



Instructions Manual

INSPECTIS[®] OAI v7.2

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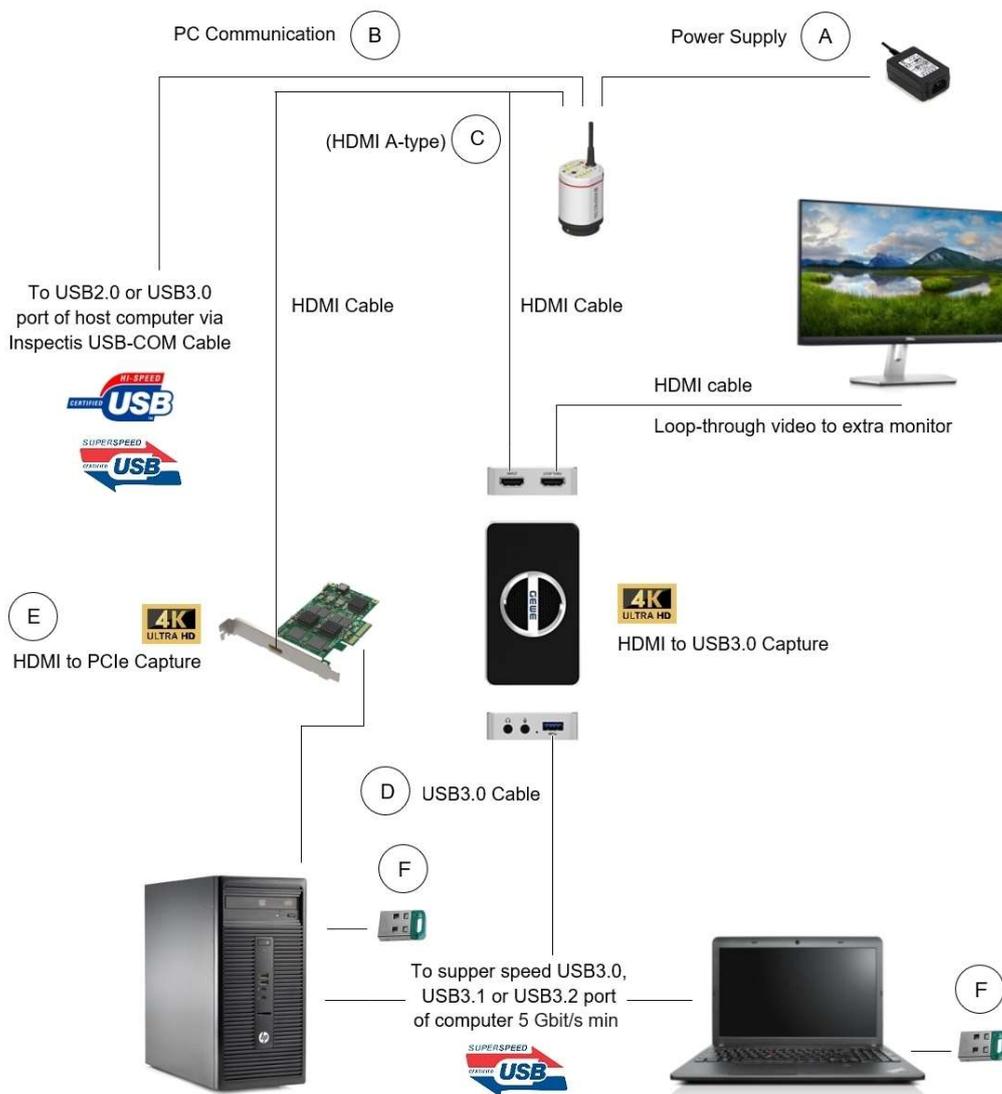
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Installation and Setup

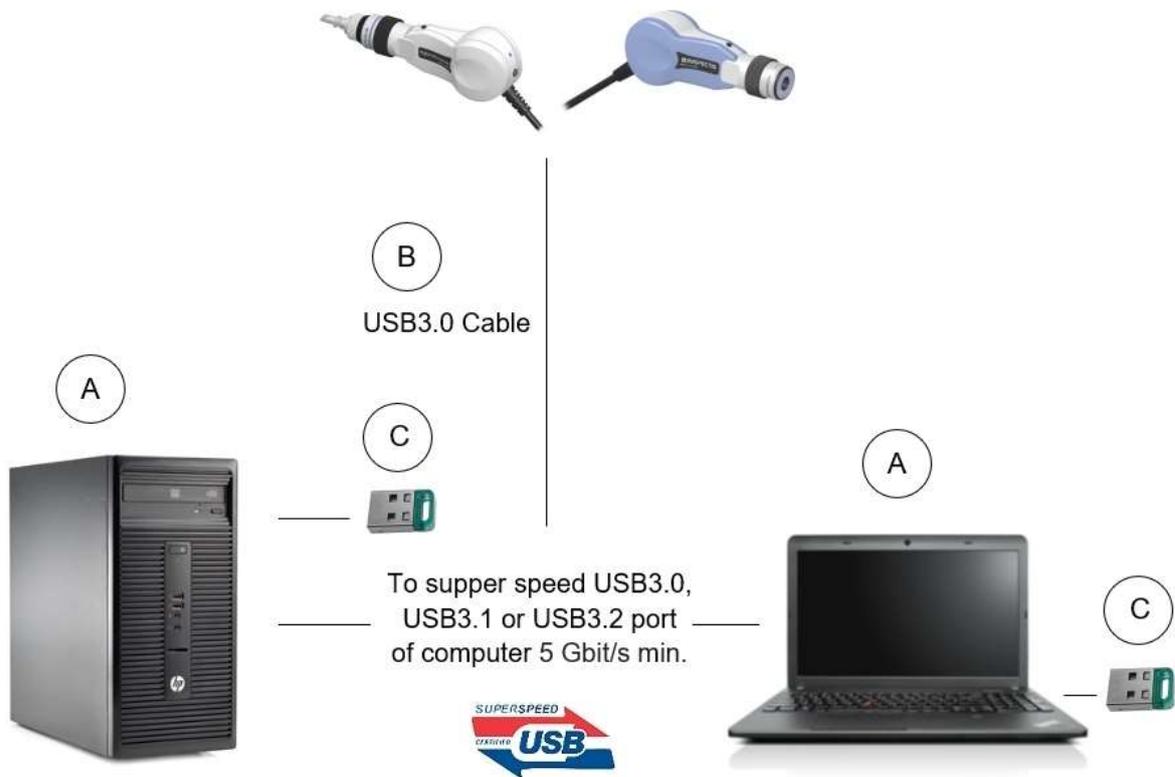
Connecting the 4k or FDH Digital Microscopes

- A. Connect the provided 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.
- F. Plug the software protection Dongle to a free USB port of the computer. Dongle is not needed if you intend to install the 15 days trial version of INSPECTIS software.
- G. Install INSPECTIS software. Refer to page 6 for detailed instructions.



Installing the USB Digital Microscopes

- A. Plug the Digital Camera to a free USB3.0, USB3.1 or USB3.2 port of the computer. Minimum bandwidth requirement for the USB port is 5Gbit/s.
- B. Plug the provided software protection Dongle to a free USB port of the computer. The protection dongle will be found inside the product box. Dongle is not needed if you intend to install the 15 days trial version of INSPECTIS software.
- C. Install INSPECTIS software. Refer to page 6 for detailed instructions.

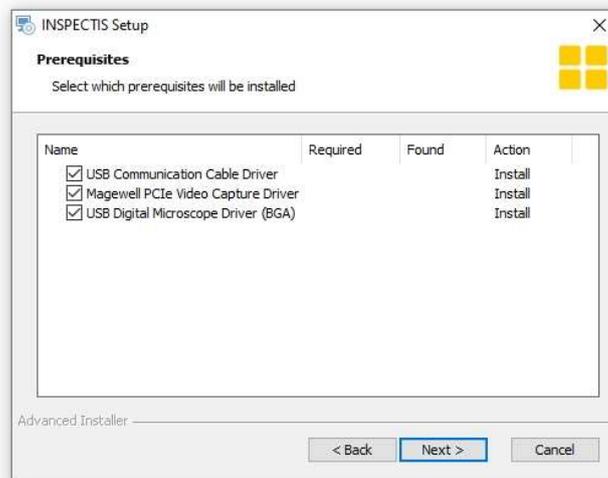


Installing INSPECTIS Software

- 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:

1. Plug the provided software protection Dongle to a free USB port of your computer. The protection dongle will be found inside the product box.
2. Run the setup file. The installation wizard will start and guide you through the installation.
3. All device drivers will be installed automatically by the installation wizard. If drivers are already installed in your computer, or if you are not using PCIe Converter or USB Digital Microscope devices, uncheck the relevant boxes.



4. Follow on-screen instructions to complete the installation.
5. When the installation is complete click "Close" to exit the window.

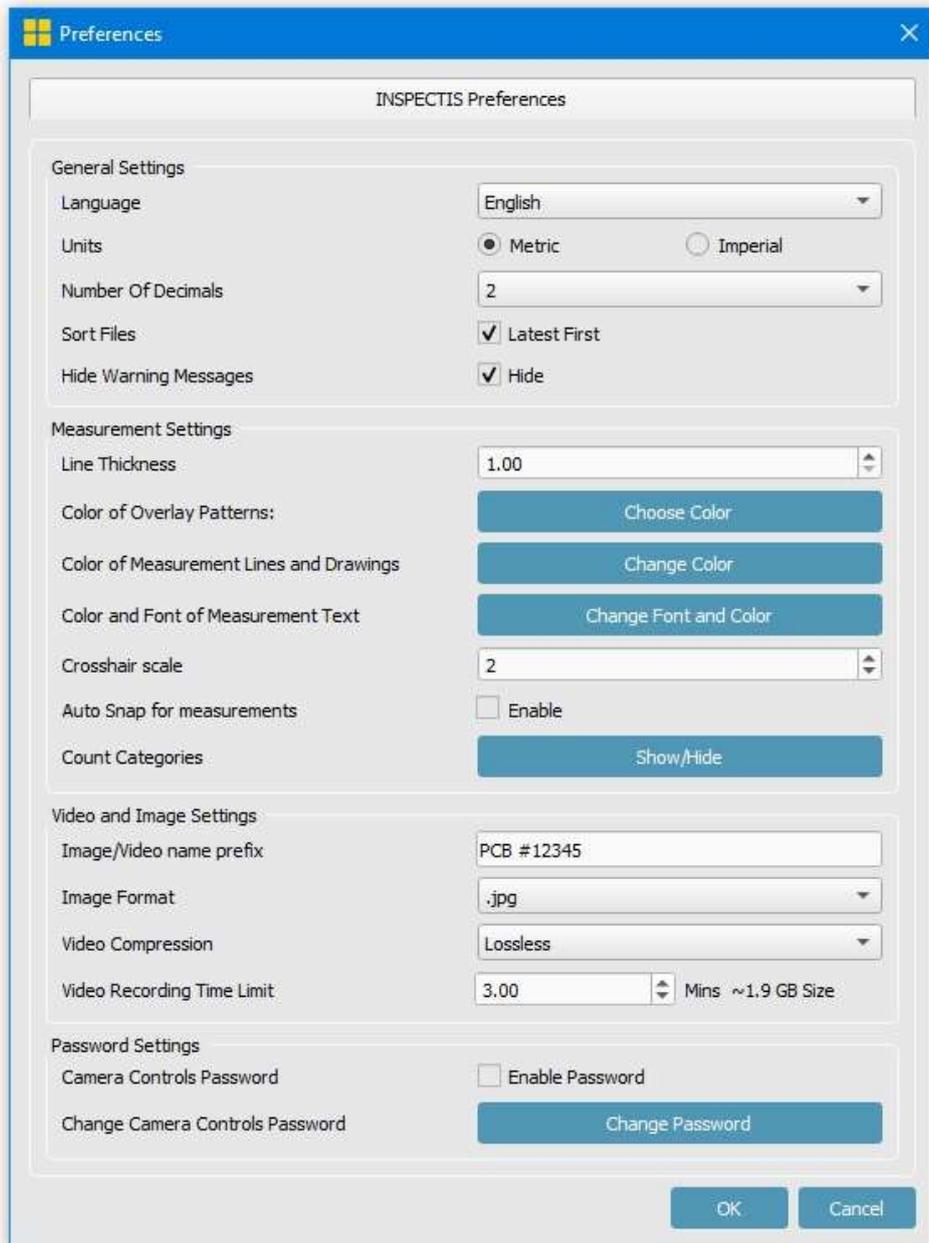
Running INSPECTIS for the First Time

1. Before launching INSPECTIS software please make sure your Inspectis digital microscope is connected to the computer. Refer to previous chapter on how to connect your device.
2. Make sure the software protection dongle is plugged into a free USB port on computer.
3. Right-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 OAI"** if a full license has been ordered.
 - 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 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.

Software Preferences

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



Setup your preferred Language, Units and Number of Decimals to be displayed 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.

Entering a password blocks unauthorized access to the Preferences and Camera Control dialog box.

Device Settings

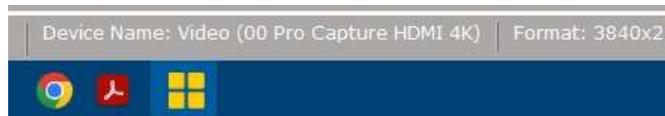
Selecting Device

Click  to show the device settings menu and select  to see list of the available Inspectis devices. Select your device to connect it to INSPECTIS.

Your Device	Device Name
FHD 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), Video (Pro Capture)
USB3.0 Digital Microscope (BGA)	-> Inspectis 5MP Camera

Once the device is selected, software automatically sets the optimum device settings. Your device will be automatically set by INSPECTIS next time you launch the program.

INSPECTIS software displays connected device names on the status bar.



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

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 5MP Camera** -> (BGA)
2. **Video (Pro Capture HDMI 4K)** -> (PCI Converter)
3. **USB Capture HDMI 4K+** -> (USB3.0 Converter)

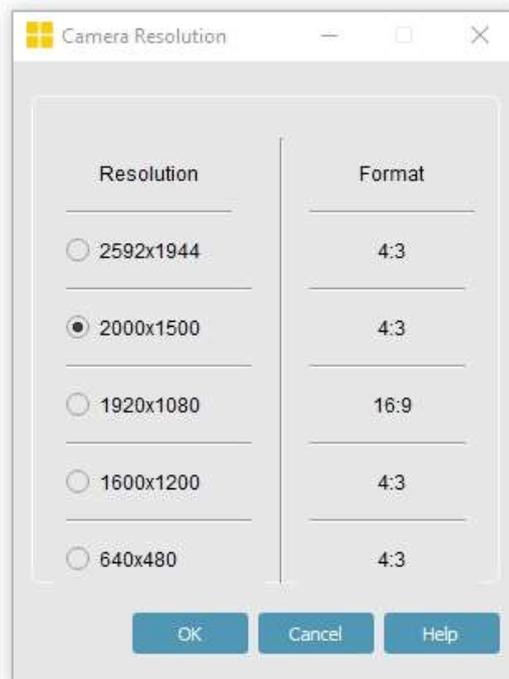
To restart your device while software is running, press F12 on your computer keyboard.

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.

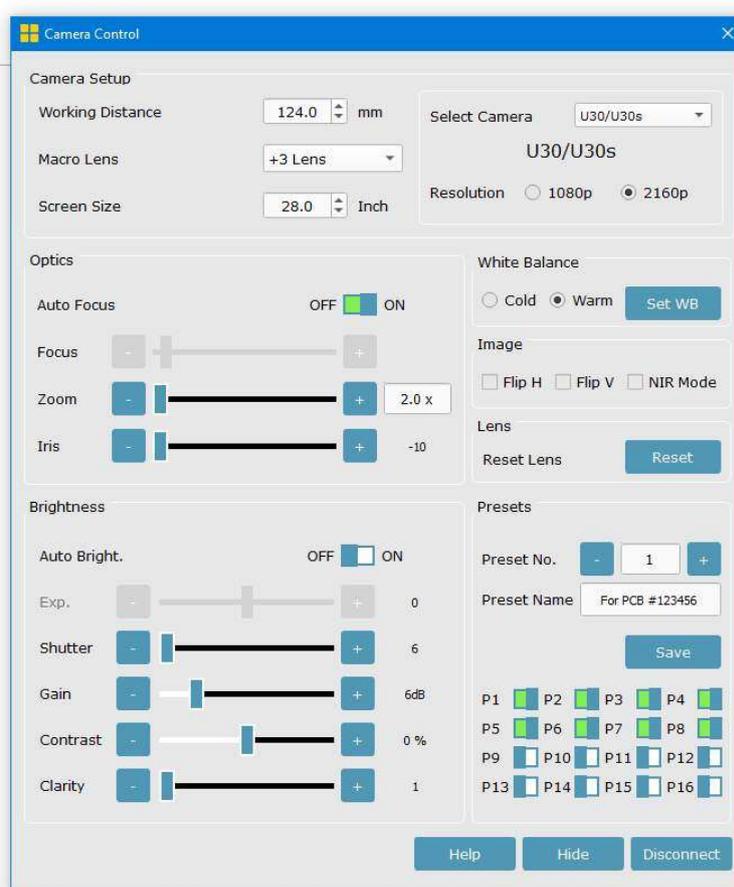


Camera Connection, Control and Setup

Connecting U and F type Digital Microscopes to INSPECTIS Software

INSPECTIS software needs to be connected to F and U type Digital Microscope via Inspectis USB-COM communication cable. Inspectis 5MP Camera (BGA) communicates with the software via its USB interface.

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.

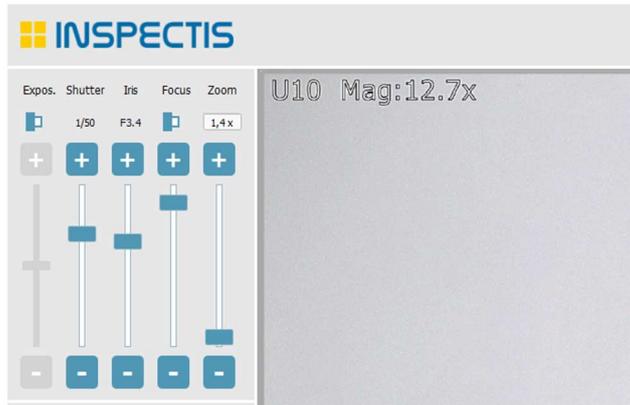


For learning how different lens and camera attributes affect the picture, refer to the white paper provided by Inspectis.

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

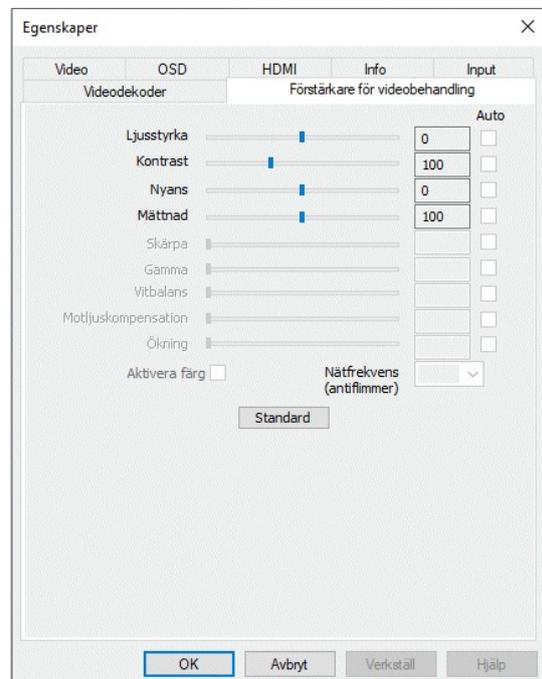
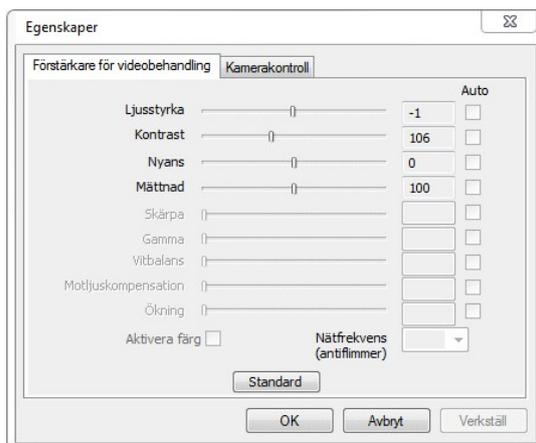
To hide Camera Control dialogue press Hide  button.

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.

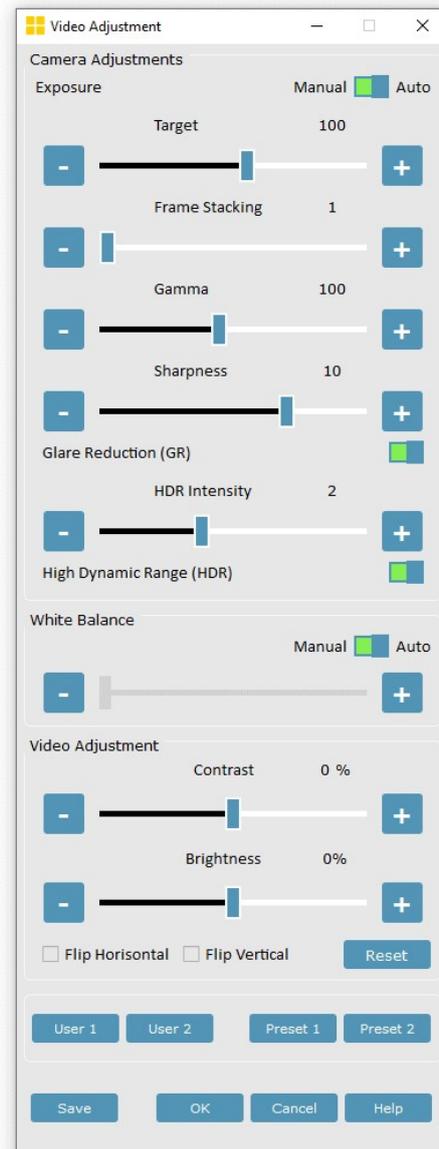


Connecting USB Digital Microscopes to INSPECTIS Software

Inspectis 5MP Camera (BGA) communicates directly with the software via its USB interface.

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

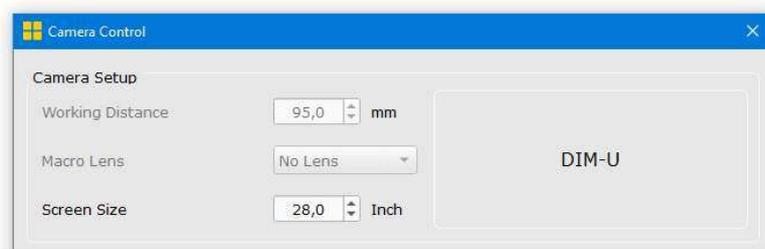
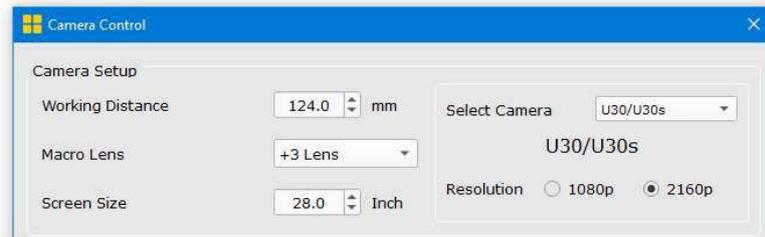
User buttons  or Preset buttons  at INSPECTIS main window recalls previously configured and saved Camera setups.



Setting up the Camera and the Lens

Thanks to the real-time communication with the Digital Microscope, INSPECTIS 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

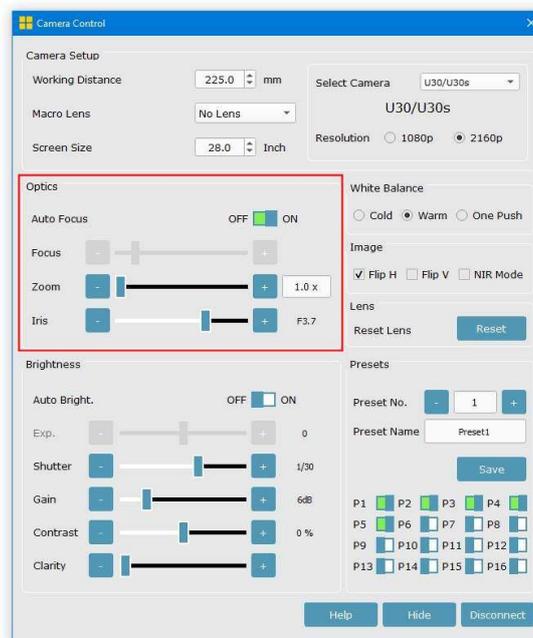
If your F30s, F35x or U30s camera is Long Working Distance, select it from the menu. Pre-defined calibrations of the LWD type cameras are different and will be automatically loaded when you select the LWD.

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, select 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.

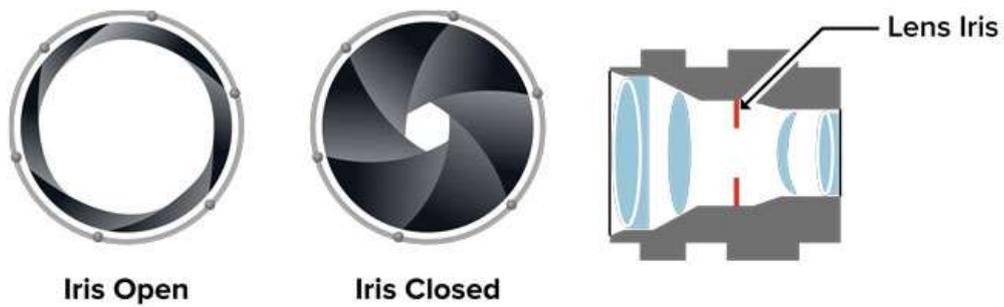
Use +/- buttons or drag the focus handle.

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.

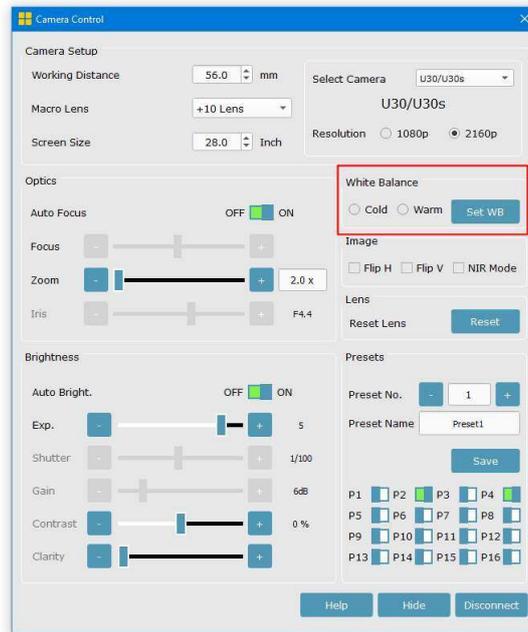


If your application requires a large depth of field, close the Iris a few steps (e. g. use higher F-numbers) and compensate for the image brightness lost with more illumination, slower shutter speed and/or more gain. Pay attention to the fact that too slow shutter will affect frame rate of the live video.

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.

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.

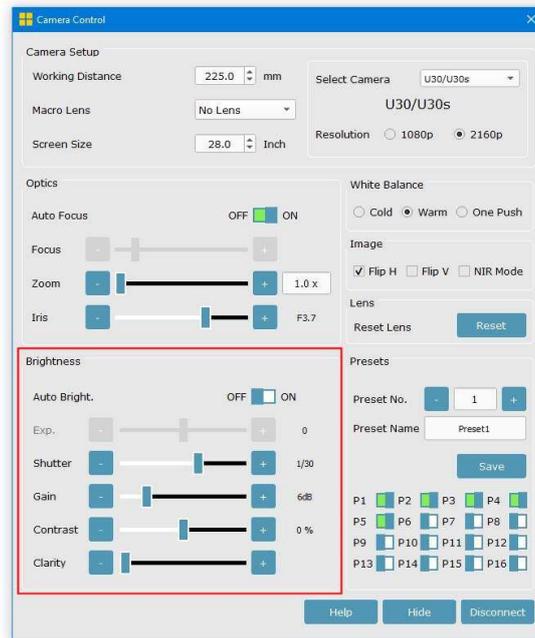
One push WB data is lost when the camera power is turned off.

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



Brightness (Shutter, Gain, Contrast, 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

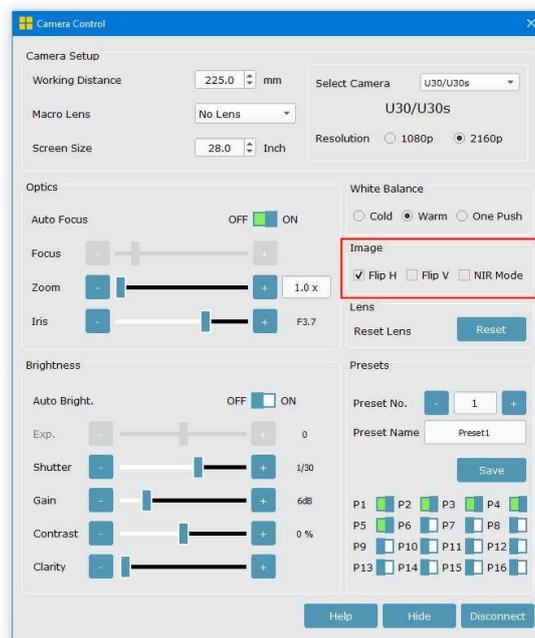
Clarity adjusts only the mid-tones of the image colours and makes the object appear clearer and sharper.

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

Image Flip and NIR Mode

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

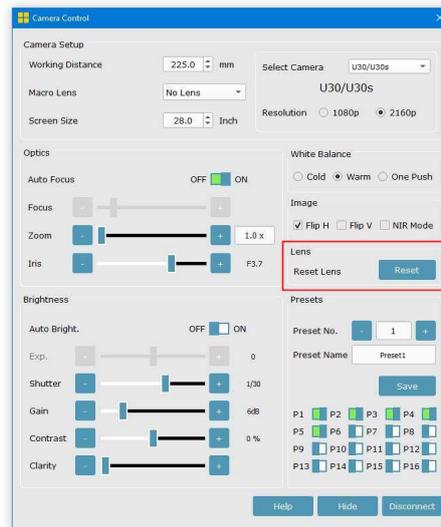
The NIR mode removes the near-infrared short-pass filter that is physically installed in front of the image sensor. The sensitivity in the near infrared region (λ 660-1000 nm) is increased by disengaging the NIR filter. When the NIR Mode is selected, the image becomes black and white.



Reset Lens

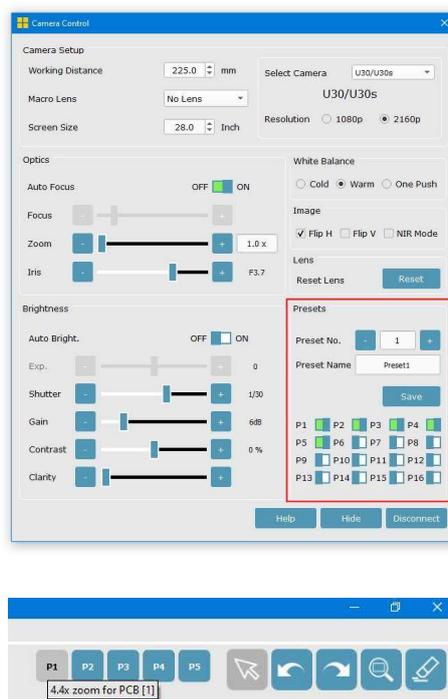
This function initializes the zoom and focus lens stepper motors and sends them their initial positions. When the camera is turned on or when the camera is connected to the software, the lens is automatically reset to its starting point.

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

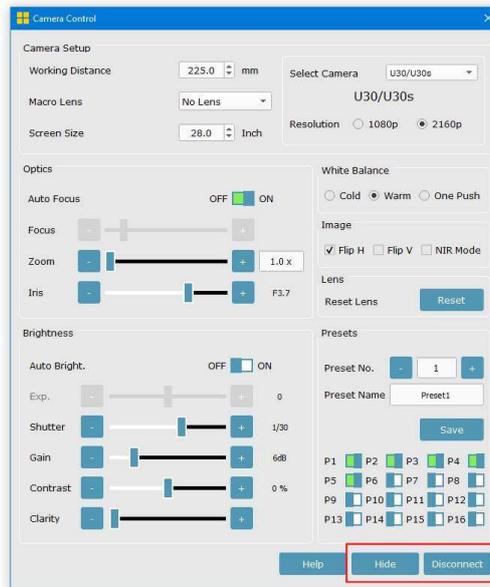
Up to 16 camera and lens configurations can be defined, saved, and recalled via hotkey icons on the INSPECTIS main window. Hotkeys are numbered P1 – P16. Their user-defined names can be displayed by hovering over the buttons.



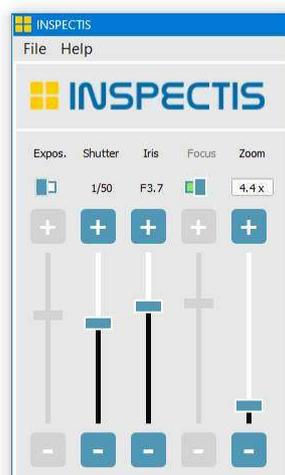
Hide and Disconnect

Pressing Hide closes the camera control dialog and returns to the main INSPECTIS window while communication is still active. Basic camera and lens controls are visible at the top left of the main window.

Disconnect interrupts communication between the camera and the software.

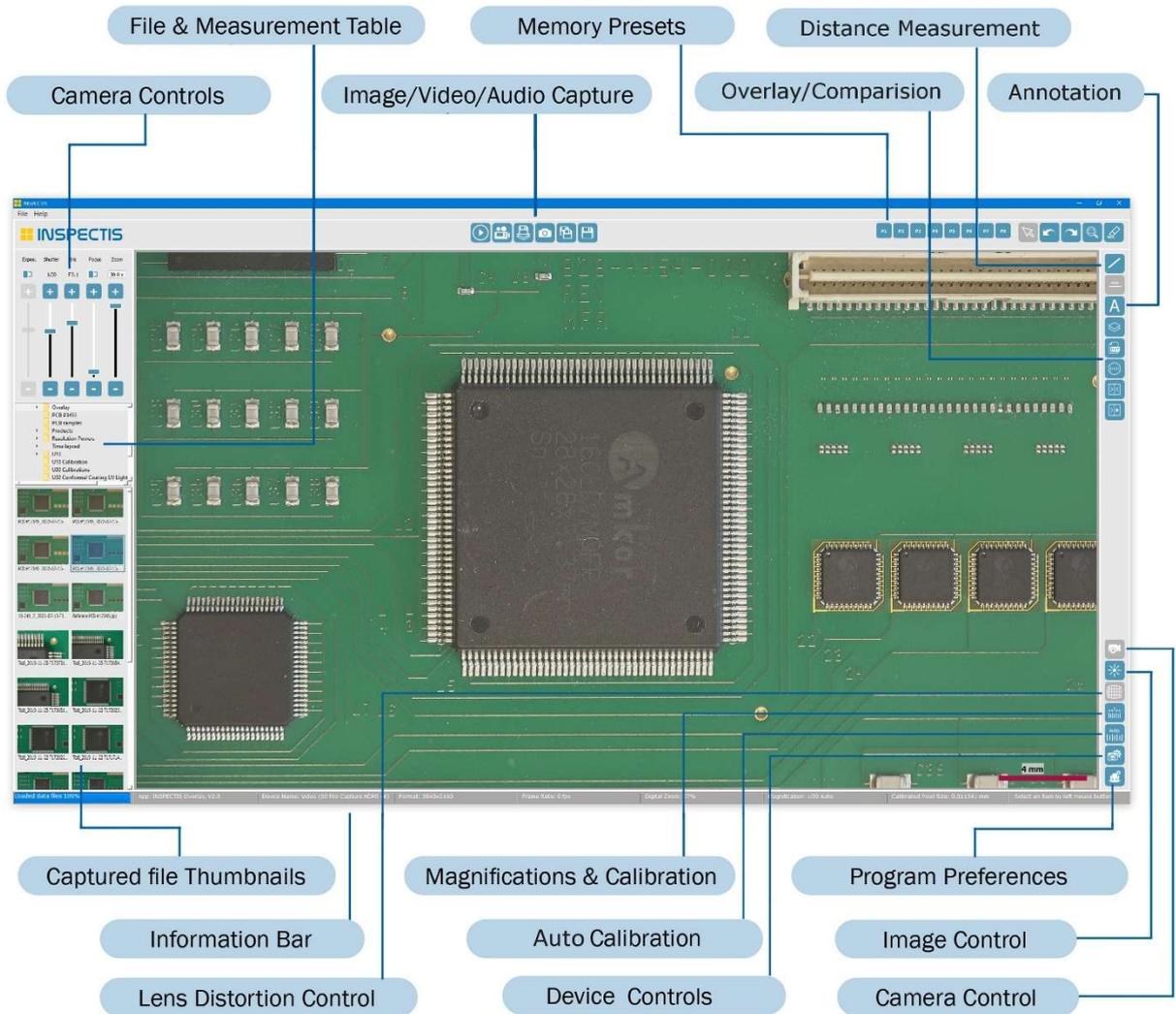


Basic camera and lens controls are visible on top-left of the Inspectis main window once you hide Camera Control dialogue.



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.



Most of the functions are available with a shortcut key indicated as [key] for quick access.

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]



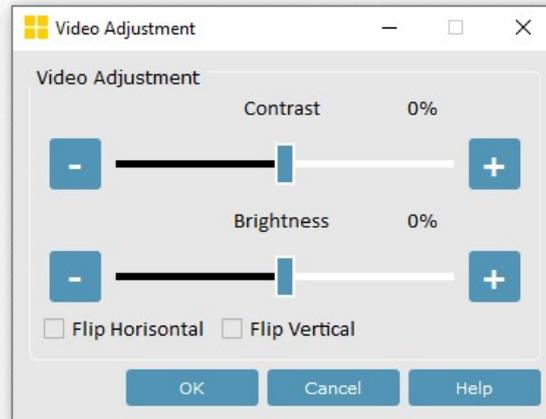
Full Screen [Shortcut Key: F6]. To close the full screen view, press ESC or press the  icon.

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.

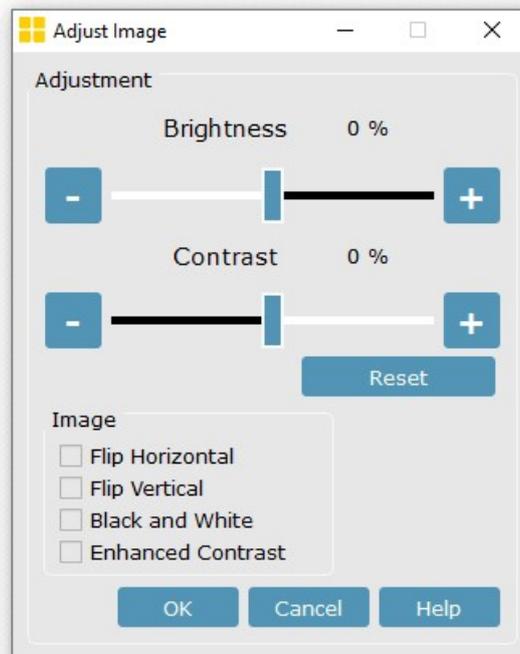
Image Adjustments

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

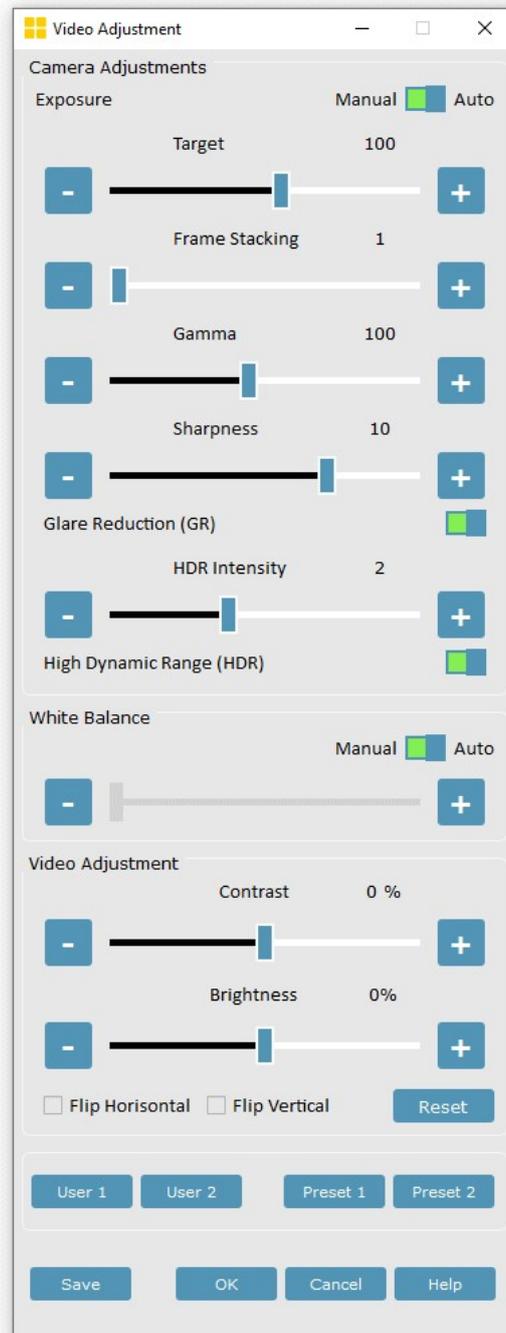
If image is Live user can change orientation of the image, brightness, and contrast values. Notice frame rate of captured video might be affected if Contrast and Brightness are added to live video.



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.

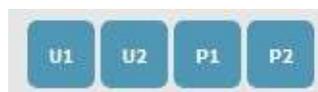


If your connected device is Inspectis 5MP Camera (BGA), the Video Adjustment dialogue will be according to below picture:



Two factory-set camera settings **Preset 1** and **Preset 2** are also available. These presets are fixed and cannot be changed.

If your device is Inspectis 5MP Camera (BGA), **User 1**, **User 2**, **Preset 1** and **Preset 2** settings will be available as **U1**, **U2**, **P1** and **P2** quick-access buttons on top-right of the INSPECTIS main window.

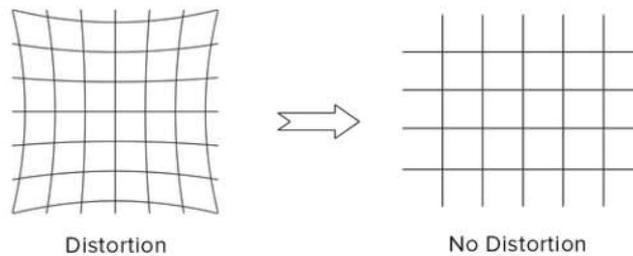


Distortion Correction

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

Automatic distortion correction is enabled automatically when the camera is connected to the software.

Switch off/on the Distortion Correction using  icon.



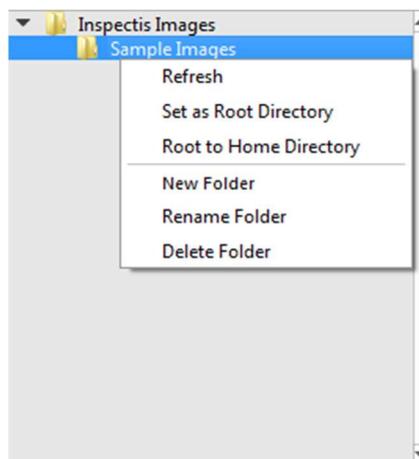
Distortion Correction is applied for 1x to 4x zoom factors only. Notice frame rate of the live video is reduced when DC is processing.

Folder Structure and Thumbnail View

Folder Structure

Right click on the folder structure and choose the working folder to be used for saving the 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:

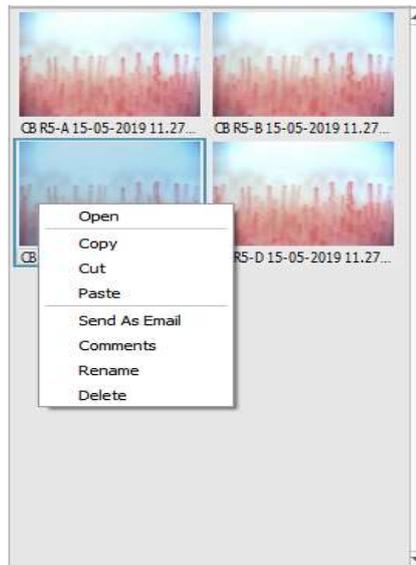


By clicking "Set as Root Directory", other folders except for the selected working folder will be hidden.

Clicking "Root to Home Directory" will display all folders.

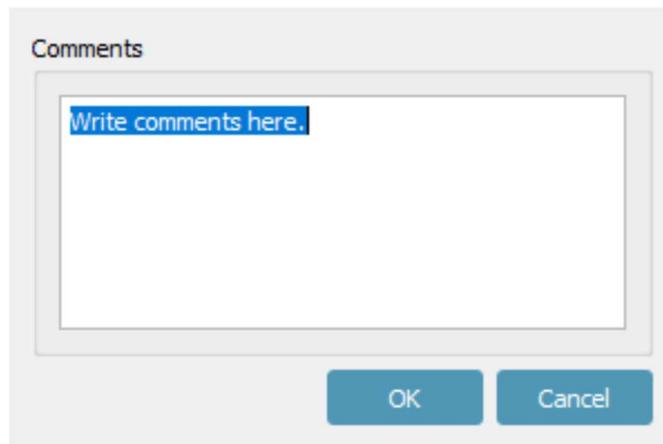
Thumbnails and Image Functions

By right-clicking on a saved image thumbnail, image functions are displayed



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. Comments will also be automatically printed on the Report when you attach the image to the report.



Saving Images

There are four options for saving an image:



Save Averaged Images [Shortcut Key: F9]. Captures multiple images and combines them before saving the final image. Results in a clearer image with less noise.



Capture Live Image [Shortcut Key: F11]. Captures a still image from live video and saves it under current working folder as .jpg (default) or .png. 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 As [Shortcut Key: Ctrl+A]. Saves the image with user specified name and folder.

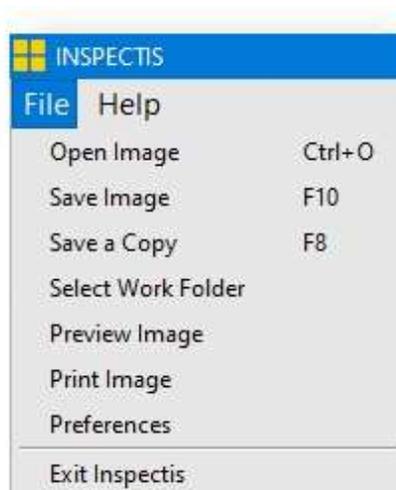


Save Image [Shortcut Key: F10]. Saves the image together with measurements and overlays under the current working folder. Image will be automatically labelled with date and serial number with "*_measured*" suffix.

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.



Recording Video

Click on  icon to start recording a video at .AVI format. [Shortcut Key: F2]. Image shall be live to record a video.

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 under [Preferences](#).

Measurements and Analysis Tools

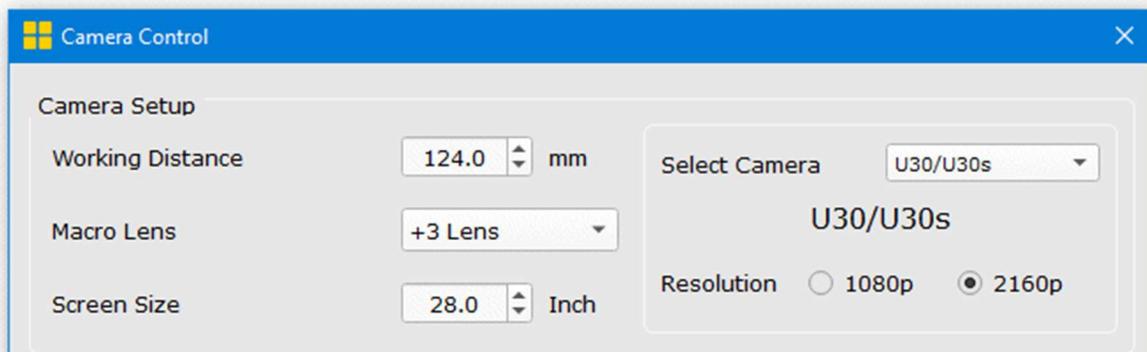
For performing accurate measurements, current magnification must be calibrated and working distance be kept unchanged.

If your digital microscope is connected to the host computer via the Inspectis communication cable, factory default calibrations would be available for the entire zoom range of your digital microscope.

The software tracks the zoom automatically and displays calibrated magnification value for each zoom position at the top left of the INSPECTIS image field. Note that default calibrations are only valid if the working distance of the digital microscope is set correctly.

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

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

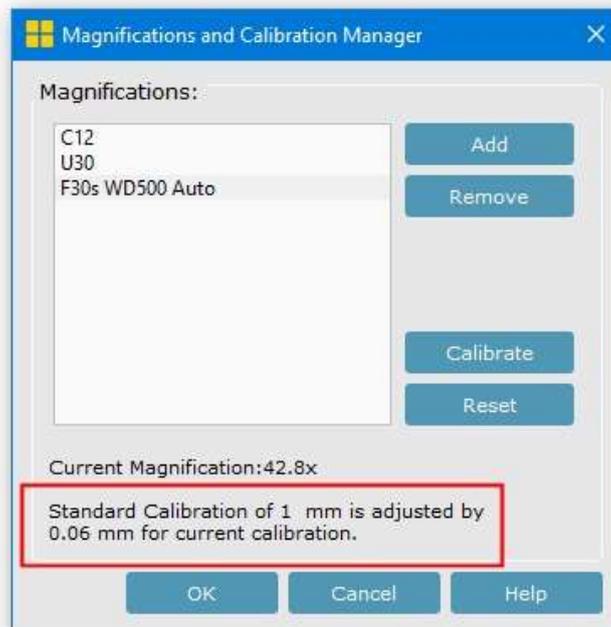
All Inspectis digital microscopes are pre-calibrated. However, to achieve high measurement accuracy, you must perform new careful manual or automatic calibrations for your preferred magnifications and working distances.

Each new custom calibration will adjust the default calibration in INSPECTIS by a correction factor. Information about how much the default calibration is adjusted is displayed for each magnification in the Magnification and Calibration Manager dialog.

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

Reset

button on Magnification and Calibration Manager dialogue.

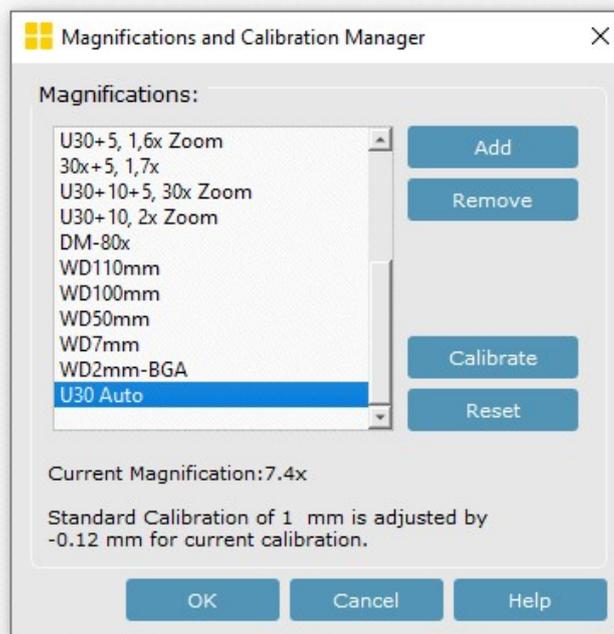


Magnification Manager

When your digital microscope is connected to the software, automatic magnification will be used by default. This is displayed at the top left of the INSPECTIS image bar as "xx Auto", where "xx" is the name of your U, F, C or DIM digital microscope.

However, custom magnifications for any specific zoom position can be added and calibrated to the software via the Magnification and Calibration Manager.

Click the icon  to display the dialog. You can select and use a custom magnification as long as the zoom position of the digital microscope is unchanged. When the digital microscope zoom position is changed, the software returns to the 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

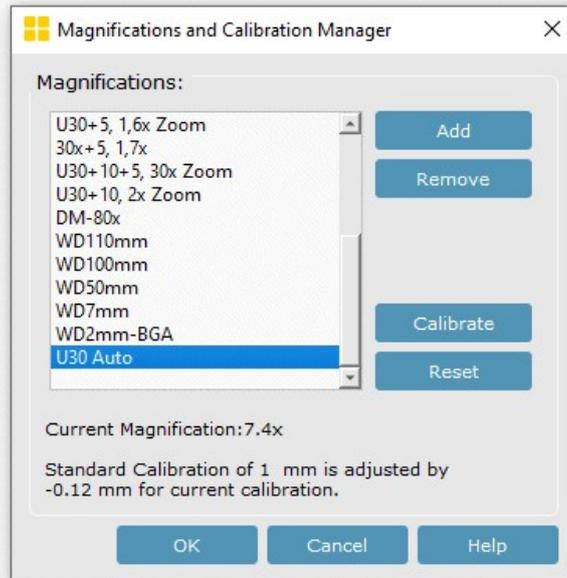
 Reset

button on Magnification and Calibration Manager dialogue.

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 ensure that the live image is in focus.

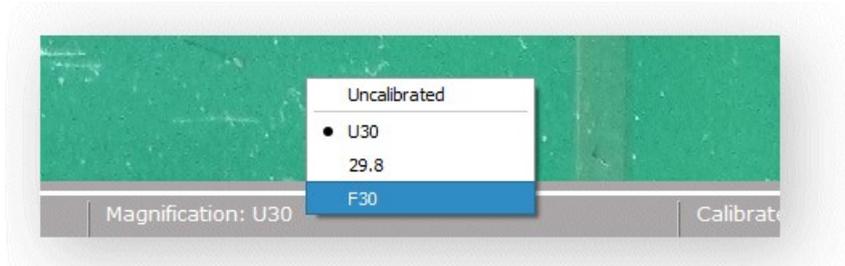
Open the Magnification and Calibration Manager and click the Add button. Write the desired name on the magnification and press the OK button. The live image is paused, and the calibration procedure starts. See the next section for the calibration procedure.



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 in the INSPECTIS status bar and select the desired magnification.

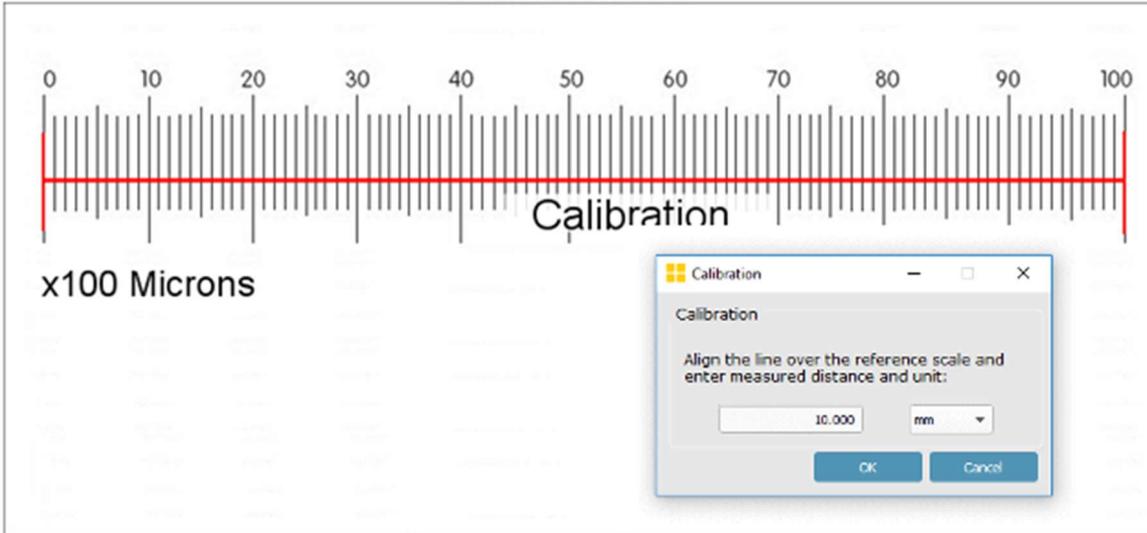


Note working distance of the current camera setup defined as the distance between the camera and the focused object shall not be changed after making the calibration. Altering working distance will change the magnification resulting in incorrect calibration.

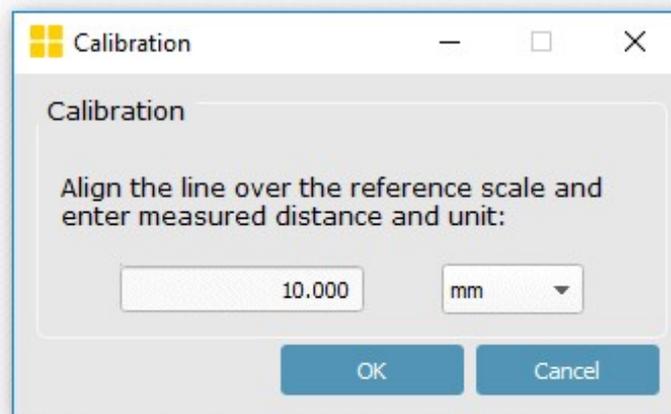
Calibration of Magnifications

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. Click  to open Magnifications and Calibration Manager, select the desired magnification and click Calibrate. The live image will be frozen and calibration windows with a calibration line will appear.

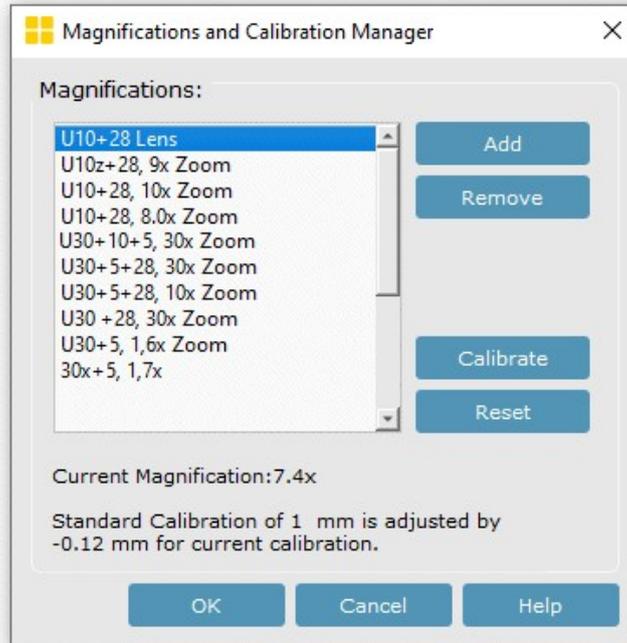


Select, drag, and align both ends of the calibration line to the matching lines on the reference image. Type in the distance and select the unit (**mm** or **µm**) in the calibration window. If imperial units are selected in Preferences, imperial units (**inch**, **mil**) will be shown in calibration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



Note working distance of the current camera shall not be changed after calibration. Altering working distance will change the magnification resulting in incorrect calibration.

When you re-calibrate your factory-set 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.

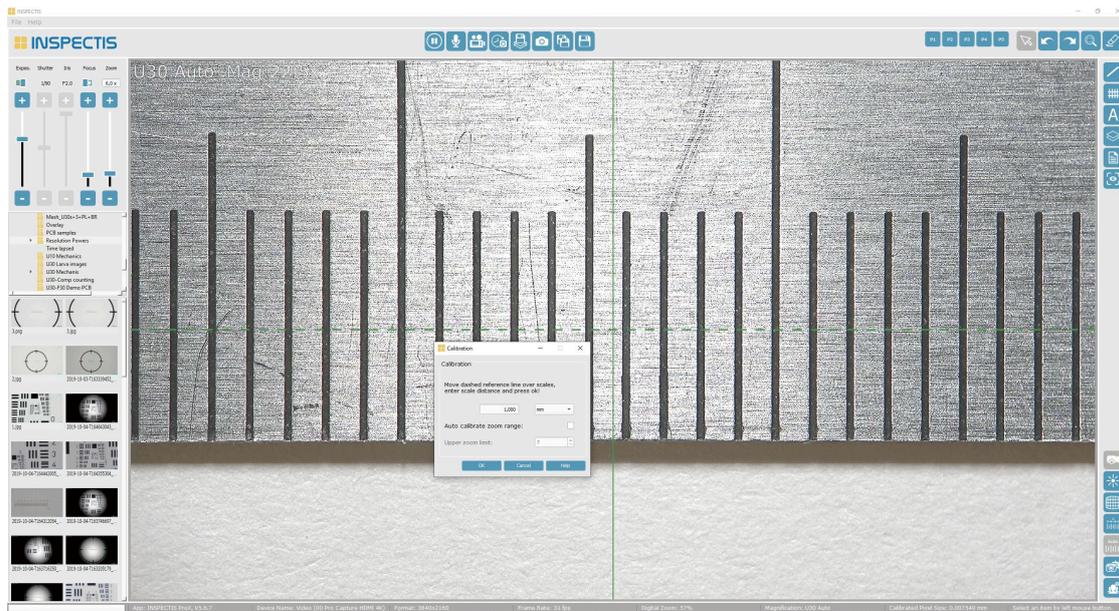
Auto Calibrating Magnifications

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/ μ m and click OK.

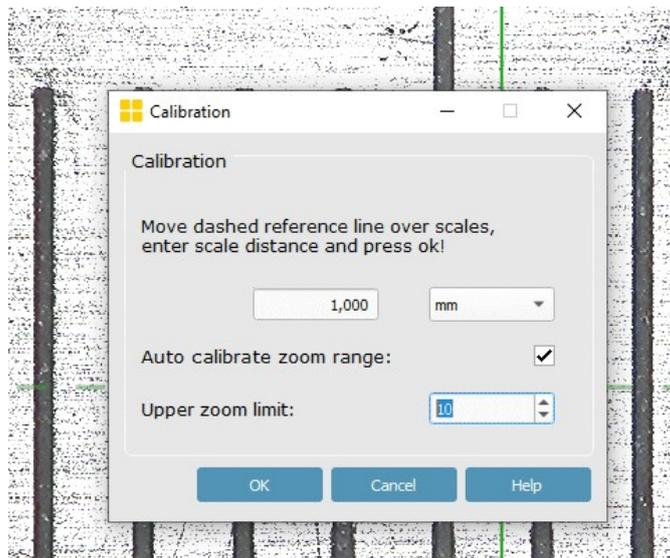


Software will automatically find the scales, mark them by reference red lines and ask you to accept and save the calibration. If reference lines are correctly drawn on scales, press OK to save calibration value for

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 OAI provides a simple tool for doing non-contact distance measurement on the picture.

 **Measure Distance.** To 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  automatically activates after each measurement to fine-tune the measurement line if necessary.

To fine-tune the start and end position of the measurement line:

- Click and drag the ends of the measurement line to change the distance.
- Click and drag the measurement line to move the line.
- Click and drag the text box to move it to another position.

Press and hold Ctrl key on computer keyboard before drawing the measurement line to make Horizontal or Vertical Distance measurements.

Number of decimals for measurement results can be set in Preferences (1 to 5 decimals).

Thickness and Colour of measurement lines as well as Font Size and Colour of the text can be changed in Preferences.

To modify, move or delete a measurement activate the Select Tool  and right-click on the specific measurement line.

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

To delete and clear all items, click on .

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

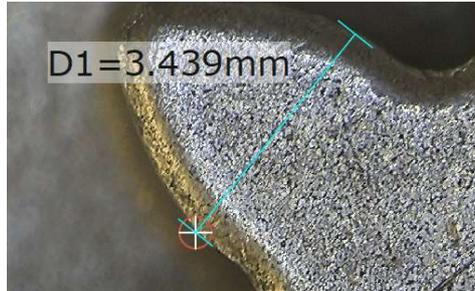
Measurement Table on top-left of INSPECTIS window is automatically displayed as soon as a measurement tool is selected.

Measurement Table  				
	Tool	Parameter	Value	Unit
1	D1	Length	4,04	mm
2	D2	Length	4,4	mm
3	D3	Length	2,98	mm
4	Ø1	Diameter	3,64	mm
5	Ø1A	Area	10,41	mm ²
6	α1	Angle	39,86	°

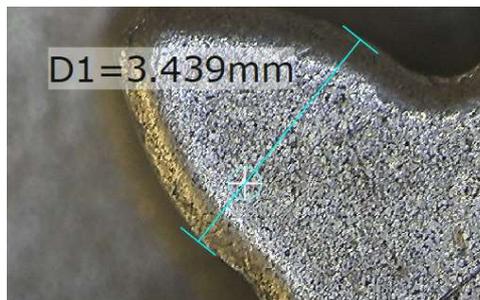
Snap Mode

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 to Excel or other CSV file compatible software.

Measurement Table			
Tool	Parameter	Value	Unit
1 D1	Length	4,04	mm
2 D2	Length	4,4	mm
3 D3	Length	2,98	mm
4 Ø1	Diameter	3,64	mm
5 Ø1A	Area	10,41	mm ²
6 α1	Angle	39,86	°

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 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](#).

Barcode, QR, and Data Matrix Scanner



Click  by left mouse button to automatically scan a Barcode, QR-Code and Data Matrix visible on the image field. The encoded information e. g. text or numeric data will be read by the software and transferred to an Excel file which is automatically created from a Template and saved under current Work Folder. The Excel file is named with the decoded Barcode ID.



Default Excel file Template has the following layout. You may define your specific Template and saved it

under ../INSPECTIS/Templates on C:/Program Files (x86). Right click on  icon to select the Template. Current Template will be used by software until a new Template is selected.

Task	Date & Time	Notes

Date and time are always displayed in cell A1 even in user defined Templates.

Encoded information is always displayed in cell A2 even in user defined Templates.

Other cells may be edited and saved as a new Template according to your specification.

Images in the Work Folder can be exported onto the Excel file by right clicking on the thumbnails and selecting "Send Image to Excel".

Double-click the Excel file thumbnail to open it after inserting the images.

Left-clicking an image thumbnail in the Work Folder will automatically copy it to the computer clipboard to be pasted onto the open Excel file or any other APP outside the INSPECTIS Software.

If there are multiple Barcodes on the image field, the software will highlight only the first decoded Barcode.

Notice size of the Barcode (e. g. live image magnification) and/or brightness of the live image shall be sufficient for being scanned by the software.

Supported Barcode Formats are: DATA MATRIX, EAN-13/UPC-A, UPC-E, EAN-8, Code 128, Code 93, and Code 39.

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

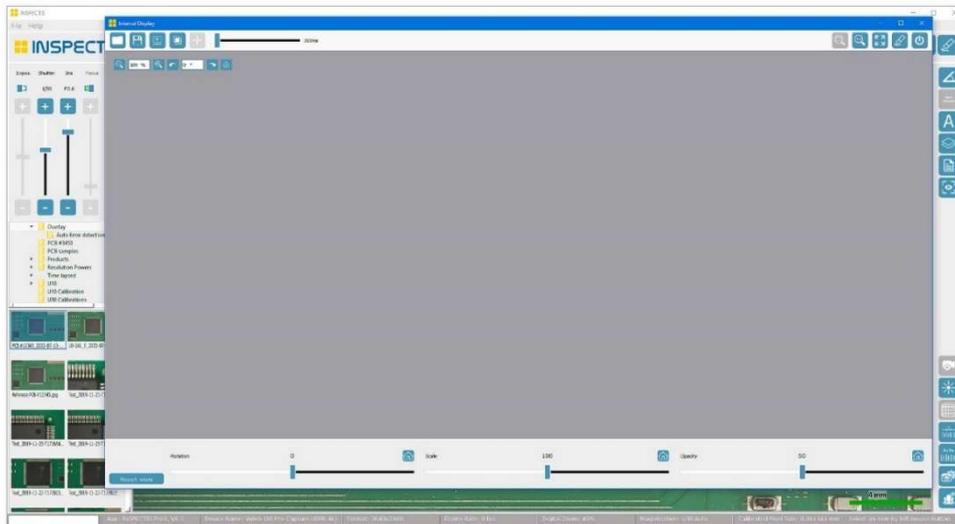
This feature overlays the live image of the camera on a still image with selective transparency. Images are turned on / off frequently with the help of an adjustable timer that allows the operator to detect any differences between them.

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.

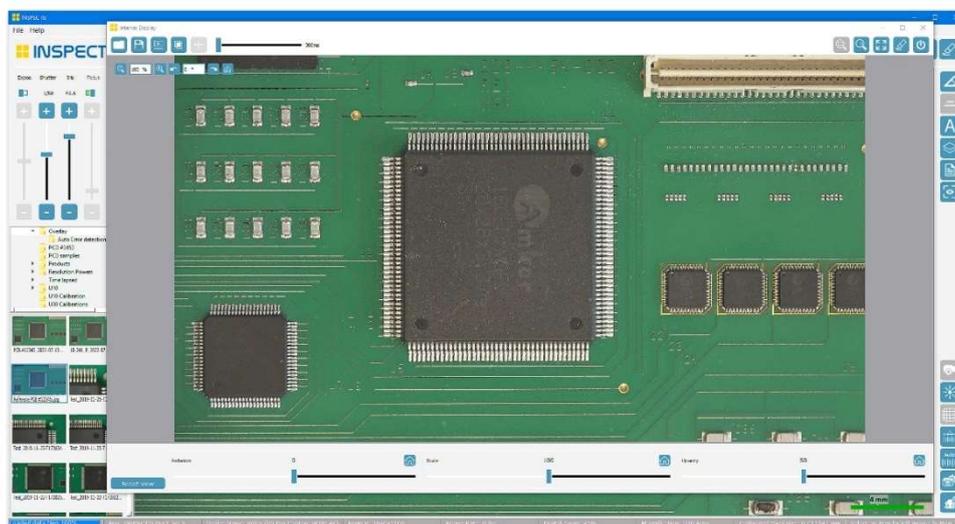
Although the Timer Controlled Overlay Display function can automatically align the superimposed images, it is strongly recommended to use a holder or fixture to hold the inspecting objects in a fixed position.



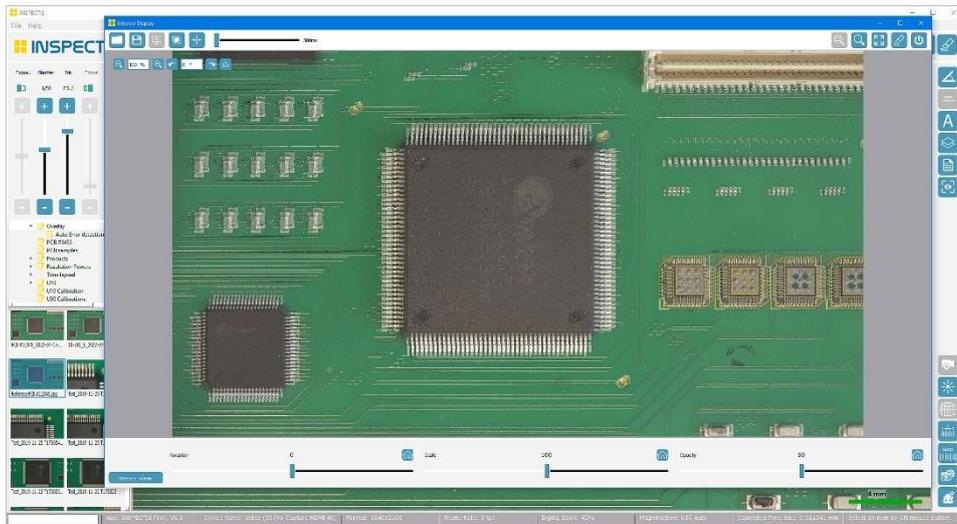
To start the TCOD click on the  icon on the menu bar.



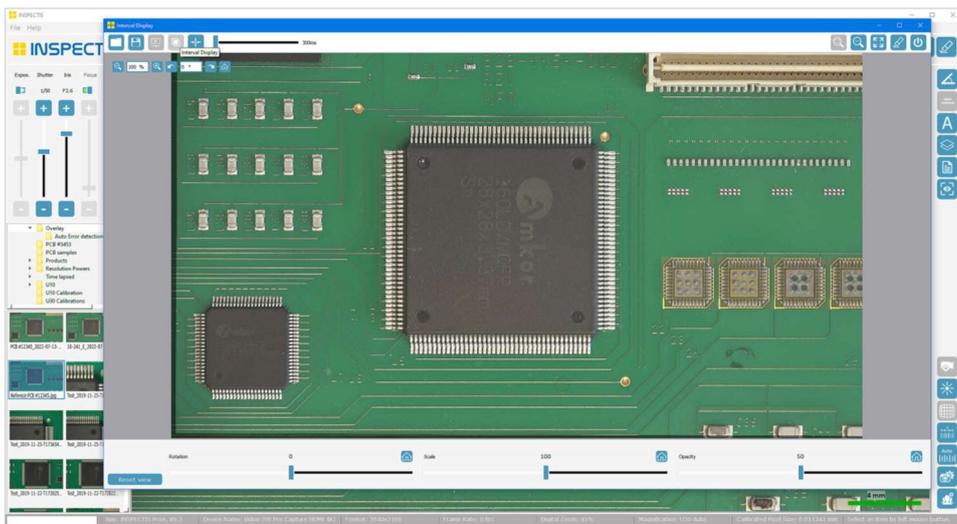
From main INSPECTIS window click on the reference picture. It will be display on TCOD window. You can also select the reference image via the  icon on TCOD window.



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.

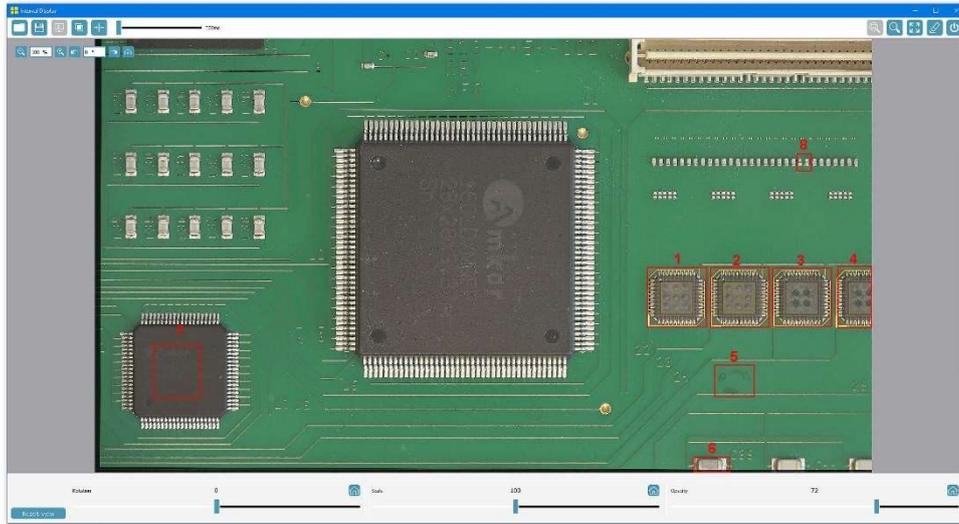


Select Interval Display . The TCOD will now automatically switch off and on the overlay image at any defined frequency between 200ms to 2000m /switch. Adjust the frequency via the timer slider as desired.



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 TCOD window.

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

DXF Edit and Overlay

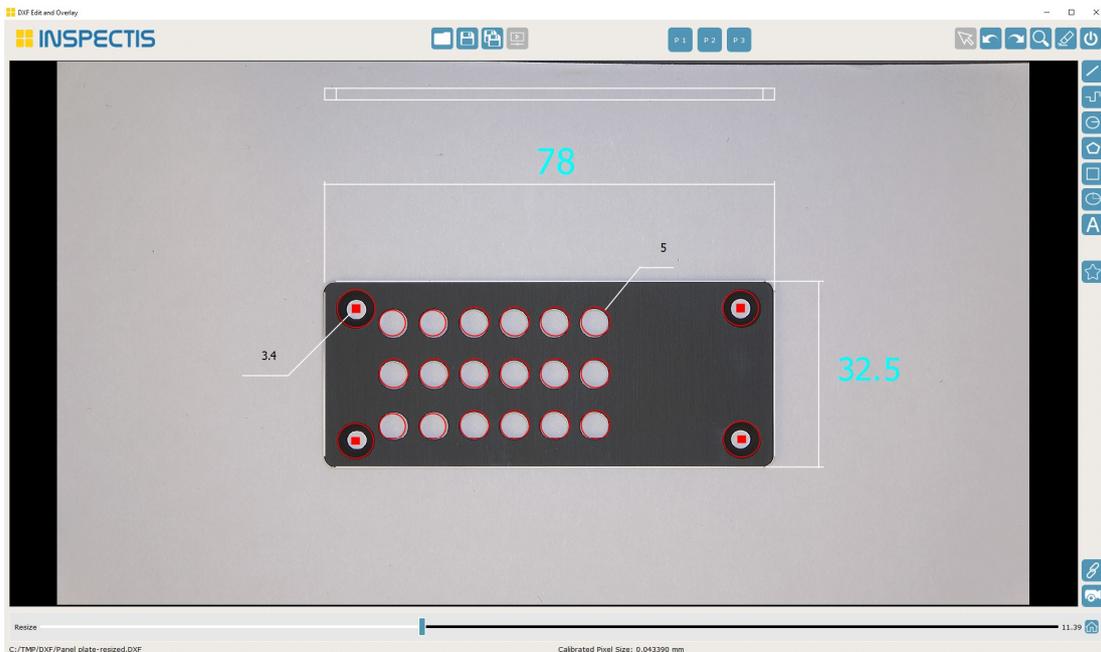
With DXF Edit and Overlay tool you may:

- 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.

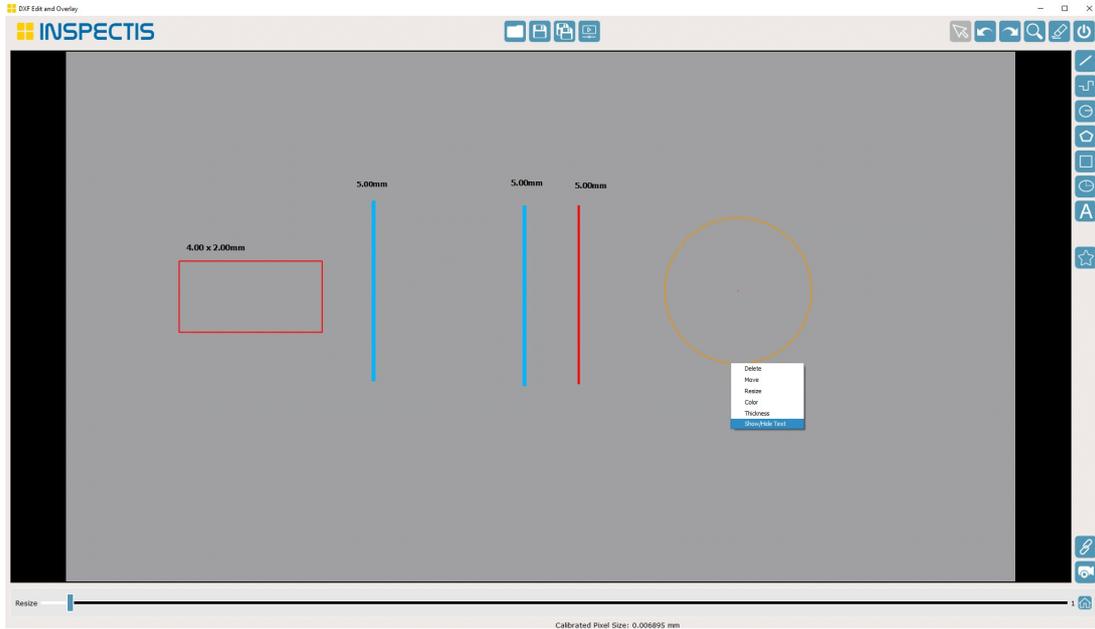
Before selecting DXF Edit and Overlay tool, set up your camera parameters and required magnification on INSPECTIS main window. Calibrate your magnification if necessary.

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

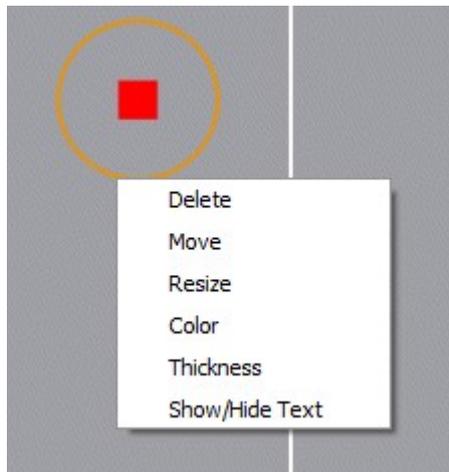
a) **Open an existing DXF file:** Select Open icon  to open an existing DXF file. Resize it to actual magnification using the Resize control bar on bottom of the window, edit and overlay on live image by clicking . Save as editable DXF in vector format  or PNG image for overlay as Digital Graticule



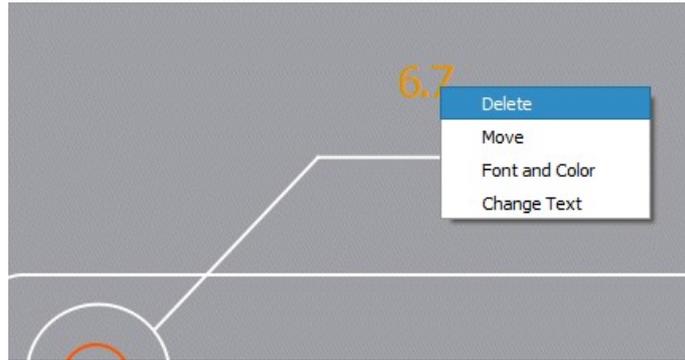
b) **Create a DXF file using the Drawing tools:** Turn off live image by de-selecting  and use drawing tools to create your requested patterns in DXF vector format. Line, polyline, circle, polygon, rectangle, ellipse, and text tools are available. Save the file in PNG for overlay as Digital Graticule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



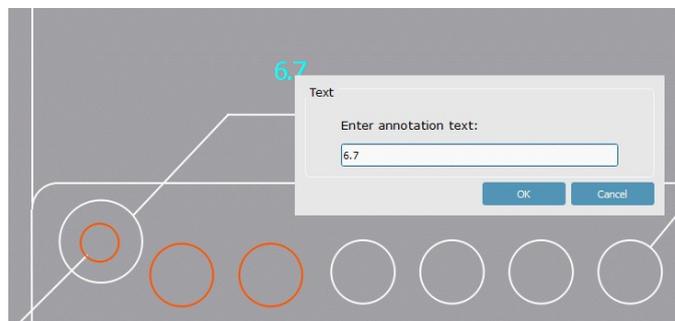
Right-click an object to Delete, Move, Resize, change Colour, change Thickness or Show/Hide geometrical value.



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



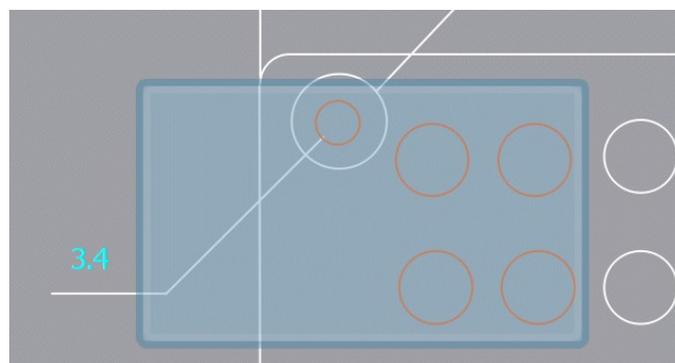
Double click on annotation to change the Text.



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 tacking 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.

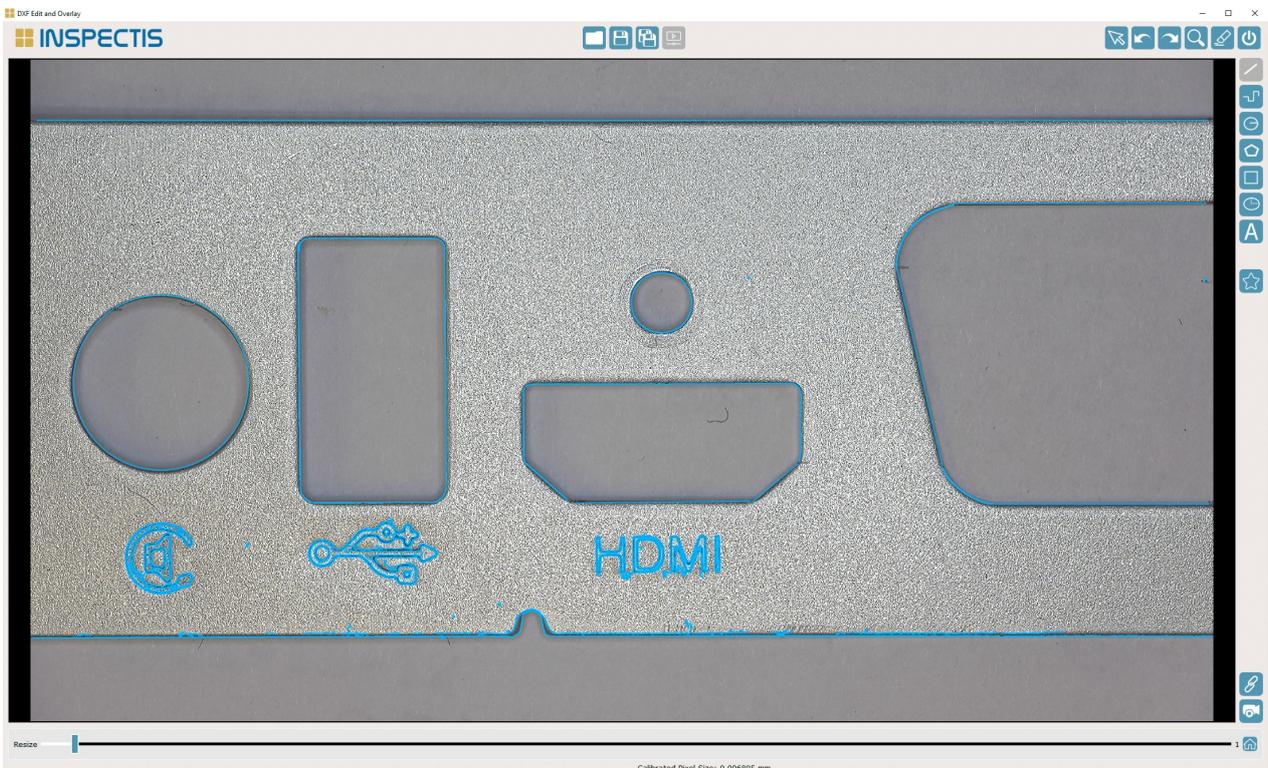
Select a still picture from main window or switch to live image .

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.

Digital Graticule

Digital Graticule lets a custom designed pattern of lines, shapes, and annotations with transparent background in saved in PNG file 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.

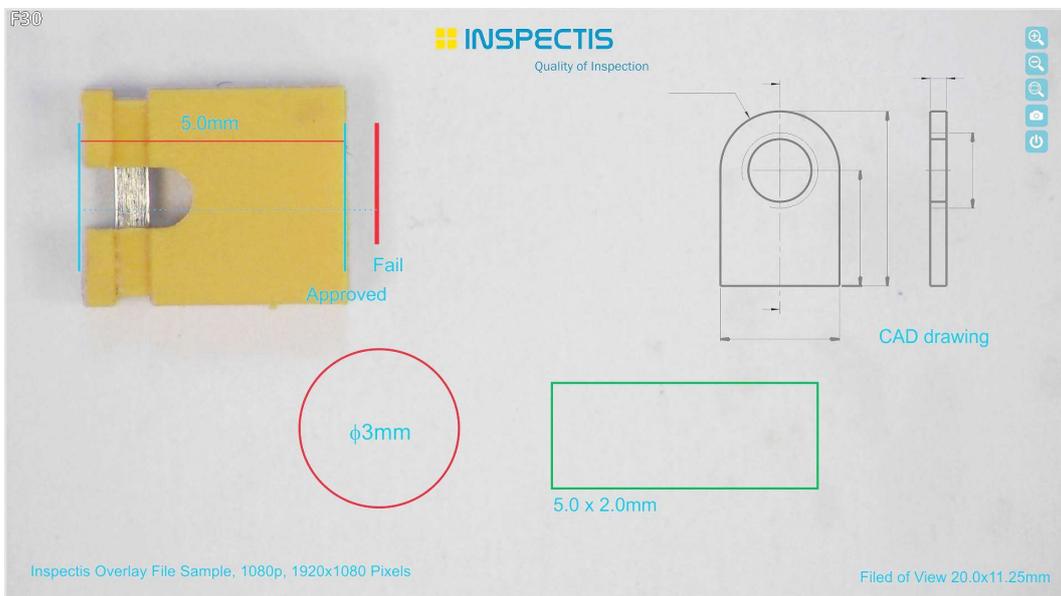
Graticule files can be produced in a graphical design program, like Photoshop, CorelDRAW etc. or directly in INSPECTIS ProX and OAI using the DXF Edit and Overlay tool. You can learn more on how to create graticule files in external programs in the document "How to generate Overlay pictures for INSPECTIS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

Graticule file format shall be same as the video 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.

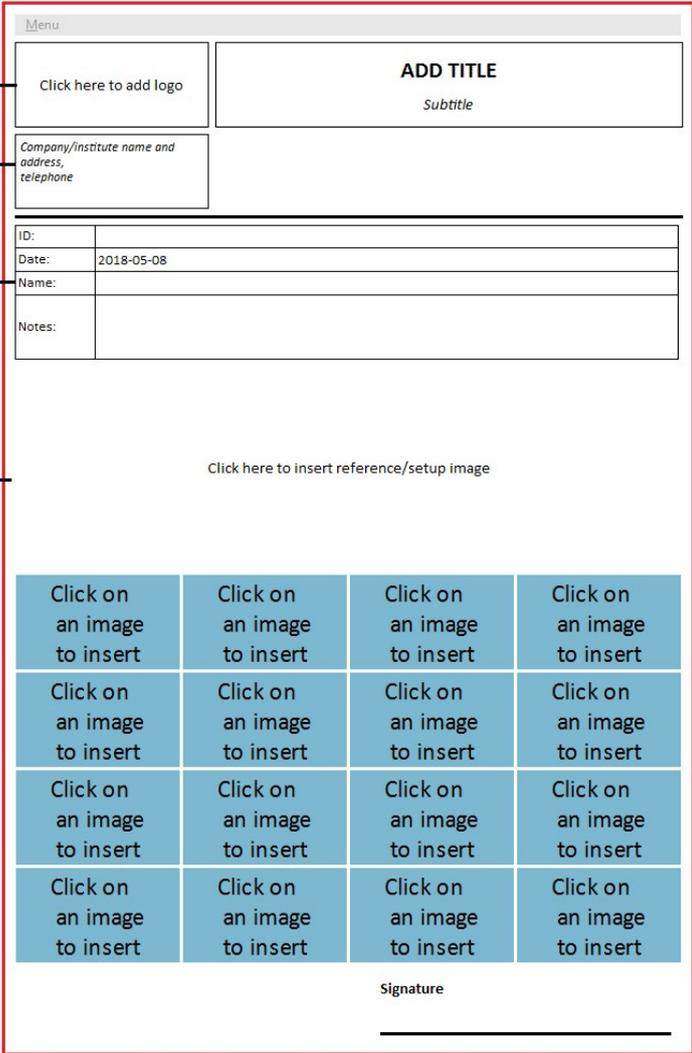
To enable synchronized zooming, rotating and panning click  icon.

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



Reporting

To start creating a report click  icon.



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

- Title:** A box containing "Click here to add logo" and another box with "ADD TITLE" and "Subtitle".
- Company Details:** A box with the placeholder text "Company/institute name and address, telephone".
- Report Details:** A table with fields for ID, Date (2018-05-08), Name, and Notes.
- Image Area:** A large area with the text "Click here to insert reference/setup image" and a grid of 16 blue buttons, each labeled "Click on an image to insert".
- Signature:** A line with the label "Signature" below it.

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.

Shortcut Key List (Hot-keys)

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



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].



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**].



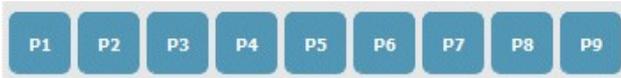
Undo [Shortcut Key: **Ctrl+Z**].



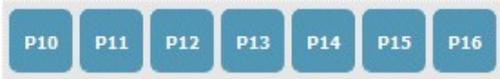
Redo [Shortcut Key: **Ctrl+Shift+Z**].



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**].



Switch between Manual/Auto Exposure [Shortcut Key: **E**].

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**].

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:** DELL Precision Workstation, Intel Core i7, 16 GB RAM
- **Laptop:** DELL Latitude, Intel Core i7, @ 5.0 GHz, 8 GB RAM 15.6", Full HD
HP EliteBook, Intel Core i7, 16 GB RAM 15.6", Full HD

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