



Instructions Manual

INSPECTIS[©] ProX V6.3.x

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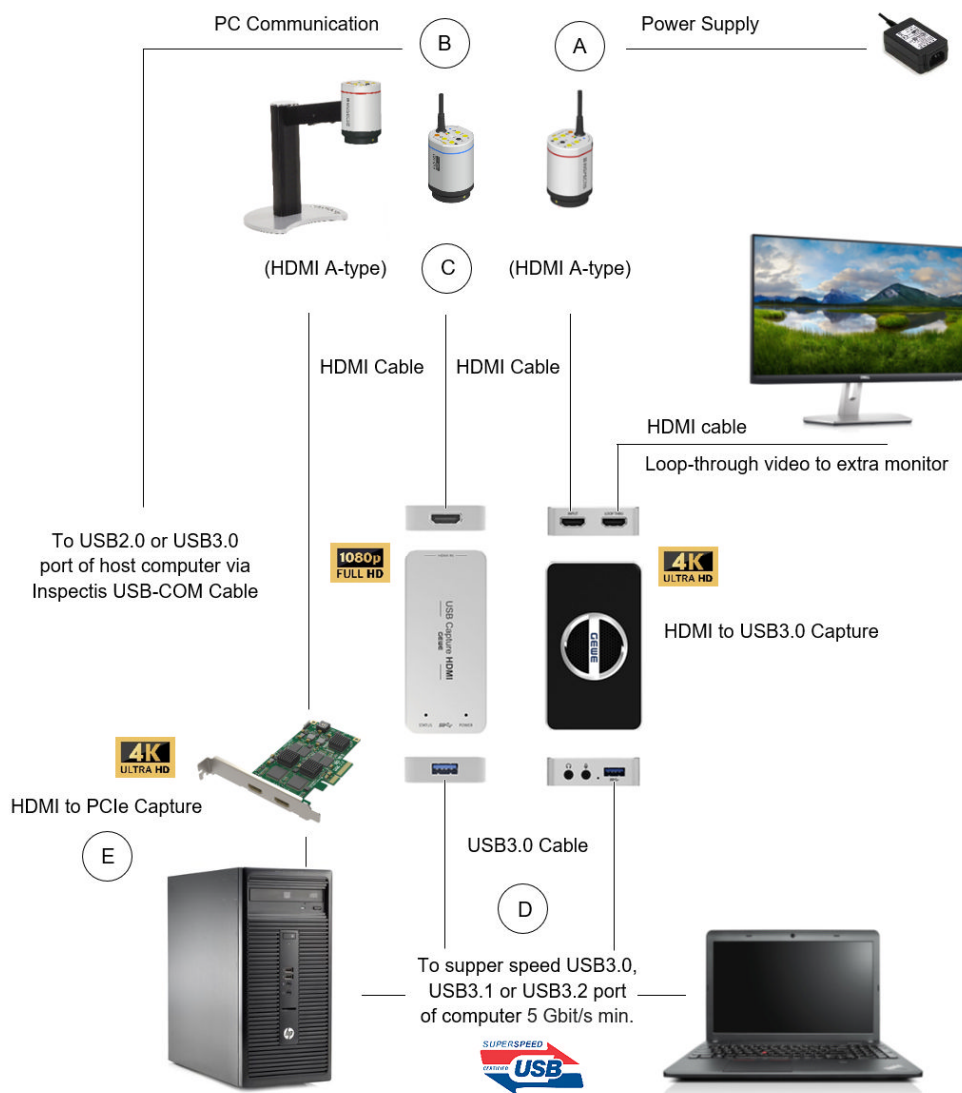
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Installation and Setup

Connecting your Digital Microscope

- A. Connect the power supply to MiniDin 5P input of the digital microscope.
- B. Attach the USB-COM cable to MiniDin 8P of the digital microscope and USB port of the computer.
- C. Attach HDMI video output of the digital microscope to the HDMI input of the Capture device.
- D. Attach USB output of the Capture device to a super speed USB3.0, USB3.1 or USB3.2 port of the computer. Minimum bandwidth of the USB port shall be 5Gbit/s to stream the live video with high frame rate.
- E. If your HDMI capture is a PCIe card, plug it into the computer first and install its driver. The USB3.0 HDMI capture devices are plug&play and does not require driver installation.



Installing INSPECTIS Software


Important notes before installation:

- Installation shall be done with full administration privileges.
- You might need to disable antivirus system of your computer temporary during the installation.


To install INSPECTIS software the user must run the provided installation file. Double-click on it and a new window will be displayed.

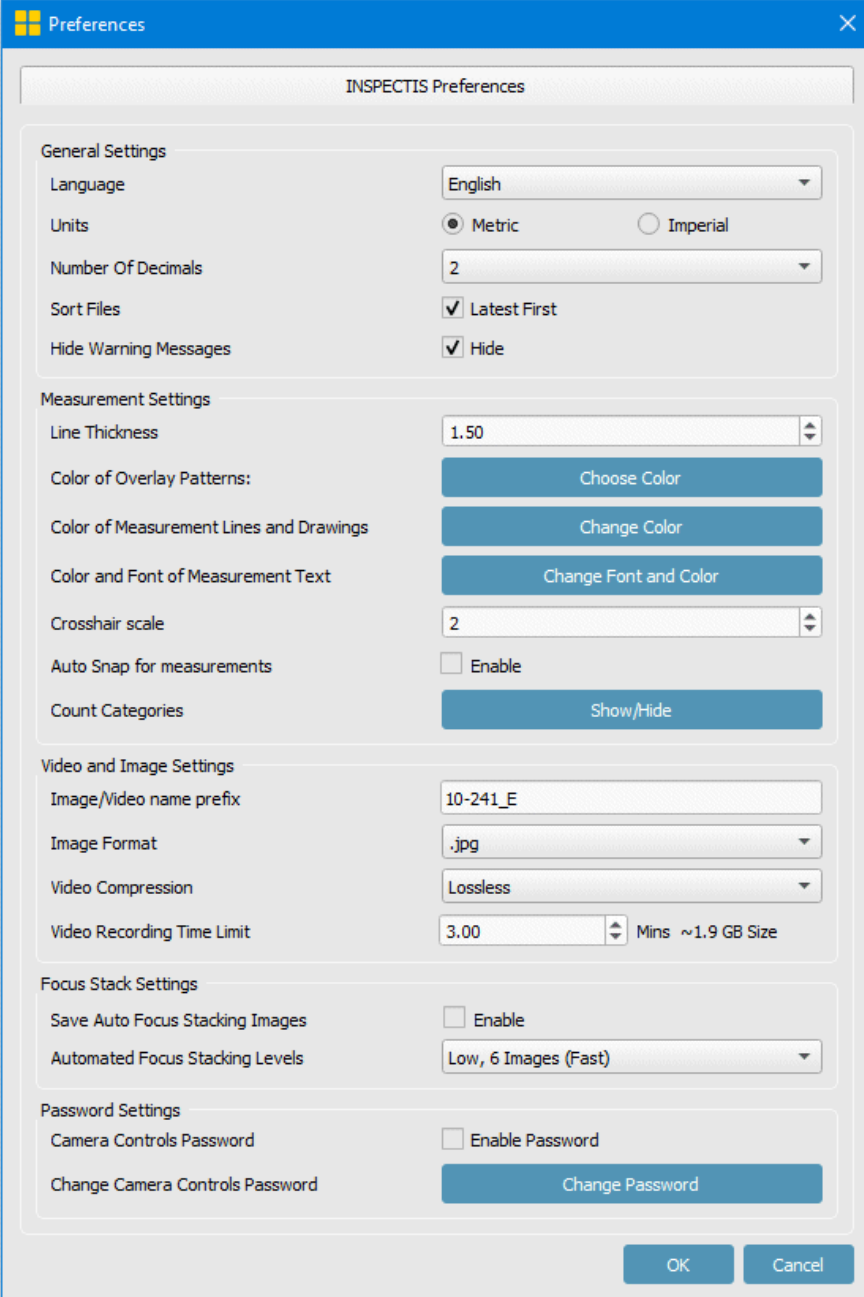
1. Click "Next" to continue.
2. Choose a folder in which to install INSPECTIS software. Click "Next" and "Next" again to start the installation.
3. Follow on-screen instructions to complete the installation.
4. When the installation is complete click "Close" to exit the window.
5. To install device drivers for the COM-USB communication cable, run CDM21228_Setup under Communication Cable Driver folder.

Running INSPECTIS ProX for the First Time

1. Before launching INSPECTIS software please make sure your Inspectis digital microscope is connected. Refer to previous chapter on how to connect your device.
2. Insert the software protection dongle into a free USB port on computer. The protection dongle will be found inside the product box.
3. Click on INSPECTIS  icon on your computer desktop and select **Run as Administrator** first time. Running as Administrator will enable you to register and activate the software automatically over internet.
4. Select language from the list.
5. From the "Software Version" selection window, select:
 - "INSPECTIS ProX" if a full license has been ordered with the software protection USB dongle. All software functions will be enabled.
 - 15 days trial version for trying the software for 15 days. All software functions will be enabled for 15 days. Skip part 5 (license number).
6. Fill in license number (found in the package) and the other requested information.
7. If automatic on-line registrations is not possible, complete the Off-line Registration form and email it to info@inspect-is-com to get an software activation key.
7. PLEASE READ THE LICENSE AGREEMENT CAREFULLY before using INSPECTIS software.
8. The software will automatically detect and select the installed INSPECTIS device.

Software Preferences

In Preferences, overall settings of the INSPECTIS software is defined. Click  icon to display the preferences window.





The screenshot shows the 'INSPECTIS Preferences' dialog box. It is organized into several sections: General Settings, Measurement Settings, Video and Image Settings, Focus Stack Settings, and Password Settings. Each section contains various configuration options like dropdown menus, checkboxes, and buttons. At the bottom right are 'OK' and 'Cancel' buttons.

Section	Setting	Value / Option
General Settings	Language	English
	Units	<input checked="" type="radio"/> Metric <input type="radio"/> Imperial
	Number Of Decimals	2
	Sort Files	<input checked="" type="checkbox"/> Latest First
	Hide Warning Messages	<input checked="" type="checkbox"/> Hide
Measurement Settings	Line Thickness	1.50
	Color of Overlay Patterns:	Choose Color
	Color of Measurement Lines and Drawings	Change Color
	Color and Font of Measurement Text	Change Font and Color
	Crosshair scale	2
	Auto Snap for measurements	<input type="checkbox"/> Enable
	Count Categories	Show/Hide
Video and Image Settings	Image/Video name prefix	10-241_E
	Image Format	.jpg
	Video Compression	Lossless
	Video Recording Time Limit	3.00 Mins ~1.9 GB Size
Focus Stack Settings	Save Auto Focus Stacking Images	<input type="checkbox"/> Enable
	Automated Focus Stacking Levels	Low, 6 Images (Fast)
Password Settings	Camera Controls Password	<input type="checkbox"/> Enable Password
	Change Camera Controls Password	Change Password

Setup your preferred Language, Units and Number of Decimals for measurements. Type the Prefix you prefer to be added to the name of saved imaged and videos. Review other software preferences and change the default if crucial for your application.

Device Settings

Selecting Device

Click  to show the device settings menu and Select Device  to connect your device to INSPECTIS.

Once the device is selected, software automatically sets the optimum device settings and finds the Inspectis device automatically next time you launch the program.


INSPECTIS software displays connected device names accordingly on the status bar:




If you are using the USB capture device, make sure the USB port of your computer is a super speed 5Gbit/s port.

Device	Device Name
FULL HD HDMI to USB3.0 Converter	-> USB Capture HDMI
4K HDMI to USB3.0 Converter	-> USB Capture HDMI 4K+
4K HDMI to PCIe Converter	-> Video (00 Pro Capture HDMI 4K) or Video (Pro Capture)
USB3.0 Digital Camera	-> Inspectis USB3.0 DM or Inspectis 5MP Camera

If another device is preferred, right click on the device name on the status bar to show the device list and select the desired device.


To select a device from the list of available devices, click  under Device Settings group or right click Device Name on status bar of INSPECTIS.

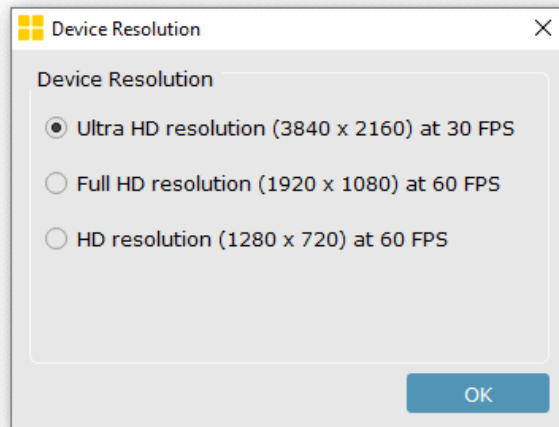
To automatically select your device click  under Device Settings group. Software will search for Inspectis devices and select one according to following priority:

1. Inspectis USB3.0 DM or Inspectis 5MP Camera
2. 4K HDMI to PCIe Converter
3. 4K HDMI to USB3.0 Converter

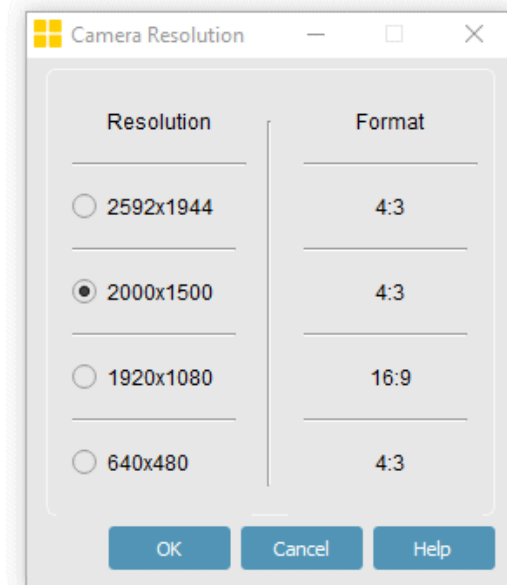
To restart your device while software is running, press F12 on your computer keyboard.

Device Resolution

When attached to U, F and C series digital microscope, output resolution of converter devices can be changed between 4K and FHD (1080p) and HD (720p) by clicking  under Device Settings group. For PCIe converter default resolution is set to 3840x2160. For USB3.0 converters default resolution is set to 1920x1080. If your USB3.0 converter supports 3840x2160 you can change Device Resolution to 4K.



When attached to USB3.0 digital camera (BGA inspection system), Resolution and Format (aspect ratio) of the live image can be set according to the below tab. Default resolution for USB3.0 digital camera head is 2000x1500 pixels.



Camera Connection, Control and Setup


Connecting Digital Microscope to INSPECTIS Software

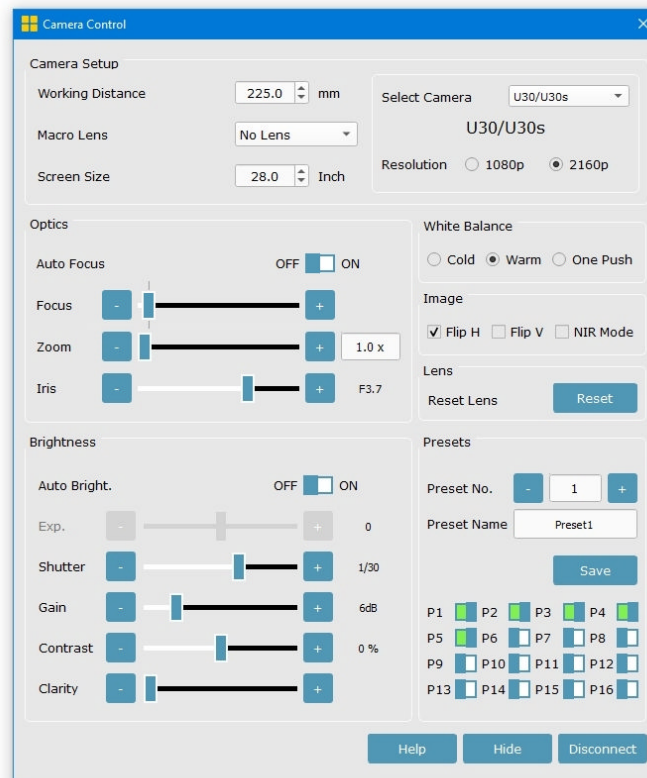
INSPECTIS software needs to be connected to Digital Microscope via Inspectis USB-COM communication cable to control camera and the lens.

To establish real-time connection between U, F, C, DIM type Digital Microscopes and software:

Attach MiniDin side of the Communication Cable to the digital microscope and USB side of the cable to an available USB port on your host computer before starting INSPECTIS software.





Click on  icon to establish the camera connection if the software did not connect automatically at start-up. INSPECTIS will automatically detect the port, connect digital microscope to the computer and display Camera Control dialogue.




For learning how different lens and camera attributes affect the picture, refer to the white paper provided by Inspectis.



To disconnect the camera right click on  icon or Disconnect  button at bottom-right of the Camera Control dialogue.

Hide

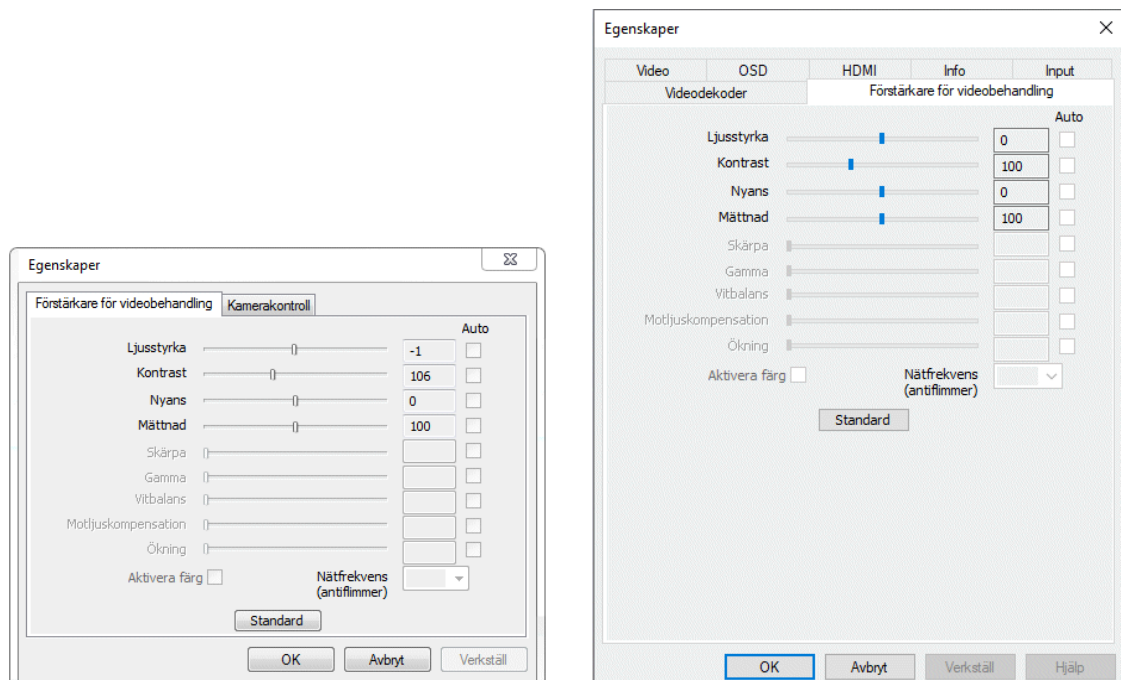
To hide Camera Control dialogue press Hide  button. Camera and lens control bars will be

enabled on INSPECTIS main window when Camera Control dialogue is hidden and not password protected.



Camera Control dialogue can be password protected. Password protection can be enabled under [Preferences](#).

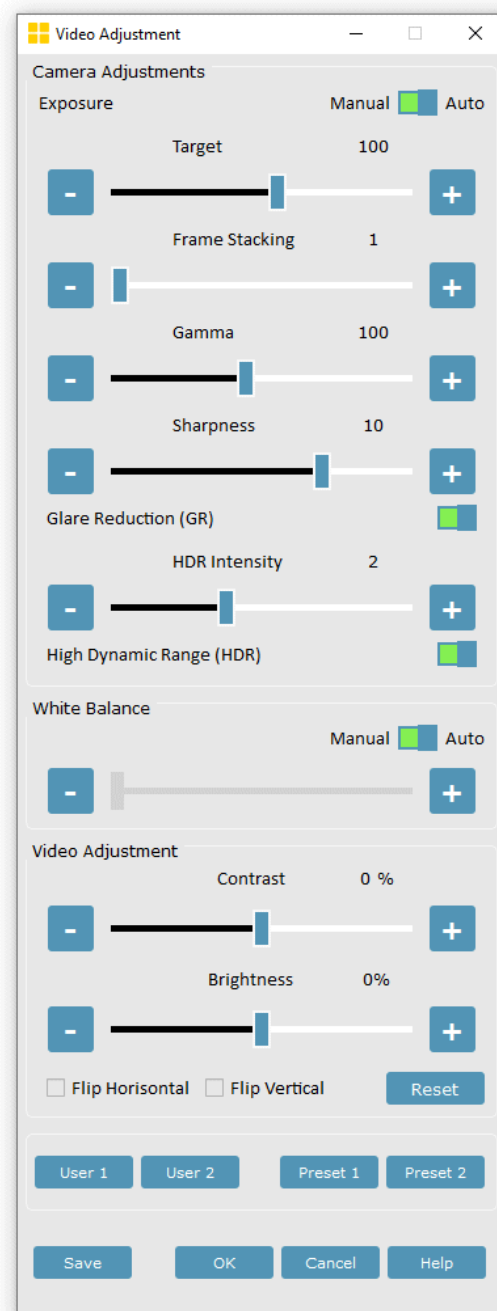
External device settings window like below may be displayed if the Inspectis USB-COM cable is not attached or if real-time communication between Inspectis digital cameras and software is not established by any reason.



Camera Control Dialogue for USB digital microscope

Camera adjustments dialogue for USB digital microscope (BGA Inspection) is as illustrated below.

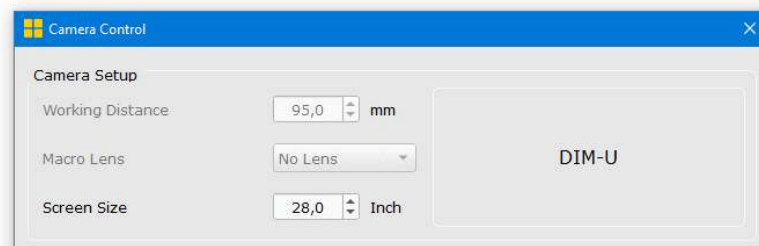
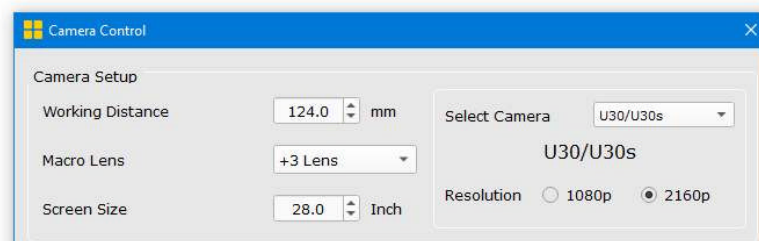
User buttons **U1** **U2** or Preset buttons **P1** **P2** at INSPECTIS main window recalls previously configured and saved Camera setups.



Setting up the Camera and the Lens

Thanks to the real-time communication with the Digital Microscope, INSPECTIS ProX can auto-track zoom position of the lens and display (factory) calibrated magnification of the image for current zoom position.

You need to enter current Working Distance (Object Distance), Screen Size and Macro Lens (close-up lens) if any is attached to your device. The calculated on-screen magnification will be displayed on the upper left corner of the live image filed. If you are running a DIM (Digital Inverted Microscope) only Screen Size can be adjusted.



Working Distance

Working distance is defined as the distance measured from the front surface of your Digital Microscope lens housing to the object at maximum zoom factor. WD of DIM microscopes is fixed and cannot be changed.

Macro Lens

If any macro lens (close-up) is attached to the Digital Microscope, select the corresponding macro lens. Enter the correct working distance value to the Working Distance field when a Close-up lens is attached to your device.

Screen Size

Diagonal size of the screen in inches. The on-screen magnification displayed on the upper left corner of the live image filed is calculated based on the screen size.

Select Camera

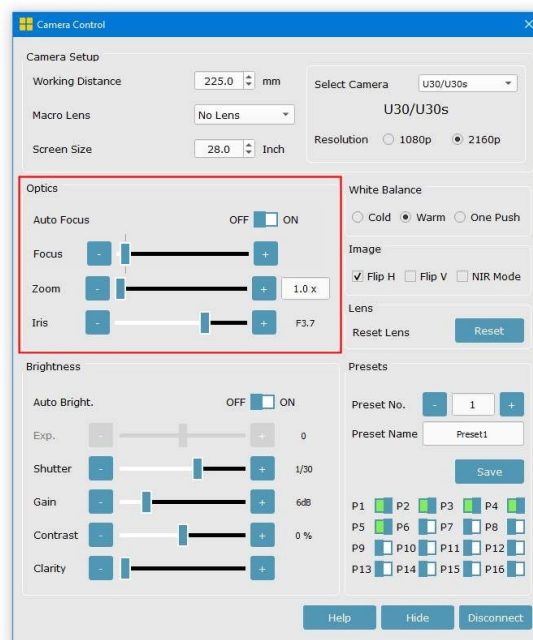
If your F30s, F35x or U30s camera is Long Working Distance, select it from the menu. Pre-defined calibrations of the LWD type cameras are different and will be automatically loaded when you select the LWD.

Resolution

Video output of all Inspectis 4K cameras can be switched to 1080p, 60 frame rate per second. If your application requires high frame rate, switch 1080p.

Optics (Focus, Zoom, Iris)

Lens attributes are controlled under Optics.



Auto Focus

All Inspectis 4K cameras as well as F35/F35s apply so called “spot focus” which means only central part of object field is used for finding best focus. F30/F30s cameras apply “field focus”. It means the entire object field is used for calculation the best focus.

Manual Focus

When switched to manual, the focus is positioned to create a sharp image of the object at 230mm working distance. This position is marked by a thin indication line.

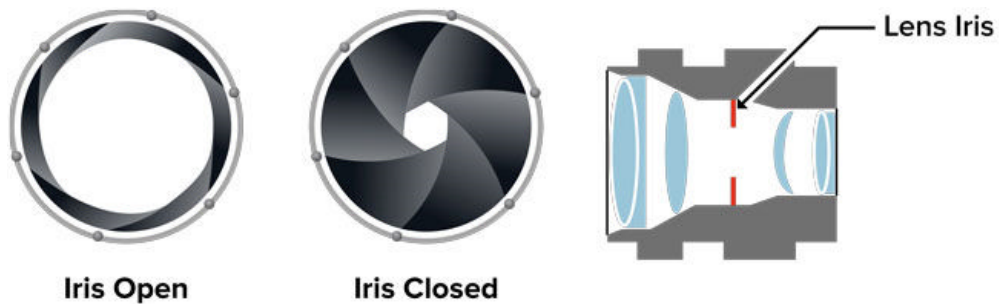
Use +/- buttons or drag the focus handle.

Hover the mouse cursor over the focus bar handle and turn mouse wheel to fine focus.

Hover the mouse cursor over the focus bar handle, hold down Ctrl key and turn mouse wheel to focus in bigger steps.

Iris

This function adjusts aperture of the lens (F-number). The intensity of illumination as well as depth of field (depth of focus) is controlled by adjusting Iris.

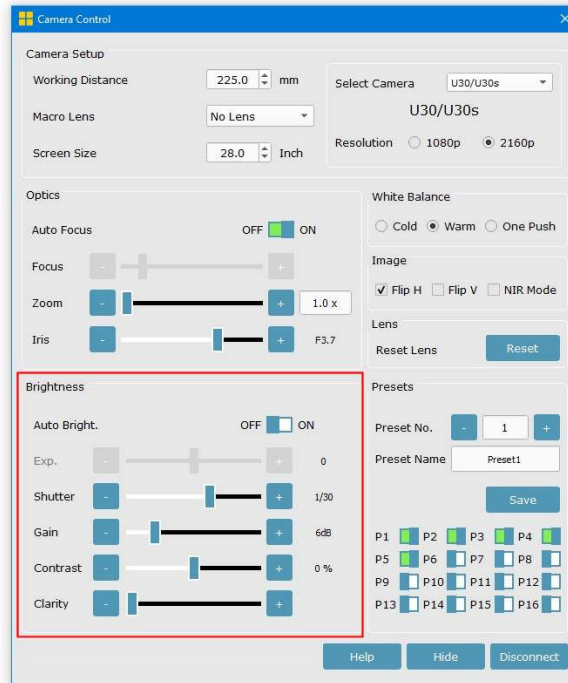


If your application requires a large depth of field, close the Iris a few steps (e. g. use higher F-numbers) and compensate for the image brightness lost with more illumination, slower shutter speed and/or more gain. Pay attention to the fact that too slow shutter will affect frame rate of the live video.

Decreasing the Iris a few steps (higher F-number), especially in the F30/F30s cameras, produces in most cases a better picture with less residual aberrations and more depth of field.

Brightness, Contrast and Clarity

Digital camera attributes are controlled under Brightness.



Auto Brightness

Auto Bright. adjusts both electronic gain and iris using an internal algorithm. Level of the auto brightness control is set by Exp. Image brightness at this mode is controlled by gain if the scene is dark, and by iris if too bright.

As Gain adds electronics noise to the image, try to avoid using the camera at Auto Brightness mode if the object illumination is not sufficient.

Shutter

Shutter is exposure time of the image sensor. The shorter exposure time (higher shutter speed) the less light will be collected by the image sensor resulting in a darker image.

CMOS image sensors capture images line-by-line (rolling shutter), why there will be a slight time difference between the top and bottom of the scanned object. As a result, video image may appear skewed if the object is moving. This phenomenon is more visible if the frame rate of the video is low.

Some shutter speeds may interfere with frequency of the light source and cause flicker. If you notice flicker at a specific shutter, try another shutter speed.

Gain

Gain is electronic amplification of the video signal resulting in brighter image. Gain, however, will also amplifies the image noise. For producing a good picture with minimum noise try to keep the Gain at low values (less than 9dB).

Contrast

Contrast is the difference in colours that makes the image distinguishable. By adjusting the contrast level, you change the entire range of the image colour tones.

Adding contrast to the image of digital microscope requires some extra image processing that may result in drop of frame rate. If high frame rate is required in an application, set contrast to zero.

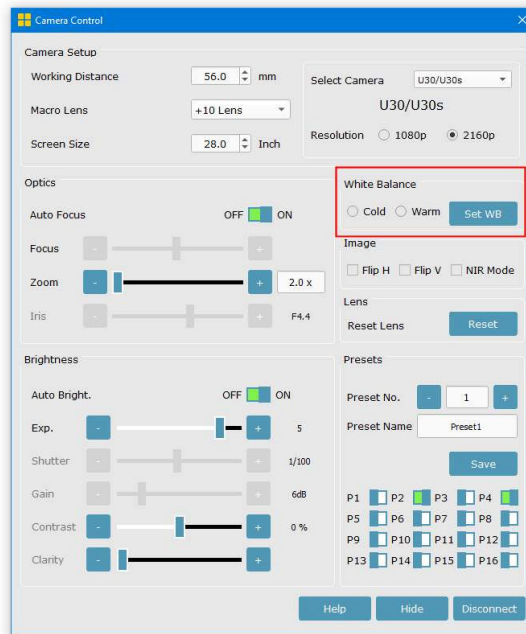
Clarity

Clarity adjusts only the mid-tones of the image colours and makes the object appear clearer and sharper.

Clarity is especially useful for highlighting details of the inspecting object. Adding clarity does not affect frame rate.

White Balance

Inspectis cameras feature three WB modes, Cold, Warm and Set WB (One Push). Select right WB depending on colour temperature of the illumination.



Warm is adapted to colour temperature of the Inspectis illumination devices.

Set WB (one push) makes an instant calculation of the WB based on the colour temperature of the current object at entire field of view. To **Set WB** put a white paper under the microscope, set Brightness to Auto and push **Set WB** button.

One push WB data is lost when the camera power is turned off.

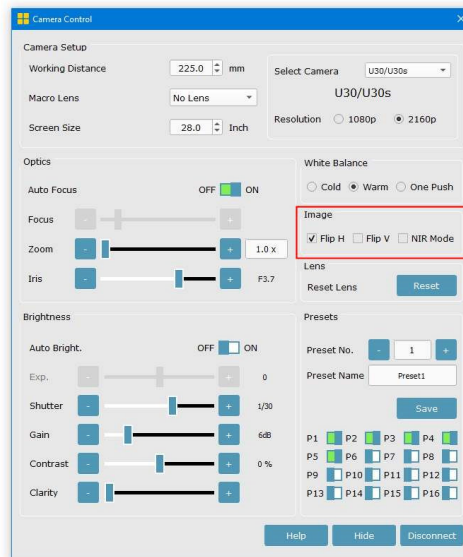
WB of the video can also be set anytime using the white button on top of the Digital Microscope.



Image Flip and NIR Mode

Flip reverses the video output from the camera vertically and horizontally.

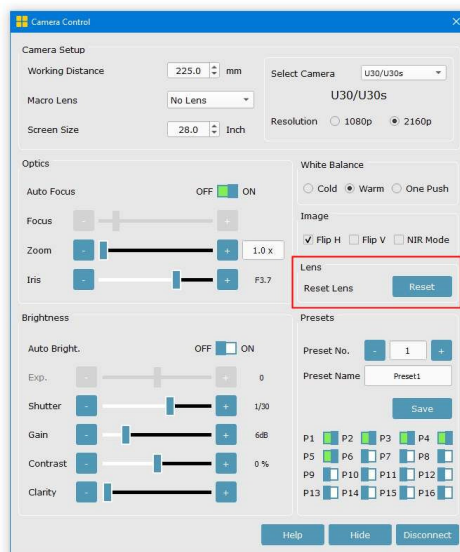
NIR Mode removes the near infrared short pass filter which is installed in front of the image sensor physically. The sensitivity in the near infrared region (λ 660-1000 nm) is increased by disengaging the NIR filter. When the NIR Mode is selected, the image becomes black and white.



Reset Lens

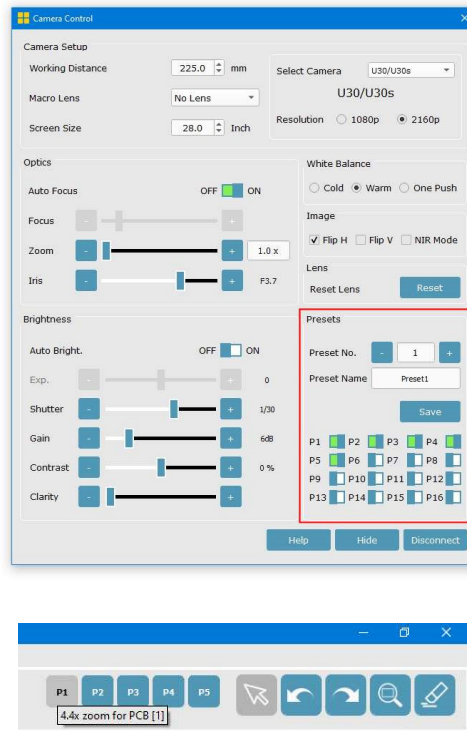
This function initializes stepper motors of the zoom and focus lens and send them to their designated starting point. At power-on or when the camera is connected to the software the lens is automatically reset to its starting point.

Reset lens manually if the digital microscope or the software is not turned off or restarted for a long time. Doing this will maintain accuracy of calibrations and measurement.



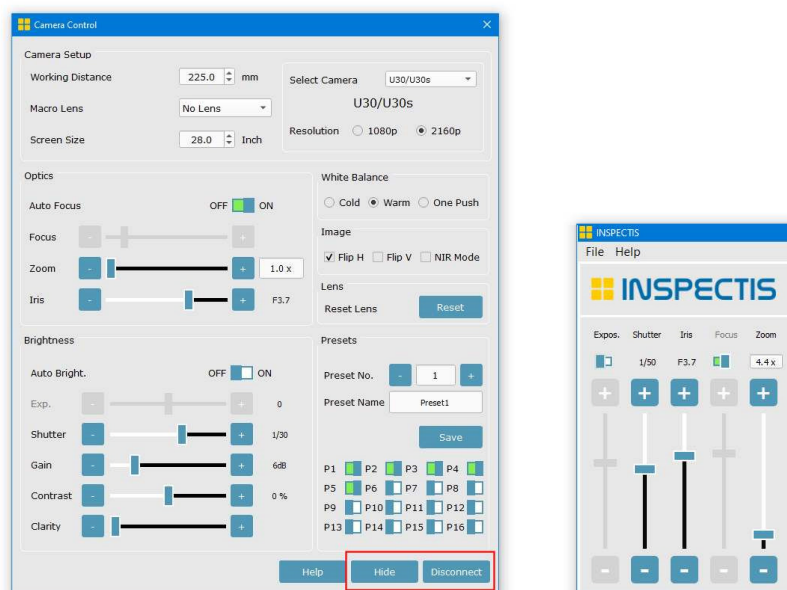
Presets

Up to 16 camera and lens configurations can be defined, saved, and activated as quick access buttons on INSPECTIS main window. Quick access buttons are numbered P1 – P16. Their user-defined names can be displayed by hovering the mouse cursor over the buttons.



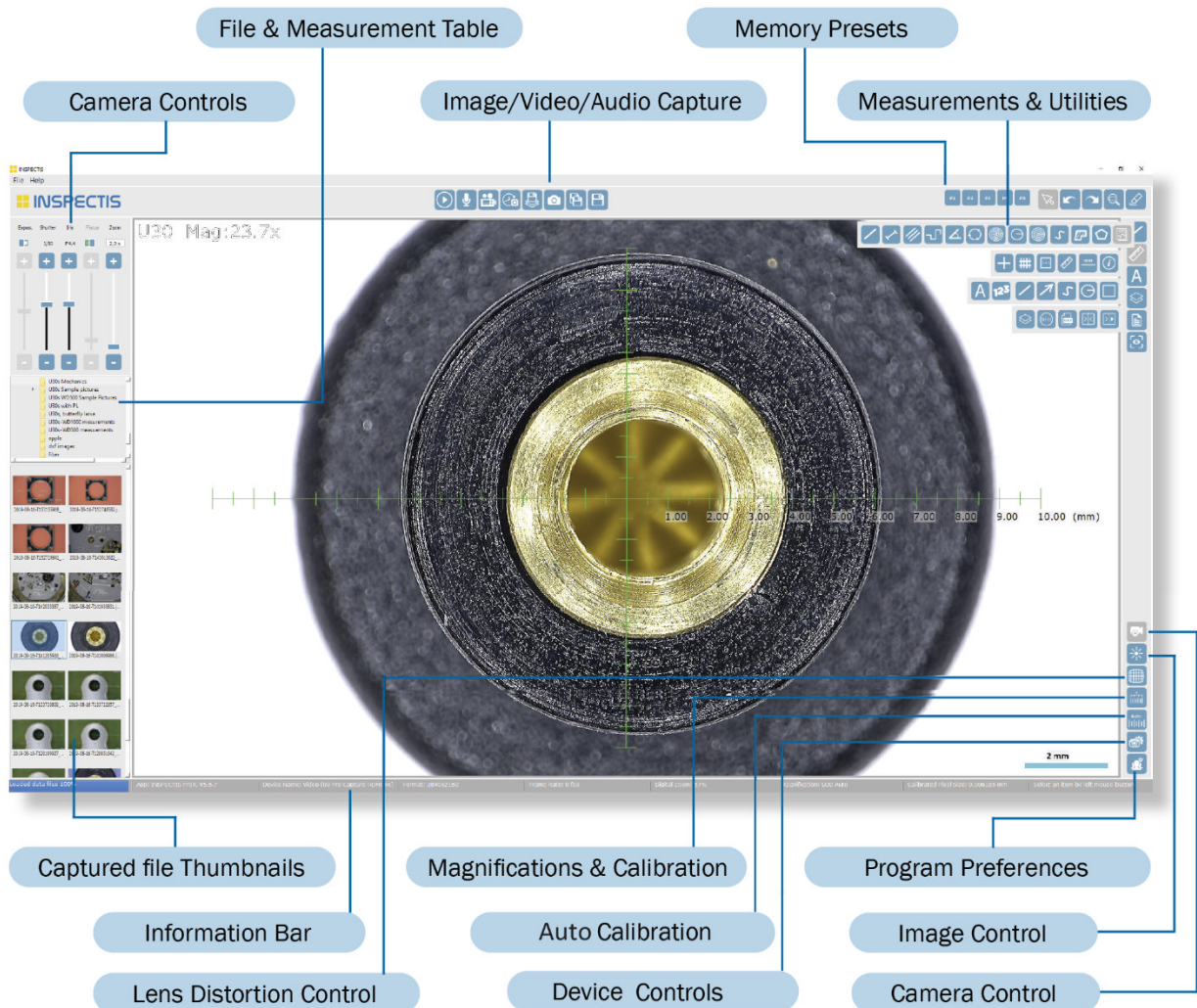
Hide and Disconnect

Pushing hide, will close the Camera Control dialogue and return to the main window. Basic camera and lens controls are displayed on top-left of the main window. Disconnect will terminate the communication between the camera and software.



Working with INSPECTIS Software

INSPECTIS software is designed with an icon-based graphical user interface to help users navigate quickly. Most of the functions are available with a shortcut key indicated as [key] for quick access.



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Live Video and Still Images

INSPECTIS software automatically shows the live image of your device on start. To pause the live image,

click  or SPACE BAR.

To start the live image again click  icon or press SPACE BAR.

Zooming

Both live and still images can be zoomed-in and zoomed-out digitally. Zoom functions are accessed by

clicking Zoom group icon .



Zoom In [Shortcut Key: F4]



Zoom Out [Shortcut Key: F3]



Zoom to Fit Screen [Shortcut Key: F5]



Full Screen [Shortcut Key: F6]. To close the full screen view, press ESC or press the



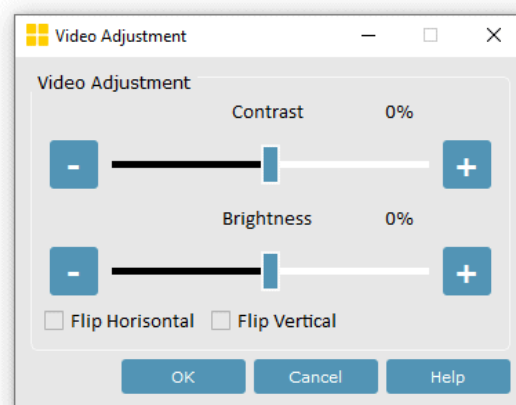
icon.

Digital zoom-in and zoom-out can also be done by the wheel of the computer mouse. Mouse cursor defines centre of the zoomed area. To pan the image when zoomed-in, press and hold the middle button of the mouse.

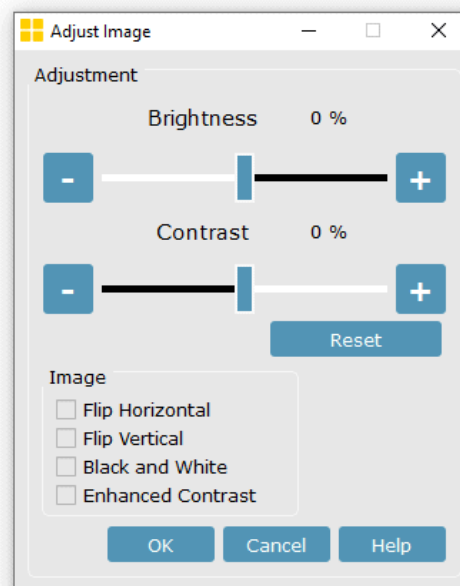
Image Adjustments

To adjust contrast and brightness of the image, click  icon. Depending on connected device and live or still image different adjustment windows will appear.

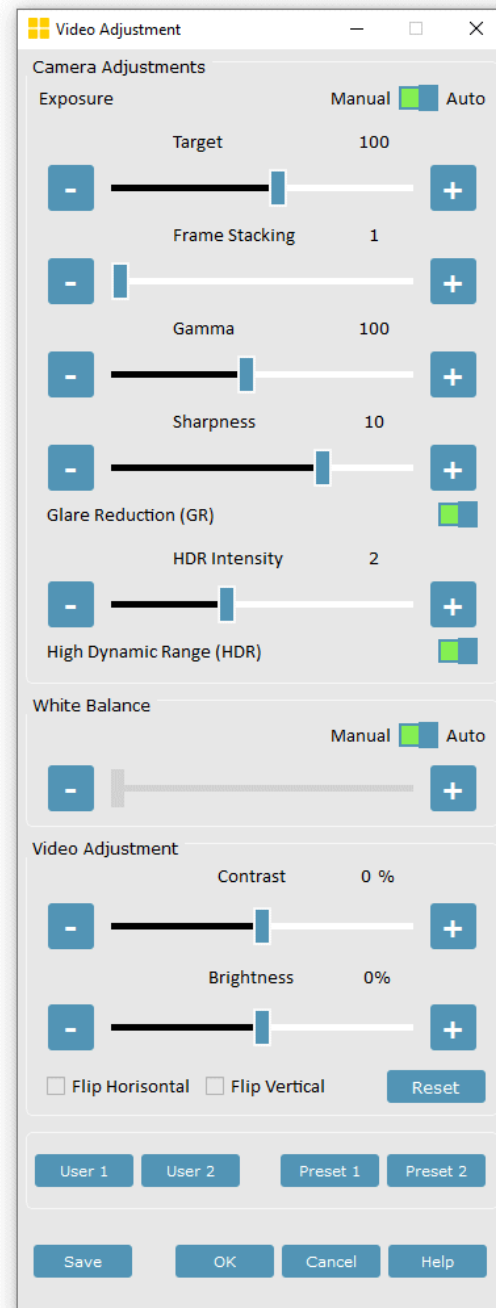
If image is live user can change orientation of the image, brightness and contrast value. Notice frame rate of captured video might be affected if Contrast and Brightness is added to live video.



If the image is still, its brightness and contrast can be adjusted. In addition, Black and White and Enhanced Contrast can also be applied to still images.



If your connected device is Inspectis 5MP Camera, the adjustment dialogue will be according to below picture:




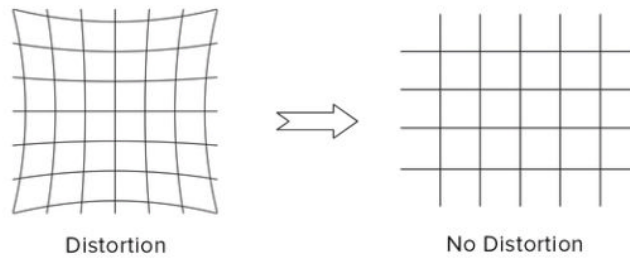
Choose between Preset1 and Preset2 or select your preferred adjustments and saved them under User1 or User2 for best image quality.

Distortion Correction

Lens Distortion Correction: Lens distortion is inherited to most wide-field optical systems.

Automatic distortion correction is enabled once the camera is connected to the software. Distortion of the current lens will then be automatically calculated and compensated by software.

Switch off/on the Distortion Correction using  icon.

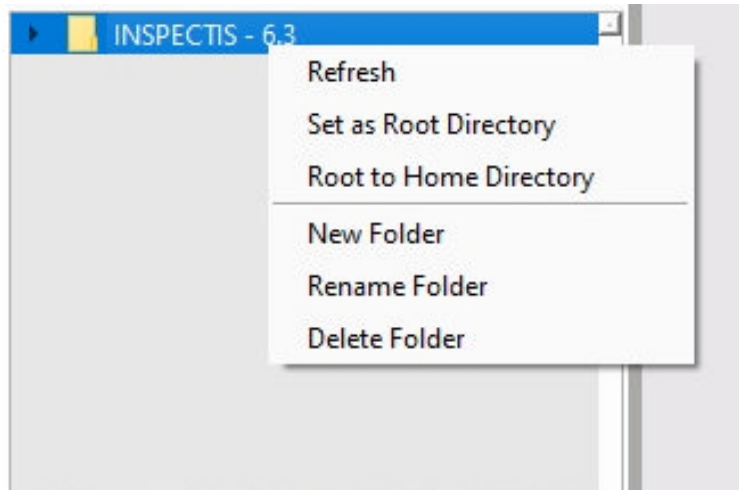


Distortion Correction is applied for 1x to 4x zoom factors only. Notice frame rate of the live video is reduced when DC is processing.

Folder Structure and Thumbnail View

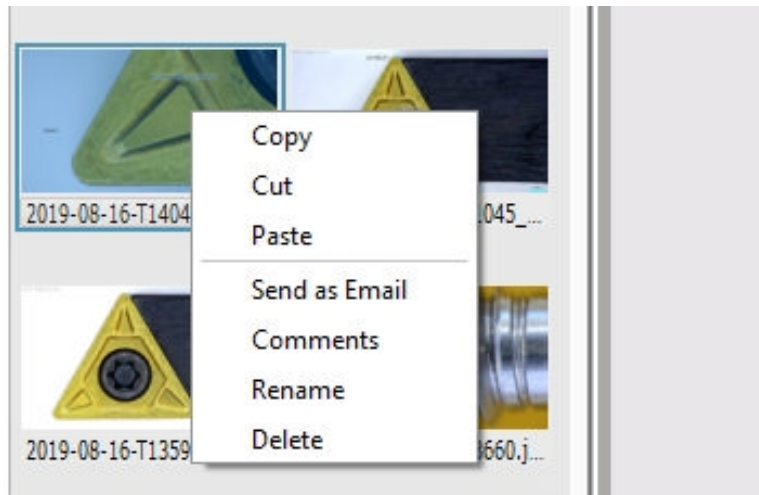
Right click on the folder structure and choose the working folder to be used for saving or recalling images and files. Working folder can be also selected via "File Menu -> Select Folder". Images and other files in the working folder are displayed as thumbnails in the Thumbnail View beneath the folder structure.

By right clicking on the file structure below folder functions can be accessed:



By clicking "Set as Root Directory ", other folders except for the selected working folder will be hidden. Clicking "Root to Home Directory" will display all folders.

By right clicking on a saved image icon, extra image functions can be accessed:



You can select one or multiple images at a time to Copy, Cut, Paste, E-mail or Delete.


Comments will be saved to the selected image file and automatically printed on Reports when you attach the image to the report.

Saving Images

There are four options for saving an image:



Capture Live Image [Shortcut Key: F11]. Captures a still image from live video of the connected device and saves it under current working folder as .png (default) or .jpg. Image will be automatically labelled with date and serial number.

If the live image is paused and there are measurements and overlays on it,  will only save the image without overlays and measurements.



Save Image [Shortcut Key: F10]. Saves the image, measurements, and overlays under the current working folder as .png (default) or .jpg. Image will be automatically labelled with date and serial number with "_measured" suffix.




Save Averaged Frames [Shortcut Key: F9]. Averages a sequence of frames and saves the image with user specified name and folder. This is particularly used to denoise the final saved image.



Save Image As [Shortcut Key: F8]. Saves the image with user specified name and folder.

Recording Video



Click on  icon to start recording a video at .AVI format. [Shortcut Key: F2].



To stop the video recording press . [Shortcut Key: F2].

Recorded video file will be saved under the current working folder and automatically named with date and serial number.

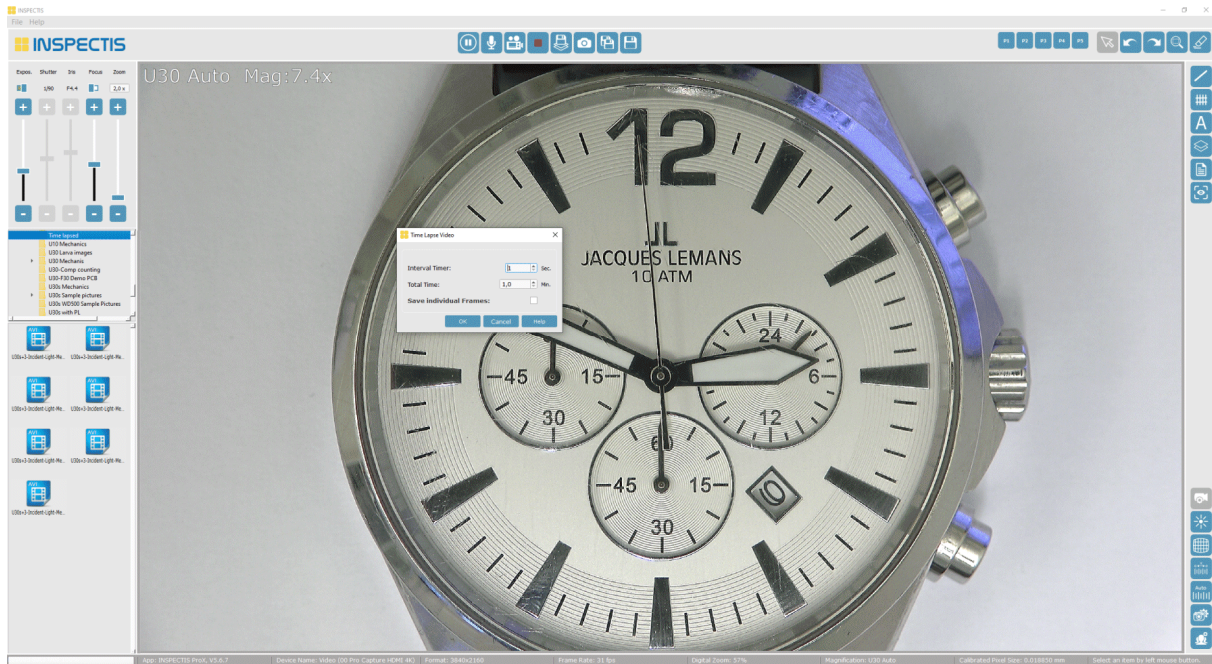
The video recording is time-limited to 3 minutes by default. Video recording time limit can be changed under [Preferences](#).

Video recording compression levels can be adjusted in the [Preferences](#).

Time Lapse Video



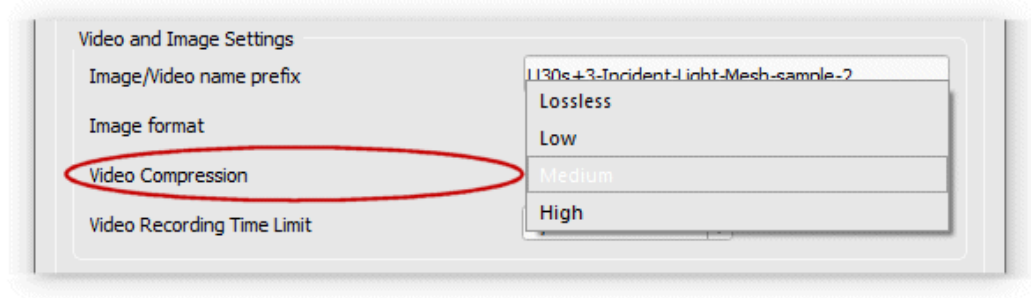
Click on icon to start capturing time-lapsed images and creating a video sequence of images at .AVI format.



To stop the Time Lapse video recording press .


Time lapsed video file will be saved under current working folder and be automatically named with date and serial number. If selected, individual frames will be saved in a sub-folder automatically created under working folder.

"Video compression" level (record quality) and "Video name prefix" can be chosen in the [Preferences](#).

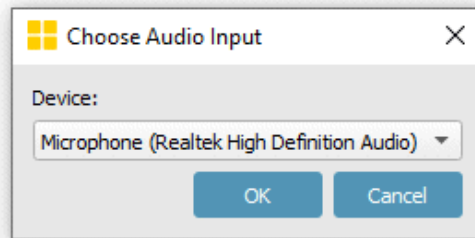


Recording Audio



Click on  icon to start recording audio, speech or dictation at .WAV format. A microphone must be connected to your computer to record Audio. [Shortcut Key: F1].

Select your microphone and press OK to start recording audio.



To stop the video recording press  [Shortcut Key: F1].

Recorded audio file will be saved under the current working folder and automatically named with date and serial number. The specific audio device can be selected after clicking on record audio icon.

Loading Images and Videos

To load a thumbnail image, video, or a document from the working folder, left click on it or right click and choose open. If the image contains measurement objects, the measurement results will also be loaded to the measurement table.

To load an image from another location, click "File/Open Image", then select the image to be opened.



Shortcut key list (Hot-keys)

Following quick-access shortcut keys (Hot-keys) are available in INSPECTIS ProX:



Save Image [Shortcut Key: F10].



Save Image As [Shortcut Key: F8].



Capture Live Image [Shortcut Key: F11].



Save Averaged Frames [Shortcut Key: F9].



Capture Video [Shortcut Key: F2].



Record Audio [Shortcut Key: **F1**].



Play/Pause Video [Shortcut Key: **Space**].



Zoom In [Shortcut Key: **F4**].



Zoom Out [Shortcut Key: **F3**].



Zoom to Fit Screen [Shortcut Key: **F5**].



Full Screen [Shortcut Key: **F6**].



Clear all Items [Shortcut Key: **Ctrl+Del**].



Undo [Shortcut Key: **Ctrl+Z**].



Redo [Shortcut Key: **Ctrl+Shift+Z**].



Picture Alignment [Shortcut Key: **A**].

For U, F, C and DIM type Digital Microscopes:



Preset 1 to 9 [Shortcut Key: **1 to 9**].

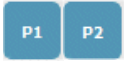


Preset 10 to 16 [Shortcut Key: **Shift+0 to Shift+6**].

Preset recalls for Inspectis 5MP Camera:



User 1, 2 [Shortcut Key: **1, 2**].



Preset 1, 2 [Shortcut Key: **3, 4**].

Camera Controls (U, F, C and DIM type Digital Microscopes):



Zoom in [Shortcut Key: **up**].



Zoom out [Shortcut Key: **down**].



Focus Near [Shortcut Key: **F**].



Focus Far [Shortcut Key: **Ctrl+F**].



Increase Iris of the lens [Shortcut Key: **Right**].

If Auto Expos. is on, **Right** highers exposure control reference level)



Decrease Iris of the lens [Shortcut Key: **Left**].

If Auto Expos. is on, **Left** lowers exposure control reference level)



Increase Exposure time (Shutter speed) [Shortcut Key: **S**].



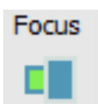
Decrease Exposure time (Shutter speed) [Shortcut Key: **Ctrl+S**].



Increase Auto Exposure [Shortcut Key: **Right arrow**].



Decrease Auto Exposure [Shortcut Key: **Left arrow**].



Switch between Manual/Auto focus [Shortcut Key: **M**].

USB3.0 Digital Microscope Camera Controls (BGA Inspection):

Reset and Restart Camera [Shortcut Key: **F12**].



Increase Contrast [Shortcut Key: **up** arrow].



Decrease Contrast [Shortcut Key: **down** arrow].



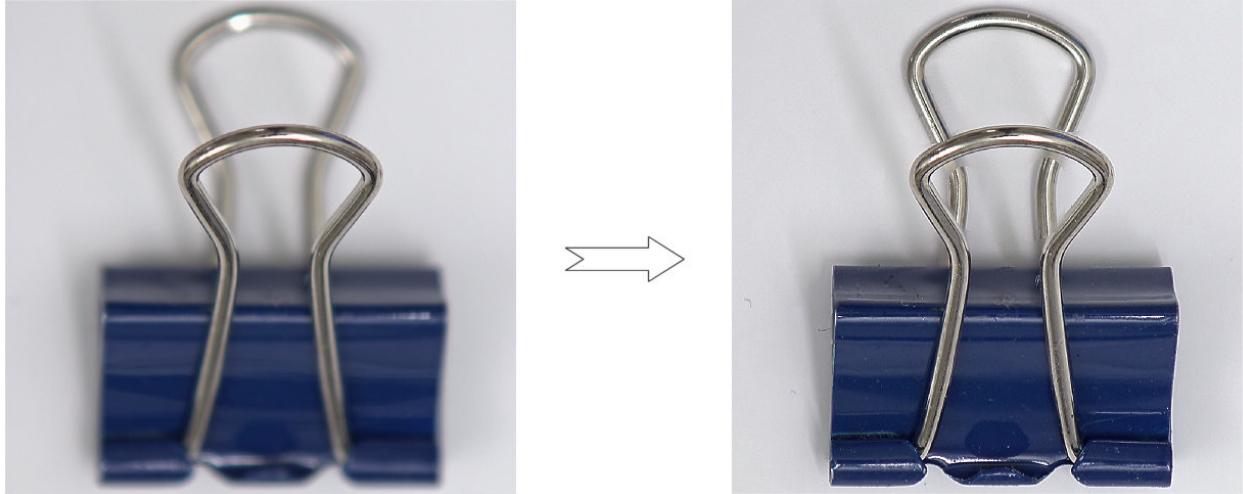
Increase Exposure time [Shortcut Key: **Right**].




Decrease Exposure time [Shortcut Key: **Left**].

Focus Stacking

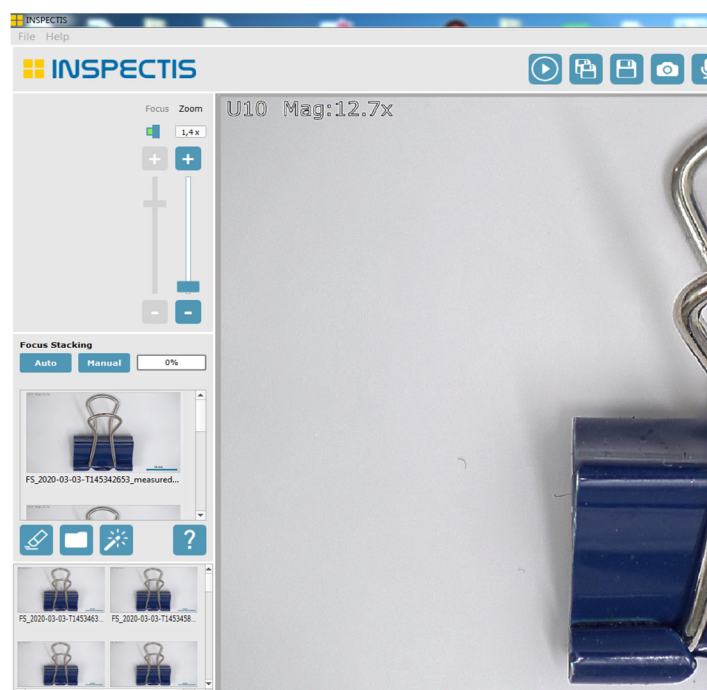
Inspectis ProX can create focus stacked images by taking 6-22 images at different focus planes to create one single sharp image.




To start the Focus Stacking press the  icon. Make sure camera is connected to the computer with the supported Communication Cable.

Zoom and Focus controls will be accessible at the INSPECTIS tool bar when Focus Stacking is enabled. Zoom and Focus can be adjusted using mouse wheel (when pointer is hovered over controls) or Up/Down arrow keys on your computer keyboard.

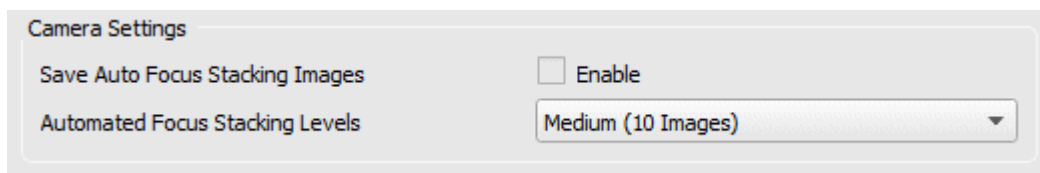
CapsLock (on computer keyboard) will also turn your mouse wheel to Focus control if you point to the live image on INSPECTIS.



Automatic Focus Stacking

To perform an automatic focus stacking, zoom to desired level, switch the Focus to Manual, and make sure the focus control bar is aligned to the bottom focus indication lines. Adjust then working distance of the camera to get a sharp picture of the lowest part of the object. Switch to auto focus and click .


Depending on Automatic Focus Stacking Levels setting under Preferences, the software will automatically capture 6-22 pictures at different focus levels, starting from top of the object and stack all to one single sharp image. The resulting image is saved automatically to working folder.




If height of your object is low select "Low, 6 images".

If your object is big, select "High, 16 images" or "Ultra, 22 images".


To save the all intermediate focus images used in the focus stacking, enable " Save Auto Focus Stacking Images" setting under Preferences. Note, process time of focus stacking will be longer when Save Auto Focus Stacking Images is enabled.


To enable the Enhanced Focus Stacking function select  before starting the focus stacking. Enhanced Focus Stacking uses advanced image processing to create stacked pictures with less image quality defects.

Manual Focus Stacking

Capture images at different focus levels one by one and stack to one single image by clicking  button. The resulting image is saved automatically to destination folder.

You may also click on any saved image thumbnail on your working folder to add it to focus stacking field.

Images can be selected from any folder in your computer by clicking on  icon .

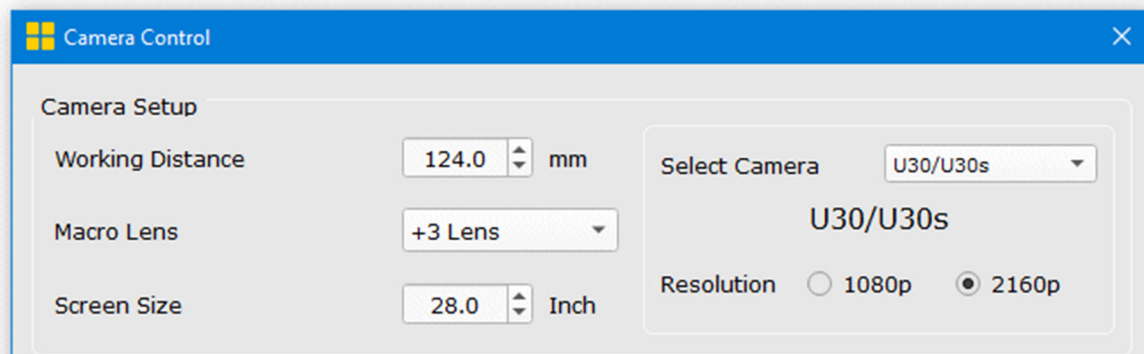
To remove all images from focus stacking field, click on the  icon.

Measurements and Analysis Tools

For performing accurate measurements, current magnification must be calibrated and working distance be kept unchanged.

If your Digital Microscope is connected to the host computer via Inspectis` Communication Cable, factory set Standard Calibrations for entire zoom range of your Digital Microscope would be available. Software tracks the zoom and displays calibrated on-screen magnification of each zoom factor automatically on top left of the INSPECTIS image field. Notice factory-set standard calibrations are only valid and accurate when Working Distance of the digital microscope is set to maximum.

Before performing geometrical measurements, make sure Working Distance, presence of Macro Lens (Close-up) and Screen Size of your computer on Camera Control dialogue are selected correctly.




If you select an uncalibrated image, measurement results will be presented in pixels.

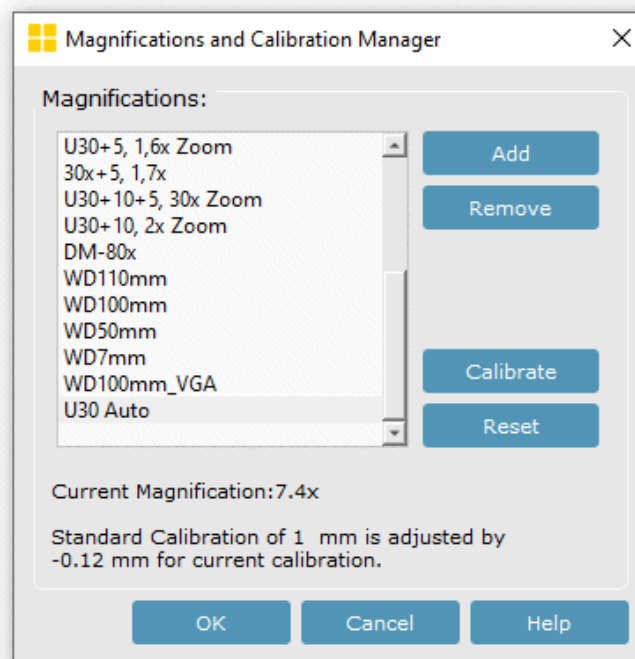
Magnification and Calibrations

To achieve high measurement accuracy, we highly recommend performing new accurate manual or automatic calibrations of your preferred magnifications and working distances.

All Inspectis Digital Microscopes are pre-calibrated in software. However, for achieving high measurement accuracy, you need to perform new accurate Manual or Auto calibration for your preferred magnifications and working distances.

Every new custom calibration will adjust the standard calibration in INSPECTIS by a correction factor. Information about how much the standard calibration is adjusted is displayed for each magnification on the Magnification and Calibration Manager dialogue.

You can reset any custom-made calibration and return to the factory set value any time by using Reset  button on Magnification and Calibration Manager dialogue.




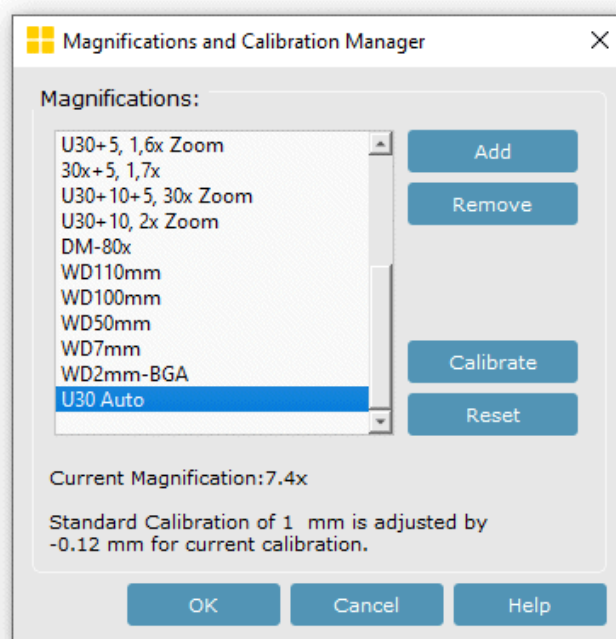
Magnification Manager

Once your digital microscope is connected to the software, Auto magnification will be used per default. This Magnification is displayed with "xx Auto", where "xx" is name of your U, F, C or DIM digital microscope.

However, custom defined Magnifications for a specific zoom position can be added, calibrated, or removed via Magnification and Calibration Manager.



Click on  icon to display the dialogue. You can select and use a custom mode magnification as long as zoom position of digital microscope is unchanged. Once zoom position of digital microscope is changed, software will return to xx.Auto magnification mode.



Every new custom calibration will adjust the Standard Calibration in INSPECTIS by a correction factor. Information about how much the Standard Calibration is adjusted is displayed for each magnification on Magnification and Calibration Manager dialogue.

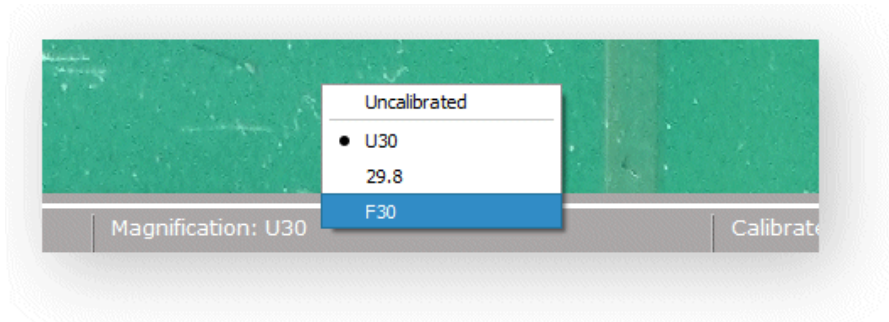
You can reset the custom-made calibration and return to factory set any time by using Reset

 button on Magnification and Calibration Manager dialogue.

Selecting Magnification

To select a magnification, open the Magnification and Calibration Manager dialogue, select the desired magnification, and click OK button.

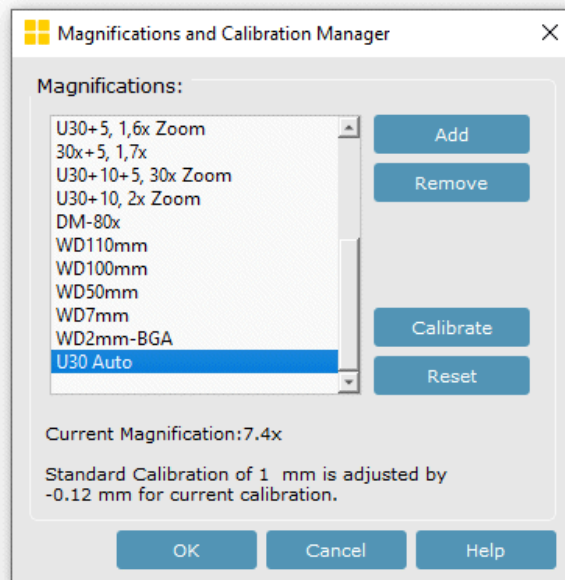
For quick selection of magnifications, right click on the Magnification on the INSPECTIS status bar and choose desired magnification.



Adding a New Magnification

Before adding a new magnification, place an accurate ruler or micrometre scale under the microscope, adjust and fix the working distance and make sure the live image is on focus.

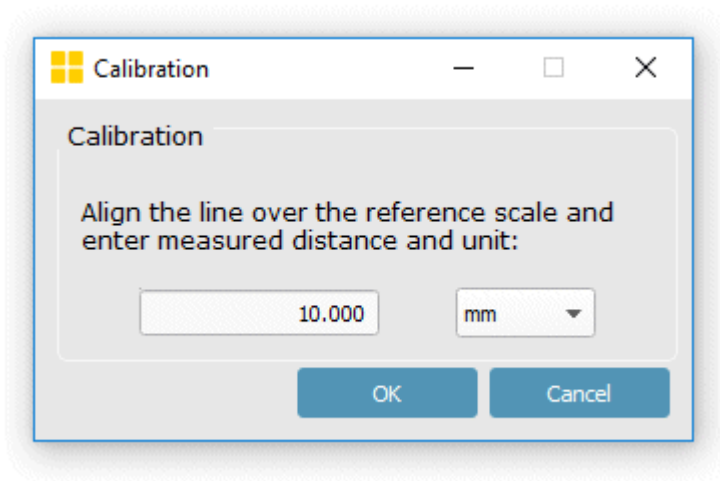
Open Magnifications and Calibration Manager and click Add button. Type preferred name of the magnification and press OK button. Live image will be paused, and the calibration procedure will start. See the next section for calibration procedure.



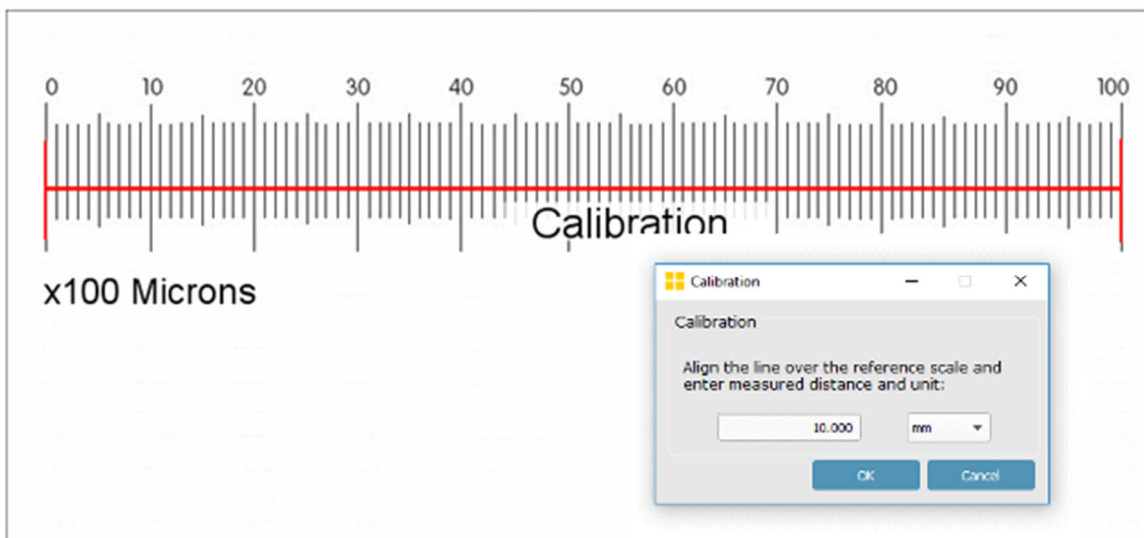
Note working distance of the current camera setup defined as the distance between the camera and the focused object shall not be changed after making the calibration. Altering working distance will change the magnification resulting in incorrect calibration.

Manual Calibration

Before starting to calibrate a magnification, place an accurate ruler or micrometre scale under the microscope, adjust the working distance and make sure the live image is on focus. Select the desired magnification and click Calibrate in the Magnifications and Calibration Manager dialogue. The live image will be frozen and calibration windows with calibration line will appear.

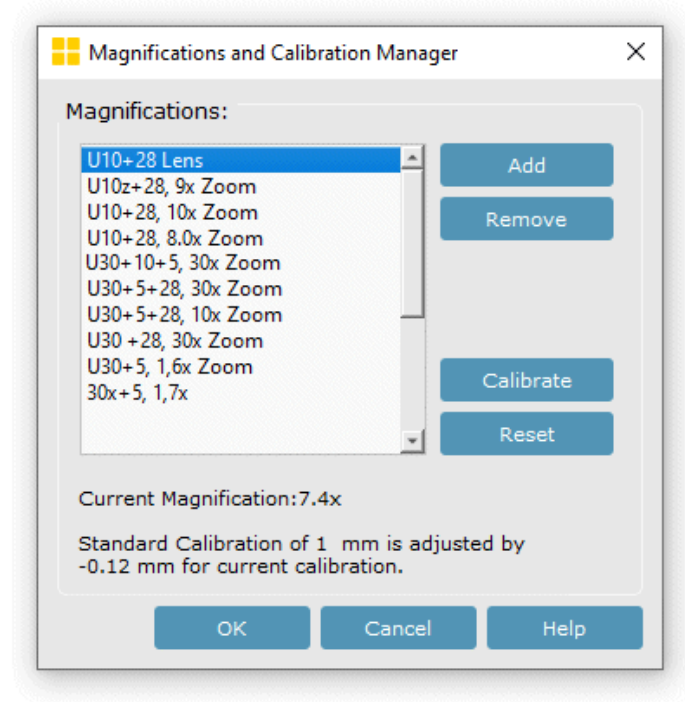


Select, drag, and align both ends of the calibration line to the matching lines on the reference image. Type in the distance and select the unit (**mm** or **µm**) in the calibration window. If imperial units are selected in Preferences, imperial units (**inch**, **mil**) will be shown in calibration window. Click OK to end the calibration process.



When you re-calibrate your factory-set Current Magnification (device is connected to INSPECTIS software via COM-cable), the new calibration will override the Standard Calibration. Information about how much the

Standard Calibration is adjusted for this magnification is displayed below the magnification list on Magnification and Calibration Manager dialogue.



You may reset a custom-made calibration to factory set Standard Calibration any time by using Reset


Reset


button.

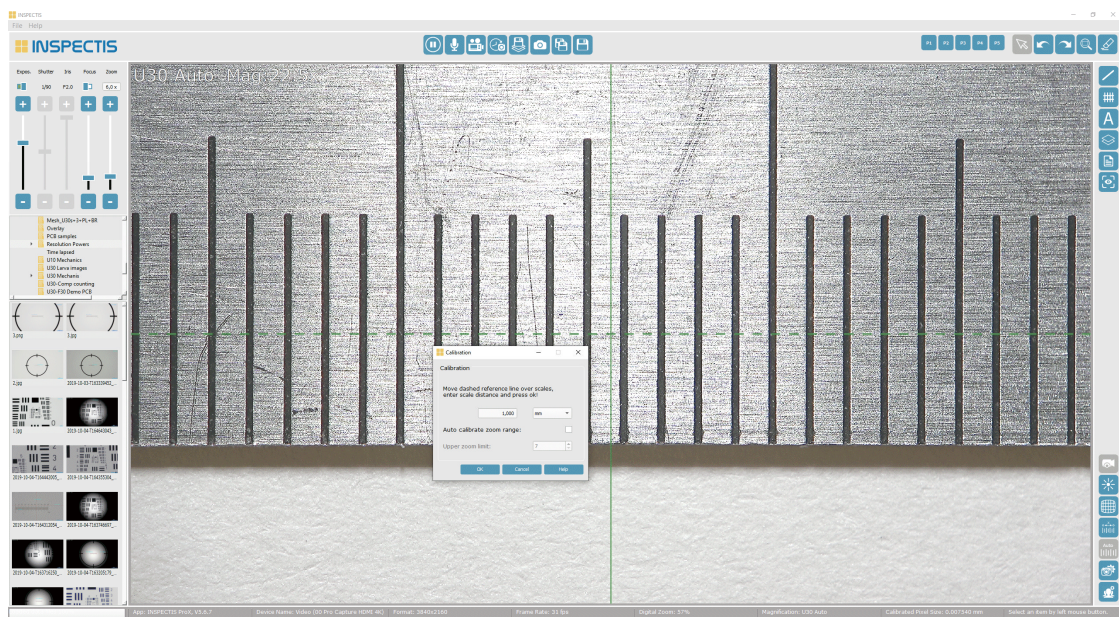
Auto Calibrating Magnifications

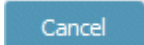
Before starting to Auto Calibrate a magnification, place an accurate ruler or micrometre scale under the microscope, adjust image brightness and white balance and make sure the live image is on focus at your preferred working distance.

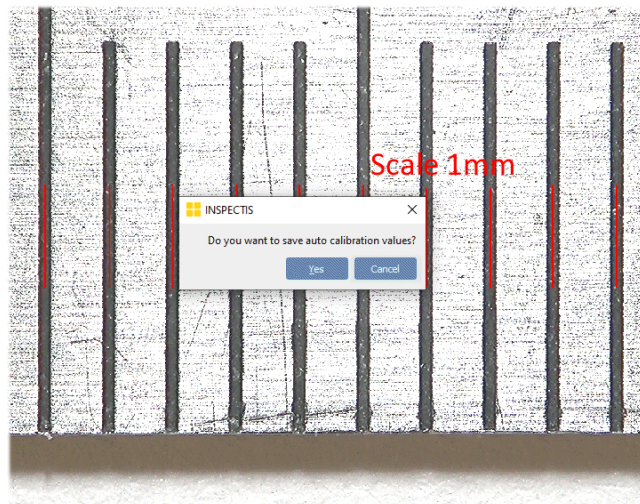
If you are planning to calibrate low-zoom magnifications 1x to 4x (large field of views), make sure Distortion

Correction is activated .

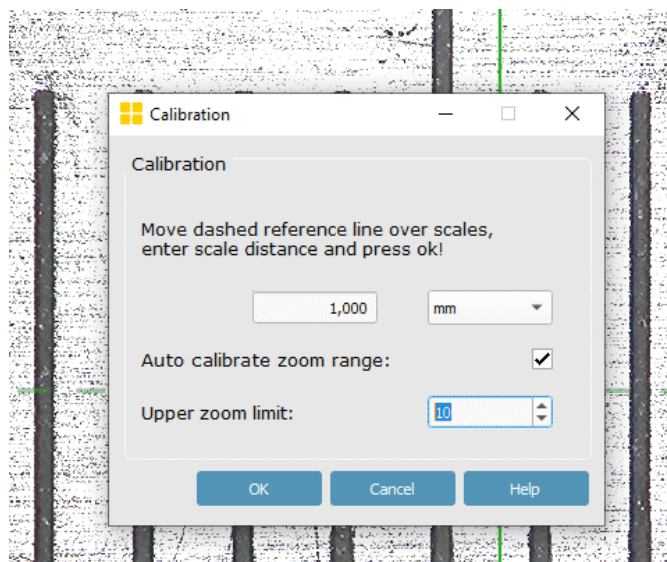
Click . Calibration dialogue will pop-up and a solid vertical as well as a dashed horizontal line around which the calibration is processed will be displayed on the live image. If necessary, turn the ruler to align scale lines in parallel to the vertical line on image. If necessary, drag the horizontal dashed line over the scales to intersect properly. Enter scales size in mm/μm and click OK.



Software will automatically find the scales, mark them by reference red lines and ask you to accept and save the calibration. If reference lines are correctly drawn on scales, press OK to save calibration value for current magnification and exit. If reference lines are not correctly displayed on scales, cancel .




If you wish to Auto calibrate several magnifications within a specific zoom range, select "Auto calibrate zoom range" checkbox and enter the "Upper zoom limit". Software will scan and calibrate all magnification within specified zoom range. Notice Auto calibration of zoom range is not available for Inspectis 5MP Cameras (BGA Inspection).




Calibration pixel size which is result of your calibration and used by software for 2D-measurements is displayed on status bar of INSPECTIS software.



You may reset any custom-made calibration and return to factory set Standard Calibration any time by using Reset  button on Magnification and Calibration Manger.

Measurement Tools

INSPECTIS provides several tools for performing non-contact geometrical measurements on the picture. You can measure distances, radius, angles, curve lengths and areas for different shapes.



To select a measurement tool right click on the measurement group icon  on the right menu bar. Measurement tools group will pop-up.






Left click on the desired tool to activate/deactivate. Last selected tool icon will replace the menu icon for quick access.

To activate the current tool for performing measurements left click on the current measurement tool icon.

To decrease or increase number of the decimals in measurements go to [Preferences](#) and select Number of Decimals (1 to 5).

To modify, move or delete a measurement activate the **Select Tool**  and click on the specific measurement. **Select Tool**  is automatically enabled after each measurement.

All measurements can be undone or redone using **Undo**  and **Redo**  respectively.

To clear all items, click on 


Measurement Table on top-left of INSPECTIS window is automatically displayed as soon as a measurement tool is selected.

Distance Measurements

INSPECTIS provides 3 types of Distance measurements:



Measure Distance:: Measure a linear distance. Press and hold the left mouse button, drag to

draw a line from A to B on the image and release the button to finish. Select  is enabled after each measurement.

Press and hold Ctrl key on computer keyboard to make Horizontal or Vertical Distance measurements.

To adjust position of measurement lines and text:


Click and drag end of measurement lines to change the distance.

Click and drag measurement lines to move all.

Click and drag the text box to move.



Measure Distance (CAD type): Measure a linear distance like CAD programs. Press and hold the left mouse button and drag to draw a line from A to B on the image, release the button and extend

measurement leaders to desired position and click to finish. Select  is enabled after each measurement.

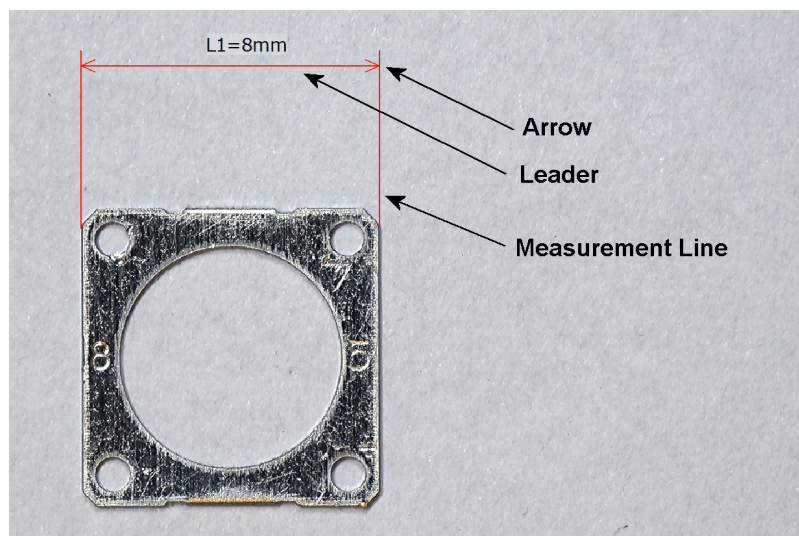
Press and hold Ctrl key on computer keyboard to make Horizontal or Vertical Distance measurements.

Click and drag end of measurement lines to change position and angle.

Click and drag leader or arrows to adjust height of measurement lines.


Click and drag measurement lines to move all.


Click and drag the text box to move.





Multiple Distance Measurement: Measure linear distances multiple times in order to get statistics (Max, Min, Average and Standard Deviation of the population). Press and hold the left mouse button, drag to draw a line from A to B on the image and release the button to finish. To finish Multiple

Distance Measurement select  any other button.

Measurement Table 				
	Tool	Parameter	Value	Unit
1	MD2-1	Length	1.539	mm
2	MD2-2	Length	0.8894	mm
3	MD2-3	Length	1.035	mm
4	MD2-4	Length	0.857	mm
5	MD2_Min	Min	0.857	mm
6	MD2_Max	Max	1.539	mm
7	MD2_Mean	Mean	1.0801	mm
8	MD2_SD	Stddev	0.273296	mm

Press and hold Ctrl key on computer keyboard to make Horizontal or Vertical Distance measurements.



Free Form Distance: Measure a free form distance. Click the left mouse button and drag to draw multiple lines from A to B on the image. Double click to finish the measurement.

Select down line cornets or line end to adjust their position.

Select lines to move all.



Curve: Measure length of a free form curve. Click and hold the left mouse button and drag to draw on the image. Release the button to finish the measurement.

Select curve to move it.

Thickness and colour of measurement lines as well as number of decimals and font size of the text can be changed in software [Preferences](#).

Angle Measurements



Angle by 2 Lines: Measure an angle by drawing 2 lines. Select the vertex first by left mouse button, draw first arm, click to draw second arm and click to finish.



Angle by 3 Points: Measure and angle by selecting 3 points. Select the vertex first by left mouse button, release to draw first arm, click to draw second arm and click again to finish.



To modify or fine-tune an angle measurement, activate Select and

Click and drag the vertex to change its position.

Click and drag any arm end to change the angle.

Click and drag the arms to move all to a new position.

Click and drag the text box to change its position.

Thickness and colour of angles as well as number of decimals and font size of the text can be changed in [Preferences](#).

Circle Measurements



Circle by 3 Points: Measure radius of a circle by selecting 3 points.



Concentric Circle by 3 Points: Draw and measure radius of concentric circles by selecting 3 points. If Snap function is activated, this measurement tool automatically snaps centre of previous concentric circle to increased accuracy.



Circle by Radius: Measure size of a circle by drawing a radius from edge to origin of the circle. Click and hold the left mouse button and drag to draw on the image. Release the button to finish the measurement.



Concentric Circle by Centre Point: Measure size of a circle by drawing a radius from edge to origin of the circle. If Snap function is activated, this measurement tool can automatically snap to origin of previous concentric circle to increased accuracy. Click and hold the left mouse button and drag to draw on the image. Release the button to finish the measurement.



To fine adjust a drawn circle, activate Select tool and:

Select circumference of the circle and drag to change radius of the circle.

Select inside the circle to drag to a new position.

Area of the circle and measured radius are saved and displayed in the measurements table.

Thickness and colour of circles as well as number of decimals and font size of the text can be changed under [Preferences](#).

Area Measurements



Area: Measure an area by drawing on perimeter of the area. The area will close when releasing the mouse button.



Polygon: Measure a polygon by selecting polygon's corners.

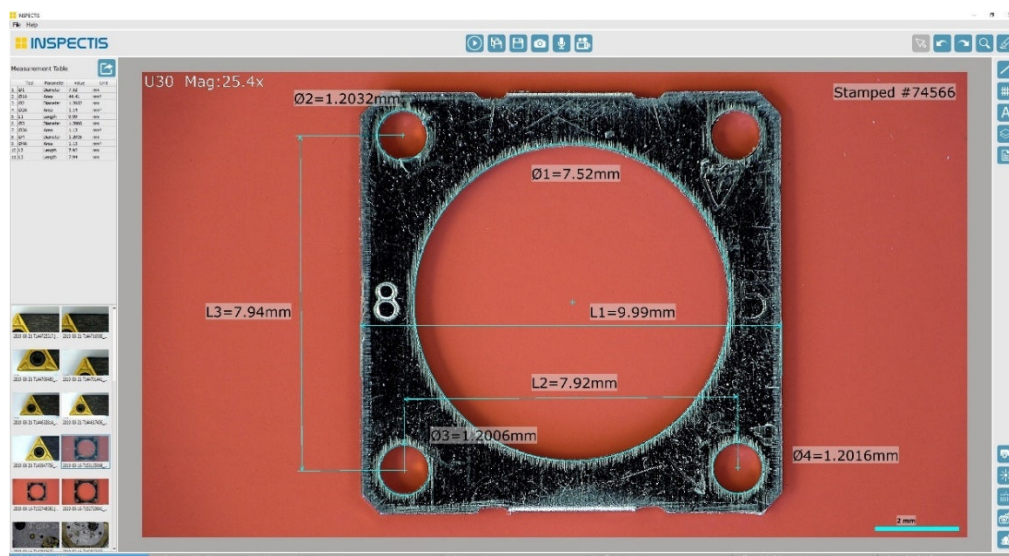


To fine adjust a drawn polygon, activate Select tool and:

Click and drag corners of the polygon to move to a new position.

Select inside the polygon to drag to a new position.

When a new polygon is drawn inside another one, their size ratio is calculated and displayed in the measurements table.

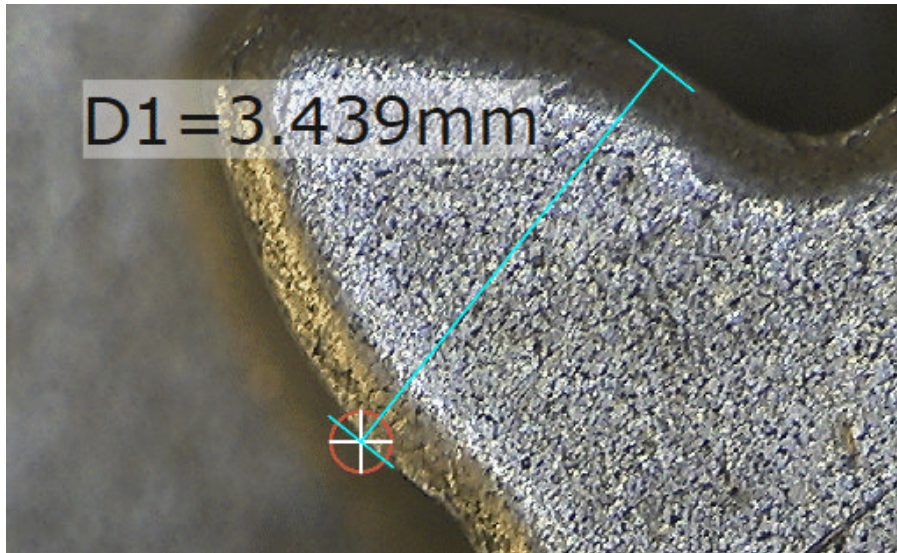


Thickness and colour of polygons as well as font size of the text can be changed under [Preferences](#).

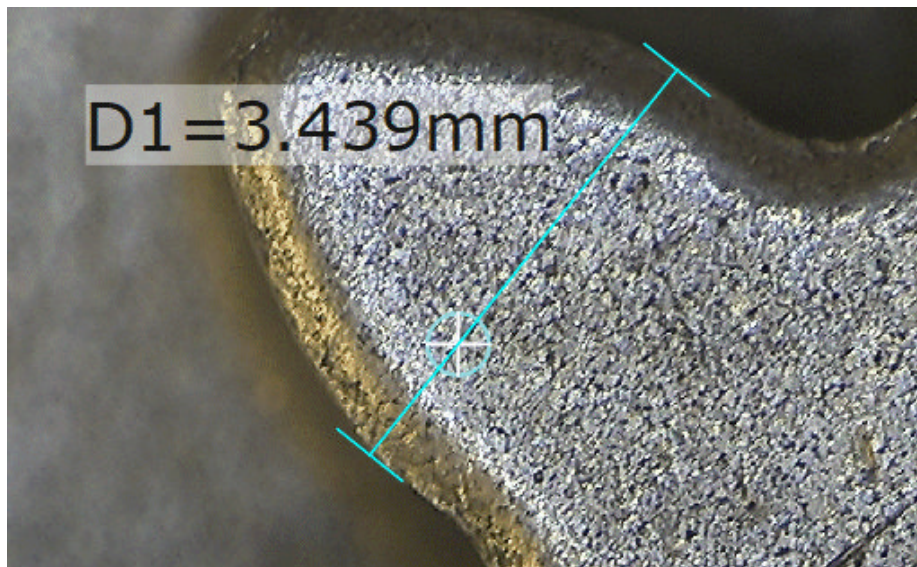
Snap Mode

To increase precision of the measurement, Snap Mode can be enabled in [Preferences](#). In this mode, starting and ending points of the current measurement is automatically snapped to the nearest point of a previously drawn circle centre, edge, or measurement line.

Snap Edge or Centre:






Snap Line:




Saving Measurements

Measurement results as well as calibration information is always saved together with the picture. All the saved measurements are part of the image and cannot be changed as they are burned into the image.

Click "Export" button  on the top-right corner of the table to export measurement as an Excel file.

Measurement Table					
	Tool	Parameter	Value	Unit	
1	R1	Length	5.99	mm	
2	D1	Length	11	mm	
3	FL 1	Perimeter	7.45	mm	
4	R2	Length	6.1	mm	
5	A1	Angle	90.1	°	


To close the table and return to the file structure window close table .


Annotation Tools

To select an Annotation Tool right click on the current  icon on the menu bar. Annotation tool menu will pop-up.







Left click on the desired tool to activate/deactivate. Last selected tool icon will replace the menu icon for quick access



 **Annotation with Line:** Draw the line and a text window will appear. Write a text or leave it blank to just draw a line. To annotate only a text, just click instead of drawing a line. Select is activated when annotation is completed to let you adjust position of the line and text box! Select annotation line or text box by left click and right-click your mouse button to delete all or to rename annotation text.

 **Counting Objects:** Choose the desired category from the counting window and count objects on the image by left clicking on each item. The counted object will be mark with the first letter of the selected category followed with the current count. After finishing counting objects, click **OK** to close category window.

Name of the categories as well as their font size and colour can be changed in [Preferences](#).


 **Draw a Line:** Press left mouse button to start and release to draw the line. Select  is activated when drawing is completed to let you adjust position and length of the line! Select line by left click and right-click your mouse button to delete.

 **Draw an Arrow:** Point to the object you want to mark, press left mouse button to start drawing arrow head and release to complete the line. Select  is activated when drawing is completed to let you adjust position and length of the arrow! Select arrow by left click and right-click your mouse button to delete.

 **Draw a Free Form Curve:** Press left mouse button to start drawing a free form curve and release to finish. Select  is activated when drawing is completed to let you change position of the curve! Select curve by left click and right-click your mouse button to delete.




Draw an Ellipse: Point to top-left edge of the area you want to mark with an ellipse or circle, press left mouse button to start drawing and release to complete. Press and hold **Ctrl** key to force ellipse be

drawn as Circle. Select  is activated when drawing is completed to let you adjust position of the ellipse! Select ellipse by left click and right-click your mouse button to delete.





Draw a Rectangle: Point to top-left edge of the area you want to mark with a rectangle, press left mouse button to start drawing and release to complete. Press and hold **Ctrl** key to force rectangle be

drawn as square. Select  is activated when drawing is completed to let you adjust position, size and shape of the rectangle! Select rectangle by left click and right-click your mouse button to delete.

Font size, line thickness and colour of annotation can be changed in [Preferences](#).

Overlay and Compare Tools

Reference Overlay Tools

To select an overlay tool right click on the current reference or overlay tool   icon on the menu bar. Overlay/Compare tool group will pop-up.



Left click on the desired tool activate/deactivate. Last selected tool icon will replace the menu icon for quick access.



Cross-hair: Left click to activate/deactivate Cross-hair on the screen. Thickness and colour of cross-hair can be changed in [Preferences](#).



Grid: Left click to activate/deactivate Grid on the screen. When Grid is selected first time, a new window will appear to define size of the grid. Right click on the Grid icon to change the grid size next time. Grid can be moved across the image field. Right mouse click to move it back to default centre position. Thickness and colour of cross-hair can be changed in [Preferences](#).



Rectangle: Left click to activate/deactivate Rectangle on the screen. When Rectangle is selected first time, new window will appear to define width and height of the rectangle. Right click on the Rectangle icon to change the rectangle size next time. To move the rectangle, click on it and drag to the desired location. Rectangle can be moved across the image field. Right mouse click to move it back to default centre position. Thickness and colour of rectangle can be changed in [Preferences](#).



Ruler: Left click to activate/deactivate the Ruler. Size and scale of the ruler depends on the current magnification. To move the ruler, click on it and drag to desired location. Ruler scaling as well as its thickness and colour can be adjusted in [Preferences](#).



Reference Scale: Left click to activate/deactivate a calibrated Reference Bar on the screen. Colour of Reference Scale bar can be changed in [Preferences](#).



Information: Left click to activate/deactivate the image information box. Image attributes such as image name, image size, calibration and device name are shown when Information is activated.

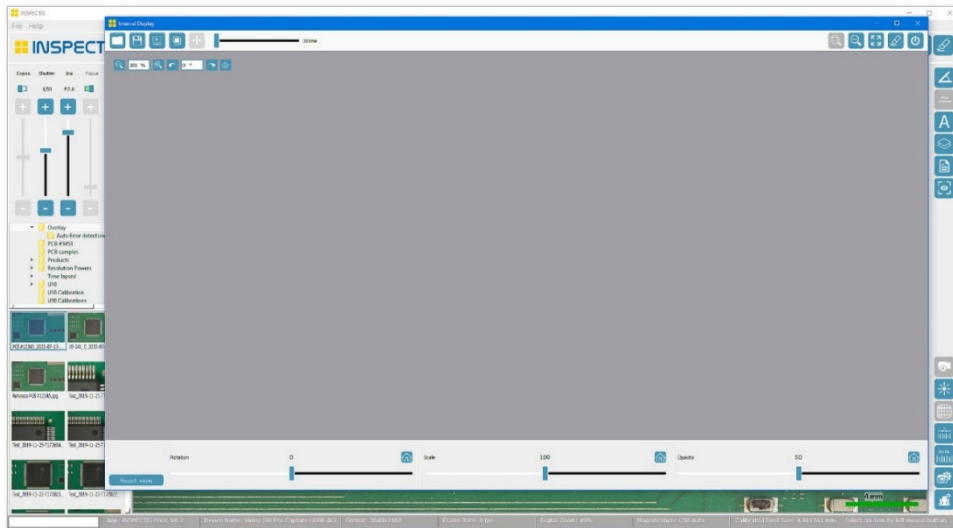
Timer Controlled Overlay Display


This feature overlays the live image of the camera on a still image with selective transparency. Images are turned on / off frequently with the help of an adjustable timer that allows the operator to detect any differences between them.

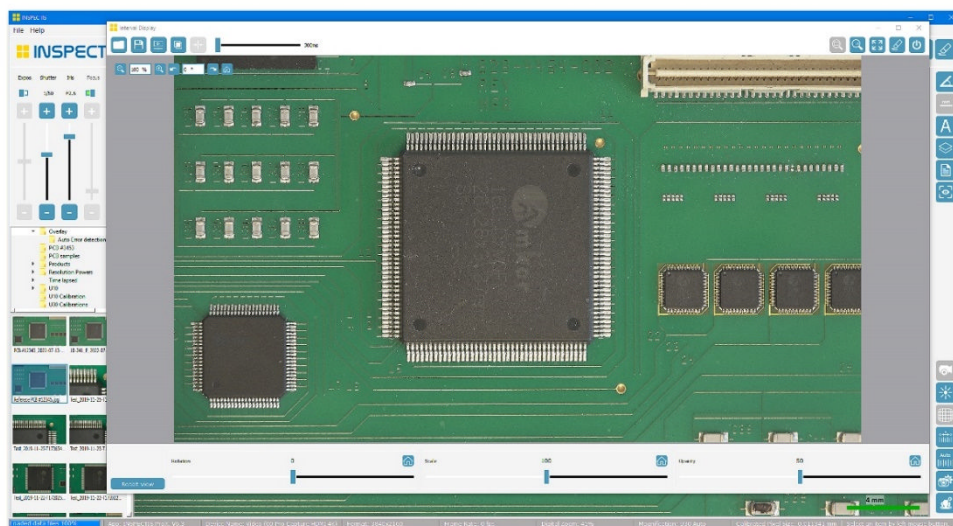
Before running this function, you must prepare and capture a reference image of your object to be inspected in a controlled lighting environment. Keep the lighting and camera settings the same when performing the overlay display.


Although the Timer Controlled Overlay Display function can automatically align the superimposed images, it is strongly recommended to use a holder or fixture to hold the inspecting objects in a fixed position.

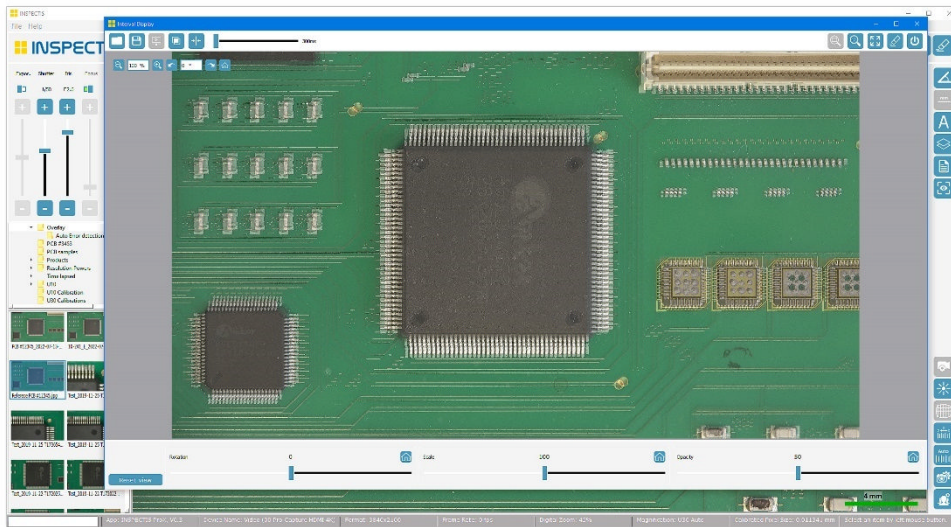
To start the TCOD click on the  icon on the menu bar.




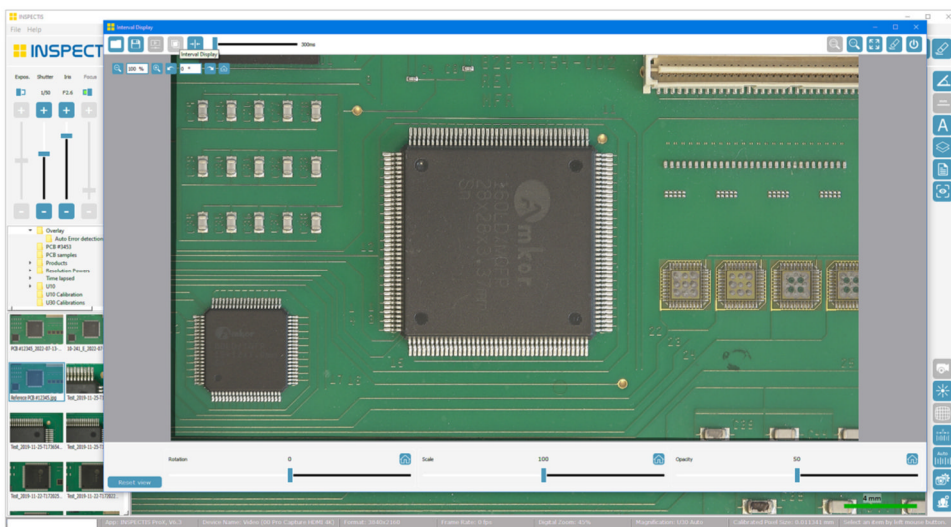
From main INSPECTIS window click on the reference picture. It will be display on TCOD window. You can also select the reference image via the  icon on TCOD window.




Switch on and overlay the live image via the  icon.




To align images based on the matched features, click on  icon [Shortcut A]. The overlay window shown above consists of 2 images and the result of picture alignment can be seen below.

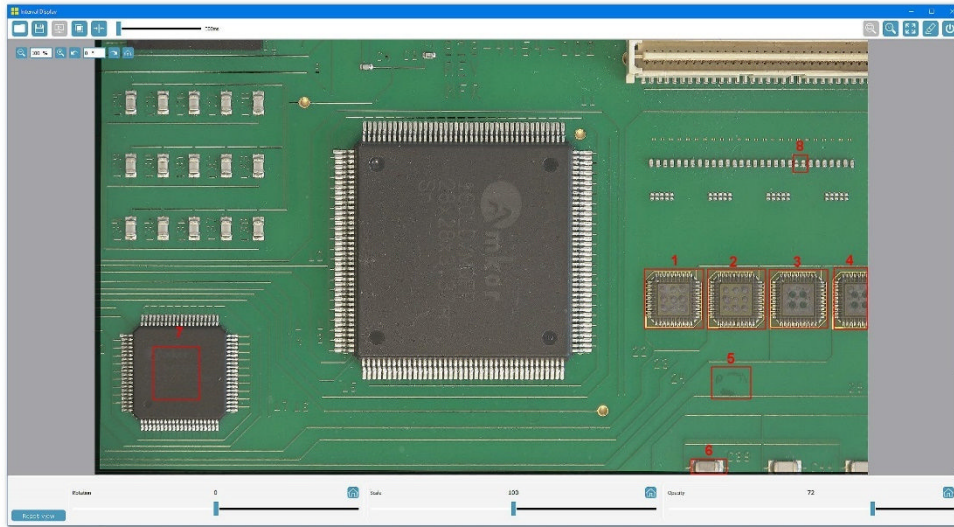




Select Interval Display . The TCO will now automatically switch off and on the overlay image at any defined frequency between 200ms to 2000m /switch. Adjust the frequency via the timer slider as desired.




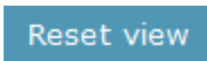
To go to full screen view, click . Press ESC on your keyboard or use the on-screen icons to exit the full screen view.

In current PCB samples 8 differences can clearly be observed by the operator.



To clear the view click  and to save the overlaid pictures on your working folder click  [Shortcut F10].

To rotate, scale or change opacity level of reference picture use control bars on bottom of the TCO window.

To Reset opacity click  . To reset view to initial rotation and scale click  .

Digital Graticule

Digital Graticule lets a custom designed pattern of lines, shapes, and annotations with transparent background in PNG format to be overlaid on the live image of digital microscope. This function is equal to placing a glass reticle into the eyepiece of an optical microscopes.

Graticule files can be produced in a graphical design program, like Photoshop, CorelDRAW etc. or directly in INSPECTIS ProX and OAI using the DXF Edit and Overlay tool. You can learn more on how to create graticule files in external programs in the document "How to generate Overlay pictures for INSPECTIS Software".

Graticule file format shall be same as the image format of your digital microscope e. g. 3840x2160 pixels for U cameras and 1920x1080 pixels for F cameras.



Right click to display the overlay icon group



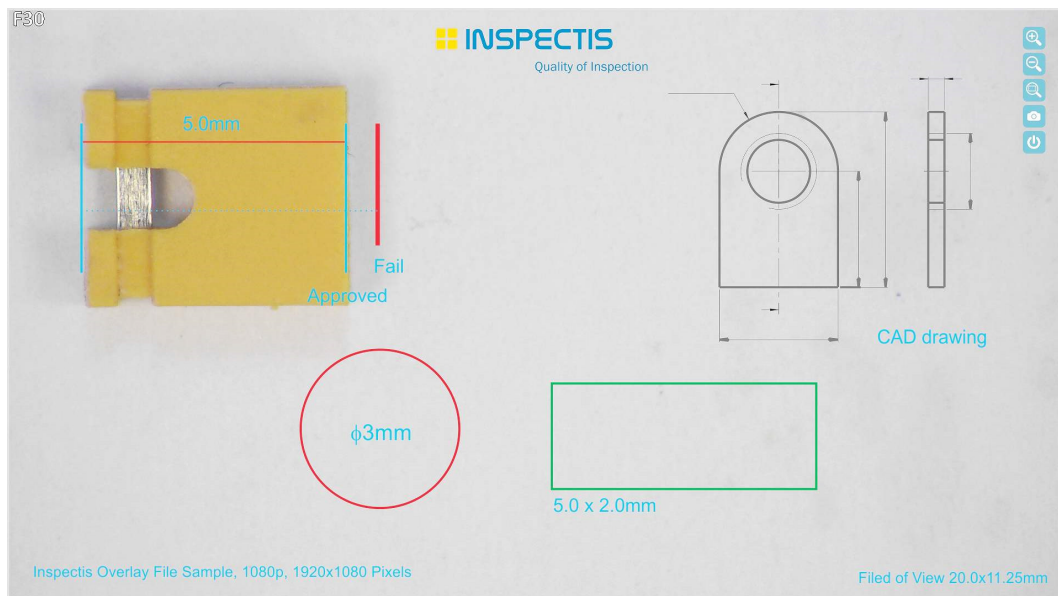
and left click to select the

graticule file in PNG. Once the file is selected the software will automatically overlay the picture on live image and switch to full screen mode.

To save the image with the overlay (and annotation, measurements etc.) press **F10**, to save the image without the overlay data press **F11** on the keyboard. Press **ESC** to remove the overlay and exit full screen.



To change the overlay image right-click on the icon .



To save the live pictures with the graticule pattern on your working folder click [Shortcut F10].



To insert a new graticule file, right-click on icon and select the file.


Compare Live and still Pictures

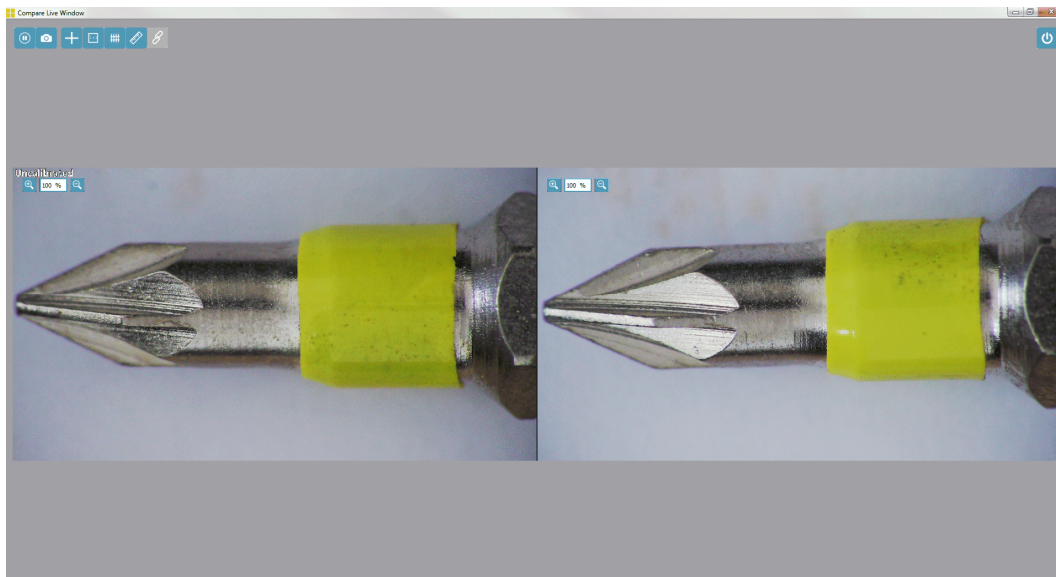
To select compare tools, right click on the current icon on the menu bar. Overlay/Compare tool group will pop-up.




Left click on the desired Compare tool to activate.

Compare Live Images


Left click  to run compare live window. Left view will display live image of the digital microscope and right view will be used for reference still image. To add a reference image, click on the image thumbnail in working folder or drag and drop the image onto the compare window. It is possible to activate reference tools (Crosshair, Rectangle, Grid and Ruler) on the live image.

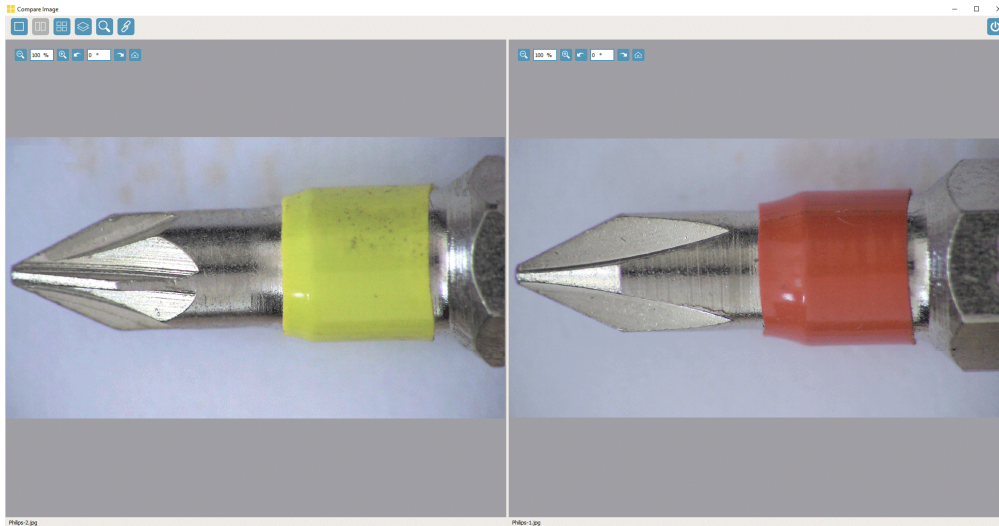


To zoom in/out images, top left controls on the Compare Live Image can be used. Press and hold the left mouse button and drag to pan the images.


To enable synchronized zooming and panning click  icon.





Compare Still Images

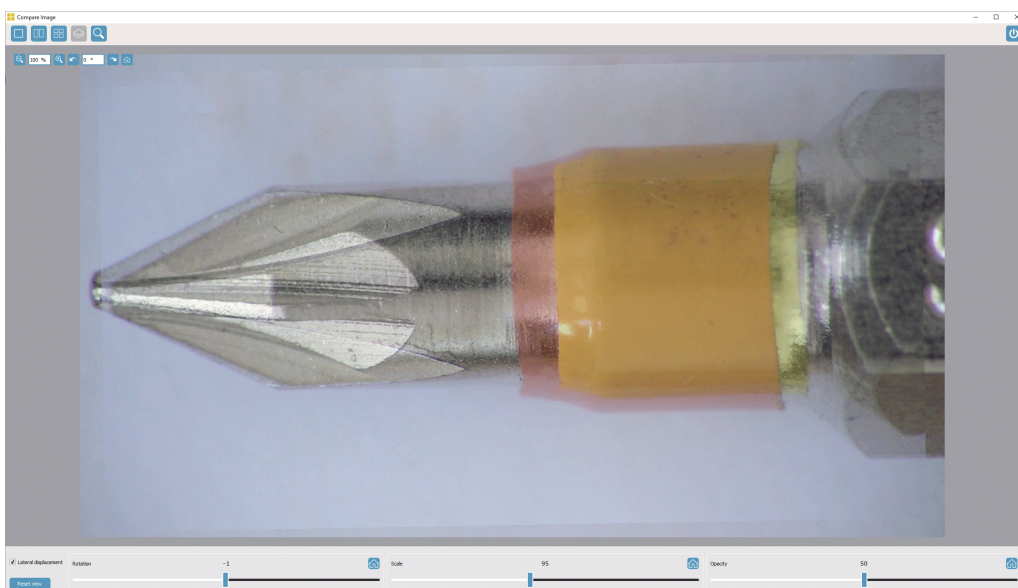
For comparing up to 4 captured images click to the  icon. To add an image to compare window click on the thumbnail at working folder or drag the thumbnail and drop it onto one of the views in the compare window. To remove an image right click on it with the mouse.



To zoom in/out and/or rotate images, top left controls on the individual views can be used. Press and hold the left mouse button and drag to pan the images.

To enable synchronized zooming, rotating and panning click  icon.

To switch between, one, two or four image view, press , ,  icons respectively. To activate Overlay View, click  icon.







DXF Edit and Overlay

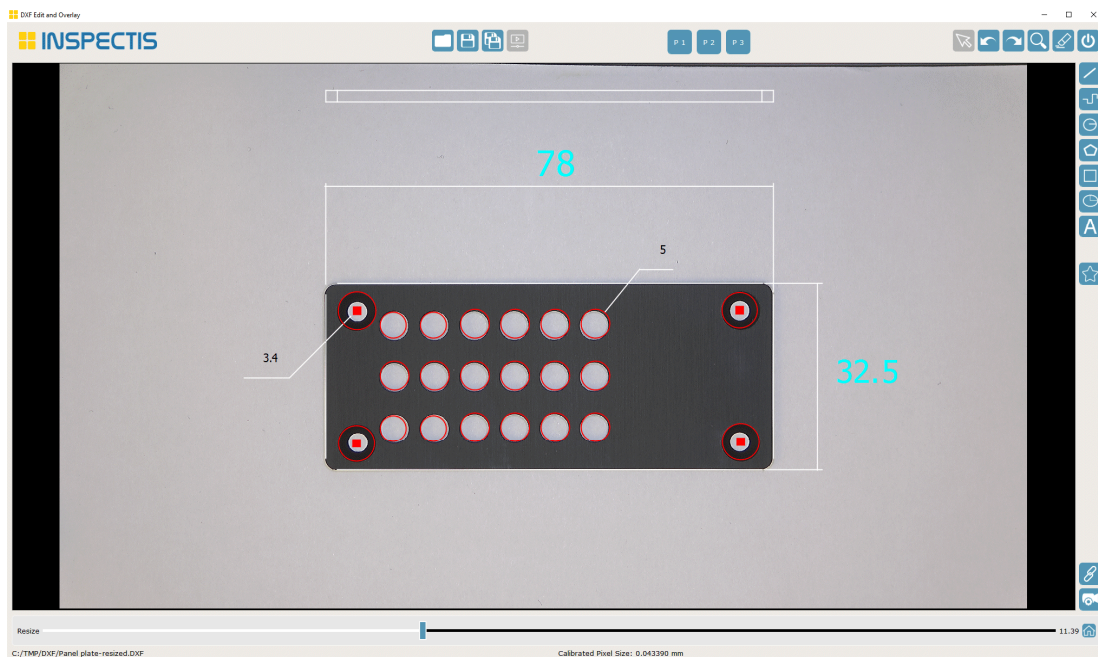
With DXF Edit and Overlay tool you may:



- Open an existing DXF file, edit and overlay on live image directly or save it in PNG format as Digital Graticule.
- Create a DXF file using the built-in drawing tools and save it in PNG format as Digital Graticule.
- Produce a DXF from an object using Optical Edge Detection tool.

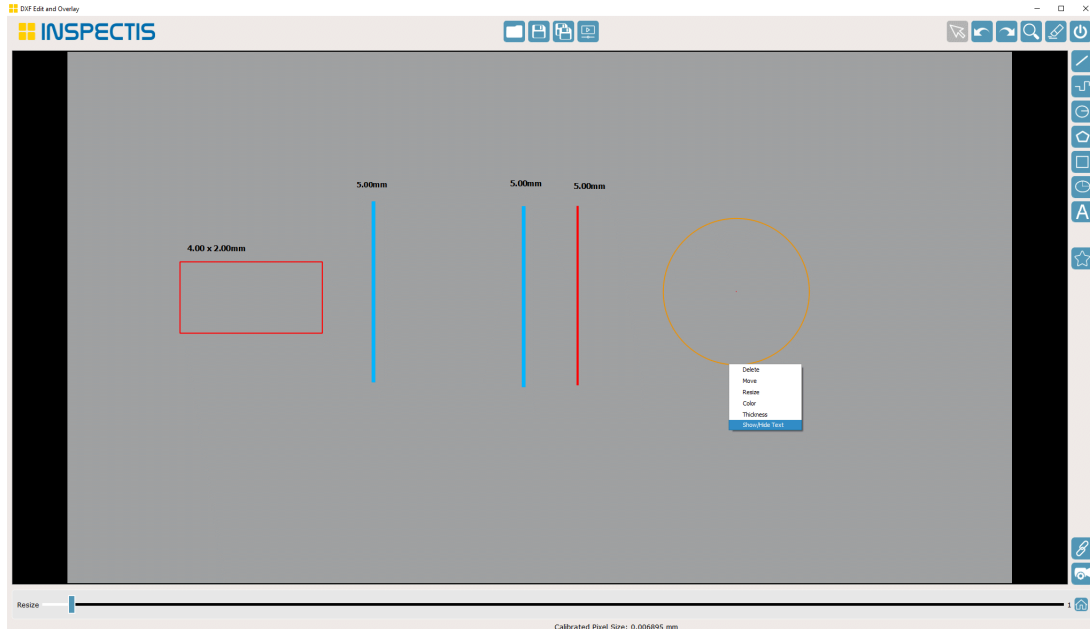
Before selecting DXF Edit and Overlay tool, set up your camera parameters and required magnification on INSPECTIS main window. Calibrate your magnification if necessary.

Under Overlay/Compare tool group  select DXF Edit and Overlay tool  .

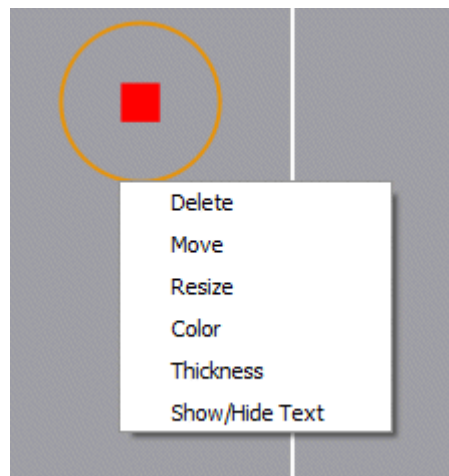
a) **Open an existing DXF file:** Select Open icon  to open an existing DXF file. Resize it to actual magnification using the Resize control bar on bottom of the window, edit and overlay on live image by clicking  . Save as editable DXF in vector format  or PNG image for overlay as Digital Graticule  .



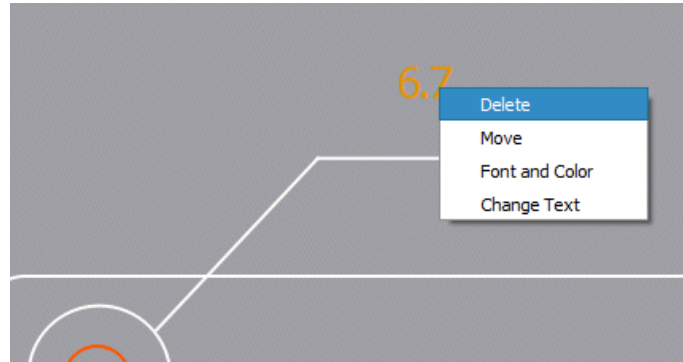
b) **Create a DXF file using the Drawing tools:** Turn off live image by de-selecting  and use drawing tools to create your requested patterns in DXF vector format. Line, polyline, circle, polygon, rectangle, ellipse, and text tools are available. Save the file in PNG for overlay as Digital Graticule .



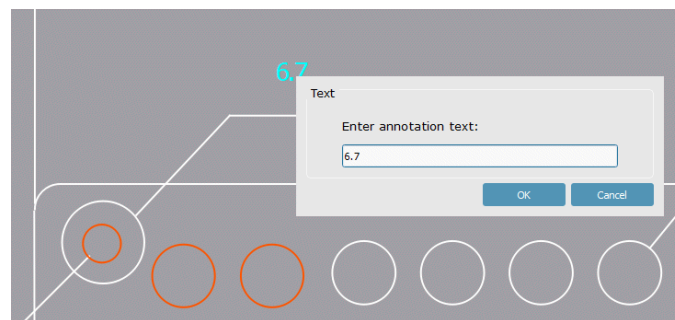
Right-click an object to Delete, Move, Resize, change Colour, change Thickness or Show/Hide geometrical value.



Right-click on annotation to Delete, Move, change Font and Colour and change Text.



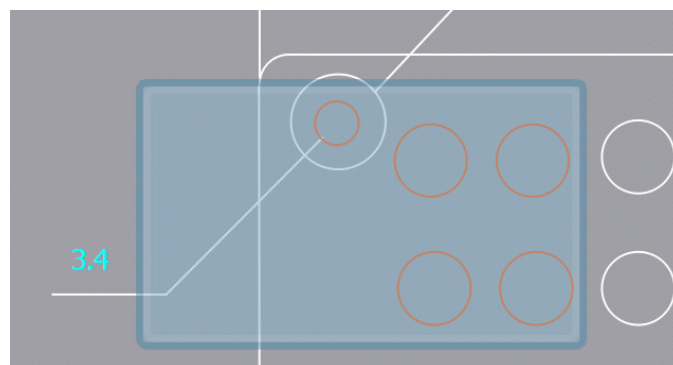
Double click on annotation to change the Text.




Double-click on an object to change size or scale of it.

Select more than one object at a time by enclosing the objects in a selection window specified by a rectangle with two corner points. Using the pointer, click the first corner, drag the pointer until all the objects are enclosed in the window preview, and click the second corner. Objects must be entirely within the window to be selected if you draw selection window from left to right.


Selected objects are highlighted by orange.



Link the DXF pattern to the live image with zoom tracking by selecting Magnification Tracking . Size of the DXF pattern will be adjusted proportionally when zoom/magnification is changed.

Optical Edge Detection

To start Optical Edge Detection select  under DXF Edit and Overlay window.

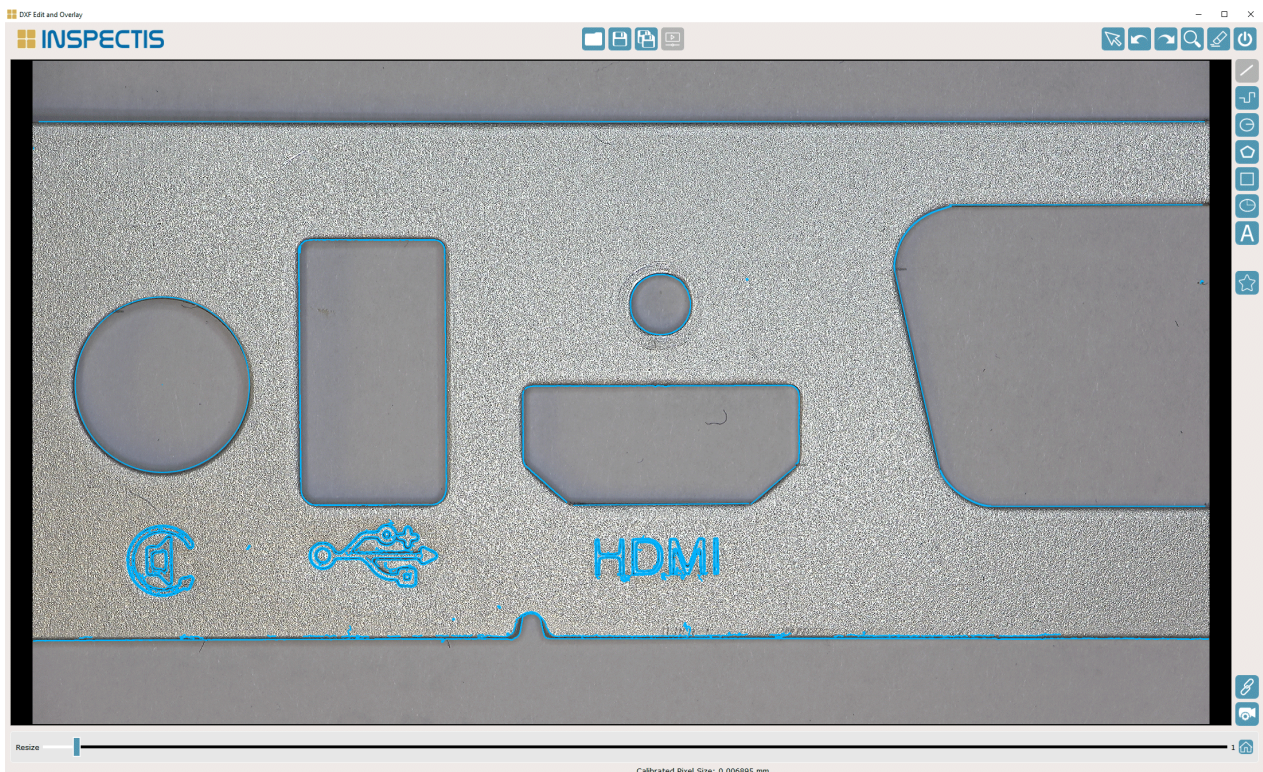
Select a still picture from main window or switch to live image .


Select Auto Thresholding or manually adjust controls to detect edges. Press **Done** when ready. Detected patterns are highlighted in DXF vector format and displayed on a new layer over the background picture. All detected objects can be edited by the INSPECTIS DXF editor and be saved as DXF or PNG

files using  button.

Auto Thresholding: Auto thresholding finds the edge detection parameters automatically according to the pixel intensity values.


Manual Thresholding: Filter Strength: Low pass filter to smooth out the image. Lower filter values preserve more details on picture. Thresholds: Lower and higher threshold pixel controls allow the user to reduce false edges. These values vary widely depending on sharpness, contrast and quality of the picture.

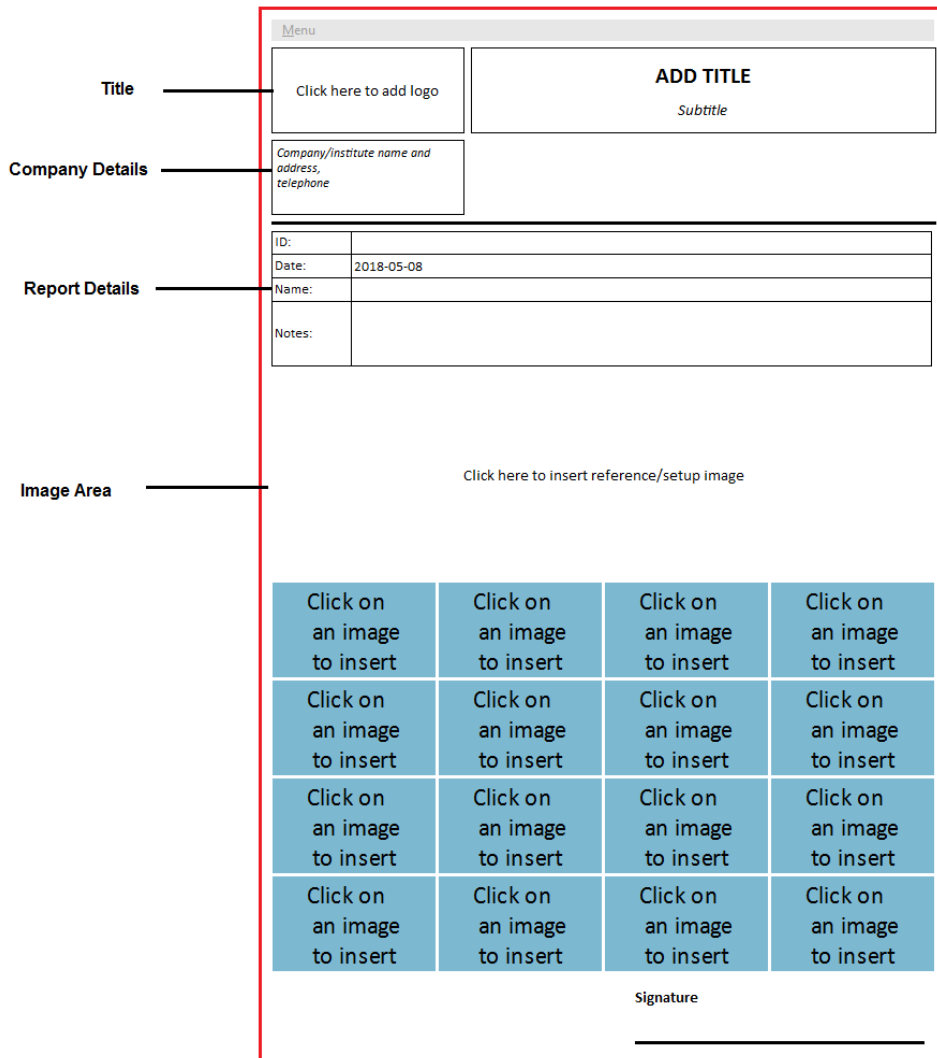


Save as PNG if you want to overlay the pattern on the live the image as Digital Graticule .

Save as DXF if you need to edit and file later.

Reporting

To start creating a report click  icon.



The screenshot shows a report creation form with the following sections and labels:

- Title:** Points to the top section containing a logo placeholder and a title/subtitle area.
- Company Details:** Points to the section for company/institute name, address, and telephone.
- Report Details:** Points to the section containing ID, Date, Name, and Notes fields.
- Image Area:** Points to the large area for inserting images, which includes a grid of 16 image placeholders and a signature line.

The form structure is as follows:

Menu

Click here to add logo

ADD TITLE
Subtitle

Company/Institute name and address, telephone

ID:

Date: 2018-05-08

Name:

Notes:

Click here to insert reference/setup image

Click on an image to insert

Click on an image to insert

Click on an image to insert

Click on an image to insert

Click on an image to insert

Click on an image to insert

Click on an image to insert

Click on an image to insert

Click on an image to insert

Click on an image to insert

Click on an image to insert

Click on an image to insert

Click on an image to insert

Click on an image to insert

Click on an image to insert

Click on an image to insert

Signature

Title Area: Add logo and editable title/subtitle to a report by clicking on the respective area. Title can be saved as a template for the future reports. Click "Menu/Save Template" to save the template

Company Details: Update company details. "Menu/Save Template" also saves company details.

Report Details: Editable fields to update the details. Date is auto-generated and can be edited.

Image Area: Click on an image in the thumbnail view to include it in the report. Right click to remove the image. A reference or set-up image can also be added.

Click Menu/ Save As PDF to save a PDF copy of the report and click on "Send As Email" to mail the report in a PDF format. Detailed information of each image as well as measurement results will be automatically printed on the report. A PDF reader must be installed on the PC to view the reports.

Notes

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System Requirements

Minimum System requirements:

Component	Minimum specification
CPU	Intel Core i5, CPU @ 2.4 GHz or faster
Operating System	Windows 10/11 (x64 version Professional, Enterprise)
Memory	8 GB of RAM
Hard disk	200 GB of Free Space
Display	Laptop: 15.6" / 1920 x 1080 (Full HD) PC: 24"-27" / 3840 x 2160 (4K)
Ports	One USB 3.0 or USB3.1 or USB3.2 port (5Gbit/s) Two USB 2.0 port One PCIe Gen2 x4 (if PCIe converter is used)

Recommended computers by Inspectis:

- **Station:** HP Workstation Z2, Intel Core i7, 16 GB RAM
- **Laptop:** DELL Latitude 3520, Intel Core i7, @ 4.8 GHz, 8 GB RAM 15.6", Full HD
HP EliteBook, Intel Core i7, @ 4.2 GHz, 8 GB RAM 15.6", Full HD

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