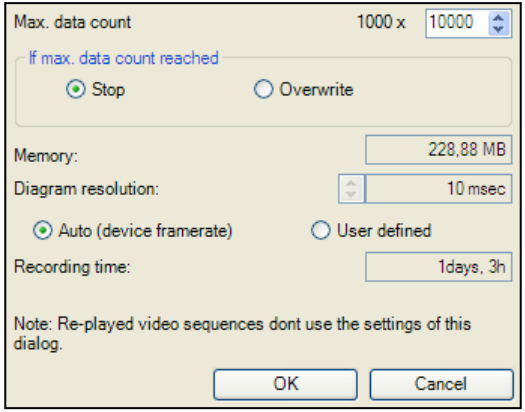
In the Tools, Configuration and Temp/Time Diagram menu you can display the temperature over time for each configured measure area as well as for predefined values (please also see **2.2.4**).
The **Show** options define if a certain temperature value is displayed or not. If the **Graph** is shown you 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.



A further option is to define the time scaling of the diagram at a minimum [**sec.**]. If activating **When replaying set initial time to length of video** the time scaling is adjusted to the length of the stored video sequence loaded into the software.



In the **diagram measuring settings** you can define the maximum of data (**Max. data count**) which is displayed in the diagram. 1.000 x 10.000 results in 10.000.000 (ten millions) data values; the needed **Memory** will be calculated automatically. Using the option **Auto (device framerate)** the **Recording time** is calculated based on the frame rate of the camera (please also see **3.4.1**).
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.



4.3.2. Scaling of diagram axes

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).

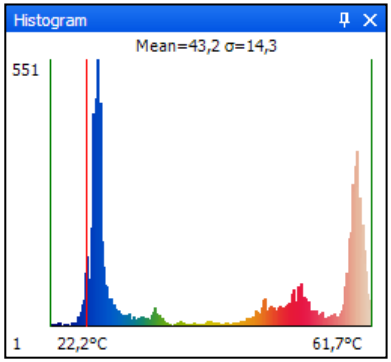
Steuerelemente der Temperaturachse

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.

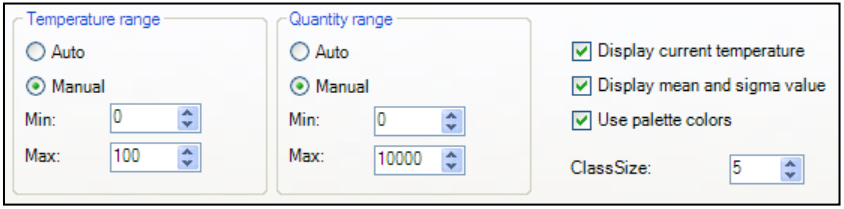
9	Zoom (increase) into the diagram. The time axis will remain.
10	Zoom (decrease) into the diagram. The time axis will remain.
11	Whole range: Display of whole temperature range which is set in the camera.

4.4. 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 **Quantity range** can be generated by the software or by the user by defining the minimum/maximum temperature value respectively minimum/maximum quantity.

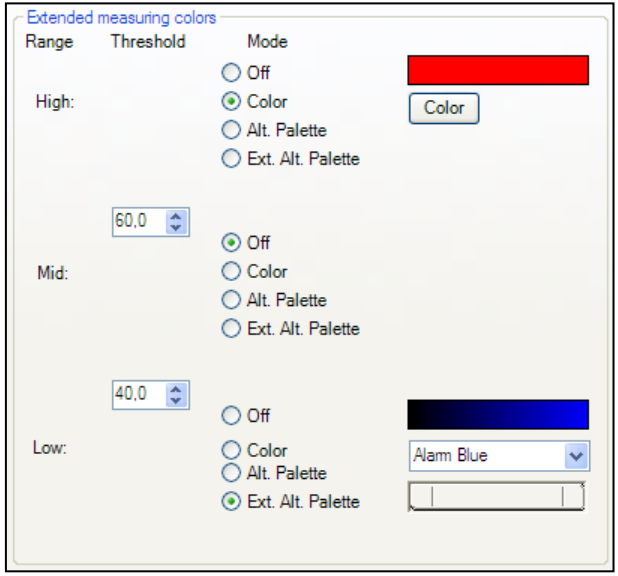


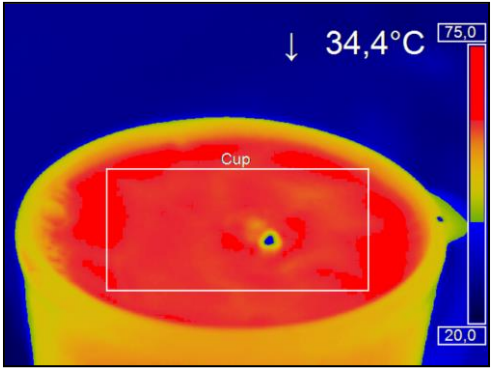
Further options are:

Display current temperature	If activated the red line will show the current temperature at the mouse in the graph.
Display mean and sigma value:	Average temperature and statistical deviation 1σ (1 Sigma) will be displayed.
Use palette colors	You can choose between colored or black/white presentation.
Class size	Number of values measured which should be affiliated to one class for common colored display.

4.5. 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.

4.6. Image subtraction

Once you have activated the feature by using **Image subtraction** in the **Devices** menu or via the **Icon** on the toolbar, an image is saved in the background and a temperature difference is calculated and displayed for all the following images.

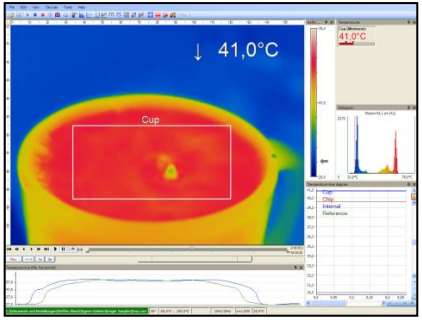
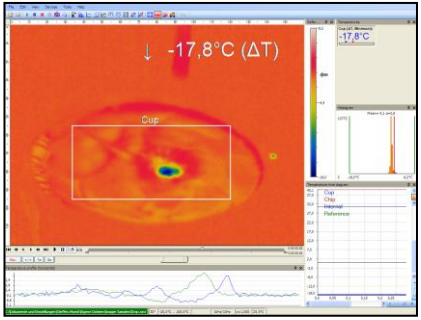


Image subtraction is not activated. The current averaged temperature of the measure area is displayed in the right top corner.

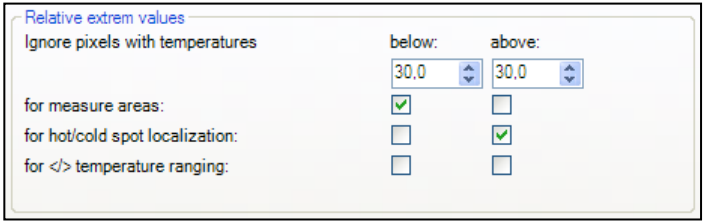


After activating the image subtraction function the current temperature difference compared to the previous image is displayed.

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

4.7. Relative extreme values

Within the Tools, Configuration and Extended measurement 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 </> temperature ranging means that all pixels with the respective temperature do not influence e.g. the automatic scaling of temperature-time-diagram.

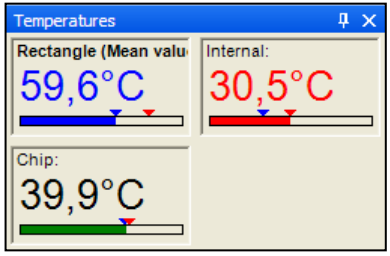
Alarm

4.8. Alarms

In the Tools, Configuration and Alarms menu you can define an alarm for each configured measure area as well as for the predefined values (please also see **2.2.4**).

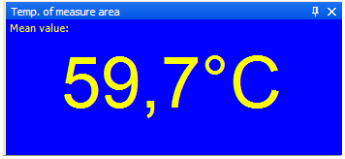
Measure area	Display ranges Min.	Display ranges Max.	Alarms Low	Alarms High	Show GraphBar	Alarm	Alarm to PIF
Rectangle	0,0	100,0	60,0	80,0	☑	☑	☐
Cursor	0,0	100,0	20,0	40,0	☑	☐	☐
Chip	0,0	60,0	39,0	41,0	☑	☐	☐
Internal	0,0	60,0	20,0	30,0	☑	☐	☐
Reference	0,0	100,0	0,0	40,0	☑	☐	☐
[All]:	0,0	100,0	20,0	40,0	☑	☐	☐

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 **Show Graph Bar**. 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**. If the measured temperature reaches or goes below the lower alarm value the color of bar changes to **blue**. Temperatures in between the defined thresholds are displayed **green**.



Note

If the alarm value is reached the digit/bar color will change from **green** to **red** (high alarm) or **blue** (low alarm).

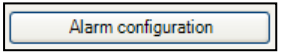


If a temperature value shall be used as alarm you need to tag the **Alarm** option. If active, the alarm can also be put out via the Process Interface (PIF) using the **Alarm to PIF** option.

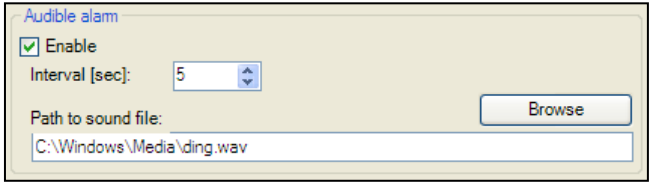
Note

If activating the alarm 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.

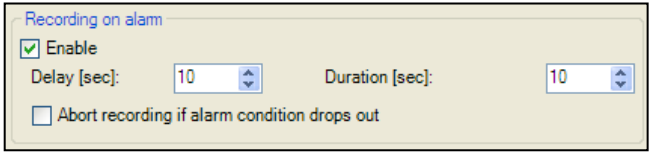
In the Alarm configuration window you can set an **audible** alarm.



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.

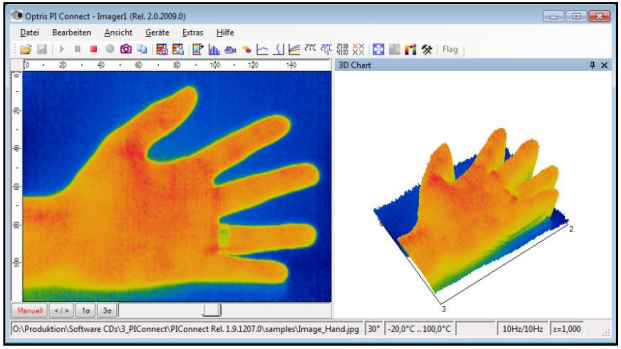


Furthermore, a recording can be stopped via **Abort recording if alarm condition drops out**. If this option is not chosen the recording will be finished based on the time in the duration box.

With the **Snapshot on alarm** option you can set a **Delay [sec]** time before an alarm will trigger the storage of an image.

4.9. 3D display of thermal image

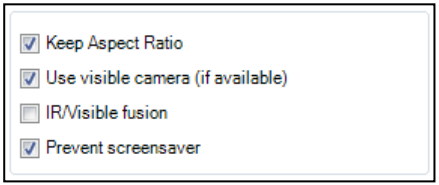
Thermal images can be displayed in real time as 3 dimensional images. The 3D chart is displayed in a separate window. To add the software window please use the menu item **View** and **Windows** or the **Icon** on the toolbar



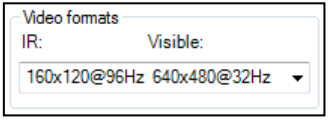
5. Visual Camera (PI200 only)

5.1. Enabling the visual camera

The PI200 thermal imager features a visual camera. With the help of BI-SPECTRAL technology, the visual image (VIS) can be combined with a thermal image (IR). Both can be finally captured time synchronously. The visual camera can be enabled in the **Tools**, **Configuration** and **General** menu via the option **„Use visible camera“**.

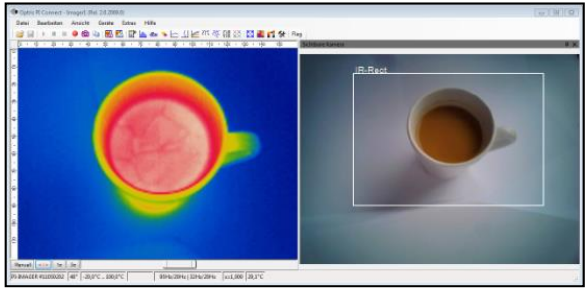


The menu **Tools**, **Configuration** and **Device** displays the **Video formats** depending on the current imager's configuration.
The thermal image (160 x 120 pixels) will be shown with 96 images per second (96 Hz), the visual image (640 x 480 pixels) with 32 Hz.



5.2. Monitoring modus

The monitoring modus is used to have an easy orientation at the point of measurement. In this modus the visual image is displayed in a separate window.

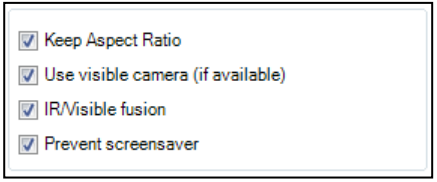


To add the separate software window please use the menu item **View** and **Windows** or the **Icon** on the toolbar.

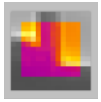
Note
The rectangle within the visual image shows the area covered by the thermal image. In order to cover a big area the wide-angle lens is used, to cover a smaller area the telephoto lens.
In the **View**, **Image Information** and **IR rectangle** menu it is possible to hide the displayed rectangle.

5.3. Cross-fading modus

5.3.1. General



The cross-fading modus is used in order to highlight critical temperatures at the point of measurement. In this modus the thermal image is faded into the visual image.

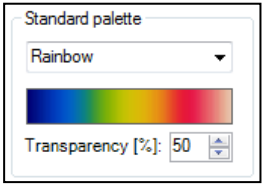


The cross-fading modus can be enabled in the **Tools**, **Configuration** and **General** menu via the option **IR/Visible fusion**. Alternatively, you can use the menu item **View** and **IR/Visible fusion** or the **Icon** on the toolbar.

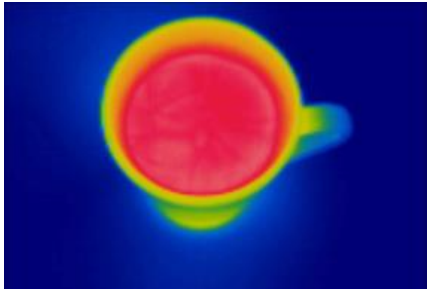
Note
The area covered by the thermal image within the visual image is limited by a rectangle. In order to hide the frame of the rectangle use the **View**, **Image Information** and **IR rectangle** menu.

5.3.2. Transparency of thermal image

The thermal image can smoothly be faded into the visual image (0…100%). To set the transparency value please use the **Tools**, **Configuration**, **Measuring colors** menu and **Standard palette** / **Transparency [%]**.



0%	The thermal image is fully faded into the visual image.
50%	The thermal image is partly (50%) faded into the visual image. Using this setting the ideal relation of both images can be defined (please see section **5.3.3**).
100%	The thermal image is fully transparent and will not be shown in the visual image.



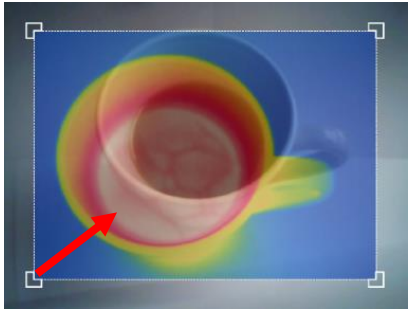
Cross-fading of thermal image and visual image by 0% setting

Cross-fading of thermal image and visual image by 50% setting

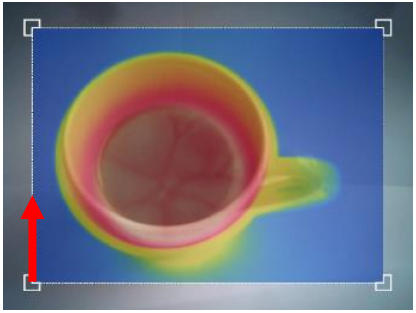
Cross-fading of thermal image and visual image by 100% setting

5.3.3. Moving the thermal within the visual image

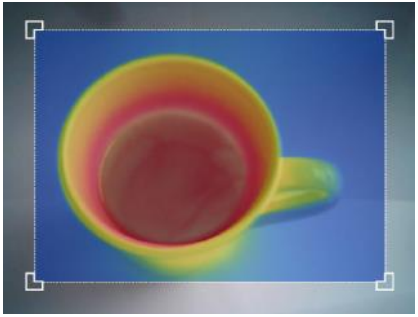
Due to the different optical axis of visual and thermal channel the relation of both images needs to be optimized. If moving the cursor to the edges of the rectangle‘s frame the grippers can be used to adjust the size of thermal image or to move the image completely (hold **STRG** synchronously).



Adjustment of thermal image by dragging to the top right



Adjustment of thermal image by dragging to the top

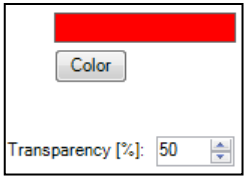


Ideal adjustment of thermal image to the visual image

Note
The ideal relation of both images can be set easily by fading the thermal image into the visual image by 50% (please see section **5.3.2**).

5.3.4. Cross-fading of defined temperatures

The cross-fading modus can be combined with the **Extended Measuring colors** option (e.g. for isothermal display of temperatures, also see section **4.5**). To set the level of fading this option into the visual image use the **Tools**, **Configuration**, **Measuring colors** and **Extended Measuring colors** / **Transparency [%]** menus:



0%	The set option is fully faded into the visual image.
50%	The set option is partly (50%) faded into the visual image.
100%	The set option is fully transparent and will not be shown in the visual image.

Isothermal cross-fading by 50% setting

Isothermal cross-fading by 0% setting

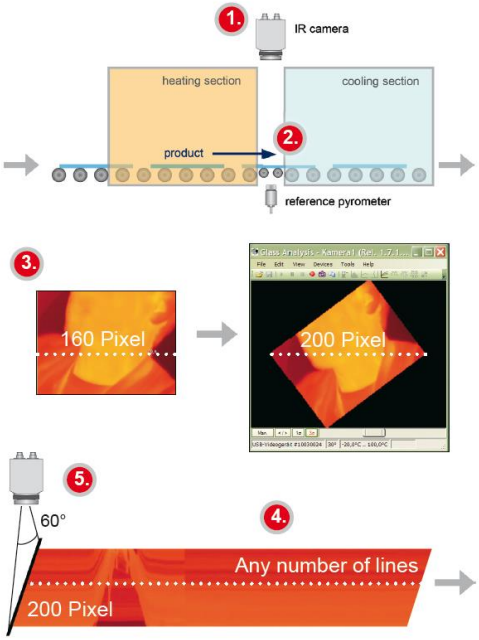
6. Linescanner mode

6.1. General information

The PI Connect software comes with a linescanner function. The linescanner 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 from 160 pixel up to 200 pixel through use of picture diagonal
4. 120 Hz data recording of unlimited lines which-in turn can produce thermal images of any resolution
5. 60° FOV as a line for detailed process analysis such as at wide conveyor belts



6.2. Basic settings

6.2.1. Linescanner configuration menu

All the settings related to the linescanner mode can be done through the **Linescanner configuration** menu. You will find the menu under **Tools**, **Linescanner mode** and **Linescanner settings** or as an **Icon** on the tool bar.

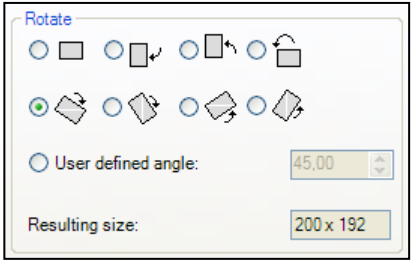
6.2.2. Choosing the layout

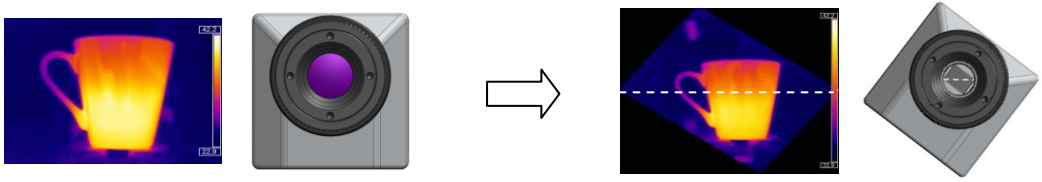
Before you configure the Linescanner mode a suitable layout (e. g. alignment of application windows) should be chosen or created. You will find more details in chapter **2.2.**

6.2.3. Rotating of the image

For some application is it of advantage to increase the number of pixels per line from 160 to 200 by changing the view angle. To do so go to **Rotate** menu (see chapter **2.3.2**)

According to the chosen angle the camera has to be mounted under defined angle, too.





6.2.4. Activating the Linescanner

In order to configure the Linescanner it is necessary to activate the Linescanner mode under **Tools**, **Linescanner mode** and **Enable Linescanner** or using the **Icon** on the tool bar.

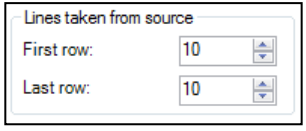
Note
There are two view options available under Linescanner mode. Linescanner sighting view is showing the position of the line and self-trigger area within the infrared image taken by the camera. Linescanner view delivers the resulting infrared image based on temperature readings for selected lines.

6.2.5. Positioning of the line (Linescanner sighting view)

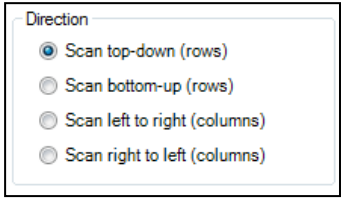
The pre-defined position of the line can be seen in the Linescanner sighting view. To access the view go to **Tools**, **Linescanner mode** and **Linescanner sighting view** or use the **Icon** provided.

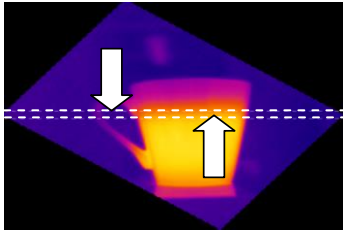
Note
This icon enables to switch between Linescanner sighting view and Linescanner view.

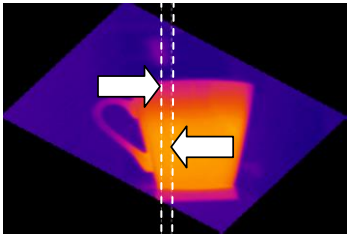
To define the position of the line within the infrared image go to **Linescanner configuration** application window (see **6.2.1**) in the **Source** menu. In the **Lines taken from source** section using **First row** and **Last row** field you can specify how many lines are to be considered during the measurement. Number 1 stands for the first line from the top in the infrared image.



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 **Linescanner sighting view** mode. You can choose from 4 different direction options provided (see below image X **scan top-down (rows)** and **scan bottom-up (rows)** and image Y **scan left to right (columns)** and **scan right to left (columns)**.

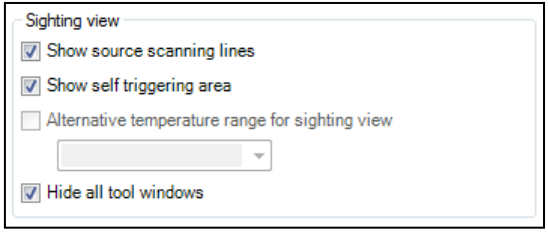






The displayed linescanner sighting views visualize the 4 possibilites how to capture and finally represent multiple lines in the linescanner view

6.2.6. Layout configuration of the Sighting view mode



You can make further modifications to the Sighting view mode using **Extended** menu. If you go to **Sighting view** you can define following modifications: **Show source scanning lines**, **show self triggering area** or **Hide all tool windows**. **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 linescanner when process is stopped using one temperature range where as different temperature range is defined to examine running process.

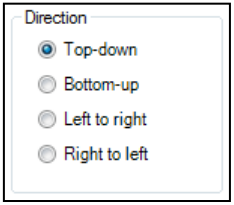
6.3. Data evaluation of the scanned line

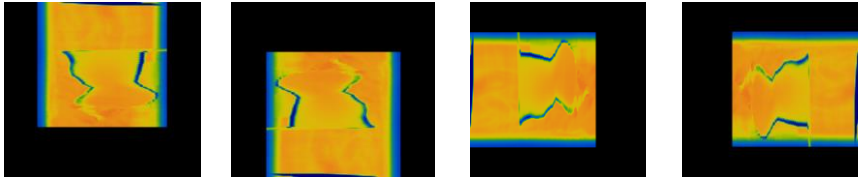
6.3.1. Linescannner view

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

Note
This icon enables to switch between Linescanner sighting view and Linescanner view.

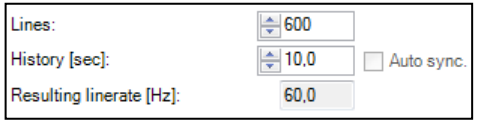
Presentation of the scanned lines can be further defined in **Linescanner configuration** application window (see **6.2.1**) under **Presentation**. **Direction** option defines in which direction the scanned lines will be displayed. Scanned lines can be displayed as **Top-down, Bottom-up, Left to right** or **Right to left**.





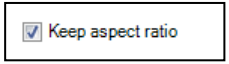
Presentation of scanned lines in the Linescanner view: Top-down, Bottom-up, Left to right and Right to left.

In **lines** you can enter how many lines will be displayed in the Linescanner view. Number of lines will also define after how many lines the infrared image will be reloaded (Linescan).



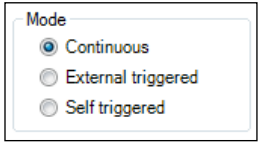
History [sec] input field determines the time frame the scanned lines should be displayed. Time frame can be based on the duration of the process cycle observed. If you tick the Auto sync box the value will be provided automatically using an external trigger input (see 6.3.2). In **Resulting linerate (Hz)** field calculated frame rate of each line will appear automatically.

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



6.3.2. Triggered display of lines

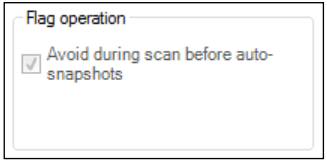
Triggering signal can be used to control how the scanned lines will be arranged within the Linescanner view. In the General menu under **Linescanner configuration** (see **6.2.1**) there are two options provided.



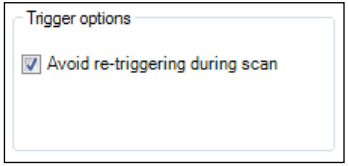
Continuous mode will apply predefined values to display the scanned lines. No triggering signal will be used to control the linescanner presentation.

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 **6.3.1**).

Further settings can be specified:
In **Flag operation** if you activate **Avoid during scan before auto-snapshots** refreshing of flag will not be executed during the linescan (see also **2.4.2**).



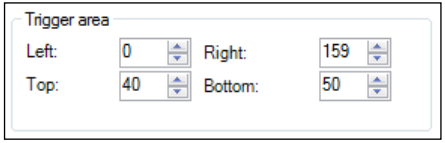
If activated **Avoid re-triggering during scan** will not allow to run a new linescan cycle while a previous cycle trigger by recent signal is not finished.

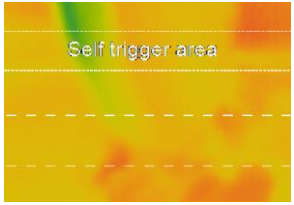


Note
For external triggering it is necessary to do modifications of the standard configuration on the Process Interface (PIF). You will find more details in the chapter **2.5.**

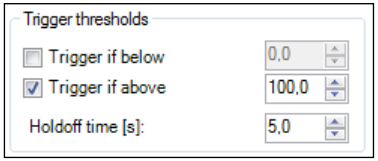
Using the **Self triggered** option it is possible to use a triggering signal provided by software to control arranging of the scanned lines. Number of lines being reloaded after this signal is defined under **Lines** und **History [sec]** (see 6.3.1). Further modifications can be carried out:

First of all **Trigger area** within the infrared image needs to be specified. In **Left**, **Right**, **Top** and **Bottom** position of particular corner needs to be selected. Switch to Linescanner sighting view mode to see the visualization of the triggered area for your reference.

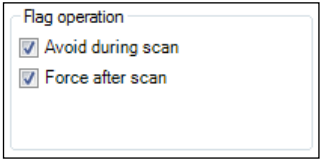




Within the trigger area **Trigger thresholds** temperatures can be set to trigger the linescan cycle. **Holdoff time [s]** determines time frame within new signal should be neglected (e. g. if a signal from the heat source in the background is triggered).

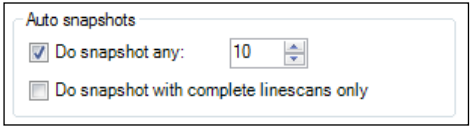


Under **Flag operation** and **Avoid during scan** can be set that refreshing of flag will not be executed during the linescan (see also **2.4.2**).
Force after scan will execute the flag once given number of scanned lines is provided.



6.3.3. Snapshot configuration

To document the measurement results a complete linescan can be saved as snapshot. You will find the **Auto snapshots** settings options in the **Linescanner configuration** (see **6.2.1**).



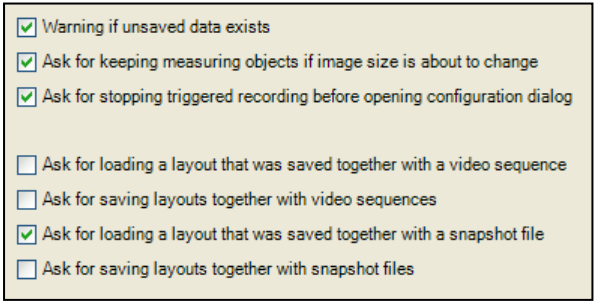
Using **Auto snapshots** and **Do snapshots any…** you can specify after how many linescans a snapshot should be captured and saved. **Do snapshots with complete linescans only** will not save a snapshot of a linescan that has been interrupted.

5. Further information

5.1. 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 by using **Tools**, **Extended** and **Options**.



Note
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 unsaved data exists	If activated a reminder will appear to warn you on unsaved data or setups before shutting down the software
Ask for keeping measuring objects…	You can choose to maintain already created measure areas and temperature profile lines, if you rotate or zoom the displayed image. By rotating or zooming the measure areas and temperature profile lines will not be related to the old position in the image anymore. They can be kept, however, if resetting the image.
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.

5.2. System requirements

Minimum system requirements:

- Windows XP (Service Pack 3)
- USB 2.0-interface
- Hard disc with at least 30 MByte free space
- At least 256 MByte RAM
- CD-ROM-drive

Recommended system requirements:

- Windows 7
- At least 2 GB hard disk storage for IR videos
- At least 2 GB RAM

5.3. About software

In the Help and About submenu you will find the version name of PI Connect software you are currently running.

5.4. 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
F10	Acknowledge alarm
Alt+P	Next palette

Ctrl+Alt+P	Previous palette
Alt+Enter	Full screen
Alt+S	Image subtraction
Alt+H	Horizontal mirror
Alt+V	Vertical mirror
Ctrl+Alt+S	Image subtraction from file
Ctrl+L	Line scanner sighting view
Ctrl+Alt+L	Enable line scanner