User Manual

Opto Software

- English -

1 Imprint

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2 Document History

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4 Introduction

OptoViewer is the software companion of your Imaging Module. It enables quick setup, image acquisition, display and recording as well as measurements capabilities.

If you want to integrate the Imaging Module into your own software environment - then the Opto-SDK is the perfect match for you. Please contact support@opto.de for this.

Plug in and get started - we wish you a smooth and successful operation.

5 Service

Our technical staff is at your disposal by telephone or email in the event of faults or questions regarding compatibility, installation or maintenance.

IMPORTANT INFORMATION

All interventions on mechanical or optical parts inside the system as well as work on the device electronics of the Imaging Modules may only be carried out by the service department of Opto France or by specially authorized specialist personnel!

Info service can be found under:

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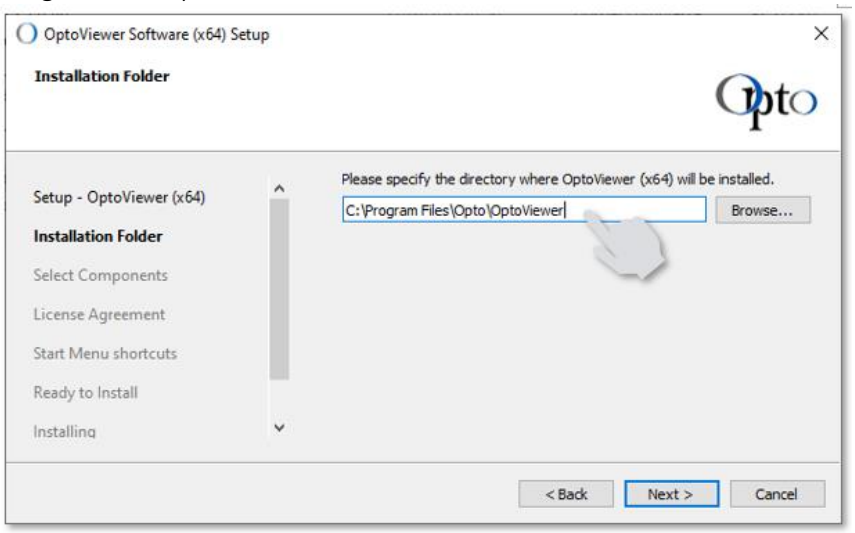
6 Notes on this Manual

The OptoViewer 2.0 application is intended to be used with Opto Imaging Modules. Before connecting an Imaging Module, we strongly recommend reading the Imaging Module user manual (see chapter 12).

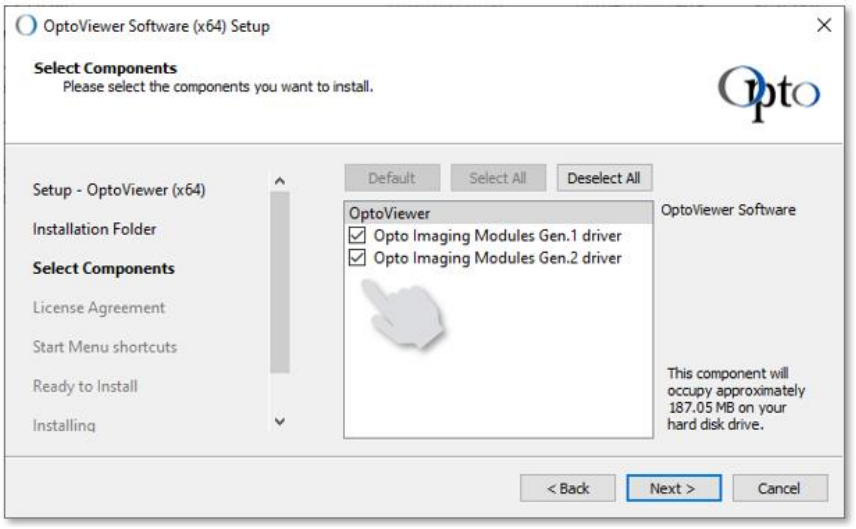
7 Installation Guide

1. Start Installer & Select Directory
   - Start OptoViewer software installer
   - Select target directory



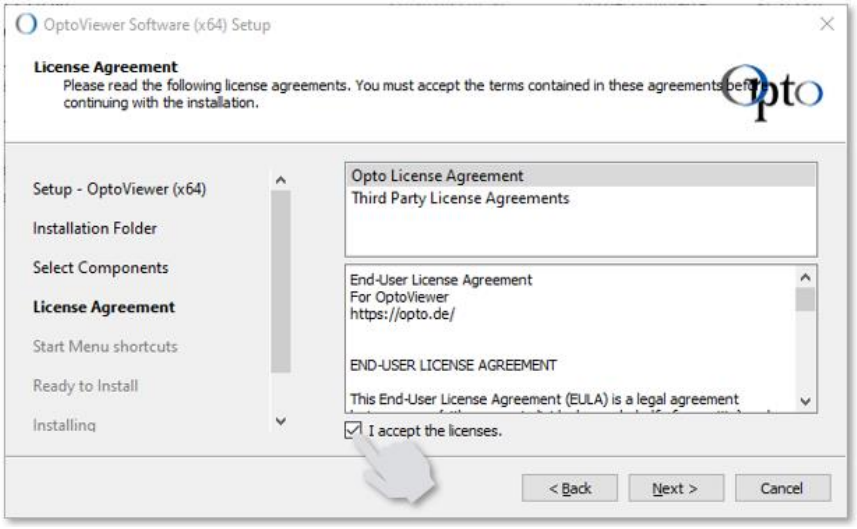
   - Continue installation with the 'Next>' button

2. Select Components
   - Select the required 'OptoViewer' components.



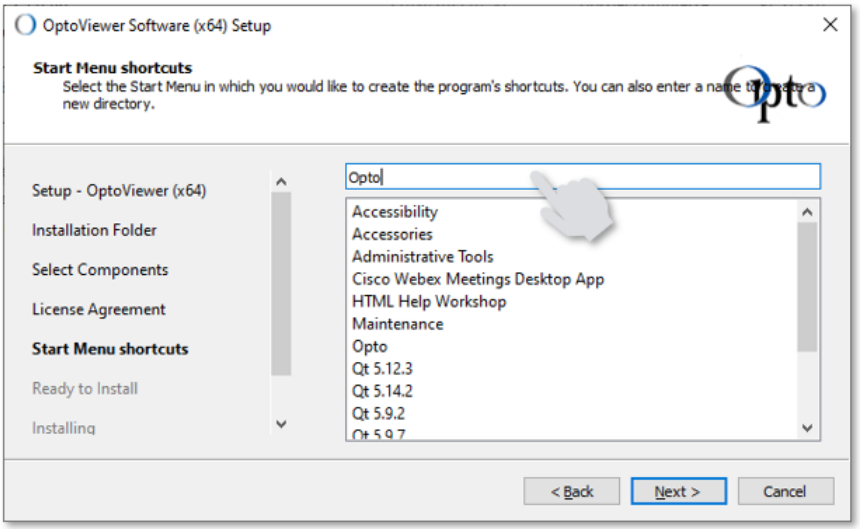
   - Continue installation with the 'Next>' button

3. Accept License Agreement
   - Confirm the licence agreements with a check mark.



   - Continue installation with the 'Next>' button

4. Assign Shortcut Name
   - Assign shortcut name for Windows start menu (default: 'Opto').

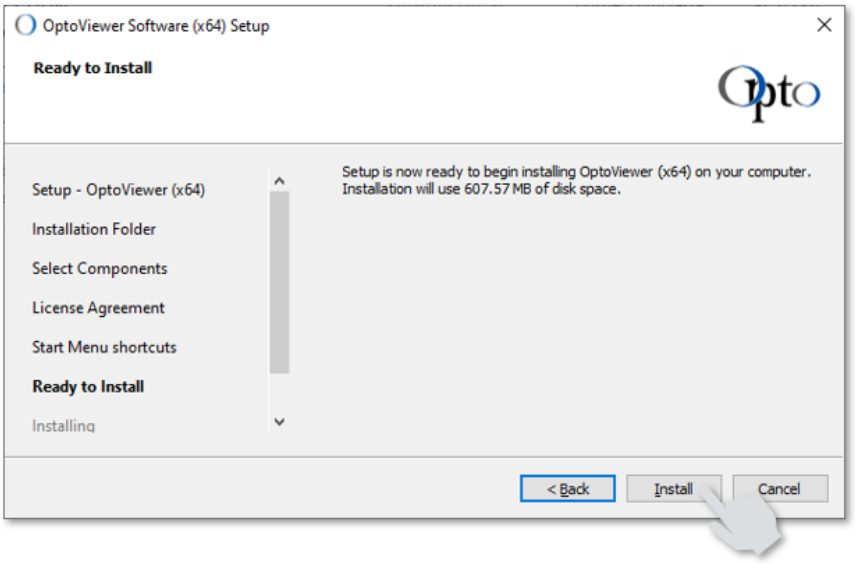


   - Continue installation with the 'Next>' button

5. Start Installation

IMPORTANT INFORMATION
The installation can take a few minutes, as the program automatically detects and installs all necessary drivers and software components

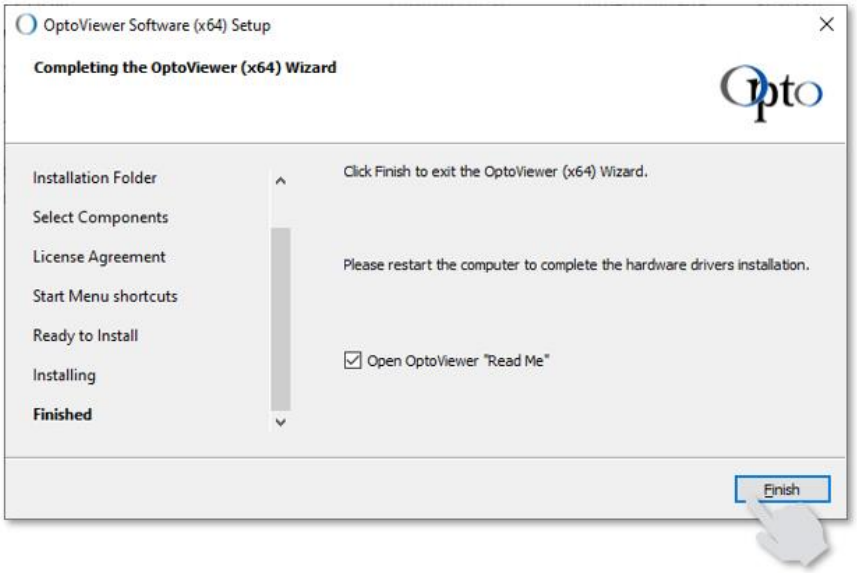
- Start installation with 'Install' button.



- Continue installation with the 'Next>' button

6. Complete Installation

- Complete installation with 'Finish' button.



- Software installation is completed.

IMPORTANT INFORMATION
For technical support, please contact support@opto.de.

8 User Interface

8.1 General layout

The OptoViewer user interface design is based on 3 main object types:

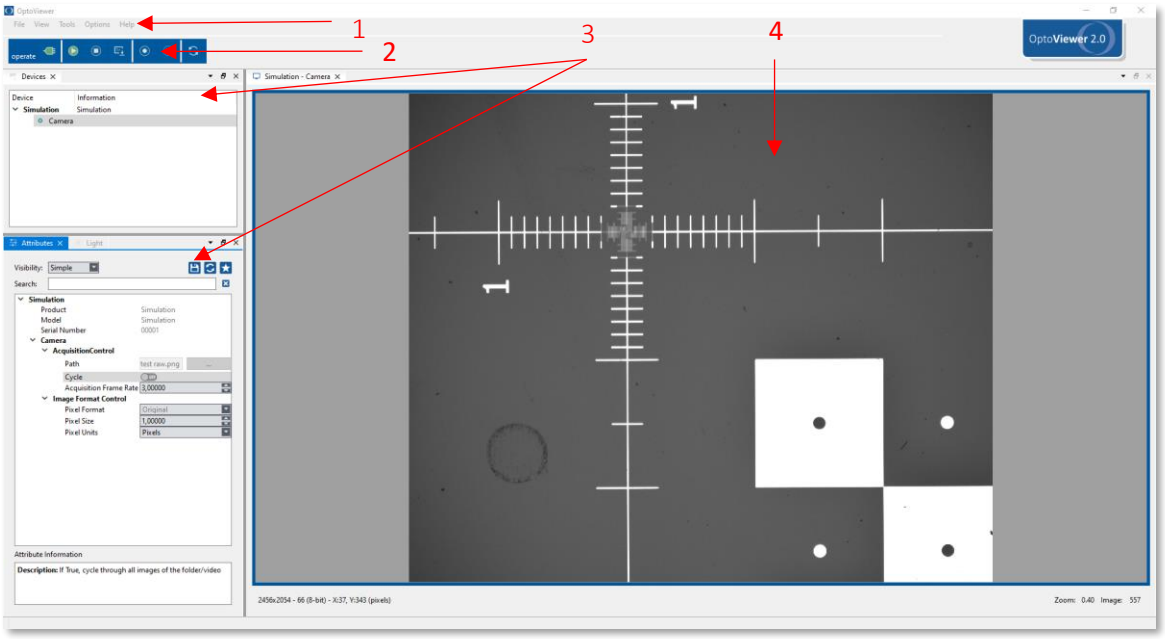


Figure 1: OptoViewer 2.0 · General User Interface

1	Menus to access features and options
2	Toolbars to enable features or make actions
3	Panels that enable to setup features or monitor
4	Image displays

8.2 Menus

Menus are mostly used to load and save files, display toolbars, setup preferences and access online help. The 5 available menus are detailed below.

8.2.1 Menu · File

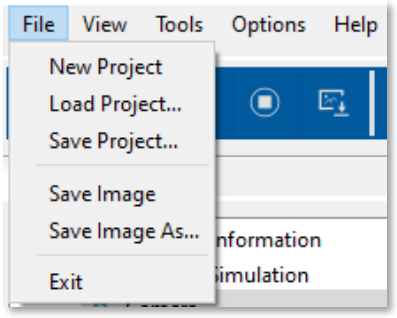


Figure 2: Menu · File

Item	Description
New Project	Generates a new project. Refer to 8.6.2 for details.
Load Project	Loads an existing project. Refer to 8.6.2 for details.
Save Project	Saves a project. Refer to 8.6.2 for details.
Save Image	Saves the current selected image with template defined naming. Refer to 9.40 for details.
Save Image As	Saves the current selected image. A dialog window opens to select file name, format and options.
Exit	Exits OptoViewer (user confirmation is requested).

8.2.2 Menu · View

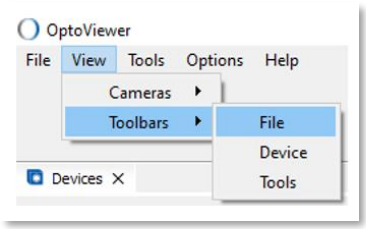


Figure 3: Menu · View

Item	Description
Cameras	Displays/hides cameras image displays.
Toolbars	Displays/hides toolbars.

8.2.3 Menu · Tools

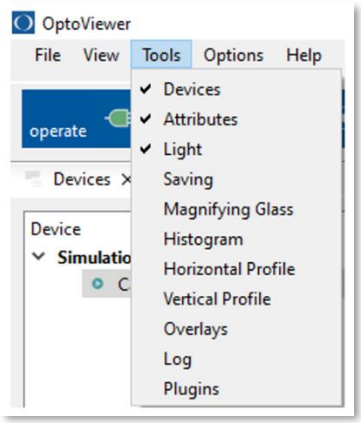


Figure 4: Menu · Tools

Item	Description
Devices	Displays/hides the *Devices* configuration panel. Refer to 9.1 for details.
Attributes	Displays/hides the device *Attributes* panel. Refer to 9.3 for details.
Light	Displays/hides the *Light* control panel. Refer to 9.2 for details.
Saving	Displays/hides the *Saving* options panel. Refer to 9.4 for details.
Magnifying Glass	Displays/hides the *Magnifying Glass* tool. Refer to 10.3 for details.
Histogram	Displays/hides the *Histogram* graph. Refer to 10.1 for details.
Horizontal Profile	Displays/hides the *Horizontal* line *Profile* graph. Refer to 10.2 for details.
Vertical Profile	Displays/hides the *Vertical* line *Profile* graph. Refer to 10.2 for details.
Overlays	Displays/hides the *Overlays* configuration panel. Refer to 9.5 for details.
Log	Displays/hides the event *Log* view. Refer to 10.4 for details.
Plugins	Displays/hides the *Plugins* panel. Refer to 9.6 for details.

IMPORTANT INFORMATION

Items in the *Tools* menu behave like 2-state buttons:

- Checked item means the associated feature/panel is visible.
- Unchecked item (greyed icon background) means the associated feature/panel is not displayed.

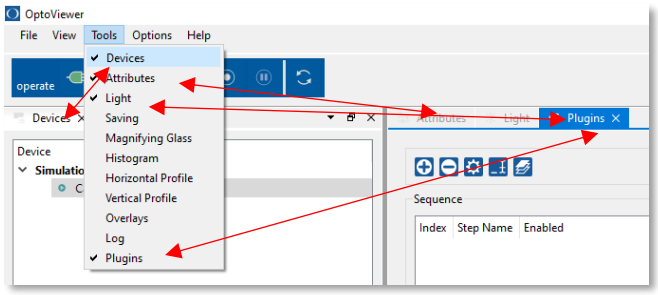


Figure 5: Menu · Tools - Status & Panels

8.2.4 Menu · Options

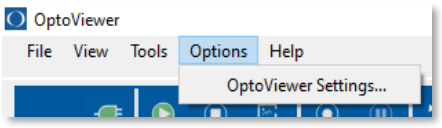


Figure 6: Menu · Options

Item	Description
OptoViewer Settings	Opens the *OptoViewer Settings* window. Refer to 11 for more details.

8.2.5 Menu · Help

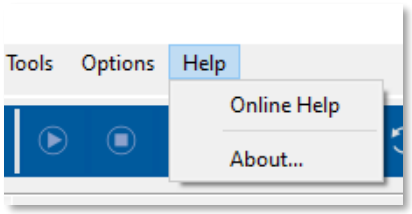


Figure 7: Menu · Help

Item	Description
Online Help	Opens the OptoViewer user manual.
About…	Software version and company information.

8.3 Toolbars

Most OptoViewer tools can be quickly accessed with toolbars:

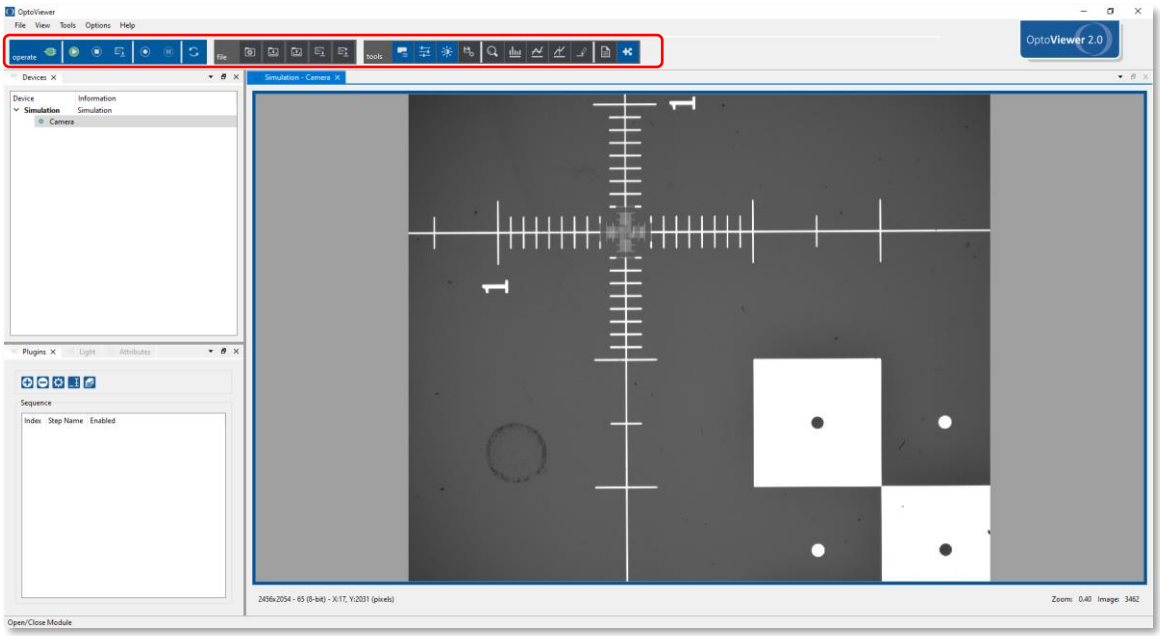


Figure 8: OptoViewer 2.0 · Toolbars

There are 3 toolbars that can be displayed or hidden using the *View/Toolbars* menu:

- *Operate* toolbar for connecting to devices and controlling image streams
- *File* toolbar provides same items as the *File* menu (8.2.1)
- *Tools* toolbar gives access to most features and settings of OptoViewer

8.3.1 Toolbar · Operate

Figure 9: Toolbar · Operate

Item	Description
	Opens/Closes Module: Releases access to selected module settings and features.
	Starts selected camera's image stream. The module has to be opened first.
	Stops selected camera's image stream.
	Saves an image to file using a template naming. Refer to 9.4 for details about automatic naming setup.
	Starts/stops image sequence recording. Refer to 9.4 for details about sequence recording setup.
	Pauses the recording process.
	Refresh the devices list.

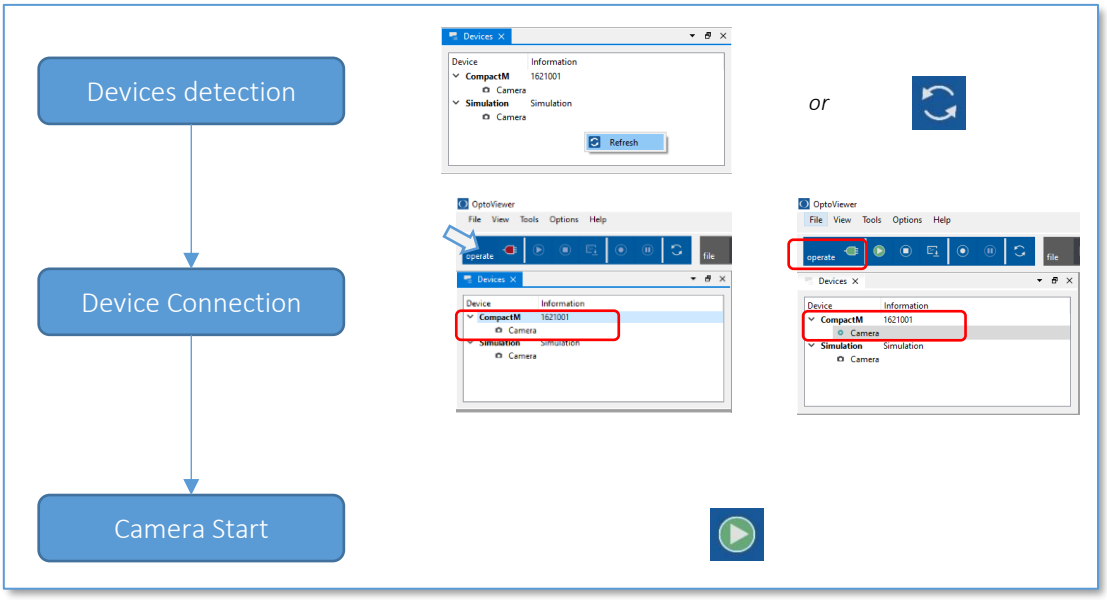


Figure 10: Opening an Imaging Module

To control a module, meaning setting it up and acquire images from its camera(s), you must first open it:

1. The module must be listed in the *Device* panel list. If it doesn't, right-click in the panel and select *Refresh*. OptoViewer will start the module detection process and update the device list to show all detected modules.

2. Click on the needed module, then press the *Open/Close Module* button. This button should change state from  (module is closed) to  (module is opened).
Once the module is opened, the other *Operate* toolbar's button will be accessible.

3. After opening a module, it becomes possible to start/stop a camera live stream and recording.

8.3.2 Toolbar · File

Figure 11: Toolbar · File

Item	Description
	Generates a new project. Refer to 8.6.2 for details.
	Loads an existing project. Refer to 8.6.2 for details.
	Saves a project. Refer to 8.6.2 for details.
	Saves the current selected image with template defined naming. Refer to 9.4 for details.
	Saves the current selected image. A dialog window opens to select file name, format and options.

8.3.3 Toolbar · Tools

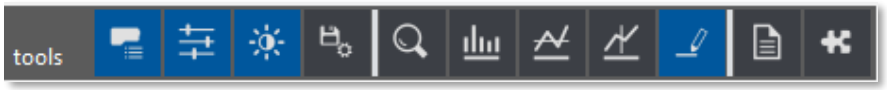


Figure 12: Toolbar · Tools

Item	Description
	Displays/hides the *Devices* configuration panel. Refer to 9.1 for details.
	Displays/hides the device *Attributes* panel. Refer to 0 for details.
	Displays/hides the *Light* control panel. Refer to 9.2 for details.
	Displays/hides the *Saving* options panel. Refer to 9.4 for details.
	Displays/hides the *Magnifying Glass* tool. Refer to 10.3 for details.
	Displays/hides the *Histogram* graph. Refer to 10.1 for details.
	Displays/hides the *Horizontal* line *Profile* graph. Refer to 010.2 for details.
	Displays/hides the *Vertical* line *Profile* graph. Refer to 10.2 for details.
	Displays/hides the *Overlays* configuration panel. Refer to 9.5 for details.
	Displays/hides the event *Log* view. Refer to 10.4 for details.
	Displays/hides the *Plugins* panel. Refer to 9.6 for details.

8.4 Panels management · Docking, Stacking, etc.

The OptoViewer allows a very flexible user interface management, with the ability to position panels in many ways. A panel can be set in a fixed position (“docked”) or floating. Docked panels can also be stacked on top of each other.

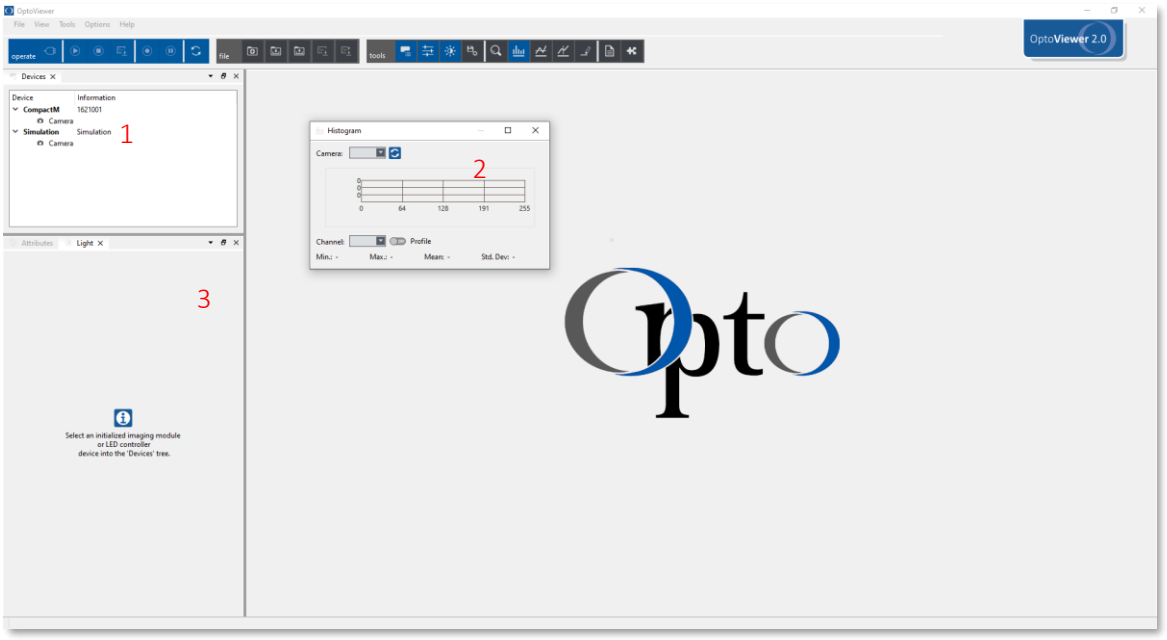


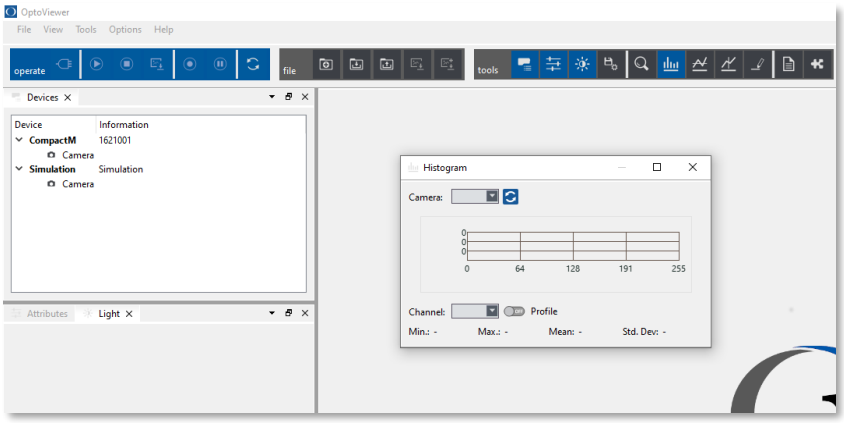
Figure 13: OptoViewer 2.0 · Panels positioning style

In the illustration above:

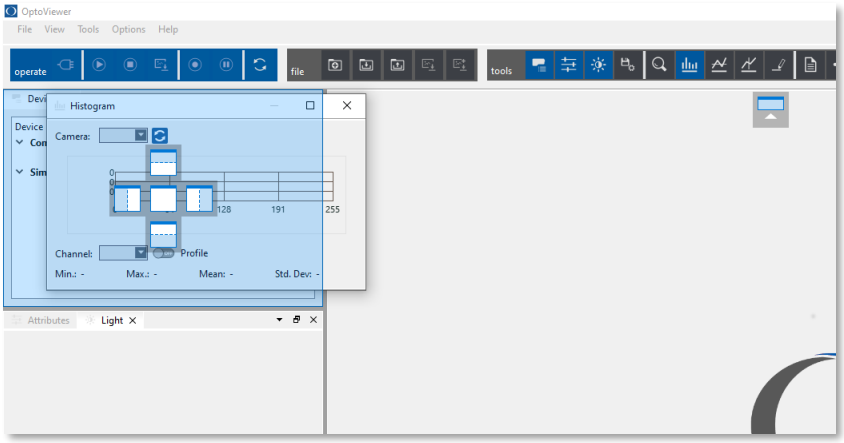
1	The *Devices* panel is docked (fixed position) in the top right.
2	The *Histogram* panel is floating.
3	*Attributes* and *Light* panels are stacked.

To change a panel’s position:

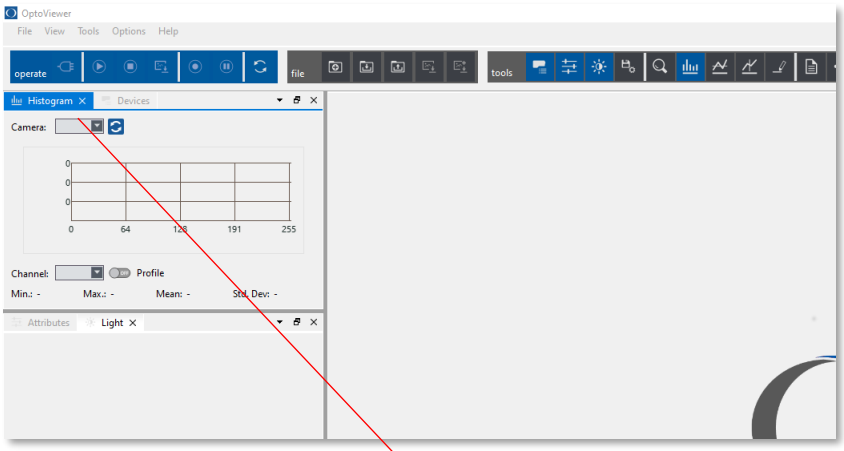
1. Click on the panel’s title bar. The title bar becomes dark blue.
2. Drag the panel to change its position.
3. Depending on the context, many possibilities will be shown to drop it. Below are some examples.



⇨ Histogram panel's initial position



⇨ Drag histogram to devices



⇨ *Drop the* panel. *Histogram and Devices panels are stacked*

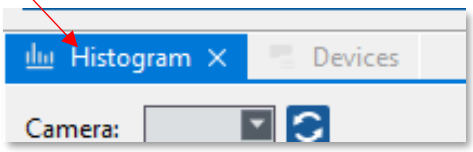
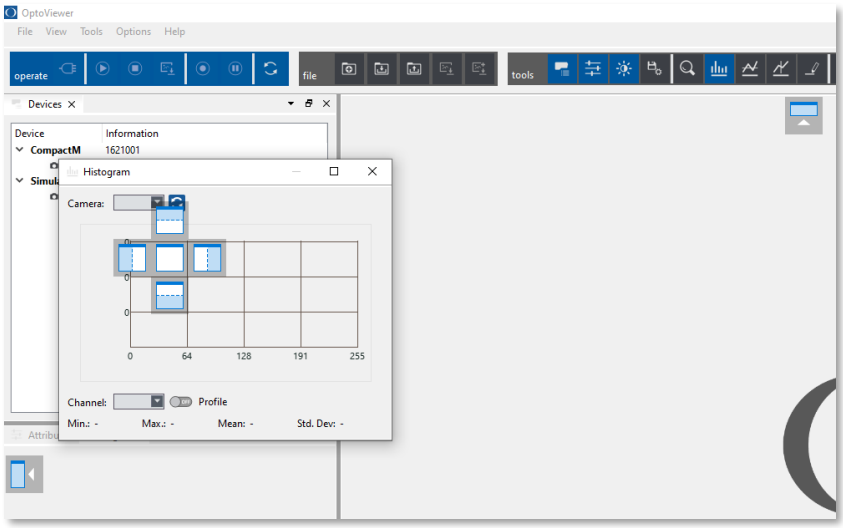
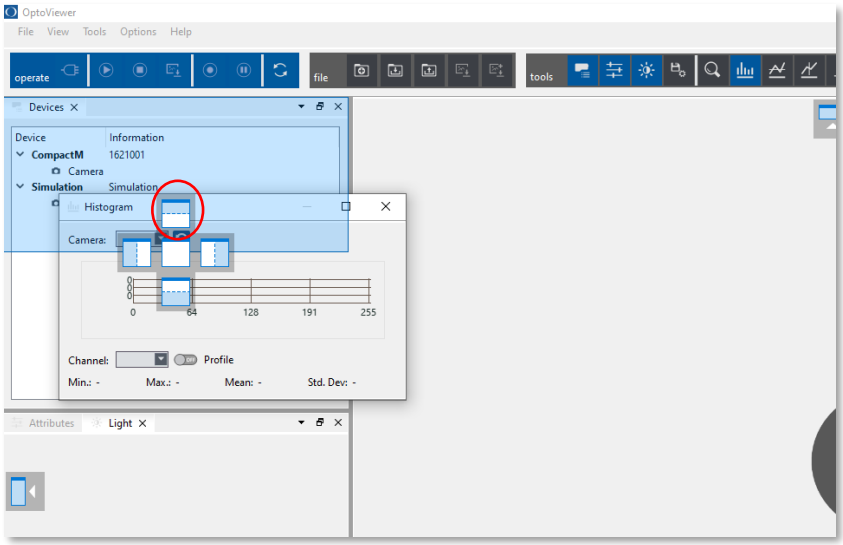


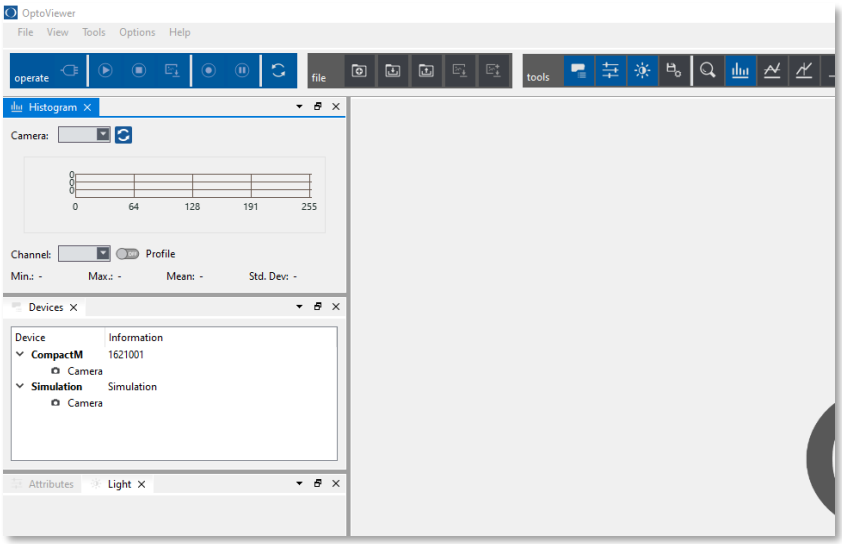
Figure 14: Stacking panels



⇨ Dragging *Histogram* above *Devices* panel: positioning icons appear

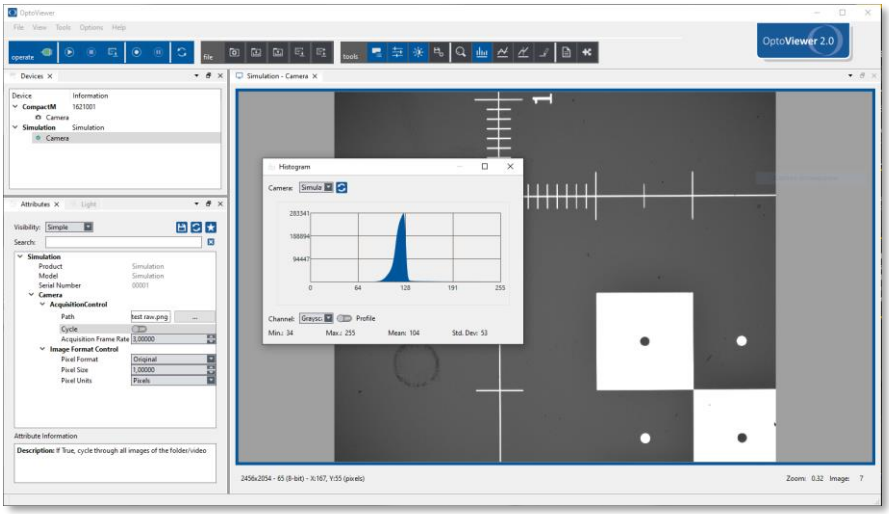


⇨ Dragging 'on panel's top' icon shows destination as a blue zone

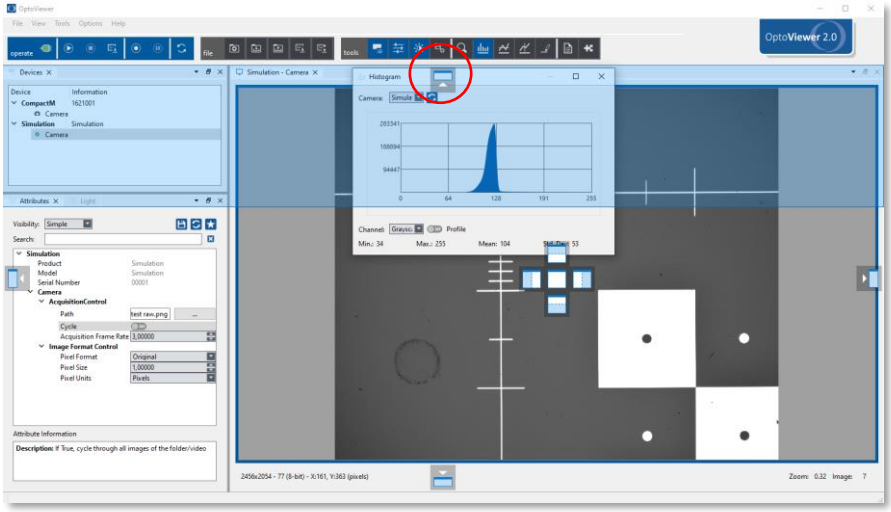


⇨ Once dropped, the *Histogram*'s panel is placed on top of the *Devices* one

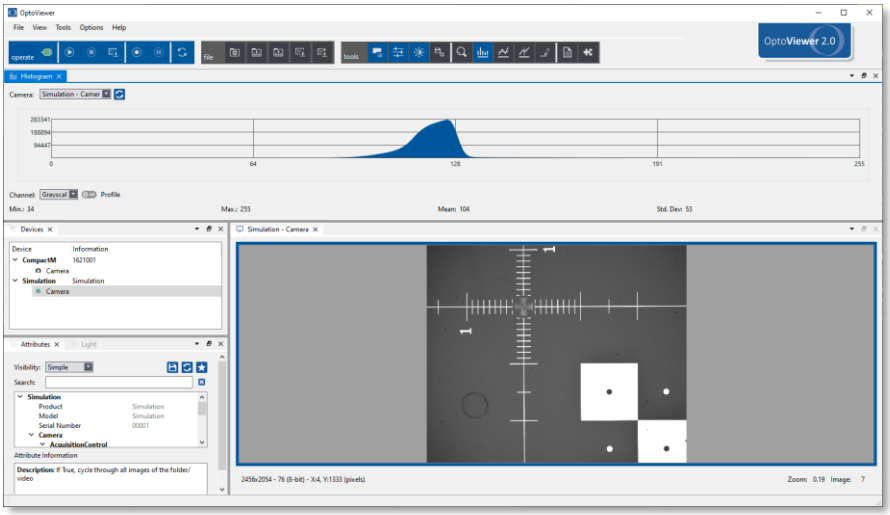
Figure 15: Placing Panels relatively to each other



⇨ Dragging *Histogram* above *Devices* panel: positioning icons appear



⇨ Dragging 'on top' icon shows destination as a blue zone



⇨ Once dropped, the *Histogram*'s panel is placed on top of the layout

Figure 16: Docking panels on top

8.5 Images Displays & Status Bar

8.5.1 Presentation

An image display automatically appears for every camera that is started. It's made of a display area, a display name and a status bar.

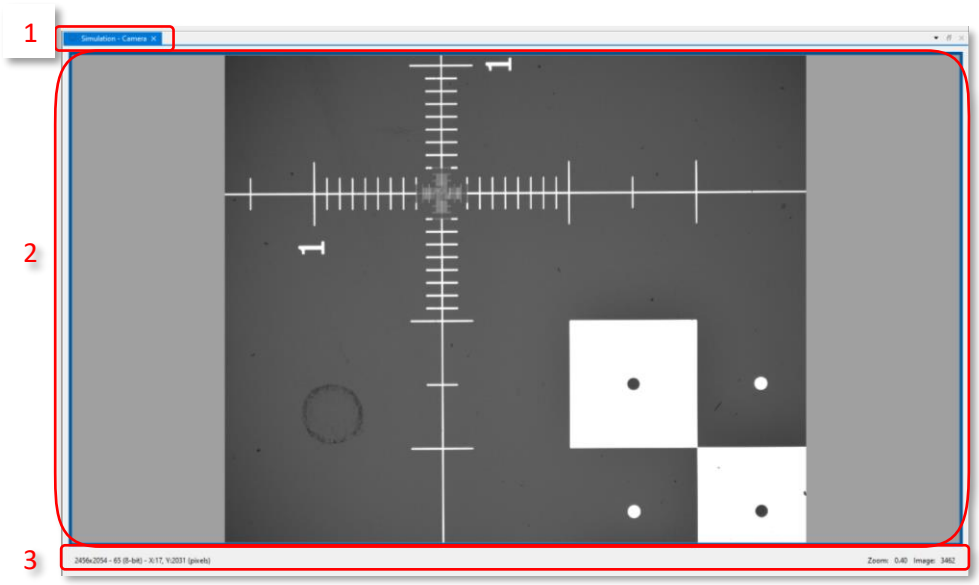


Figure 17: OptoViewer 2.0 · Image Display

1	Display name
2	Display area
3	Status bar

The display name shows the module name followed by the camera name. In the example above, the displayed image comes from the camera named *Camera* which belongs to the *Simulation Module*.
The display area contains the image. Zoom in and out is possible by using the mouse wheel. When the image is bigger than the display area, scrollbars appear.

The status bar shows the following information:

- On the left side:
  - The image size in pixel (in the example above: 2456 pixels x 2054 pixels).
  - The value of the image pixel the mouse cursor is on as well as the pixel depth (in the example above the pixel has a value of 65, coded on 8bit -> the image is monochrome 8 bits).
  - The coordinates (in pixels) of the image pixel the mouse cursor is on (in the example above x=17, y=2031).
- On the right side:
  - The zoom factor (in the example above 0.40x).
    A zoom ratio of 1 means 1 image pixel fits 1 display (monitor) pixel.
    A zoom ratio higher than 1 means 1 image pixel is represented by more than 1 display pixel -> the image display is zoomed in (magnified).
    A zoom ratio smaller than 1 means 1 image pixel is represented by less than 1 display pixel -> the image display is zoomed out.

- The image index: this value is incremented every time an image is captured. During a continuous acquisition, this value should be incrementing.

8.5.2 Full Screen Feature

It is possible at any time to display an image in full screen mode. This is a useful feature:

- to take advantage of the full monitor space,
- when multiple images are displayed in the same time.

8.5.2.1 Activating Full Screen

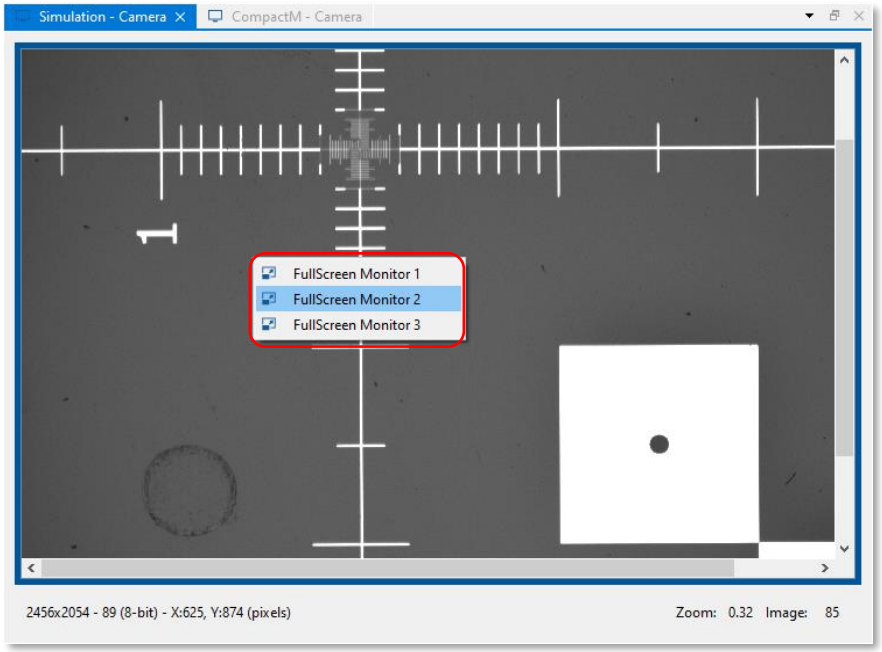


Figure 18: Enabling Full Screen

1. Right click in the display area showing the image you would like to display in full screen: a context menu appears listing available monitors.
2. Select the monitor on which to display the image in full screen: the image is displayed on the selected monitor while still being displayed in the OptoViewer main user interface.

IMPORTANT INFORMATION
Zooming is possible in a full screen view by using the mouse wheel.

8.5.2.2 Removing Full Screen

There are 2 ways to remove a full screen display:

1. Click in the full screen display to remove and press the *Escape (Esc)* key.
2. In the OptoViewer main interface, right-click in the image that is also displayed in full screen: the context menu appears. Select *Exit FullScreen Monitor…*

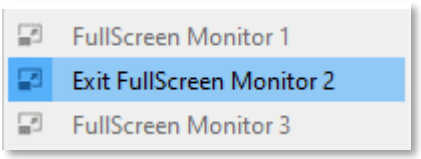


Figure 19: Exit Full Screen option

8.6 Layouts & Projects

Layouts and *Projects* are features that enable the customization of their Opto system to optimize the user experience:

- *Layouts* are presets of OptoViewer user interface. It includes which elements (panels, toolbars, etc.) are opened, how they are positioned and sized.
- *Projects* are entire definition of an OptoViewer setup including:
  - Layout settings
  - Hardware Modules settings and states (closed or running)
  - Applied processing (*Overlays* and *Plugins*)

8.6.1 Layouts

A *Layout* defines which elements (panels, toolbars, …) are opened, how they are positioned and sized. The needs for a good user experience depend on the application or domain as well as the user tasks. Depending on these factors, the tools available on the screen as well as the organization in the application window can strongly vary.

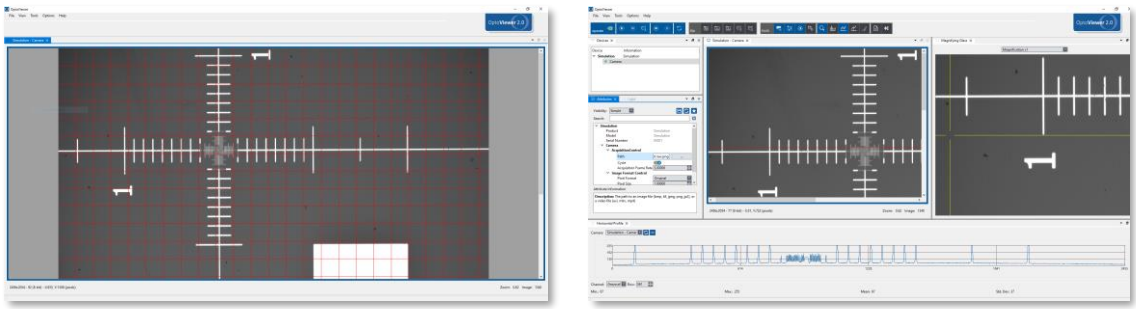


Figure 20: Basic Layout vs. Advanced Layout

It is possible to define custom layouts as presets that can be applied at any time. For more details on how to save or select a layout, refer to 11.1.

8.6.2 Projects

Whereas a *Layout* is about the user interface, the *Project* defines the whole OptoViewer system configuration. It includes the interface *Layout*, the modules settings, the *Overlays* on the displayed images and the *Plugin* sequences applied also to the images.

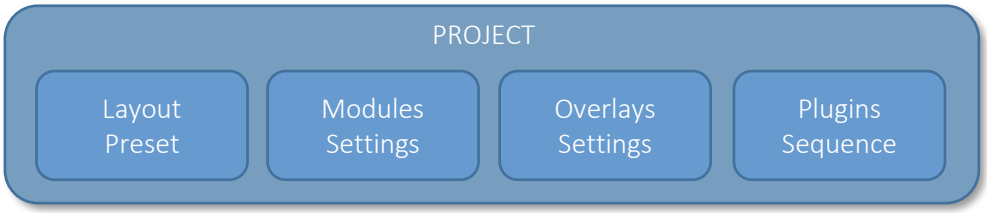


Figure 21: Project considered Specifications

Projects can be saved in *ovp files* using the *File\Save Project...* menu. This will save the whole current configuration being used:

Layout	If a layout preset has been selected (see *Layouts*), this preset will be applied when the project is loaded.
Modules Settings	E.g. frame rate of the camera or illumination type and brightness.
Overlays	Includes *Basic* and *Annotation* tools.
Plugins	Whole sequences are considered.

You can load a previously saved *Project* using the *File/Load Project...* menu. It is possible to setup OptoViewer to load a specific *Project* at start up. Refer to 11.2 for more details.

9 Control Options

9.1 Panel · Devices

The *Devices* panel lists all connected imaging modules (and their cameras) which can be physical devices or simulated ones. Refer to 8.3.1, for more information on how to open a module and start using it. When a module is selected all control panels (*Attributes*, *Light*, …) will apply to that selected module.

9.1.1 Camera Settings

For every camera, it is possible to configure its specific *Acquisition* and sequence recording parameters. Camera settings are for advanced users. Default parameters will fit most applications.

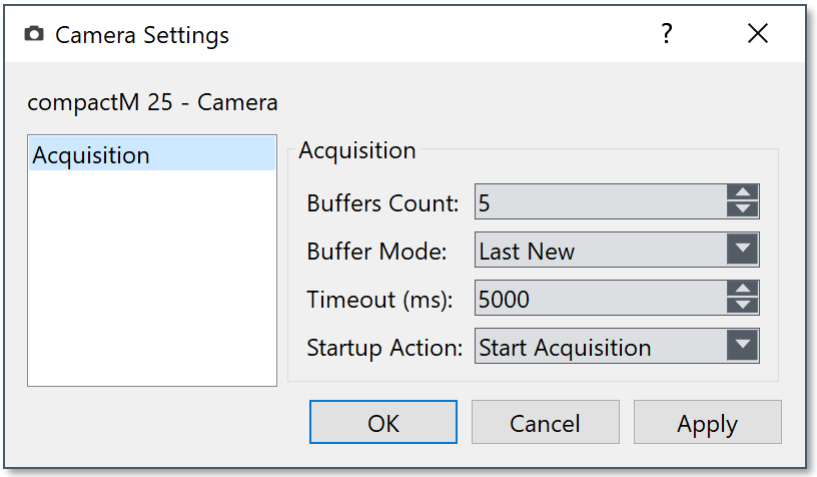


Figure 22: Panel · Camera Settings

Item	Description
Buffers Count	Number of buffers allowed to store images in case of computer latencies.
Buffer Mode	Sets which image to grab from the available buffers: • Next: available buffers are not considered, instead OptoViewer will wait for the next image coming from the camera. • Last: OptoViewer will get the last acquired buffer even if this buffer has already been used previously. • Last new: OptoViewer will get the last acquired buffer if it has not been used yet, otherwise it will wait for the next buffer to come. • Oldest: OptoViewer will get the oldest unused buffer.
Timeout	Maximum duration to wait for an image. If the timeout is reached, the software stops the acquisition.
Startup Action	Defines the behaviour of the camera when the module is started: • None: camera is not started. • Start Acquisition: the camera is started and images are displayed. • Start Acquisition and Recording: the camera is started, images are displayed and recorded (based on configuration in the *Saving* panel).

9.1.2 Simulation Modules

It is possible to define *Simulation Modules* which will generate an image stream based on image files. Definition of simulation modules can be set in the *OptoViewer Settings* window (refer to 11.3 for more details). The following attributes can be set up in the *Attributes* panel of a simulated module:

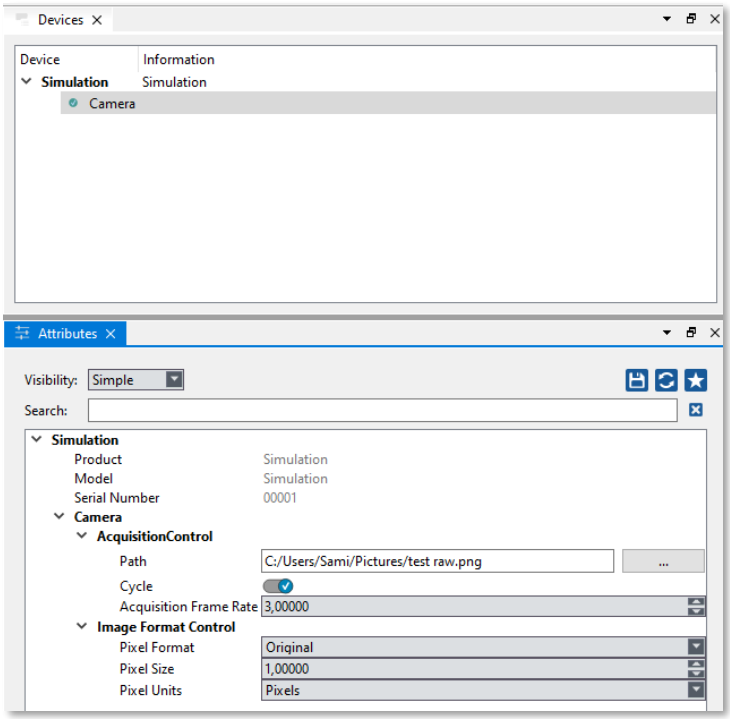


Figure 23: Simulation Module Attributes

Item	Description
Path	File path of an image that will be displayed. Depending on the state of the *Cycle* attribute, only this image will be used or all images on the same folder with the same image size and type (monochrome, colour).
Cycle	When *Cycle* is disabled, only the image file which path is defined in *Path* attribute will be used. When enabled, the image stream will cycle between all images in the same folder that have the same image size and type (monochrome, colour) as the one selected in *Path.*
Acquisition	Defines the refresh rate of the simulated image stream.

9.2 Panel · Light

The *Light* control panel controls lighting type, power and camera exposure time. It is displayed by enabling *Light* on *tools* toolbar or by selecting *Light* in *Tools* menu.

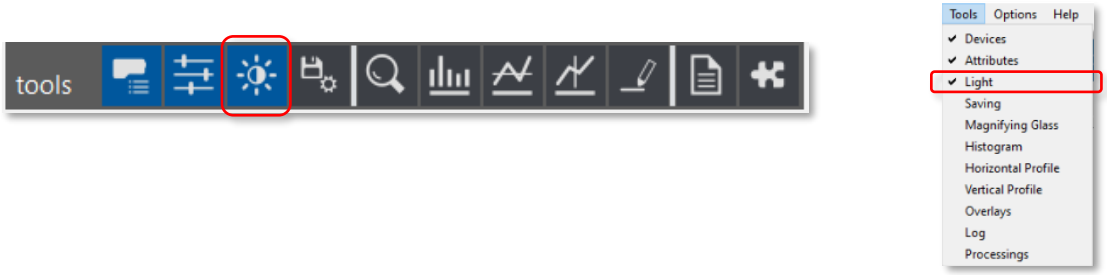


Figure 24: Opening Light panel

When the selected module is opened, a panel is displayed with three sections:

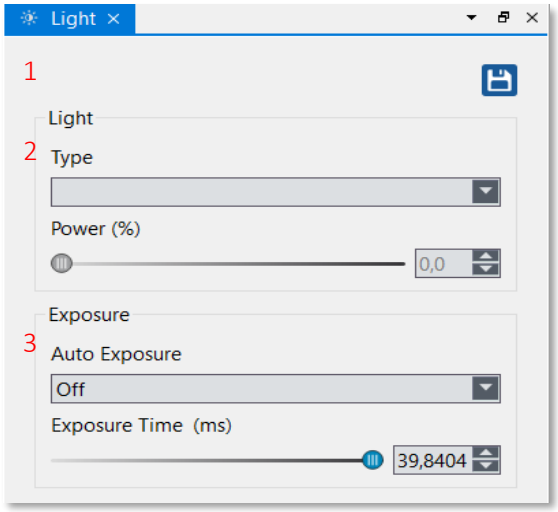


Figure 25: Panel · Light

1	*Save* button
2	*Light* management
3	*Exposure* Management

IMPORTANT INFORMATION
The light panel control is disabled and greyed out when:

- no module is selected,
- the selected module is not opened,
- the selected module has no light implemented.

These features will be described in below chapters.

9.2.1 Save Button

The *Save* button saves light and exposure attributes, but also all module attributes listed in attributes panel. A confirmation is requested when using it.

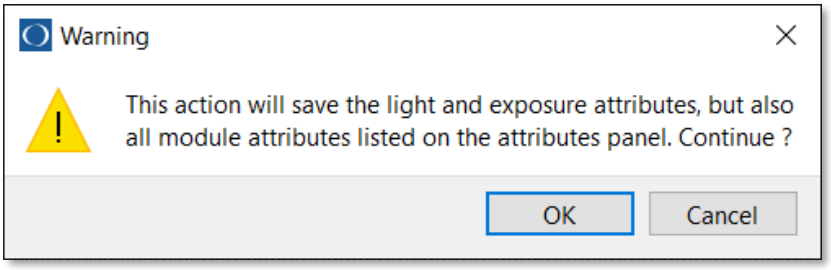


Figure 26:

Attributes saving warning message

9.2.2 Light Management

To manage the light, it is possible:

- to choose the type of light (ring, coaxial, etc. - depending on the module type),
- to adjust the power.

9.2.3 Exposure Management

An *Auto Exposure* can be activated with function *On*, so the exposure time is automatically adjusted. Be aware that no automatic gain is applied, only exposure time is controlled. When a low frame rate is set, this allows long exposure times to be applied in case of low light conditions. Long exposure time can cause motion blur in case of moving object. It is always recommended to increase the light power if possible. If it is set to *Off*, the exposure time can be manually adjusted.

9.3 Panel · Attributes

The *Attributes* panel displays the parameters of the module you have selected in the modules' list. It allows module attributes management and settings. This panel offers further settings in terms of module control.
It is displayed by enabling *Attributes* on *tools* toolbar or by selecting *Attributes* in *Tools* menu.

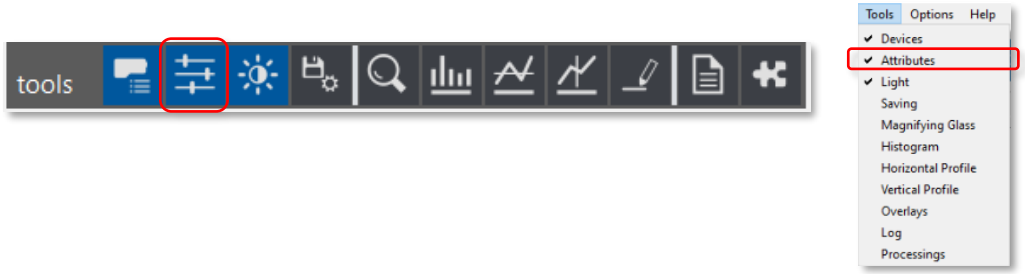


Figure 27: Opening Attributes panel

This panel displays attributes, ONLY for the selected and opened module. *Attributes* are organized in a tree structure. If the selected module is opened, a panel is displayed with three zones:

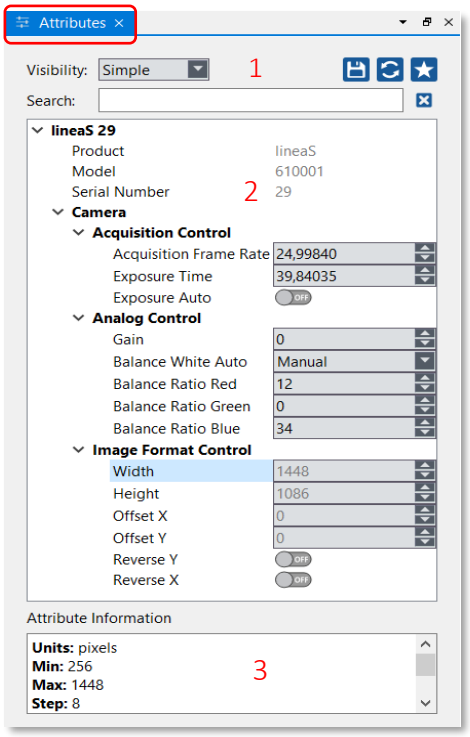
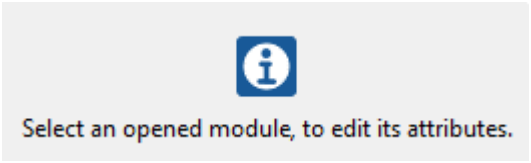


Figure 28: Panel · Attributes

1	Attributes management
2	Attribute tree
3	Attribute information

IMPORTANT INFORMATION
If no module is selected or if the selected module is not opened, the following message will be displayed:



9.3.1 Attributes Management

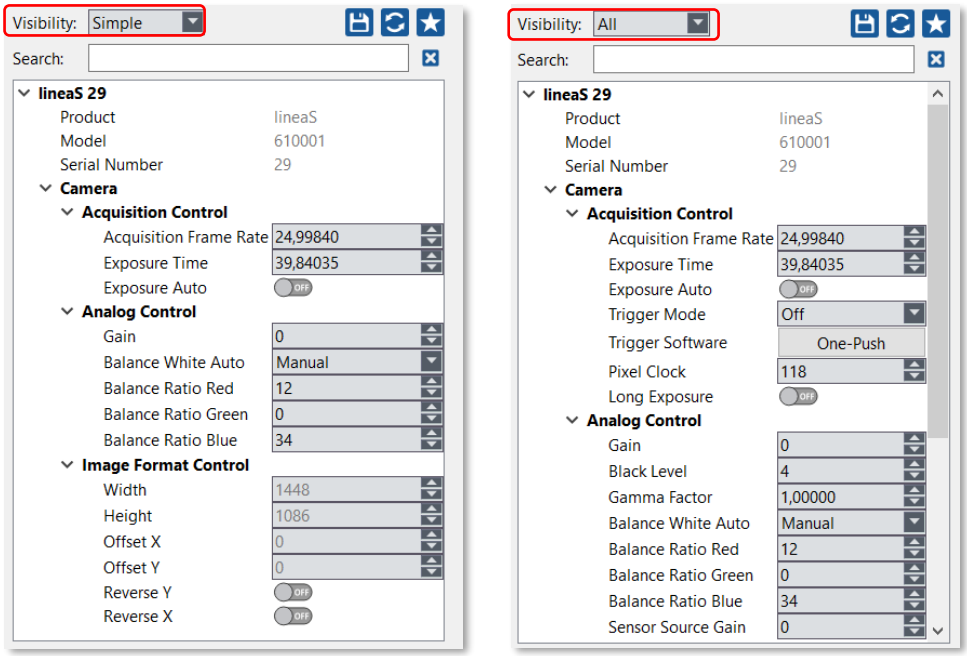
Visibility: Simple	Sets visibility (default *Simple*).
	Saves attributes.
	Refreshes attributes.
	Displays Favourites.
Search:	Searches for attributes according to the filter input.
	Deletes filter.

9.3.1.1 Visibility

Changing the *Visibility* value will update the attributes tree. *Visibility* can be set to *Simple*, *Intermediate*, *All* or *Favourites*.

- *Simple*, *Intermediate* and *All* respectively display a minimum, intermediate and maximum number of attributes in the tree.

- *Favourites* displays attributes as configured with button .



Visibility *Simple* Visibility *All*

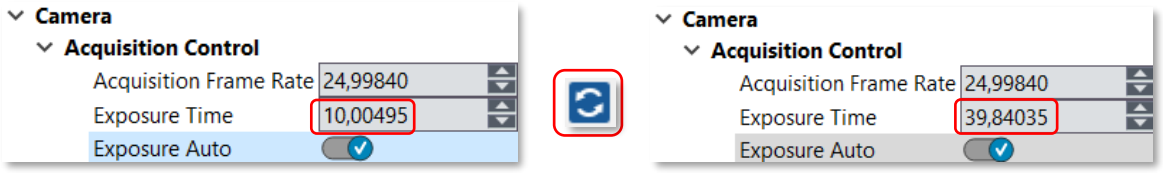
Figure 29: Examples of attributes visibility

9.3.1.2 Save Attributes

Attributes values can be modified directly in the tree (refer to *Attributes Tree* for details). These values can then be saved. Next time the module will be opened, the saved attributes values will be loaded.

9.3.1.3 Refresh Attributes

Some attributes are linked with each other. That means changing values could automatically have an influence on other parameters. For example, when *Exposure Auto* is checked, *Exposure Time* will be automatically adjusted. Press button *Refresh* to see updated value.



Before Refresh After

Figure 30: Example of relationship between Exposure & Frame Rate

9.3.1.4 Favourites

While dozens of attributes are available for a module, most users usually only need a very limited number (sometimes only 1 or 2). OptoViewer offers the possibility to define your own favourites, which represent a user-specific group of attributes.

Setting and using *Favourites* is a 2 steps process:

1. Click on *Favourites* button 
   A dialog box appears, allowing to select which attributes to set as favourites.

2. Set the *Visibility* to *Favourites*
   Only attributes previously selected as *Favourites* will be listed in the tree, making them very easy and quick to access.

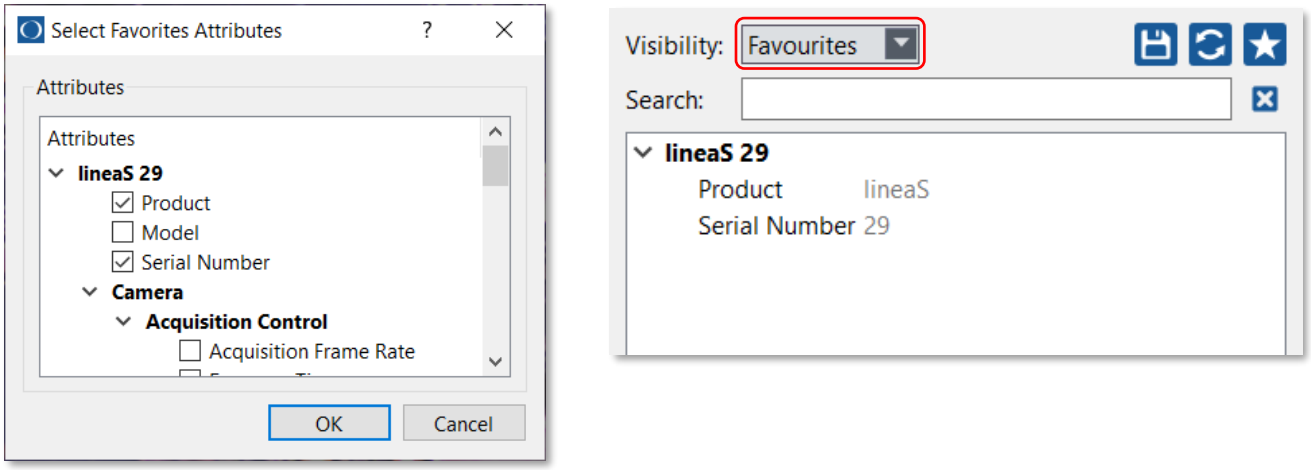


Figure 31: Using favourites feature

9.3.1.5 Search Attributes

Input a text in this field to see only filter attributes which name contains the input text. By clicking on *Delete* filter button, the search is cleared.

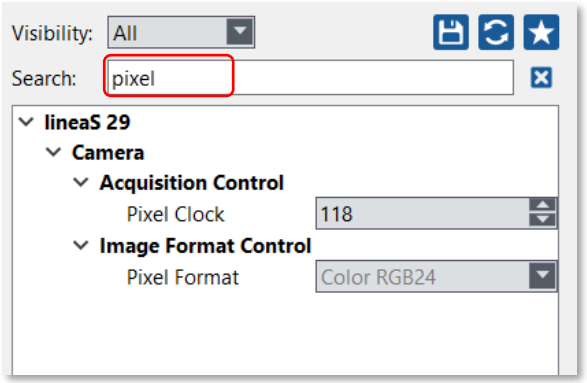


Figure 32: Example of attributes filter

9.3.2 Attributes Tree

The attributes tree displays the attributes of the selected module and their values. By clicking on the arrows, it is possible to expand or collapse the branches of the tree.

Figure 33: Attributes tree

Some attributes are read-only. They are disabled and greyed out. Others can be modified by selecting a value in a combo-box, clicking on the increment/decrement buttons or typing the value on keyboard. When a value is selected, detailed information is displayed in the A*ttribute Information* control.

IMPORTANT INFORMATION
Some attributes can only be set when the image acquisition is stopped (for example image width, height, …).

9.3.3 Attributes Information

The details displayed in the information section are at least the description. If the selected attribute has a numeric value, there are also units, range and step. The step is the value added/substracted by increment/decrement button.

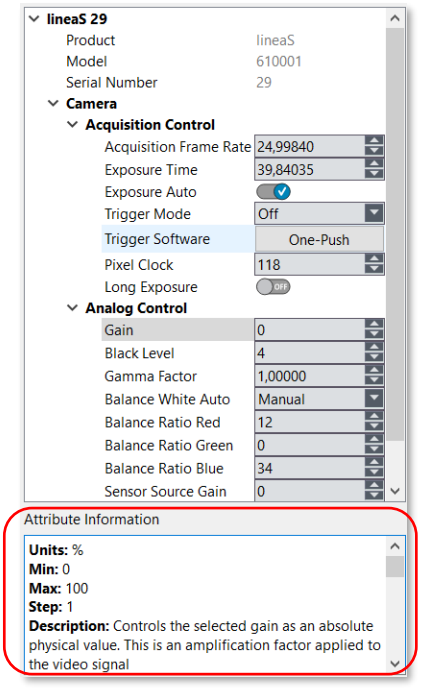


Figure 34: Attribute Information

9.4 Panel · Saving

9.4.1 Configuring Saving Sequences & Single Images

By default, records are saved in the '*Pictures*' folder on the computer, as PNG images. The memory options are displayed by enabling *Saving* on *Tools* toolbar or by selecting *Saving* in *Tools* menu.

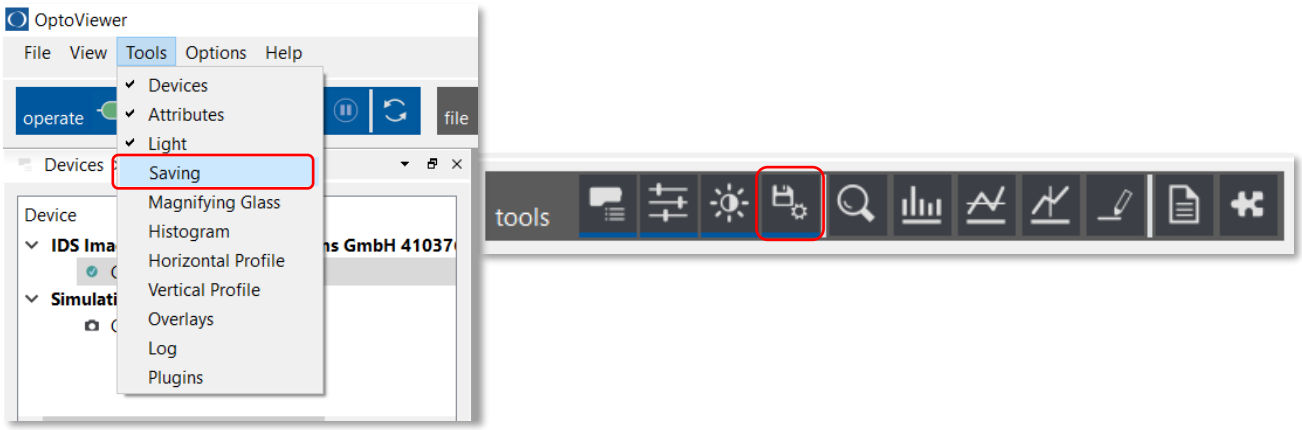


Figure 35: Opening Saving panel

This will open the Saving Panel which is divided into 2 sections:

1. *Sequence* is used for continuous recordings and can either save images in a folder or as a video file.
2. *Snapshot* is used for automatic saving of single shot images.

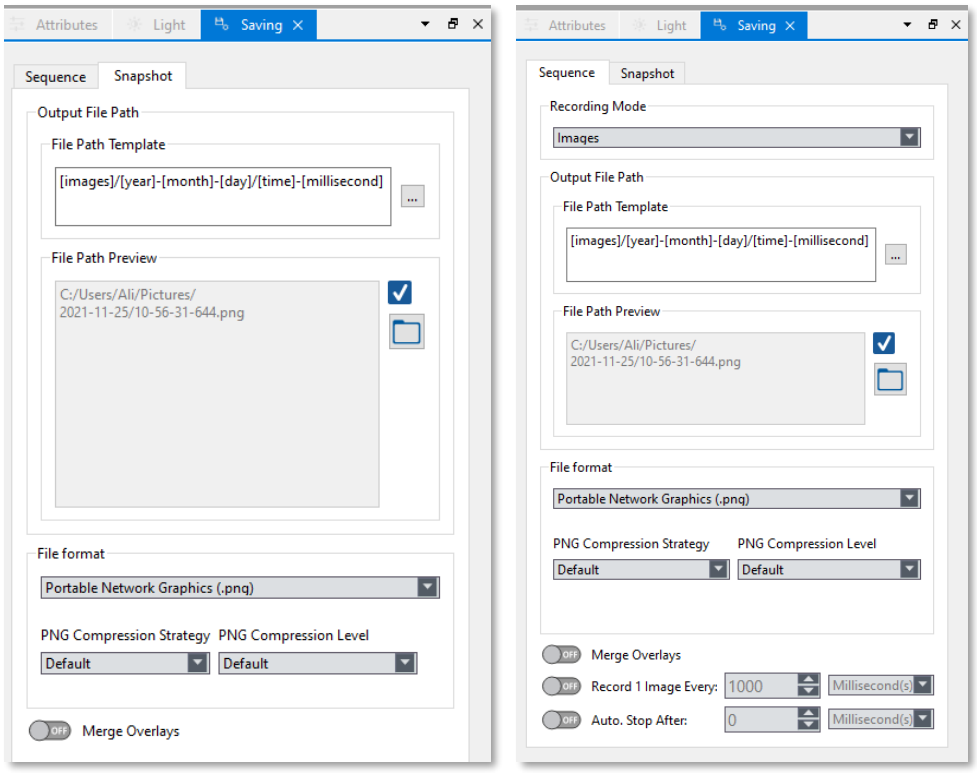


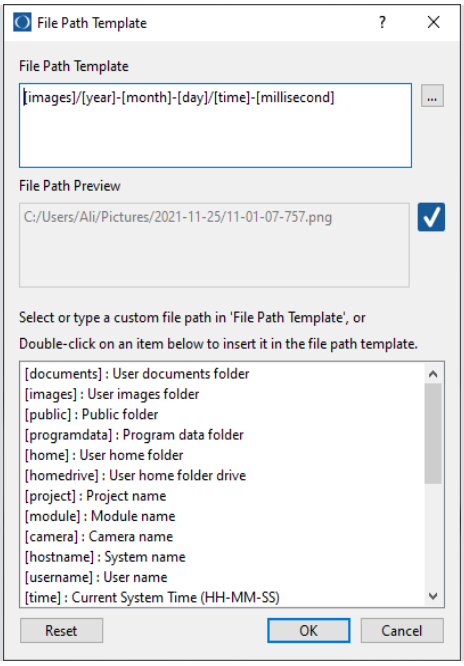
Figure 36: Saving taps

The available memory options are described in below table:

Item	Description
Recording Mode	Images (in a folder) or Video. Only available in *Sequence* tap.
File Path Template	Selects where the record or image is saved and named. The button on the right open the File Path template editor, allowing to select standard path on the computer (pictures, documents, etc.) or custom path, and append various tag to the record name: date, timestamp, frame index, etc. Refer to 9.4.2 for details.
File Format	List depends on saving mode. For images, options are png, bmp, tif, jpeg and jpeg 2000. For video, options are avi, mp4 and mkv.
File Compression	Each file format has a specific set of compression parameter. See section *File Path Template Editor* for details.
Merge Overlays	This check box allows to merge *Overlays* defined into the image.
Record Image Every…	This check box allows you to record images at a limited frequency, to reduce data size. It also known as 'Time lapse recording'.

9.4.2 File Path Template Editor

The *File Path Template* editor is used for auto naming the record. You can mix custom text and system tag to create the desired file name and save folder.
To add custom text, type in the text zone. You can add or remove "/" to change directory structure. Folders are automatically created when record start. To add tag, double click the tag in the list.



Example:
PNG
F:/OptoViewerRecord/[date]_[time]/MY_EXPERIMENT_[frameindex]
=>
F:\OptoViewerRecord\08-26-2021_16-43-48\MY_EXPERIMENT_0000021689.png

AVI
[documents]/OptoViewer/[date]/[time]
=>
C:\Users\Office Manager\Documents\OptoViewer\08-26-2021\16-46-40.avi

9.5 Panel · Overlays

Overlays are visual interactive options that are embedded to the camera display window that can display and draw shapes and compute measurements.

9.5.1 Accessing Overlays Panel

The *Overlays* panel is displayed by enabling *Overlays* on *tools* toolbar or by selecting *Overlays* in *Tools* menu.

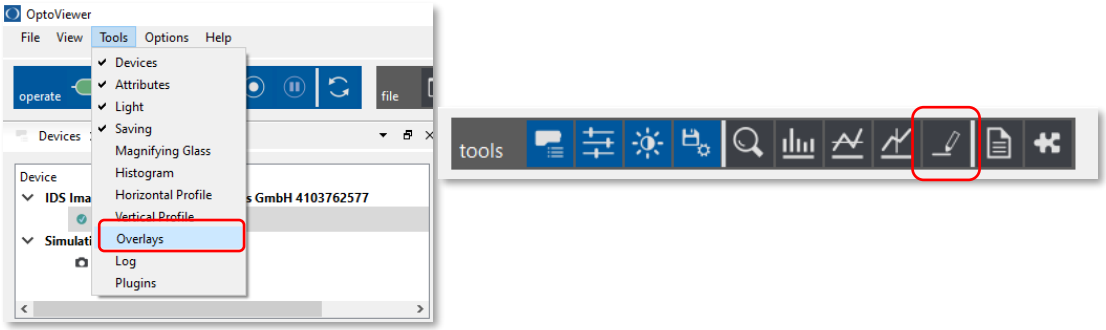


Figure 37: Opening overlays panel

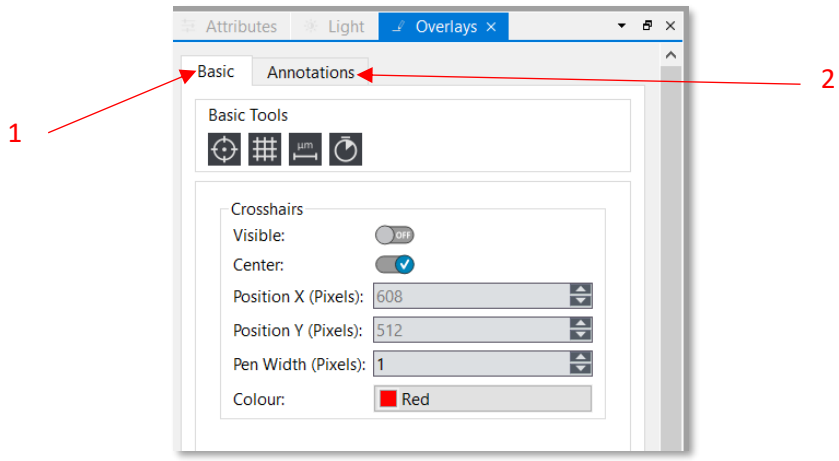


Figure 38: Panel · Overlays

Overlay tools are split in 2 tabs:

1	Basics: includes basic overlays useful for module setups or documentation purposes.
2	Annotations: includes further documentation or analysis tools.

9.5.2 Basic Overlays

The *Basic* overlays as their name suggests, are overlays that are commonly used for several purposes e.g. module setup.

- *Crosshair*:

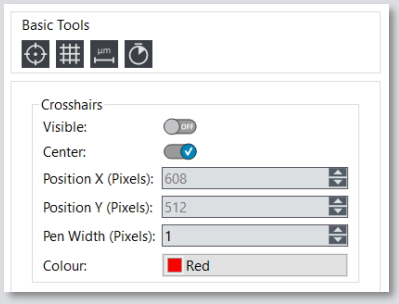
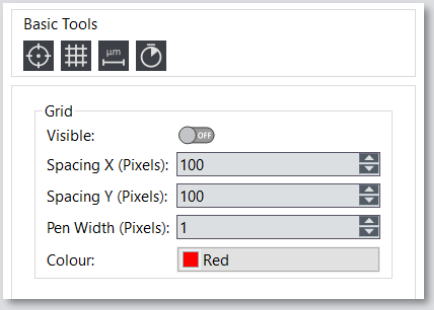
		Displays a crosshair at the desired position, with a custom width and colour. • Toggle *Visible* to display it on the window.

Figure 39: Overlay · Crosshair

- Grid :

		Displays a grid with a desired spacing, width and colour. • Toggle *Visible* to display it on the window.

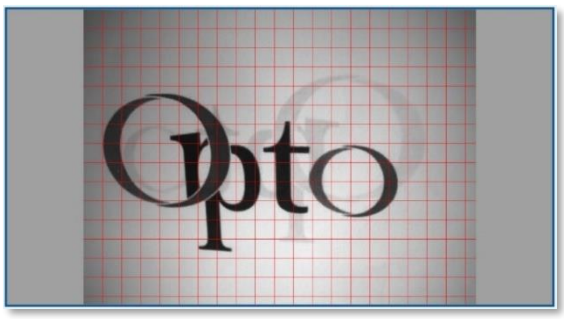


Figure 40: Overlay · Grid

- **Scale :**

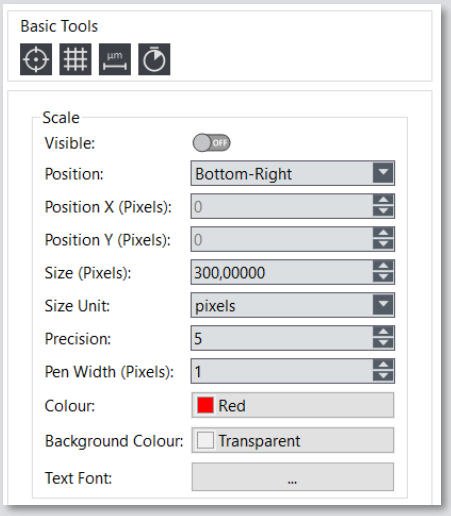
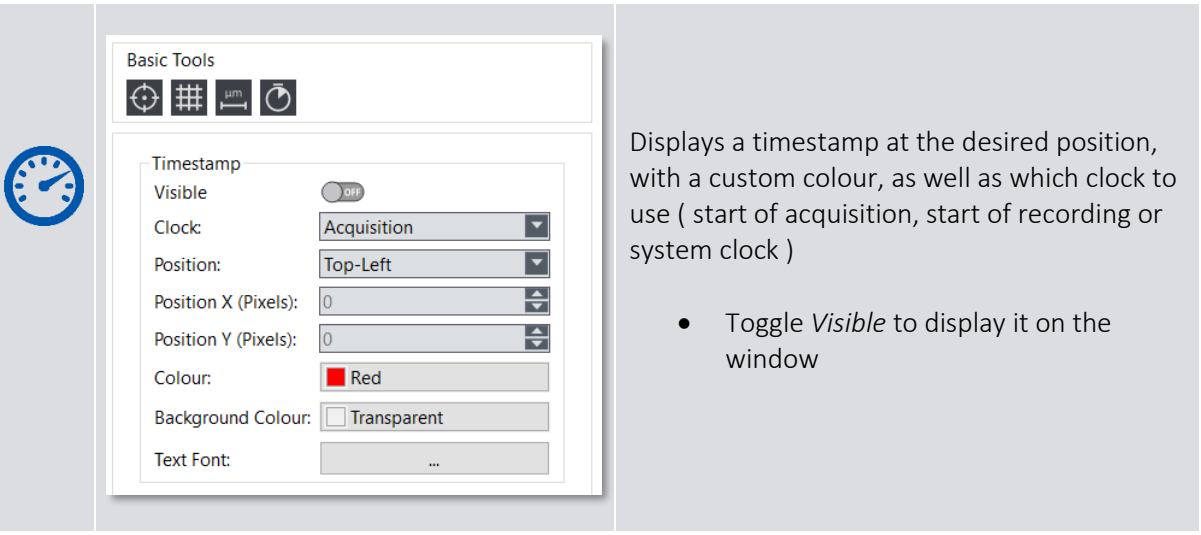
µm		Displays a custom scale at the desired position (*Bottom-Right*, etc.) with a desired width, precision and colour. It can either be defined in pixels or mm (requires a calibrated module). • Toggle *Visible* to display it on the window.

Figure 41: Overlay · Scale

- TimeStamp :



Displays a timestamp at the desired position, with a custom colour, as well as which clock to use (start of acquisition, start of recording or system clock)

- Toggle *Visible* to display it on the window

Figure 42: Timestamp overlay

IMPORTANT INFORMATION
You can only have ONE instance of every type of *Basic* overlays, *Annotations* (9.5.3) are different and can be stacked.

9.5.3 Annotations

The *Annotations* are a tool set dedicated to add certain objects in the image or FoV. These overlays can be adjusted to either add visuals (e.g. *Text, Images, Lines, Rectangles*) or to compute certain features such as angles, lengths or areas.

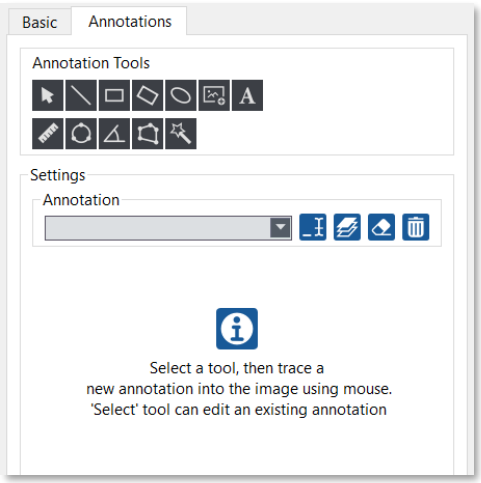
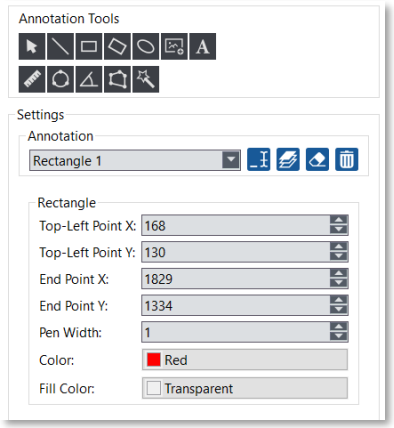


Figure 43: Tab · Annotations

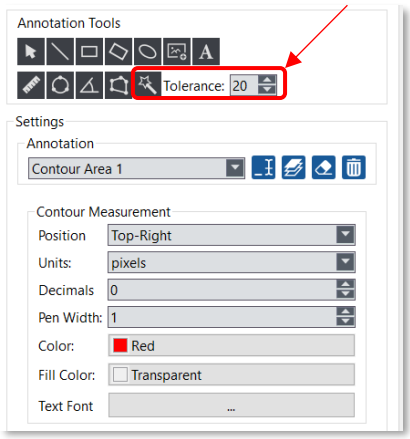
Button	Description
	Default, a cursor used to select tabs, displays, menu, etc.
	Draws a line on the display window.
	Draws a rectangle on the display window.
	Draws a circle from 3 points.
	Draws an ellipse.
	Inserts an image.
	Inserts text.
	Computes the length of a drawn segment (in pixels or mm if a calibration is used).
	Computes an angle from 3 drawn points.
	Draws a Polygon, double clicking closes the polygon.
	Contours an area by clicking on an 'object': all pixels around the clicked one that have the same value (+/- tolerance) will define a selected region which perimeter and area are computed.

IMPORTANT INFORMATION

Annotations can be stacked, and as such you can have multiple instances of the same tool present at the same time.



⇨ Drawing a *Rectangle*



⇨ Using *Contour Area* by clicking on the 't' in the Opto Logo, we can also choose a level of tolerance.

Figure 44: Examples of annotation tools

9.5.4 Managing Annotations

As described previously, annotations can be stacked, they can also be managed, renamed and deleted.

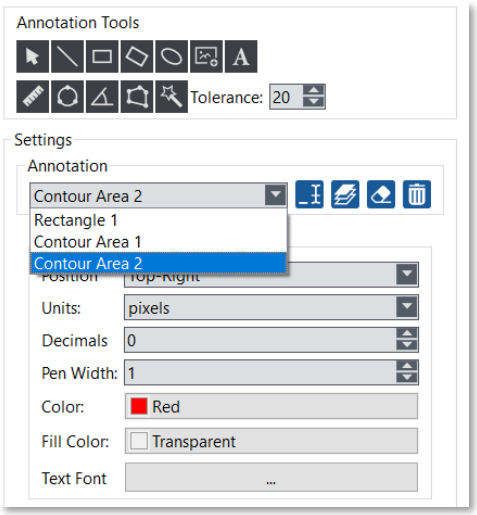
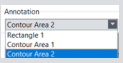


Figure 45: Annotation Management

Button	Description
	Lists annotations.
	Renames annotation.
	Re-orders list of annotations.
	Deletes an annotation.
	Deletes all annotations.

9.6 Panel · Plugins

9.6.1 Introduction

Plugins are additional tools that can be applied to image streams. Most of them are image analysis tools, used to get data from the images or processing tools used to transform or enhance images.

The *Plugins* panel is displayed by enabling *Plugins* on *tools* toolbar or by selecting *Plugins* in *Tools* menu.

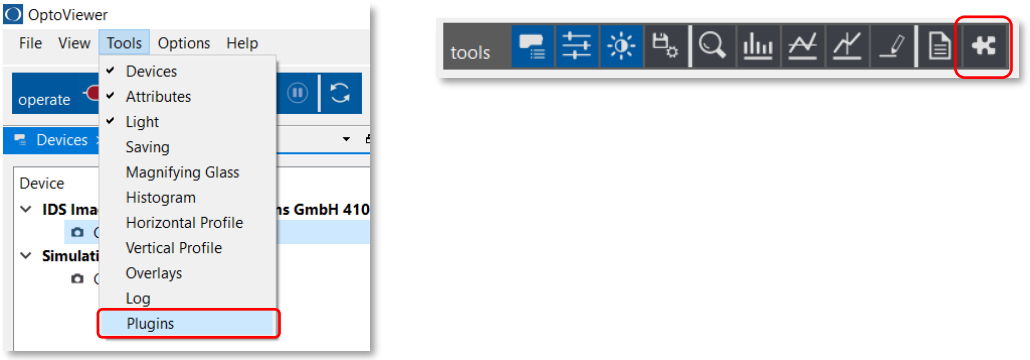


Figure 46: Opening Plugins panel

This will open the *Plugins* panel in the attributes window as shown below:

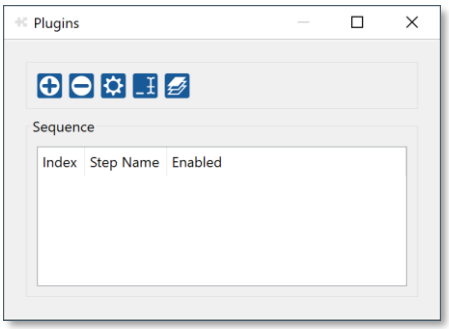


Figure 47: Panel · Plugin

Button	Description
	Adds a new *Plugin* step.
	Deletes/removes a step.
	Step setup.
	Renames a step/plugin.
	Re-orders plugins (Plugins are applied according to this order).

IMPORTANT INFORMATION
Camera/module must be initialized for running *Plugins*.

9.6.2 Using Plugins

1. Click on the *Add New Step* button.
   The following window opens, listing available plugins:

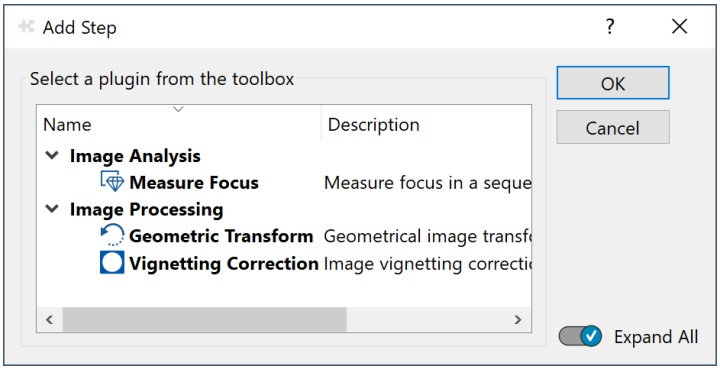


Figure 48: Plugins · Add Step

2. Select a *Plugin* from the list and press *Ok*.
   An instance of the selected *Plugin* (called a *step*) is added to the sequence and the plugin's settings window opens.

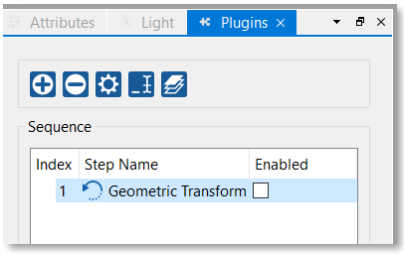


Figure 49: Plugins · Sequence Overview

3. Configure the step and press *Ok*.
   The step is added to the end of the sequence.

4. To edit the configuration of a step: 1st Select the step in the sequence list

   2nd Press the Plugin settings button

IMPORTANT INFORMATION
The sequence is applied from top to down: the step on top is executed first, then the one below and so on.

9.6.3 Standard Plugins Configuration

Some *Plugins* are included by default when OptoViewer is installed. These includes:

- Geometric Transform
- Vignetting Correction
- Measure Focus

These are described in more detail in the following chapters.

9.6.3.1 Geometric Transform

This *Plugin* enables to flip, rotate or resize an image. Most used are *Symmetry* and *Rotation* to compensate for instance an Imaging Module mounting on a stand that does not match the operator's point of view.
One *Geometric Transform* step applies only one transformation. If you need to combine multiple transformations (for instance *Symmetry* plus *Rotation*), you must insert multiple steps using the *Geometric Transform Plugin.*

To setup a *Transformation* following steps have to be carried out:

1. Select needed transformation in section *Transform Mode*.
2. Set desired parameters in workspace *Settings* below.

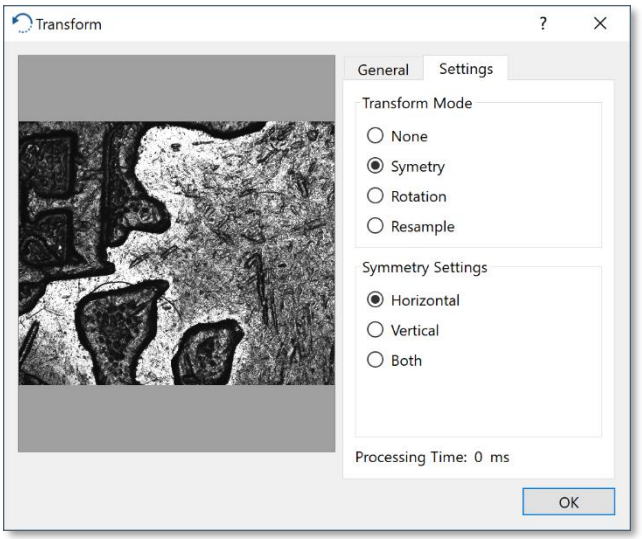


Figure 50: Plugin · Geometric Transformation - Setup Panel

Transformation specific settings are then straightforward:

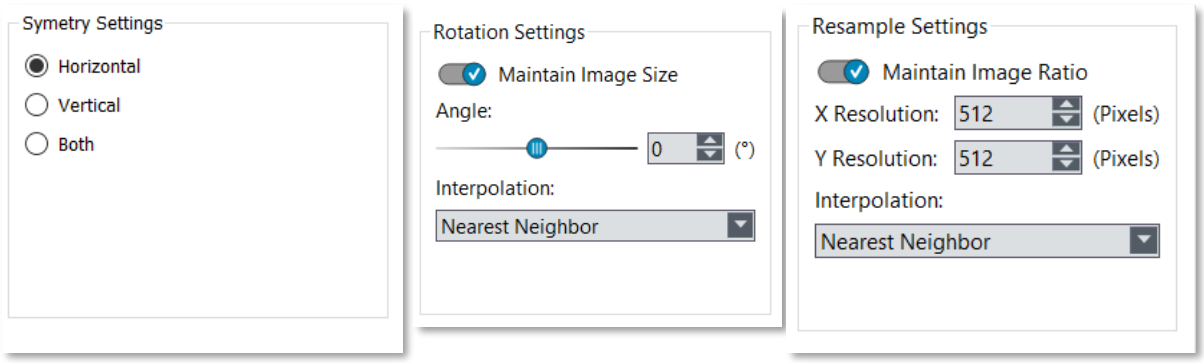
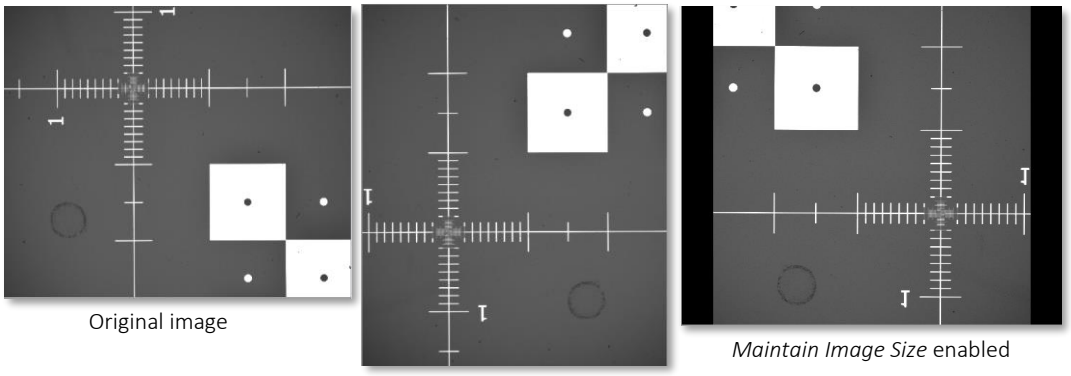


Figure 51: Transformation specific settings accord. to selected Transformation Mode

IMPORTANT INFORMATION

In *Rotation Settings* the *Maintain Image Size* parameter can be disabled to get images that are optimized for the transformation applied.

- With this setting disabled, a rotation of 90° applied to a 1024 pixels x 768 pixels image, will output a 768 pixels x1024 pixels image.
  When *Maintain Image Size* is enabled, the output image will remain 1024 pixels x 768 pixels, resulting in clipping at the top and bottom and black bars at the left and right of the image.



Original image

Maintain Image Size disabled

Maintain Image Size enabled

Figure 52: Maintain Image Size effect

9.6.3.2 Vignetting Correction

Vignetting Correction allows to compensate for brightness non uniformity due to optical limitations or illumination issues for instance.

There are 2 methods for defining a correction:

- Based on 'Reference Images'
- Based on a 'Polynomial Model' of the vignetting

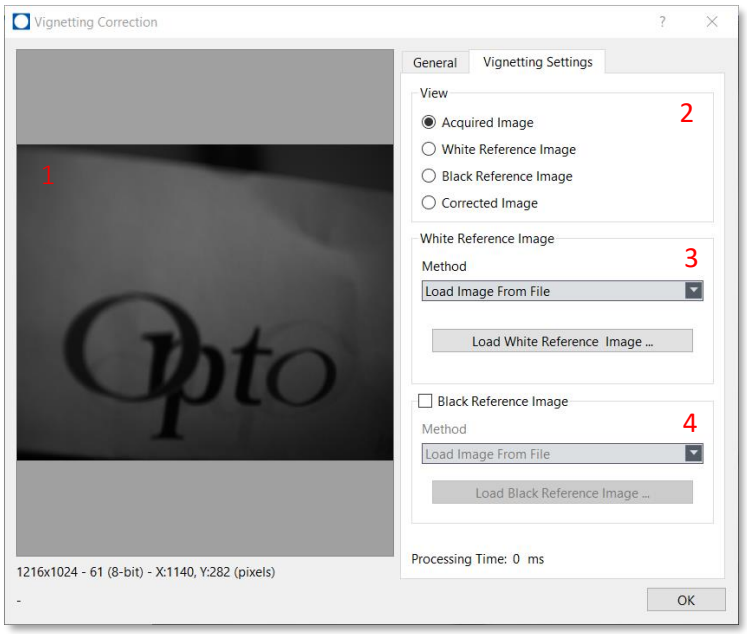


Figure 53: Plugin · Vignetting Correction - Setup Panel

1	Quick Display to see how the processes affect the displayed image.
2	Defines which image to display on the Quick Display (1).
3	Defines *White Reference Image* settings.
4	Defines *Black Reference Image* settings.

The available methods for handling the *White Reference Image* are:

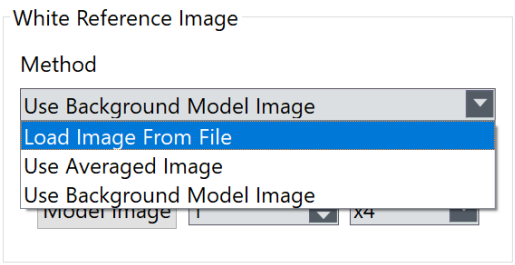
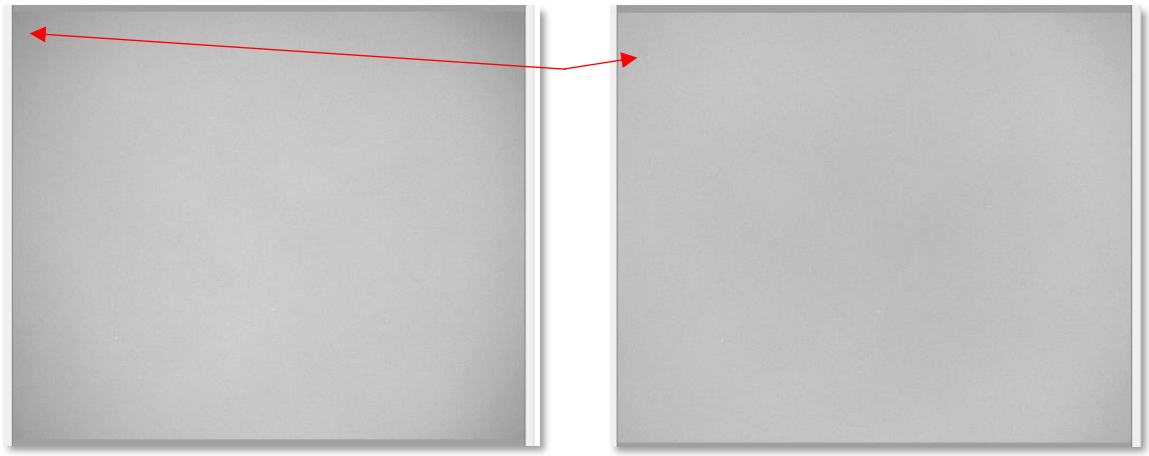


Figure 54: Vignetting Correction · Available methods

Method	Description
Load Image from File	Loads the White/Black Reference image from a defined folder.
Use Average Image	Uses images of a 'white' surface to compute an average, and correct the acquired images.
Use Background Model Image	Uses image of a 'white' surface to compute a polynomial model that corrects the image.

In the following images you can see an example correction, calculated with a 2nd degree polynomial model. The corners of the input image are darker than the centre. After the correction is applied, overall brightness is uniform.



Original bright image

Corrected image

Figure 56: Vignetting · 2nd degree correction

9.6.3.3 Measure Focus

The *Measure Focus* Plugin computes a focus indicator in a rectangular area. The higher the value, the sharper the image (in the region defined by the rectangle).

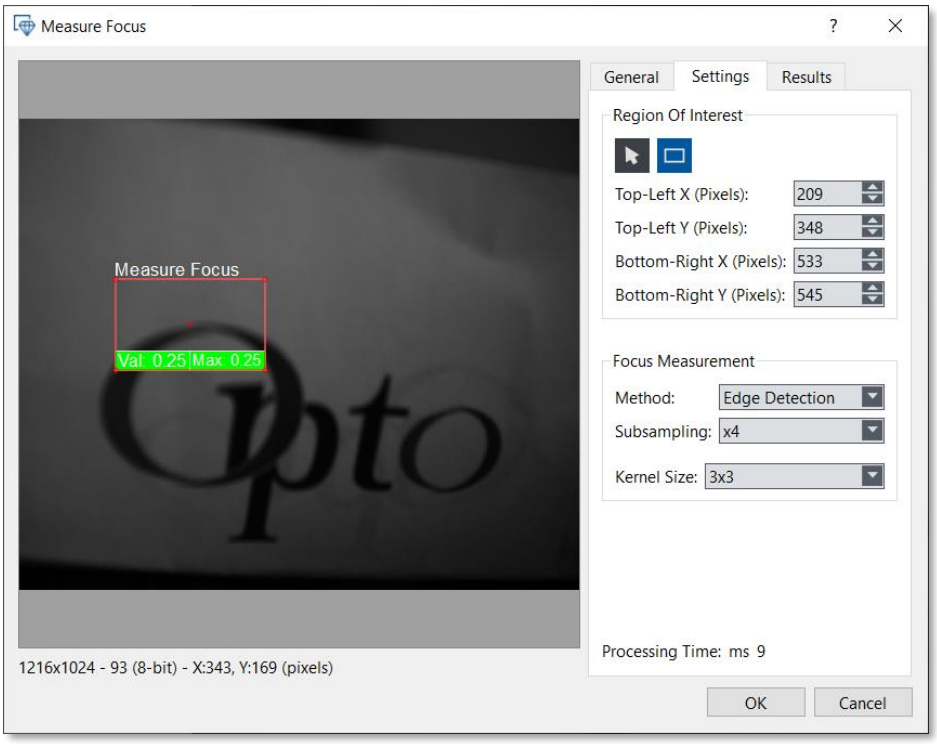


Figure 57: Plugin · Measure Focus - Setup Panel

You can view the overlay of the *Measure Focus* process in the main display:

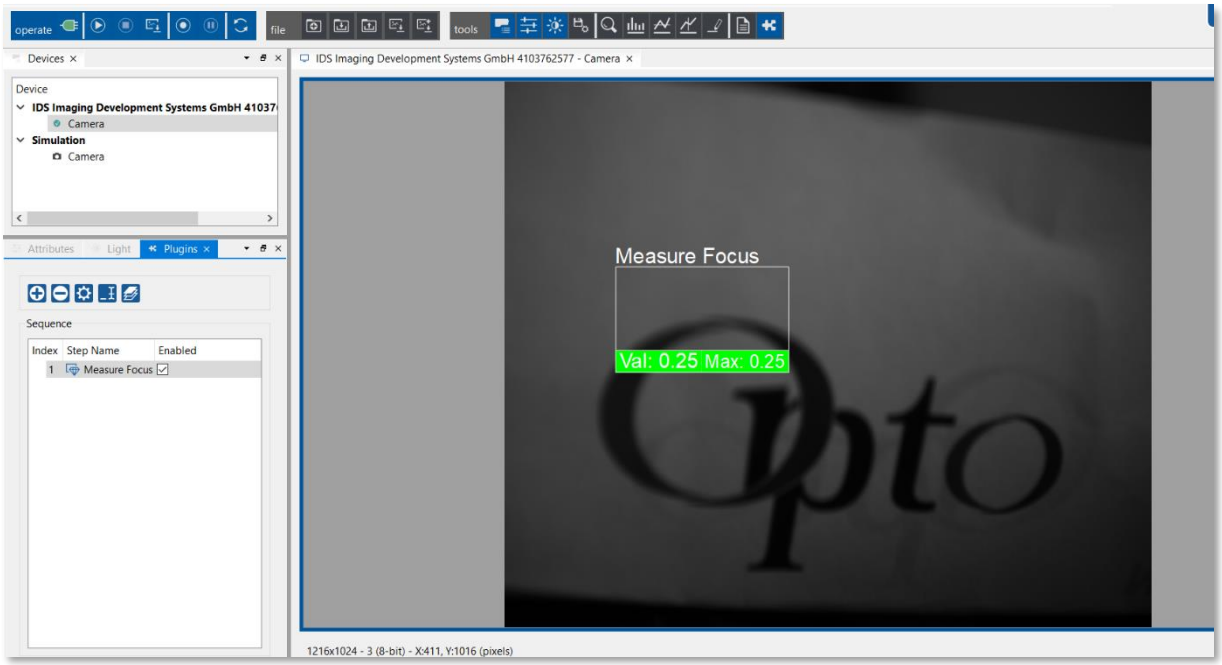


Figure 58: Live Focus Measurement

IMPORTANT INFORMATION
Don't forget to toggle *Enabled* for the plugin steps to be applied.

10 Analysis features

10.1 Histogram

This *Histogram* panel graphically displays quantitative distribution of the colour values within the image captured by the camera. It is useful to evaluate the quality of images by providing general information on brightness, contrast and saturation.
It is displayed by enabling *Histogram* on *tools* toolbar or by selecting *Histogram* in Tools menu.

Figure 59: Opening Histogram panel

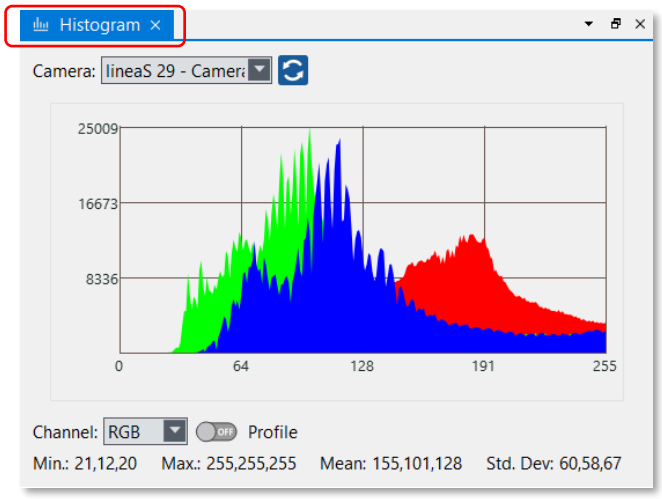


Figure 60: Histogram · Colour image

You can get a general idea of the brightness of an image by looking at the *Histogram* and observing the spatial distribution of the values. If the histogram values are concentrated toward the left, the image is darker. If they are concentrated toward the right, the image is lighter.

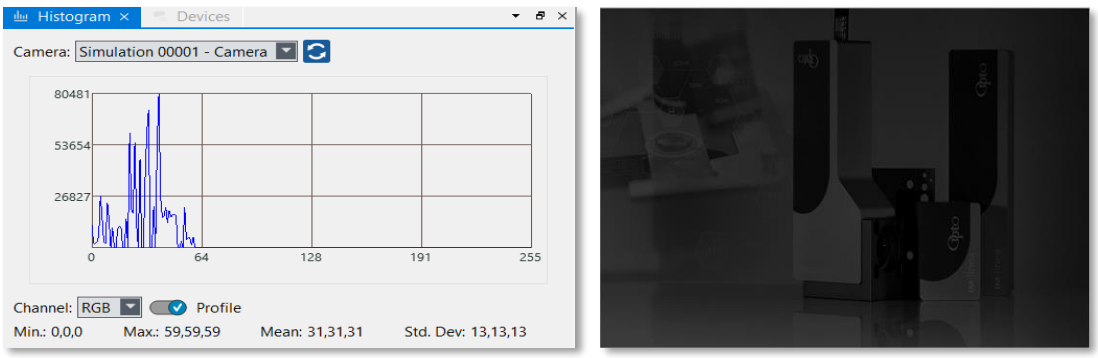


Figure 61: Under-exposed image

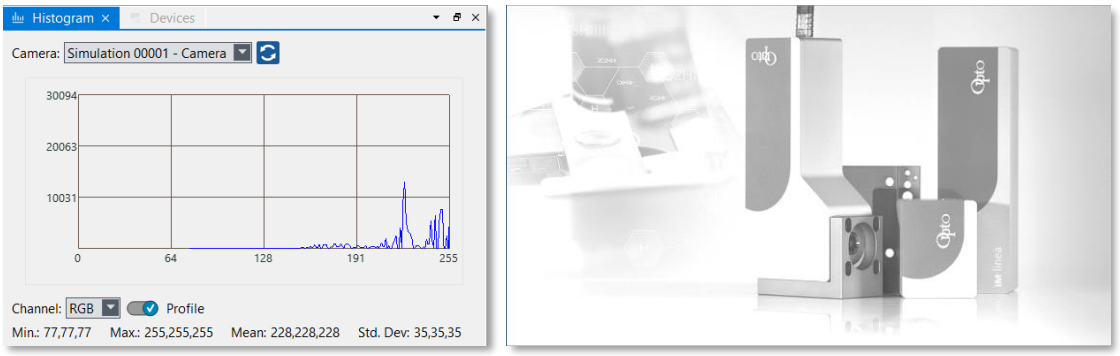


Figure 62: Over-exposed image

A histogram in which the pixel numbers evenly cover a wide range of grey levels indicates an image with good contrast. Pixel numbers that are limited to a smaller range indicate low contrast.

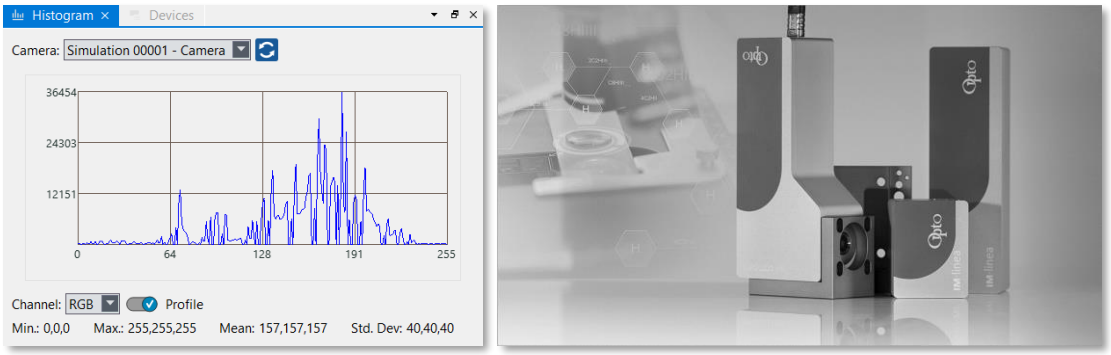


Figure 63: Well exposed image

A histogram with a prominent spike at the highest possible pixel value 255 (visible in over-exposed image above) indicates that the image's pixel intensities have experienced saturation.

The histogram of a colour image indicates the quantitative distribution of its pixels per colour components. It provides a general description of the appearance of an image and helps identify its various components.

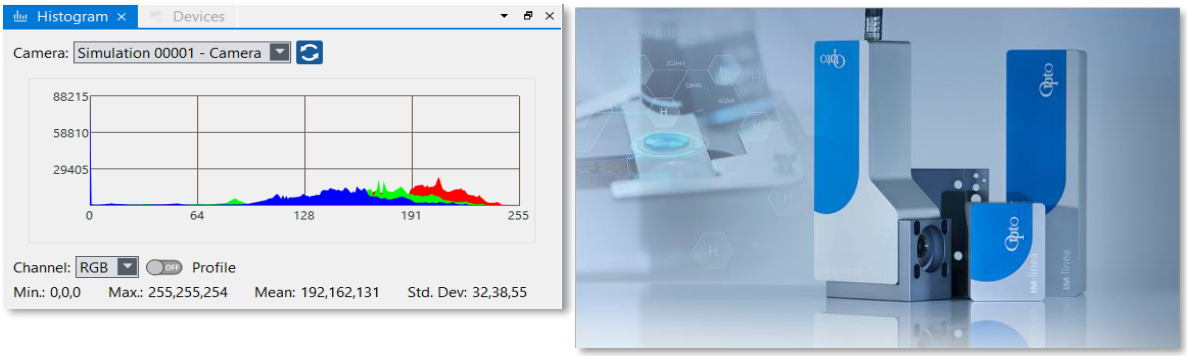
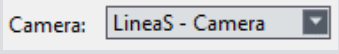
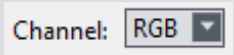
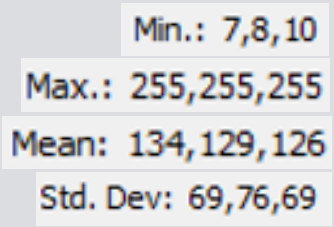
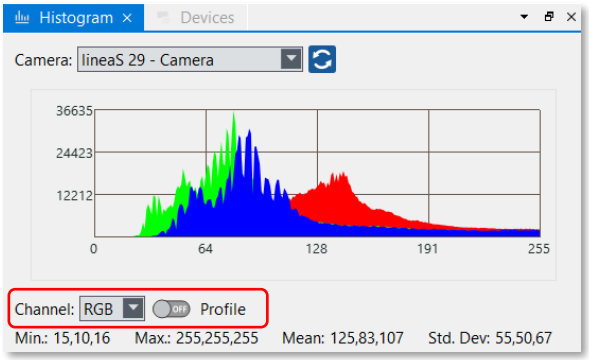


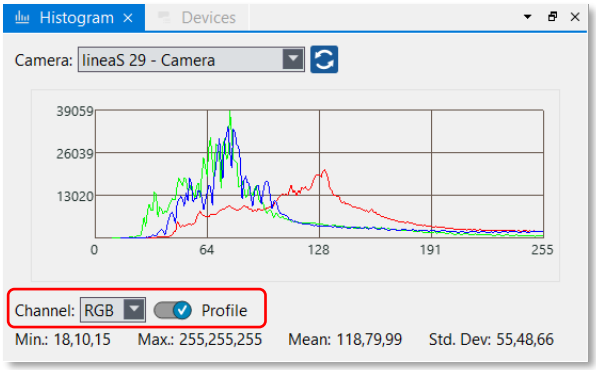
Figure 64: Colour image with associated Histogram

The following options are available:

Item	Description
	Selects the camera to be displayed.
	Refreshes the display.
	Selects RGB, Red, Green or Blue channel (default value RGB).
	Displays only the profile if checked, or full coloured curve if not checked.
	Displays the minimum, maximum, mean and standard deviation of the distribution. If RGB channel is selected, three values are displayed, one for each channel.

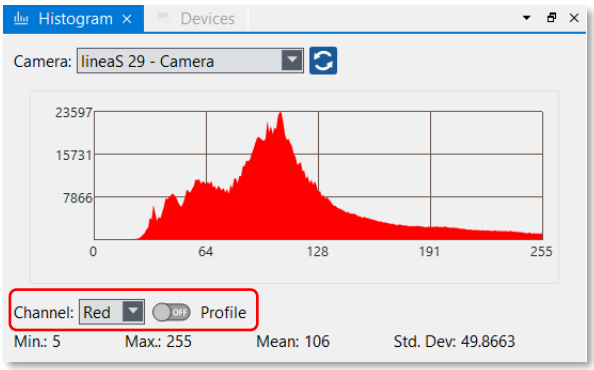


Channel: RGB · Profile unchecked

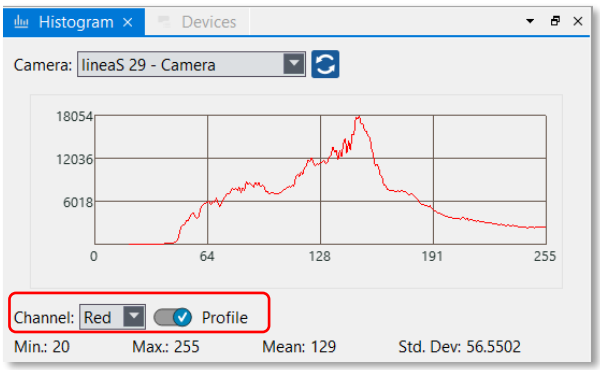


Channel: RGB · Profile checked

Figure 65: Histogram · Profile option on RGB



Channel: Red · Profile unchecked



Channel : Red · Profile checked

Figure 66: Histogram · Profile option on single channel

10.2 Horizontal & Vertical Profiles

The Horizontal/Vertical Profile panels shows the colour value of pixel row/column. It is displayed by enabling Horizontal/Vertical Profile on *tools* toolbar or by selecting *Horizontal/Vertical Profile* in Tools menu.

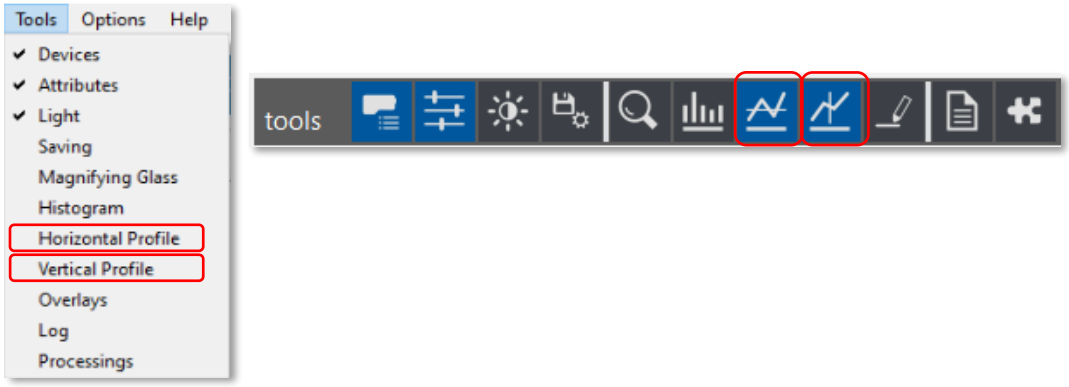


Figure 67: Opening Profiles panels

By default, the pixel row/column is placed in the centre of the image. It can be adjusted by clicking on the image or by entering a value in the *Row/Column* control.

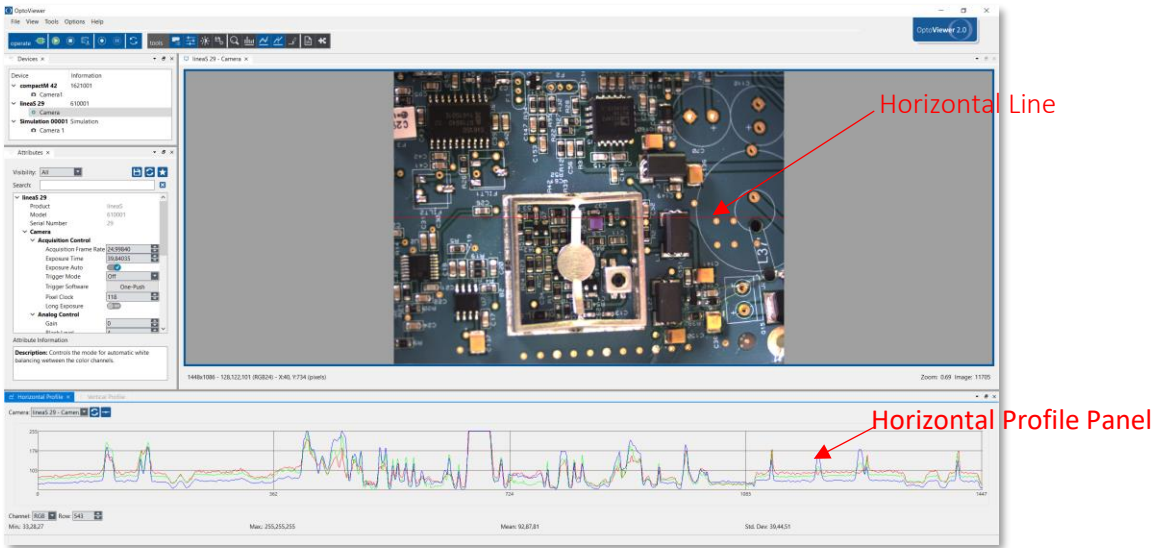


Figure 68: Panel · Horizontal Profile

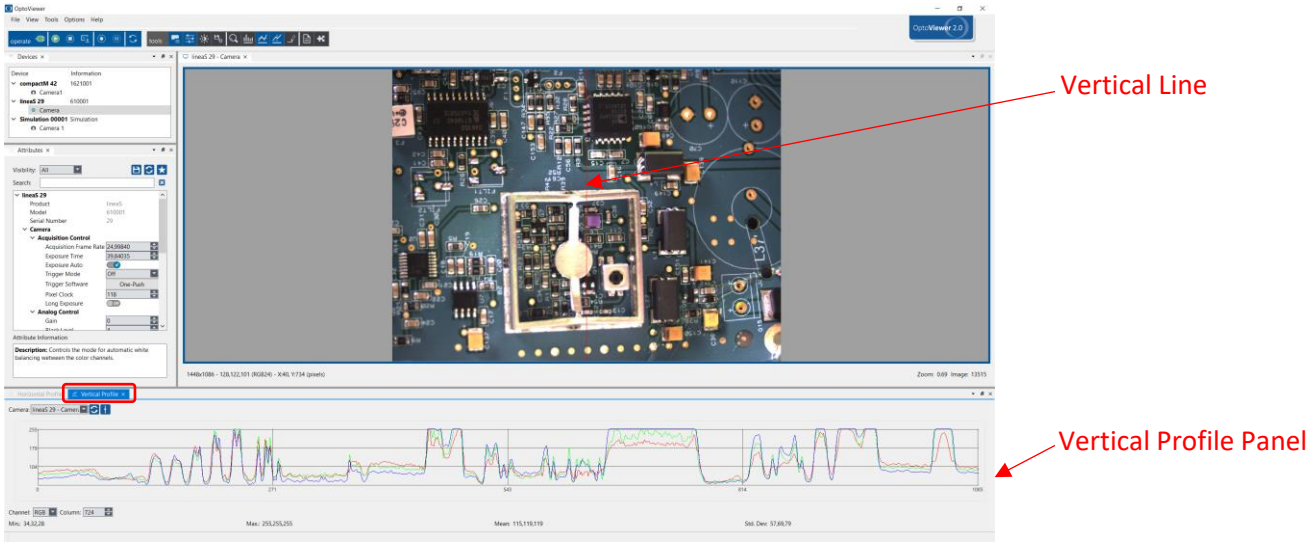
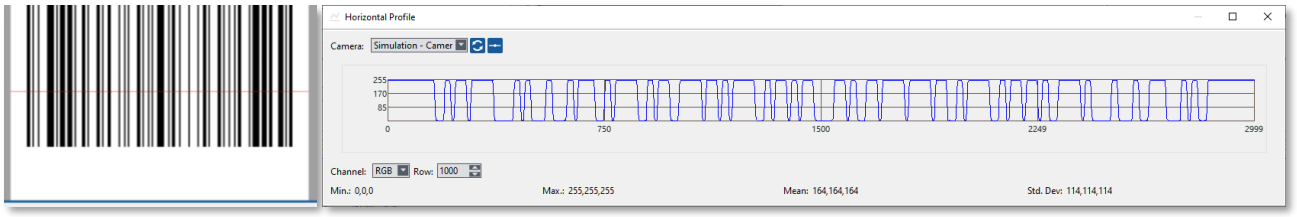


Figure 69: Panel · Vertical Profile

The following options are available:

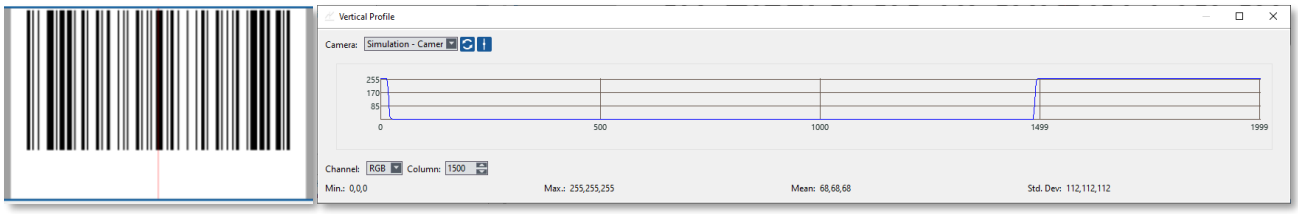
Item	Description
Camera: LineaS - Camera	Selects the camera to be display.
	Refreshes the display and put the horizontal/vertical line in the centre.
	Selects horizontal line tool (only *Horizontal Profile*).
	Selects vertical line tool (only *Vertical Profile*).
Channel: RGB	Selects RGB, Red, Green or Blue channel (default value RGB).
Row: 543	Sets the pixel row to display (only Horizontal Profile).
Column: 724	Sets the pixel column to display (only on *Vertical Profile*).
Min.: 0,0,0 Max.: 255,255,255 Mean: 68,68,68 Std. Dev: 112,112,112	Displays the minimum, maximum, mean and standard deviation. If RGB channel is selected, three values are displayed, one for each channel.

The following image shows the distinctive profile lines of a barcode.



From left to right on the *Horizontal Profile* corresponds to from left to right on the horizontal line. The curve starts and ends with value 255 (white pixels). Each decreasing peak to 0 corresponds to a black line.

Figure 70: Horizontal Profile · Barcode example



From left to right on the *Vertical Profile* corresponds to from top to bottom on the vertical line. The curve starts with value 255 (white pixels), then decreases to 0 corresponding to the black line and ends with value 255 (white pixels).

Figure 71: Vertical Profile · Barcode example

10.3 Magnifying Glass

A *Magnifying Glass* creates a display window that follows the cursor around the display panel and zooms in on the ROI surrounding the cursor.

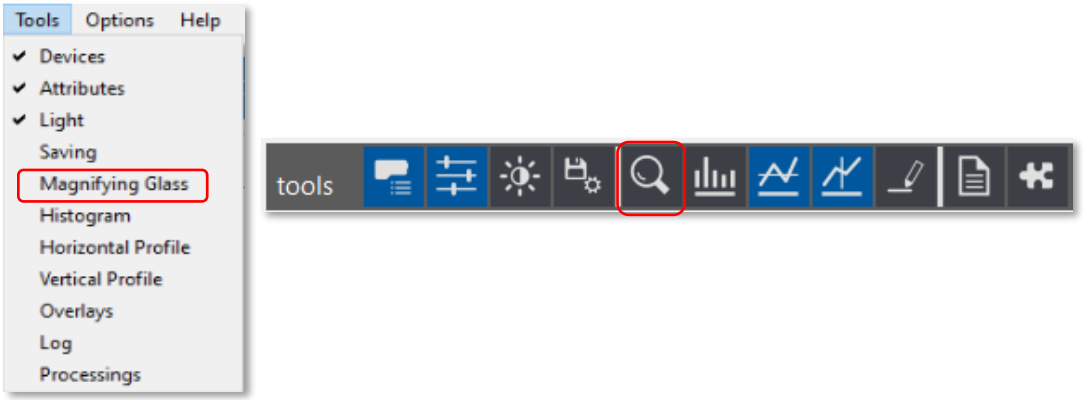


Figure 72: Opening Magnifying Glass panel

It is displayed by enabling *Magnifying Glass* on *tools* toolbar or by selecting *Magnifying Glass* in *Tools* menu.

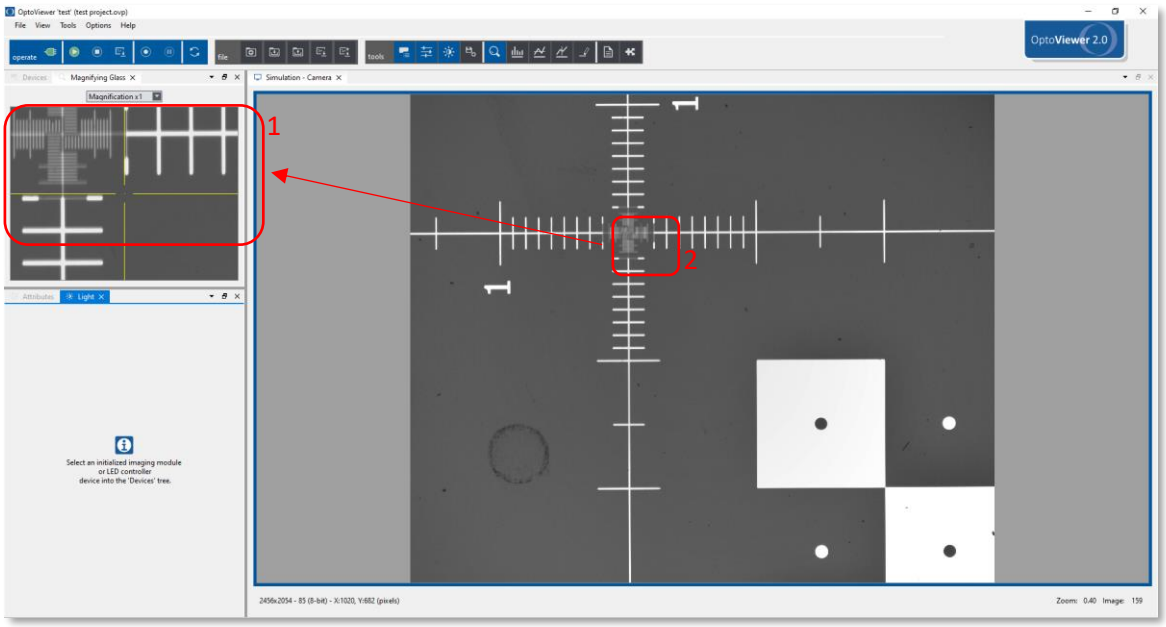


Figure 73: Panel · Magnifying Glass

1	Display panel for zoomed image.
2	Zoomed area in complete image area.

10.4 Log

The *Log* management offers a deeper look at the application and what happens in the background of the OptoViewer. It can be used to monitor actions, errors and warnings. It is displayed by enabling *Log* on *tools* toolbar or by selecting *Log* in *Tools* menu.

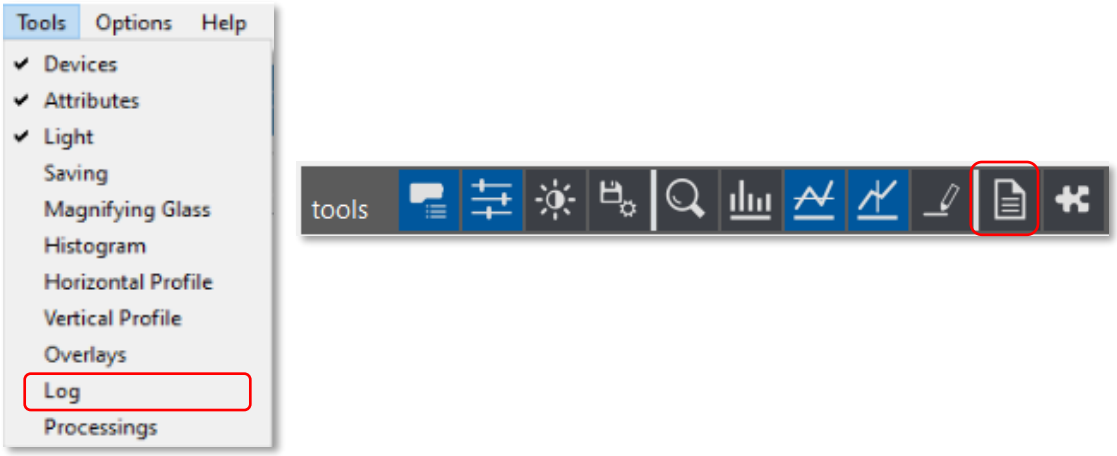


Figure 74: Opening Log panel

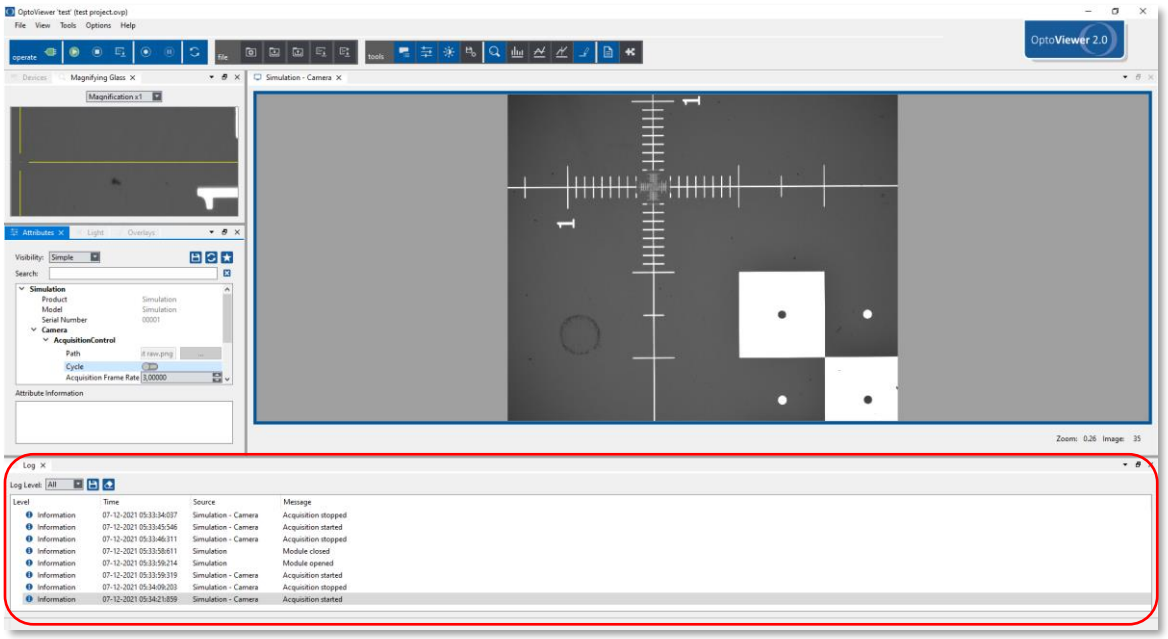


Figure 75: Panel · Log

The *Log* is used to monitor OptoViewer - any errors or warnings will be displayed.

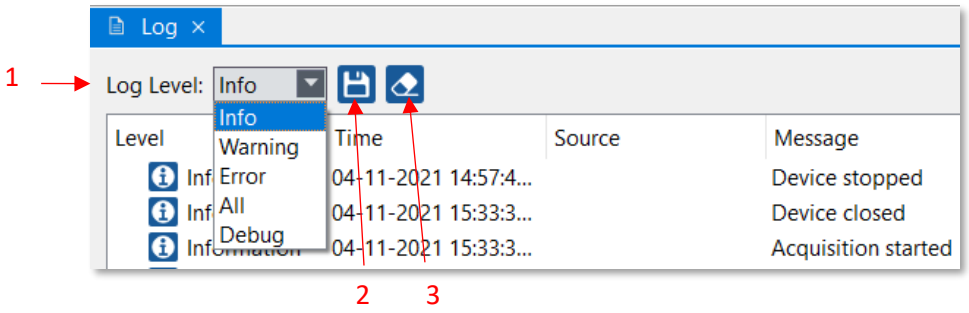


Figure 76: Log · Controls

1	Selects event types.
2	Saves log analysis in a file.
3	Clears listed log data.

IMPORTANT INFORMATION

- If there is an issue during recording or acquisition, the Opto SDK will return an error code in the Log that can be used to isolate the issue to image processing, memory issues, etc. Use the documentation for the SDK to find error descriptions.
- Deleting a *Log Level* (*Error, Warning, All*, etc.) will only delete the selected level.

11 OptoViewer Settings

To access OptoViewer application settings, use *Options/OptoViewer Settings...* menu. The settings window will be opened. The left side lists the different categories available whereas the right side shows the corresponding options.

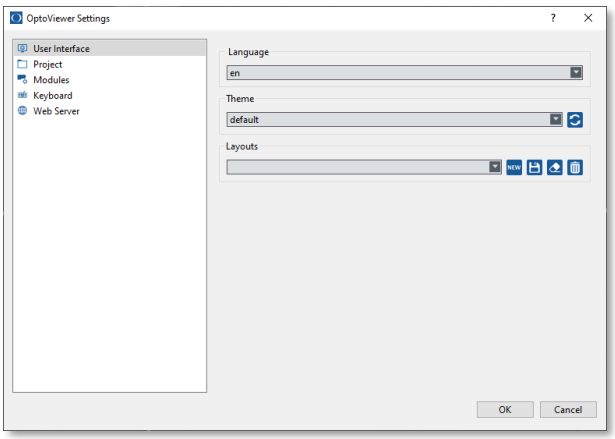


Figure 77: Panel · OptoViewer Settings

11.1 User Interface

The *User Interface* category shows the following options:

Item	Description
Language	Defines language that will be used in the user interface. Default is English.
Theme	Defines colour sets applied to the whole user interface. *default* theme is standard Windows 10 style. *Dark* theme is more suitable for low light environment.
Layouts	Enables the management of different user interface layouts. Refer to 8.6.1 for more details.

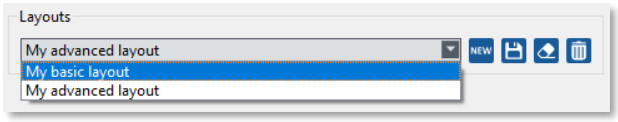


Figure 78: OptoViewer Settings · Layout Options

If *Layouts* have been previously saved, the combo box enables to one of those:

Button	Description
	Creates a new layout preset based on the currently used layout. A name is requested to identify a layout preset.
	Updates the currently selected preset to the current layout.
	Deletes the currently selected preset.
	Deletes all presets.

11.2 Project

A *Project* defines the whole OptoViewer system configuration. This includes the interface *Layout*, the modules settings, the *Overlays* on the displayed images and applied *Plugins.*

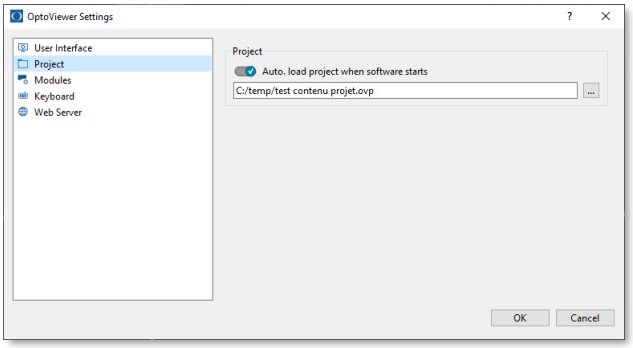


Figure 79: OptoViewer Settings · Project category

It is possible to automatically load a saved *Project* when starting OptoViewer. For more information on *Projects*, see 8.6.2.

11.3 Modules

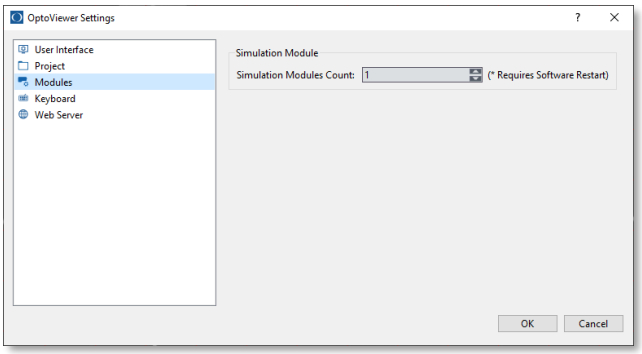


Figure 80: OptoViewer Settings · Modules category

It is possible to define *Simulation Modules* which integrates a virtual camera that can be setup to load image files instead of having a real image stream. It is possible to define more than 1 simulation module. After changing this option, restarting the software is required to get *Simulation Modules* to be listed in the *Devices* panel.

IMPORTANT INFORMATION

After restarting the software to detect a new *Simulation Module*, it requires some attributes to be set up properly to generate an image stream. Refer to 9.1.2 for more details.

11.4 Keyboard

It is possible to associate keyboard shortcuts to actions on the active camera. These shortcuts will generate the same action as the dedicated buttons in the toolbar *Operate*.

One common application of this feature is to use a pedal switch to start/stop image stream or record a sequence or an image. This is useful to trigger such actions while keeping hands free. Many pedal switches on the market works as keyboard key(s) emulators, making it easy to integrate. Some presentation pointers also work by emulating some keyboard keys and can be used for basic wireless control without the need for a keyboard or a mouse. For more information about such devices, do not hesitate to contact our technical support (support@opto.de).

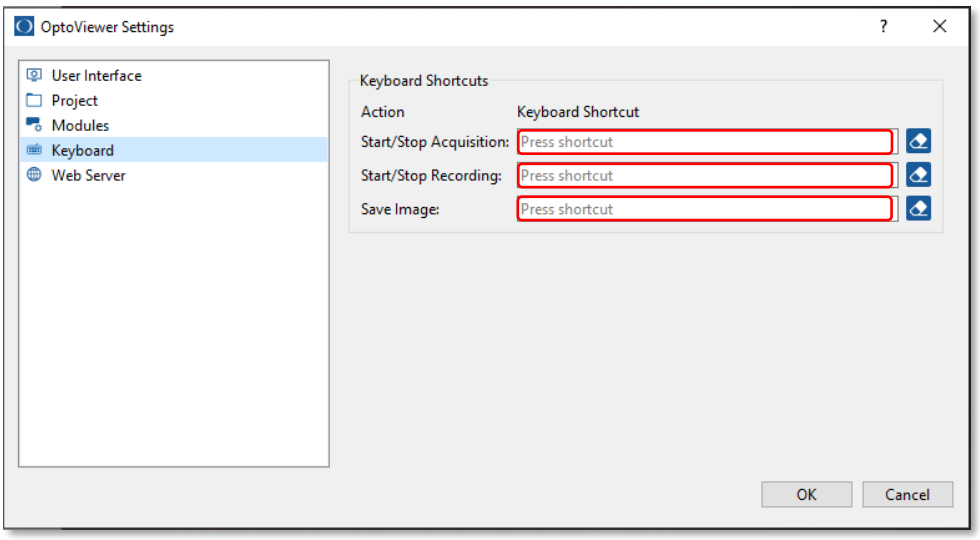


Figure 81: OptoViewer Settings · Keyboard category

To define a shortcut to an action, carry out following step:

- Click in *Press shortcut*, and press the key (for instance the 'A' key) or combination of keys (for instance 'Ctrl' + 'A' keys) you would like to associate to the action.

To delete a shortcut, press the button  on the side.

11.5 Web Server

11.5.1 Web Server Definition

A web server is a background process running on a device or in a software application. A client application or process can connect to the server locally or through the network to communicate for control purpose or getting data from the server. It is very common in network connected devices like printing machines, WIFI extenders, etc. which you can configure remotely via HTTP protocol, usually implemented in Web pages.
The same applies to OptoViewer when its integrated web server is enabled: the *Web Server* will allow remote control of the OptoViewer session (modules listing, configuration, starting, … and monitoring) either by connecting to the default webpage or by sending specific HTTP commands.

11.5.2 Web Server Settings

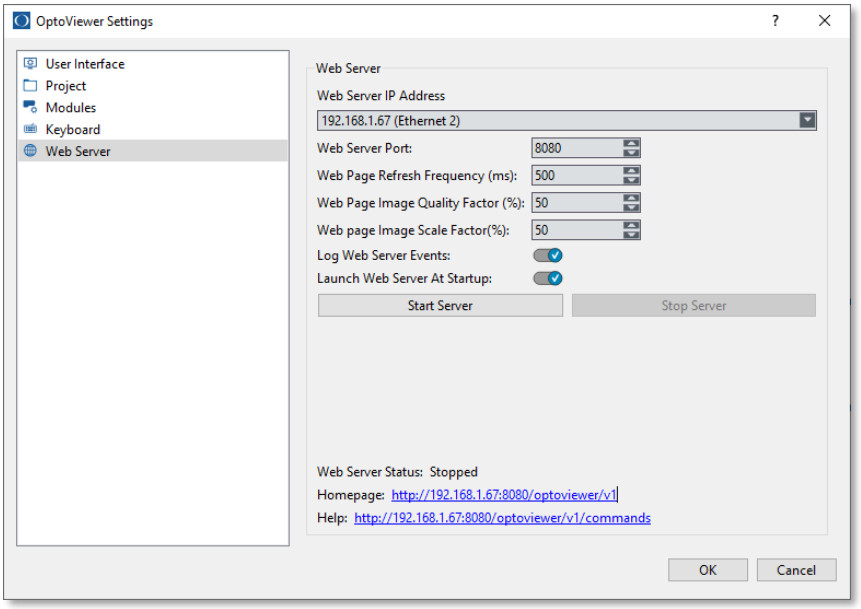


Figure 82: OptoViewer Settings · Web Server category

To enable the *Web Server* feature, connection parameters must be set:

Item	Description
Web Server IP address	Sets which IP address the server should listen to. The field lists network connections/adapters available on the system. Default option, listed as *127.0.0.1 (Loopback Pseudo-Interface)* is the one to choose when clients will be local (running on the same computer).
Web Server Port	Sets which port the server will listen to for client connection. In order to connect to the *Web Server*, client processes should target the IP address set above plus the port defined.

The next parameters are used to optimize the remote monitoring capabilities of the Web page:

Item	Description
Web Page Refresh Frequency (ms)	Defines the rate at which the Web page will refresh all monitoring information it provides. Default value is 500 ms.
Web Page Image Quality Factor (%)	Defines the quality or compression rate that is applied to the images displayed in the Web page. The higher this value, the better the image quality. The lower this value, the lower the bandwidth required for transmitting the data. Default value is 50%.
Web Page Image Scale Factor (%)	In order to reduce the bandwidth required to transmit images, set this parameter to rescale the images to a lower resolution. 100% means no scaling is applied. Default value is 50%.

More generic options are available:

Item	Description
Log Web Server Events	When activated, *Web Server* related events will be listed in the *Log* panel.
Launch Web Server At Startup	When activated, the *Web Server* will be enabled when the OptoViewer starts up.

Once all above options have been set, press *Start Server* button to start the *Web Server* process:

- The Start Server button becomes disabled
- The Stop Server Button becomes enabled
- The *Web Server Status* should indicate *Started*

If there are no such changes, it means the *Web Server* was not able to start properly. Try another port and/or IP address. We also recommend you check with IT department if there are restrictions applied on your local network on some addresses, ports or network services.

11.5.3 Default Web Page

The bottom of the *Web Server* options form contains 2 URL links:

- The first (*Homepage)* is the URL of the OptoViewer *Web Server* homepage. This homepage can be opened from any Web browser and gives access to many features of the modules : listing devices, setting attributes, starting streams and records and of course getting image display.

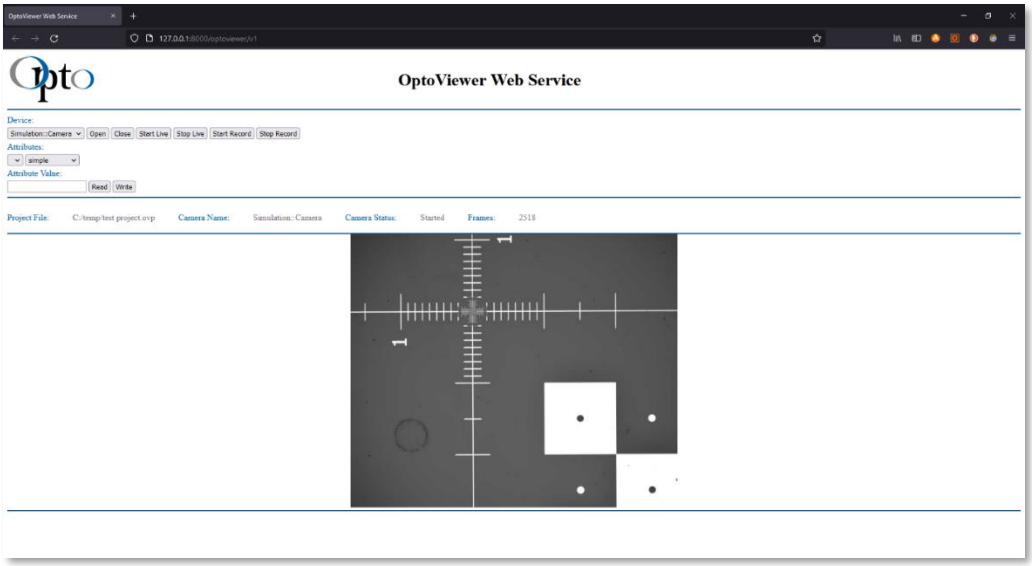


Figure 83: OptoViewer Settingd· Homepage

- The second URL opens a Web page listing all commands that can be used to communicate with the *Web Server*. These commands can be integrated in a custom application, that will control OptoViewer.

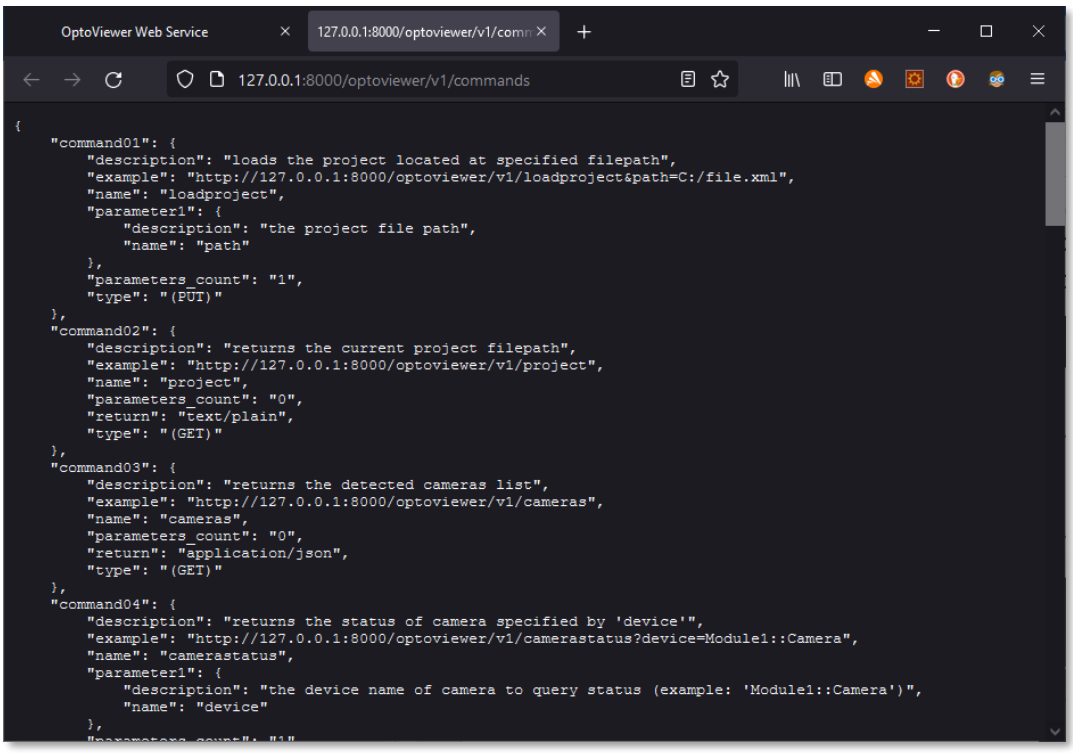


Figure 84: Web Server commands Web page

12 Additional Documentation

For further technical tips on hardware and software, we recommend that you consult the latest version of the associated documentation.

IM ● Hardware & Software Documentation		
IM · Standard Series	Quick Start Guide(s)	https://www.opto.de/en/company/downloads/
IM · USB interface	Application Note	https://www.opto.de/en/company/downloads/
Imaging Modules linea S, M · compact M · profile M	User Manual	https://www.opto.de/en/company/downloads/
Opto · OptoViewer 2.0	Quick Start Guide	support@opto.de
Opto · SDK	User Manual	support@opto.de

For further assistance please contact support@opto.de.