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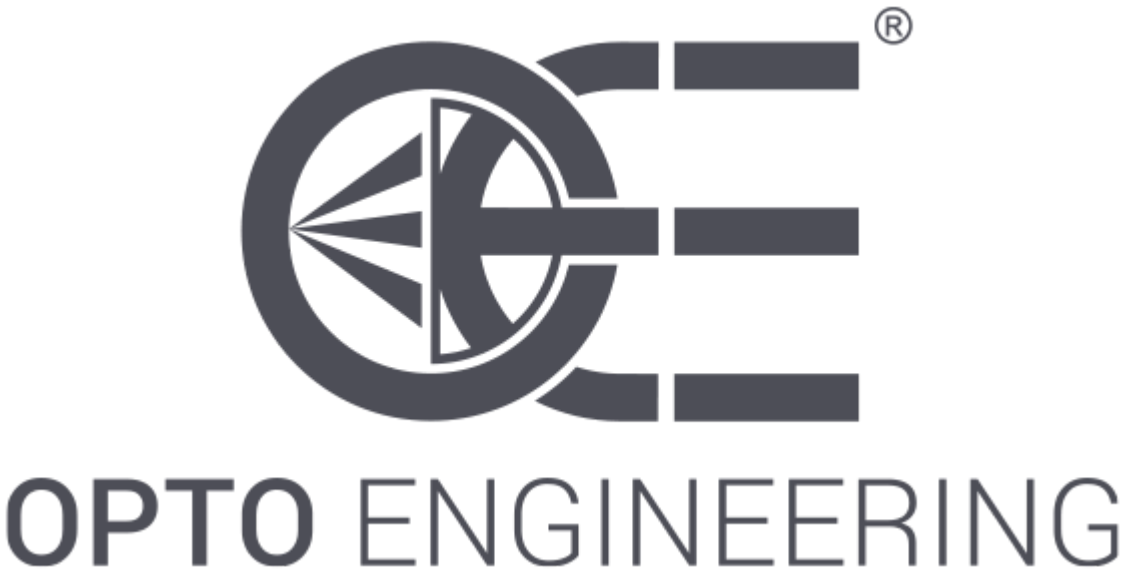
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1 Resource Center

1.1 Resource Center



Horus Resource Center

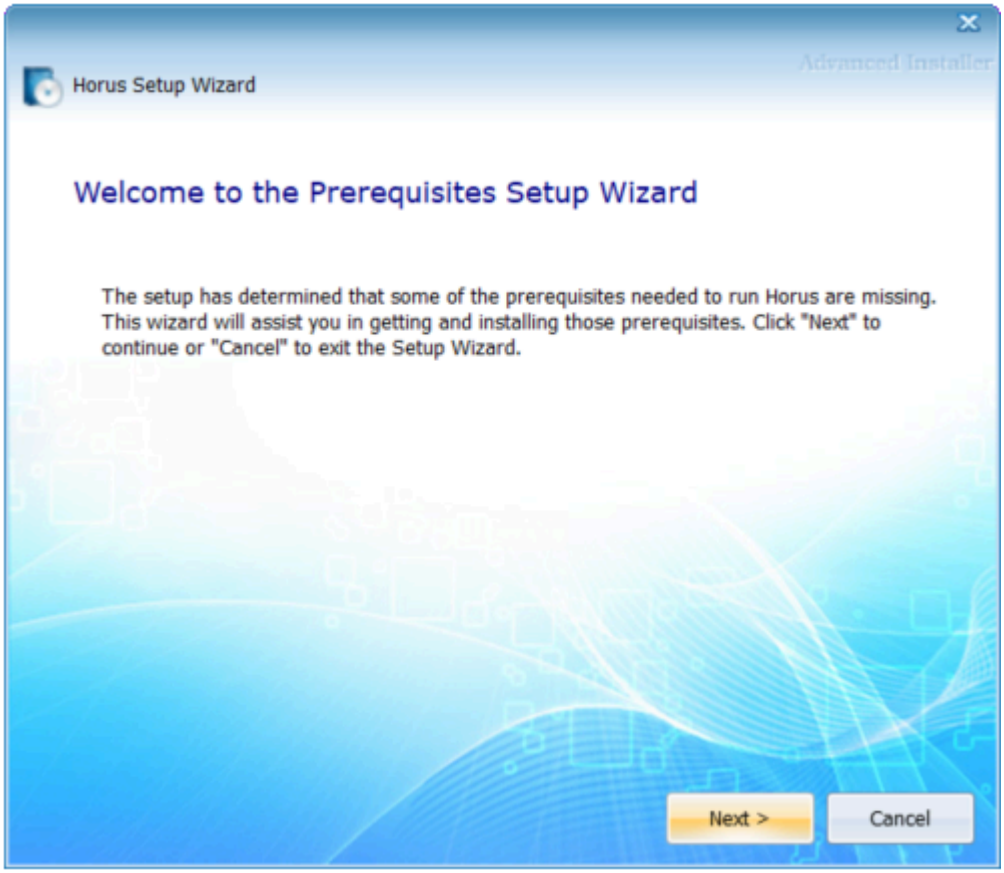
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1.3 Quick Installation Guide

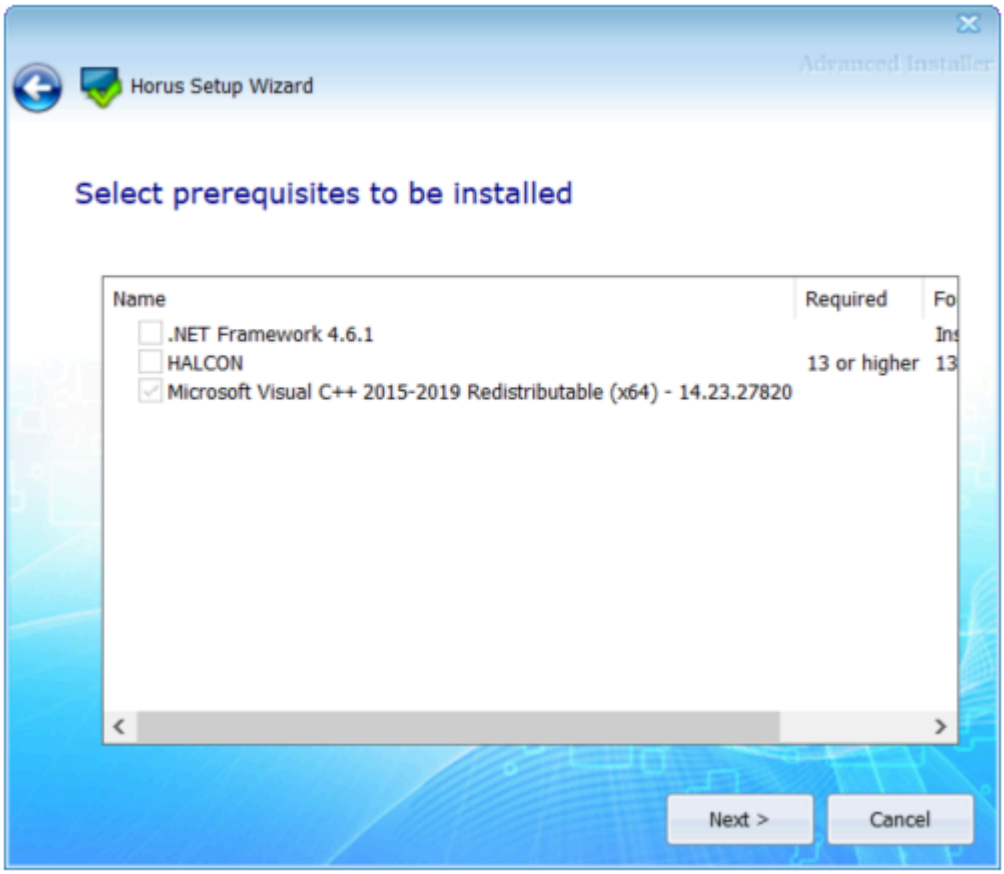
Access the website Horus Download. When the download is complete, run the file as an administrator.

If you do not have administrator rights, you will not be able to install the program. It is also advisable to disable antivirus and firewall during installation.

Confirm that you want to continue with any Windows™ (Smart Screen, UAC, etc.) requests.

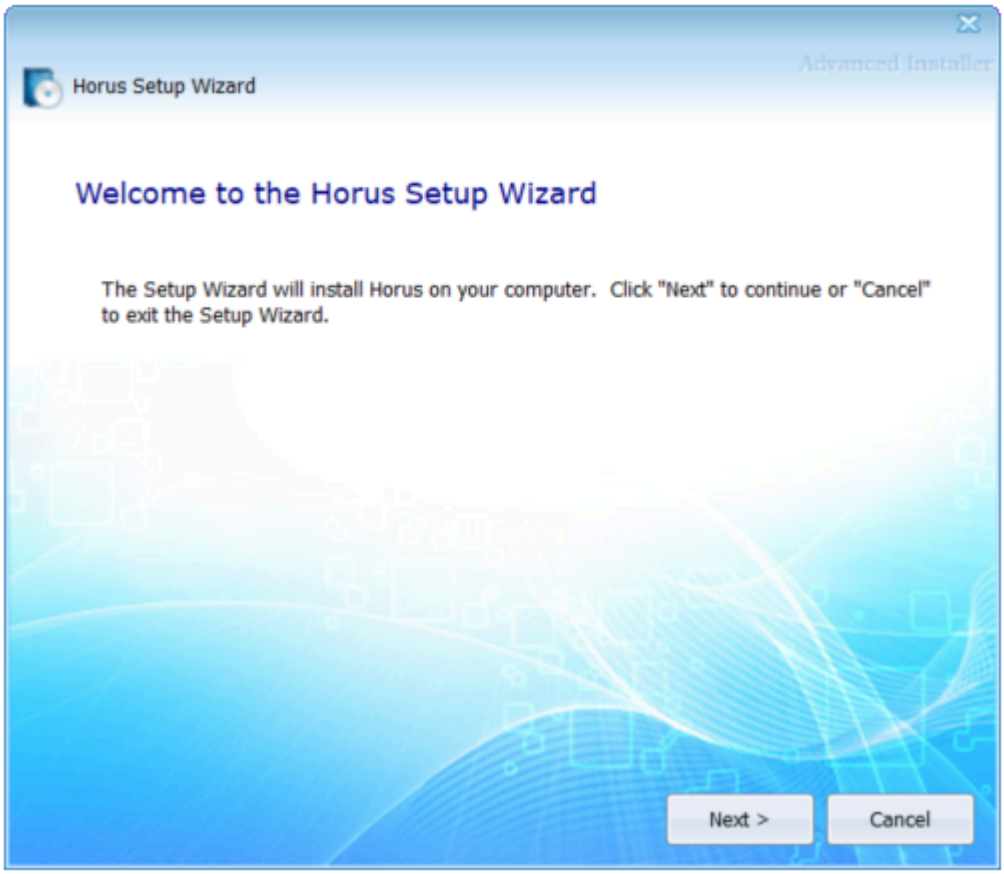


Press Next.



If the installation program evaluates the lack of basic prerequisites for the installation of Horus, these will be automatically downloaded and installed.

Press Next, the installation of the prerequisites will begin.



After installation of the prerequisites, the installation program will continue with the installation of Horus.

Press Next, then Typical; it is advisable to leave the destination folder C:\OptoEng\ unchanged. Press Next, then Install, and at the end of the installation, Finish.

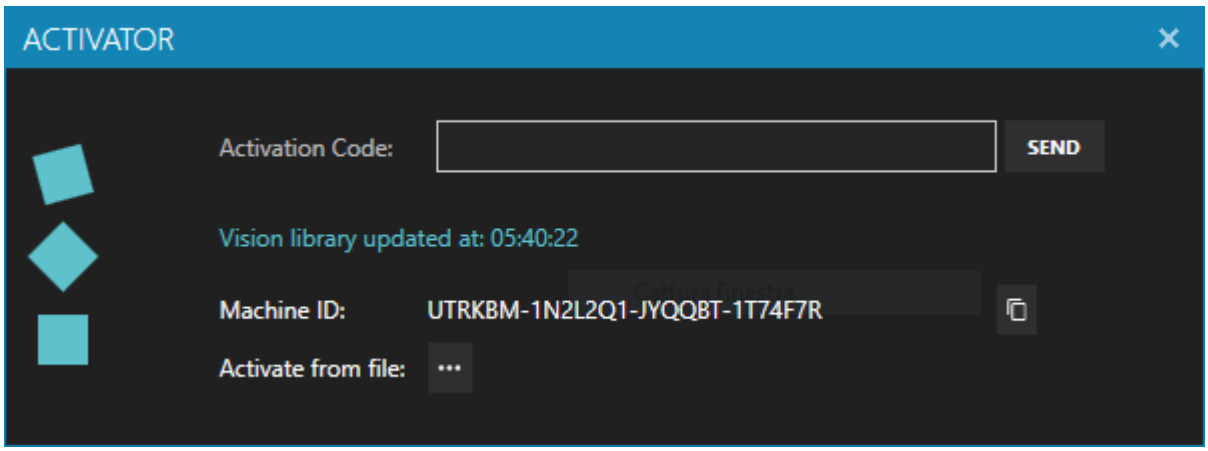
Reboot your computer.

Horus and Activator icons will be created on the desktop, launch the Activator to proceed with the request / acquisition of the license.

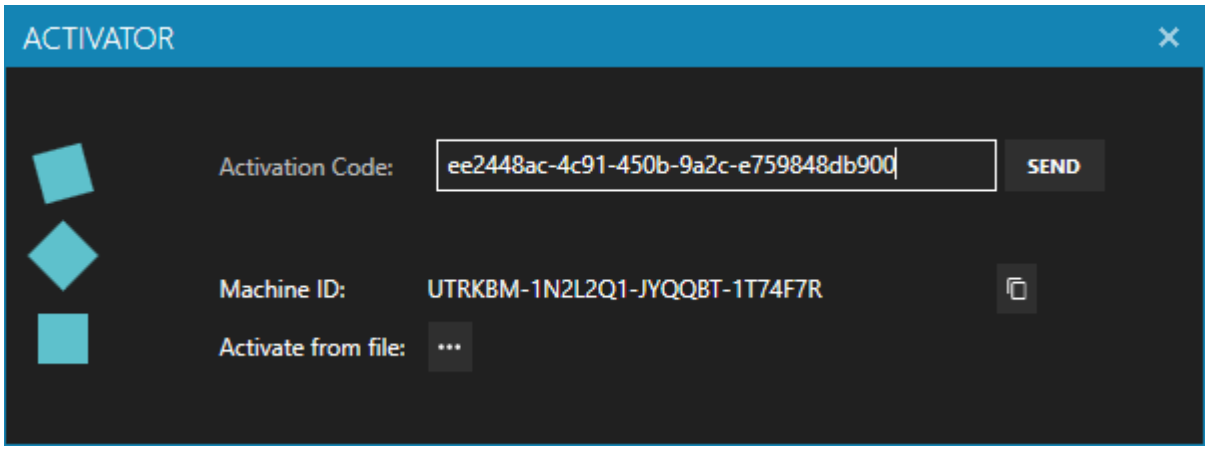


Confirm that you want to continue with any Windows™ (UAC, etc.) requests; the Activator must always be run as an administrator.

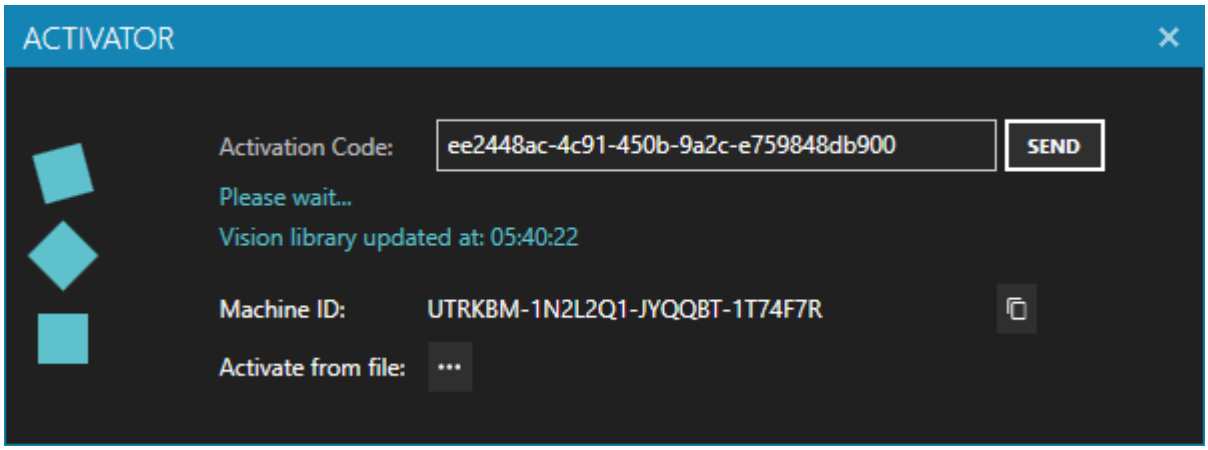
When the activator is opened it will automatically download the vision libraries license update if available.



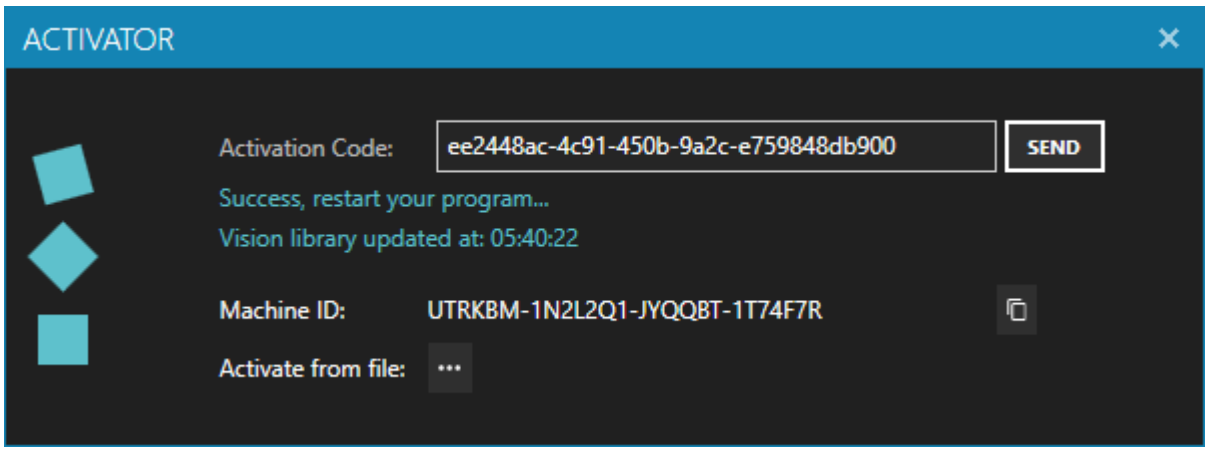
Enter the activation code provided by your sales representative and press Send.



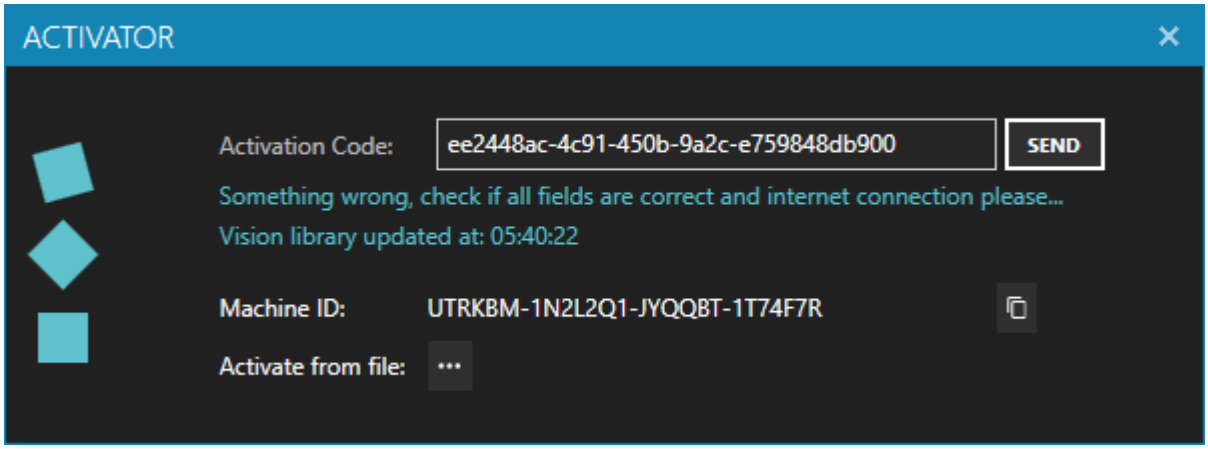
The activator will check the code via the Internet and download the licenses.



If the license is downloaded, you can close Activator and launch Horus.

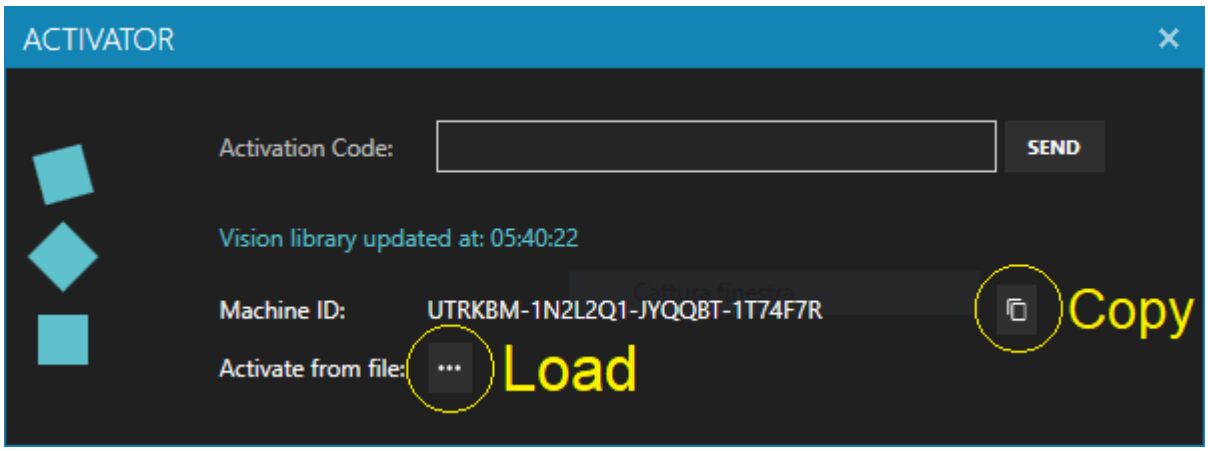


In the event of an error, check the activation code with your sales representative. Also check that you have a working Internet connection (free of firewall / antivirus, etc.).



In cases where the Internet is not available or it is not possible to bypass the corporate firewall, manual activation is possible. This must first be agreed with technical support.

Copy your Machine ID and send it to the email that will be communicated to you. You will receive an mnl file to load.



At the first run, Horus will look for the license file; if this is not present, a warning message will appear.

The system should connect to the Internet only during license activation. For demo versions, it is also necessary to launch the Activator before the first start of Horus at the beginning of each month of the evaluation period, to update the vision libraries license.

1.4 System requirements

Component	Requirement
CPU:	Intel i7 Quad-Core (> 3GHz)
RAM:	8 GB DDR4 (min.)
HDD:	256 GB SSD (or more depending on the type/number of projects)
GPU:	NVIDIA GeForce GTX 1050 (min.)
VDU:	1920x1080 (min.)
OS:	MS Windows 10 Pro 64 Bit (min.), Windows 11 supported
Camera:	Genicam, Usb3Vision, GigEVision are supported as standard/generic cameras. Other cameras supported are COE, MatrixVision, IDS, Flir (others can be implemented on request).

If you have an ethernet camera, you need a dedicated LAN port.

Security Requirements:

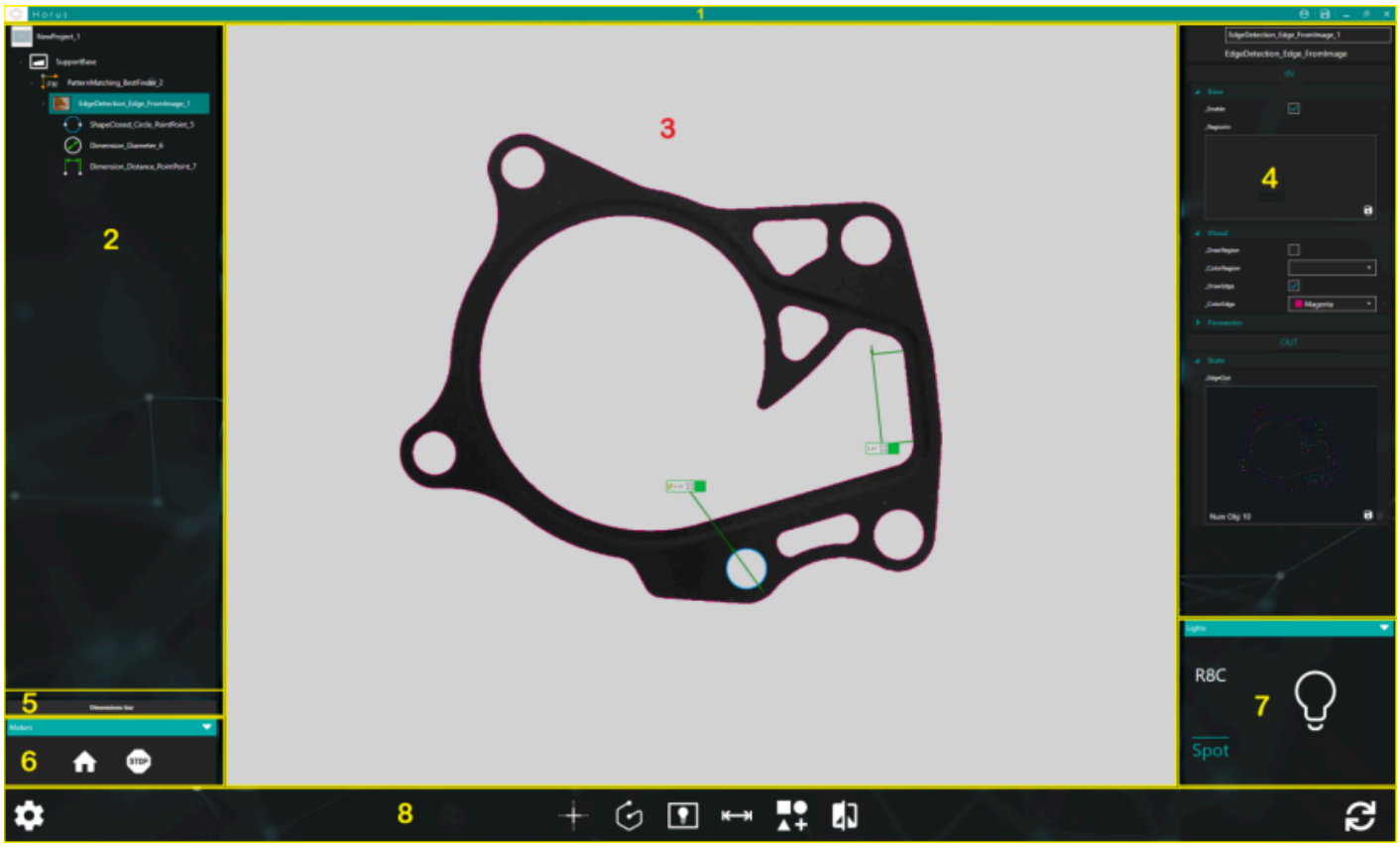
The licensed version of Horus does not need to be connected to LAN / Internet. If the machine in which the software is installed is connected to some kind of network, it is the user's responsibility to take all safety measures.

2 User Guide

2.1 User Guide

Main Interface

In this reference guide, the general functions included in Horus will be described, in order to allow the user to easily handle the software and get access to a walkthrough of the tasks that are needed to create programs and perform analysis.



Horus is software developed for high-accuracy measurements; it's designed to be live software in order to keep track of the object to measure and get fast results.

The main interface of Horus is divided into five sections:

1. Header;
2. Object Tree;
3. 2D Visualizer;
4. Property Bar;
5. Motors Console;
6. Lights Console;
7. Dimension Bar;
8. Main Console.

Each of these sections allows the user to access different features of the software.

2.2 Header

The header shows the logo and the name of the application. These features can be personalized, as well as the colour and theme of the software (for details see Settings Menu).



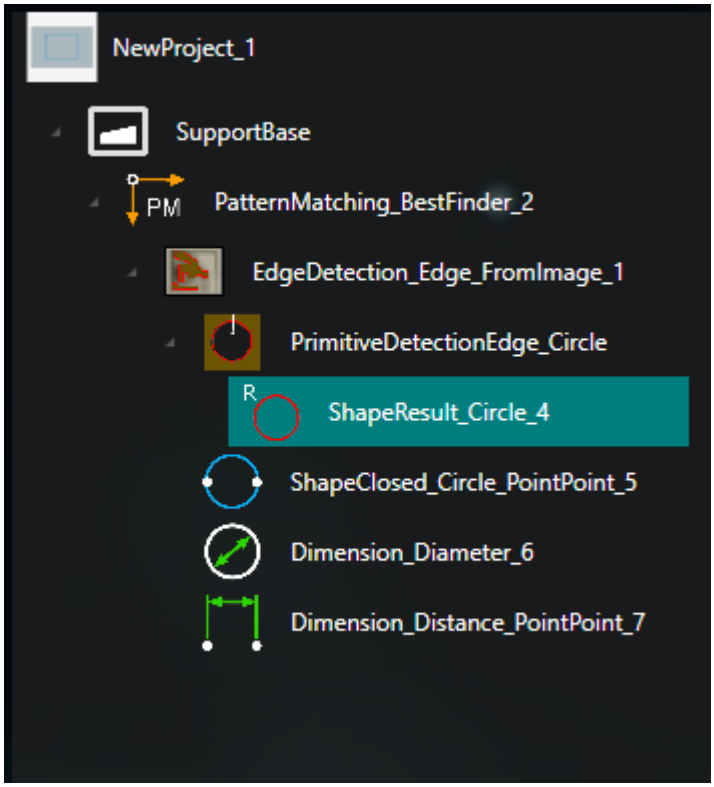
In addition, a user login and save button is displayed at the right hand side with the window controls.



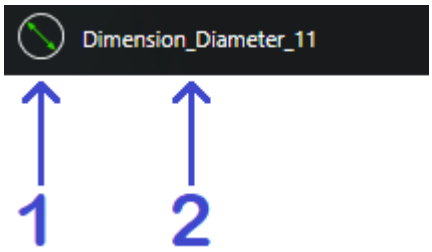
2.3 Object Tree

2.3.1 Object Tree

Horus is an “object based” system, which means that a program is seen as a sequence of tasks performed by objects specifically designed; the sequence of these objects creates the logic of the program and the analysis. Since the program starts from a defined model / template, the user can simply add what he is interested in; this explains why the objects are displayed in the tree in a particular order.



Every object element is composed of:



1. Icon Object: the icon of the object;
2. Name Object: the name of the object;

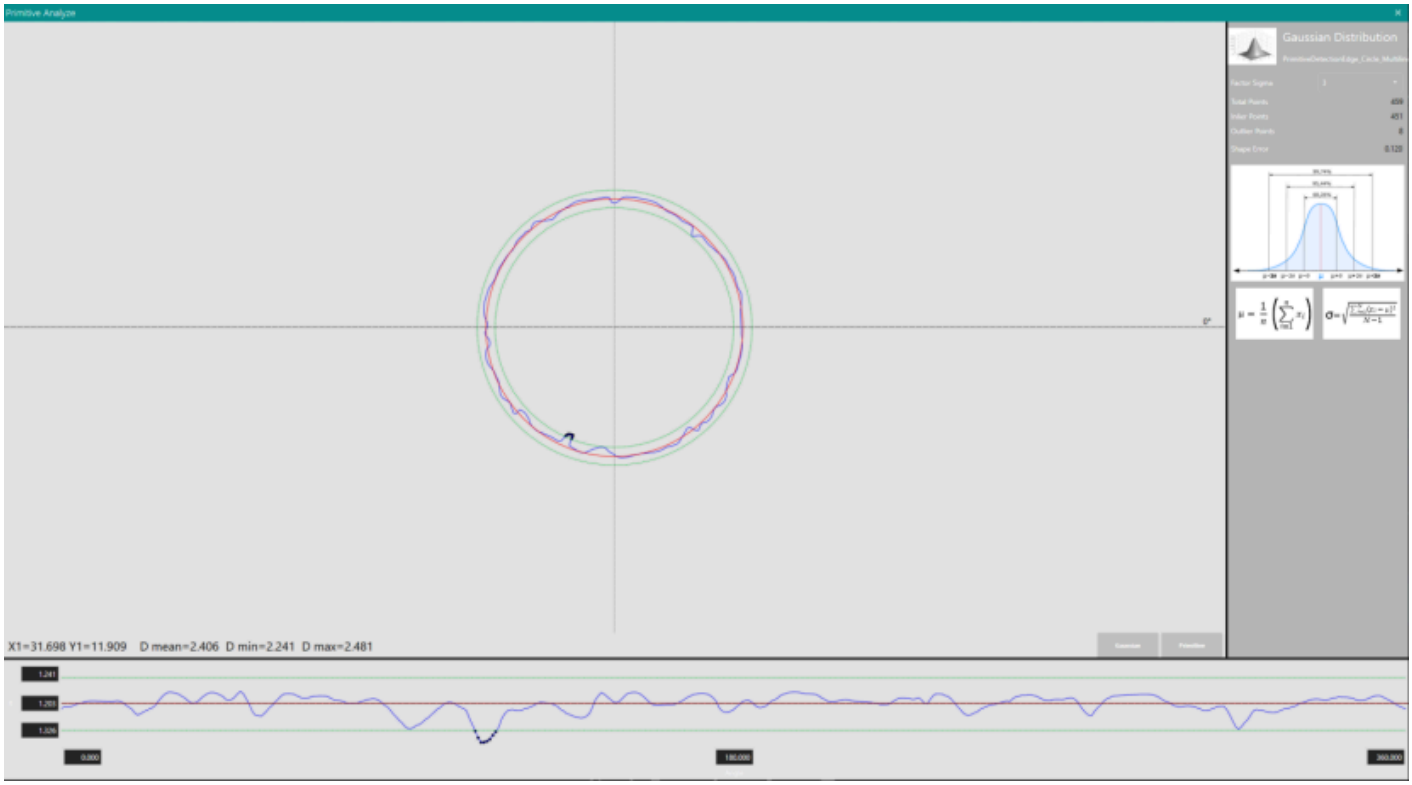
It is possible to inspect each primitive detected on the part; look at the property bar and select “Primitive Analyze”.

If you want to delete a single item, select it and press the trash icon. If you want to select multiple objects, click with the right mouse button and all objects of that level or lower will be selected. To deselect a single object, click on it with the left mouse button, or right click if you want to deselect all.

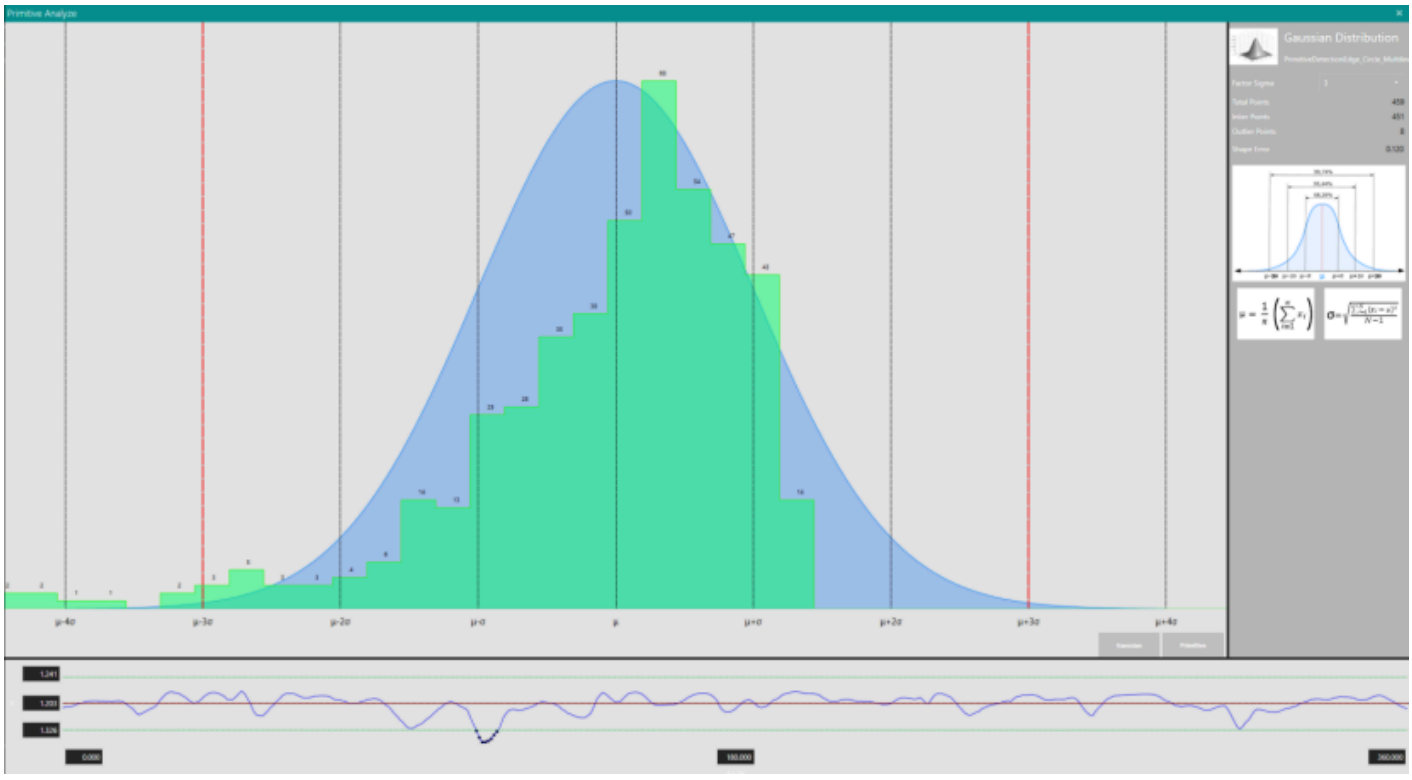

Horus
16
SupportBase
PM
PatternMatching_BestFinder_2
EdgeDetection_Edge_FromImage_1
PrimitiveDetectionEdge_Circle_Multili
ShapeResult_Circle_4
PrimitiveDetectionEdge_Circle_Multili
ShapeResult_Circle_6
PrimitiveDetectionEdge_Circle_Multili
ShapeResult_Circle_8
PrimitiveDetectionEdge_Circle_Multili
ShapeResult_Circle_10
PrimitiveDetectionEdge_Circle_Multili
ShapeResult_Circle_12
Dimension_Diameter_13
Dimension_Diameter_14
Dimension_Diameter_15
Dimension_Diameter_16
Dimension_Diameter_17

2.3.2 Inspect Primitives

After selecting "Primitive Analyze", an interface will be shown with the information of the points of the edge used to detect the primitive.

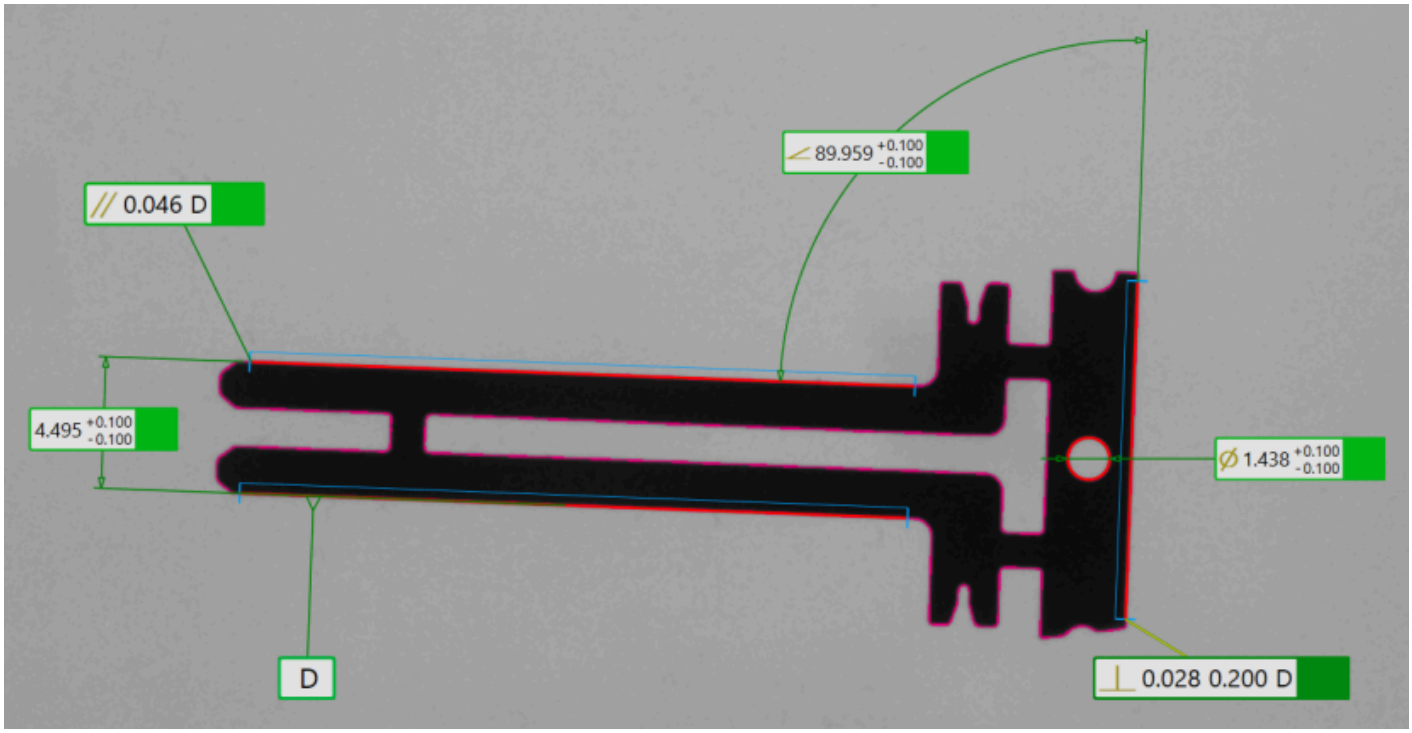


You can use it to see the points distribution, the sigma-based filter and Gaussian distribution.

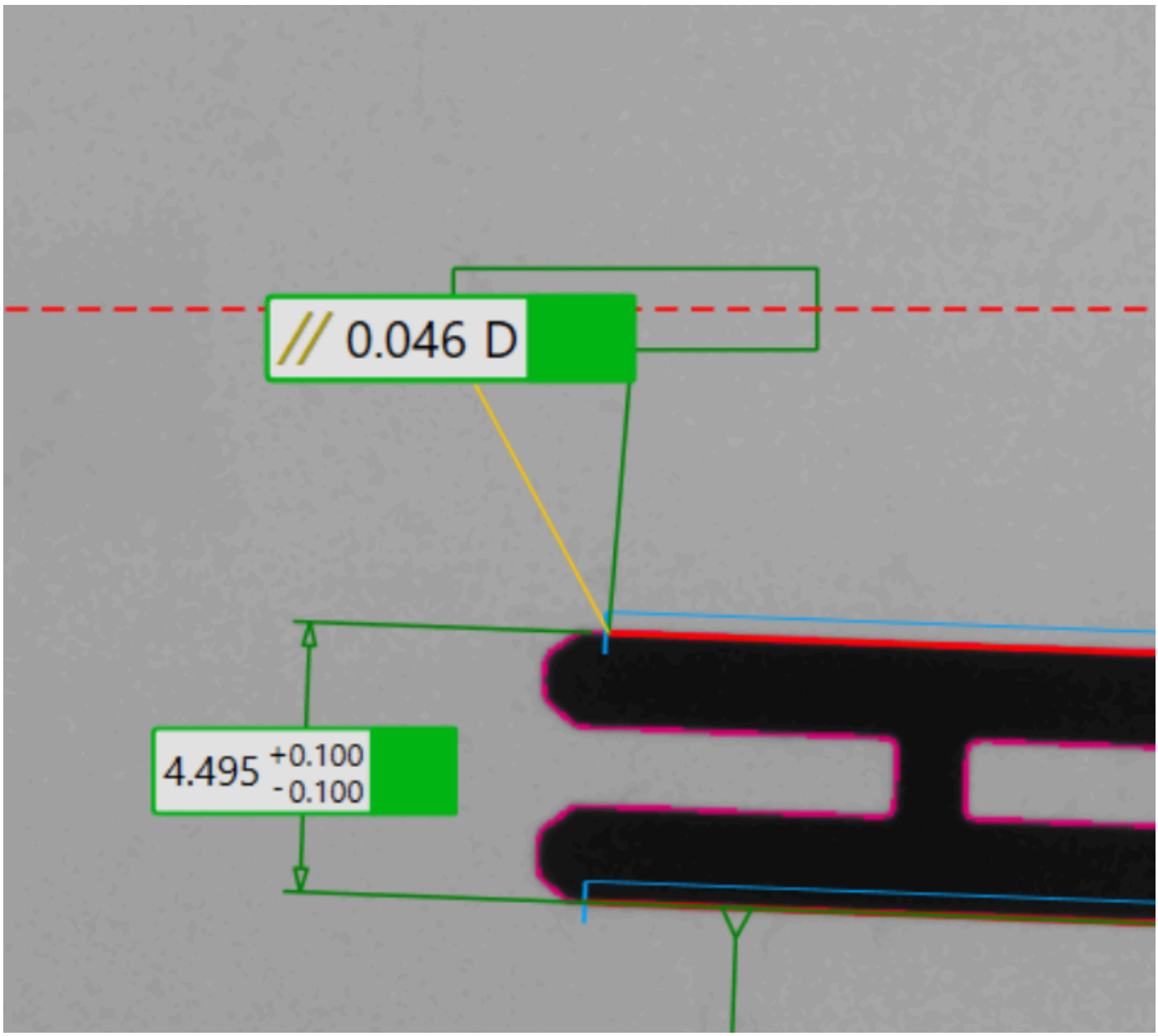


2D Visualizer

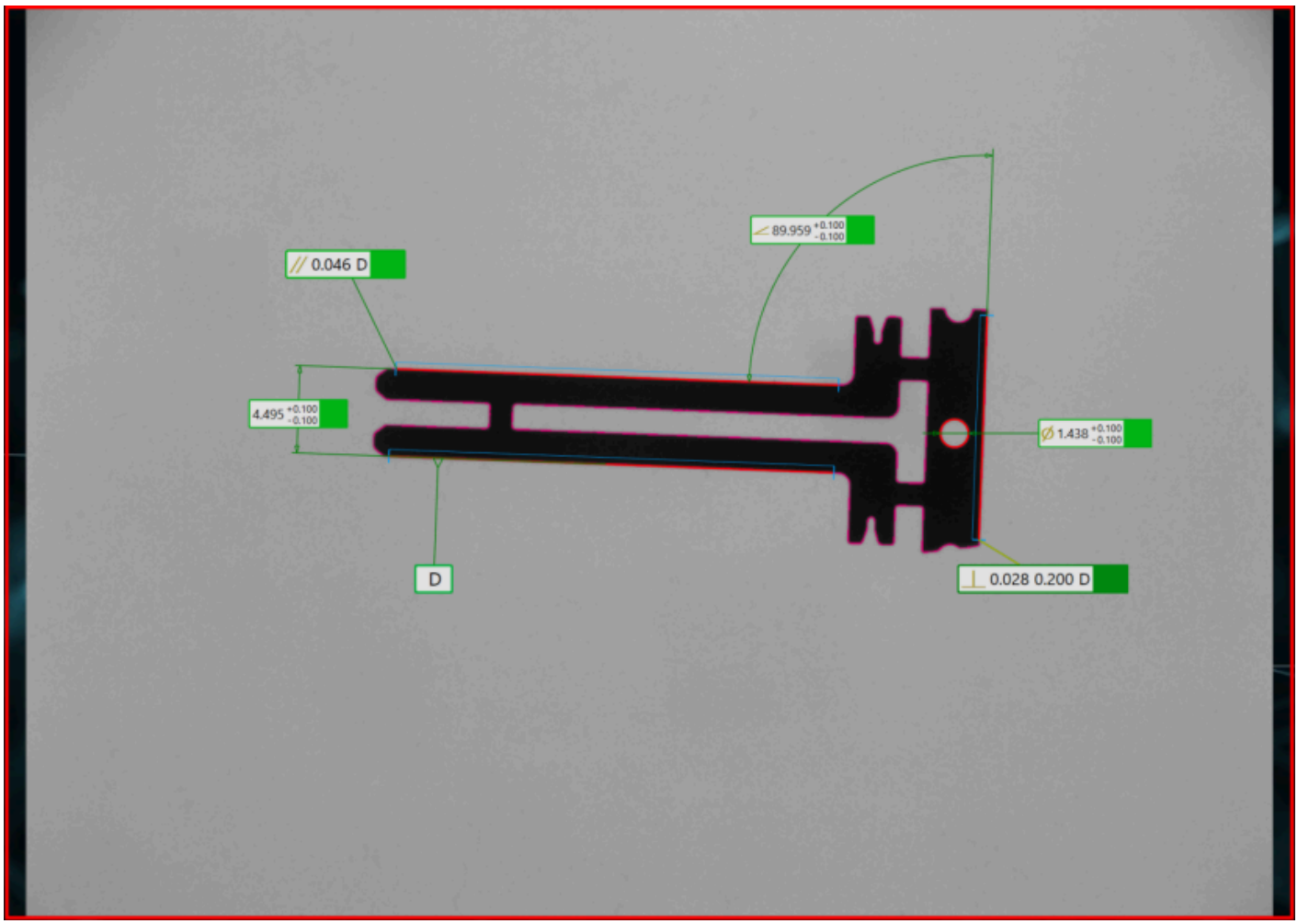
The image captured by the framegrabber, the dimensions, as well as all the drawing objects and shapes, are displayed on the visualizer.



The user can add elements by selecting features on the screen and edit them on the visualizer by dragging the objects.



NOTE: While editing, you may see the visualizer has a red border.



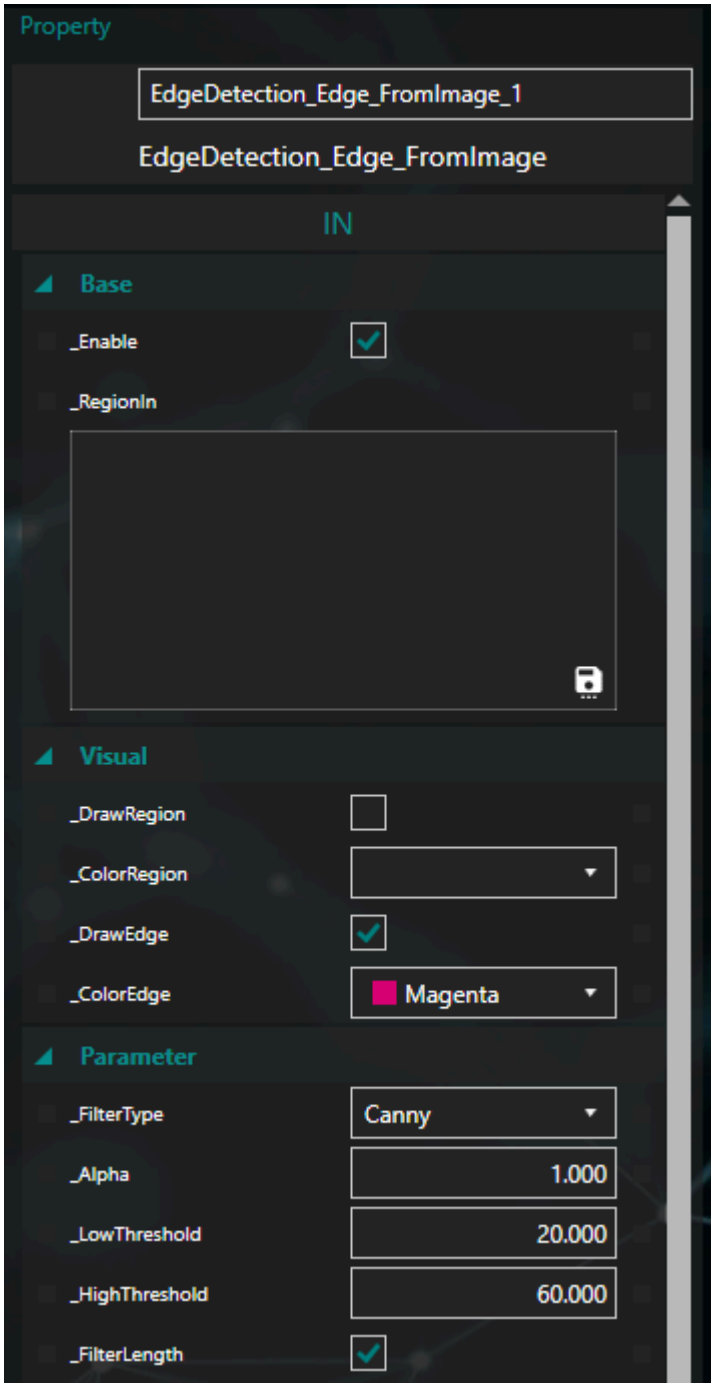
That's an indication that the image is currently frozen to allow the user to edit the program even if the framegrabber keeps acquiring new images.

Press Esc to exit the editing mode.

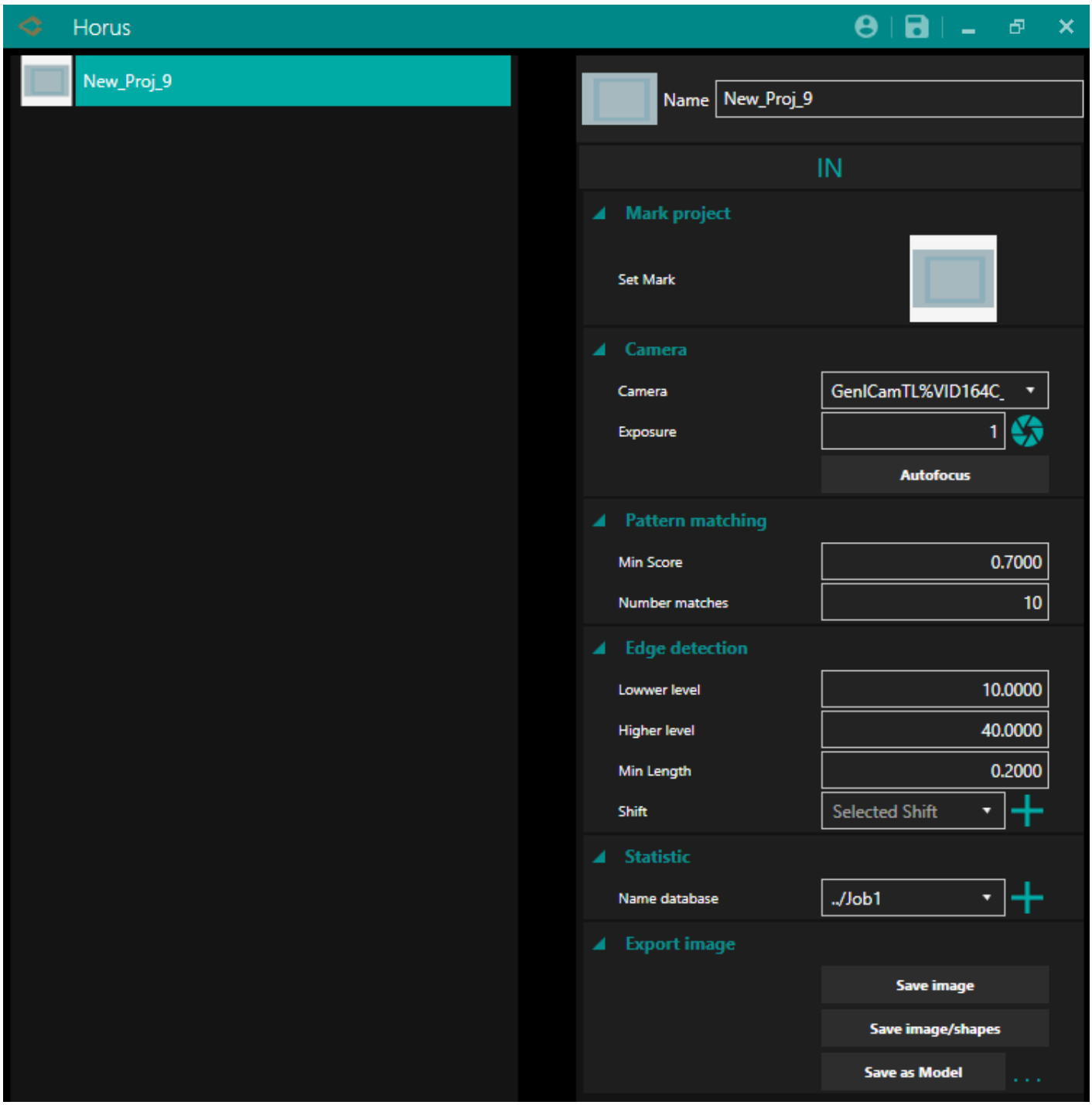
2.5 Property Bar

2.5.1 Property Bar

When an object is selected (from the objects tree or on the 2D visualizer), its properties are shown in the property bar, set on the right-hand side of the screen.



In the right bar the user can change the name of the object and the properties; the number of the properties depends on the user level, in order to give access to advanced features only to the expert users.

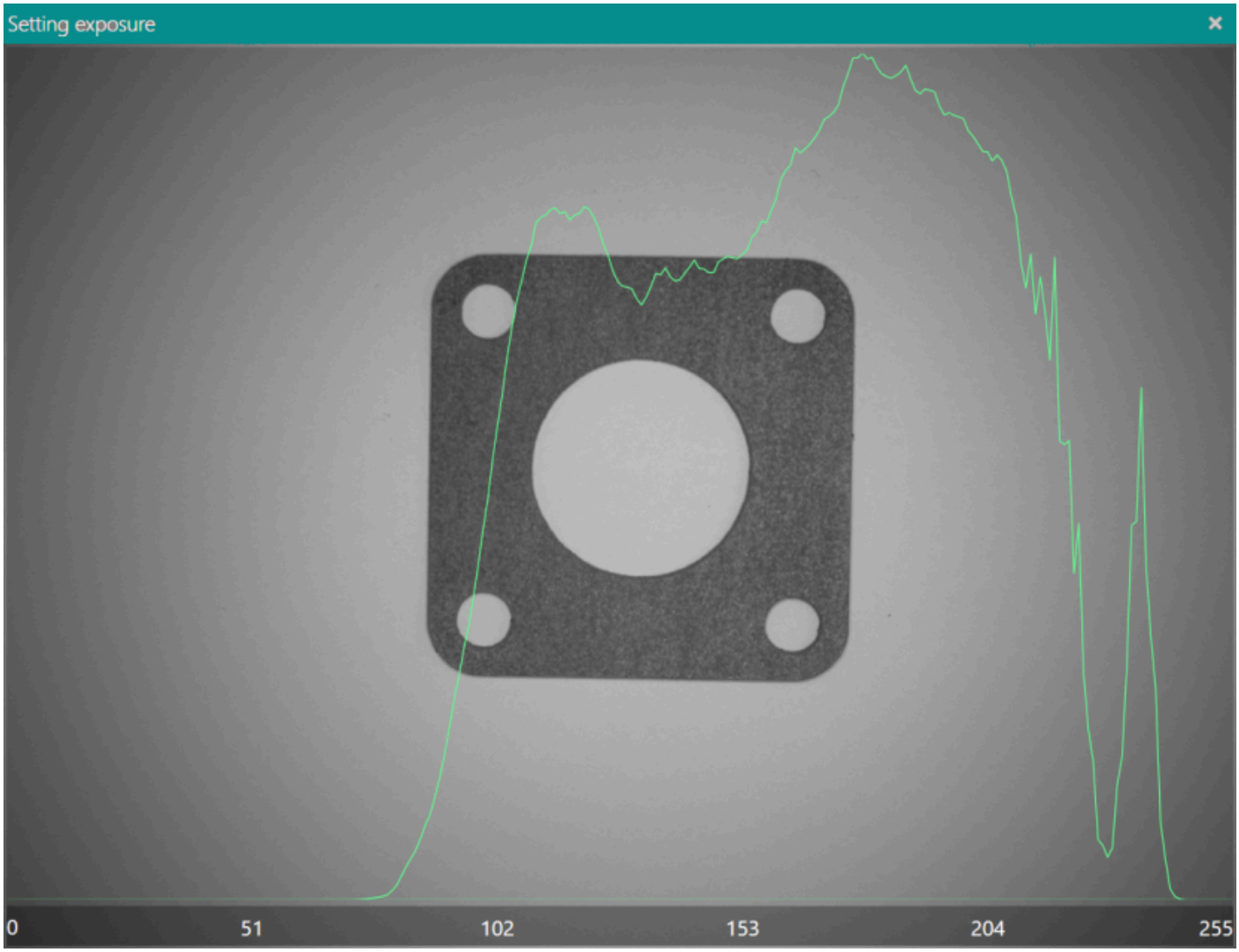


Selecting the project instead, you can change the name, assign a mark, modify settings including the camera and its exposure, set the parameters for the pattern matching and the edge detection. Particular attention must be paid to the values Min Score (the percentage needed to recognize your item; for example, 0.70 means that 70% of the model must match to recognize the object) and Number Matches (the maximum number of pieces to be recognized; for example, with 12 pieces, if NM is equal to 10, it will choose the first 10 pieces closest to the model).

You can also change the name of the database where to save the statistics and export the acquired image in various formats. If you press Save Image, the calibration is also saved with it. If you press Save Image/Shapes, you save the image as a sort of print screen; together with the image, a customizable document is generated.

2.5.2 Exposure

Adjust the exposure time.

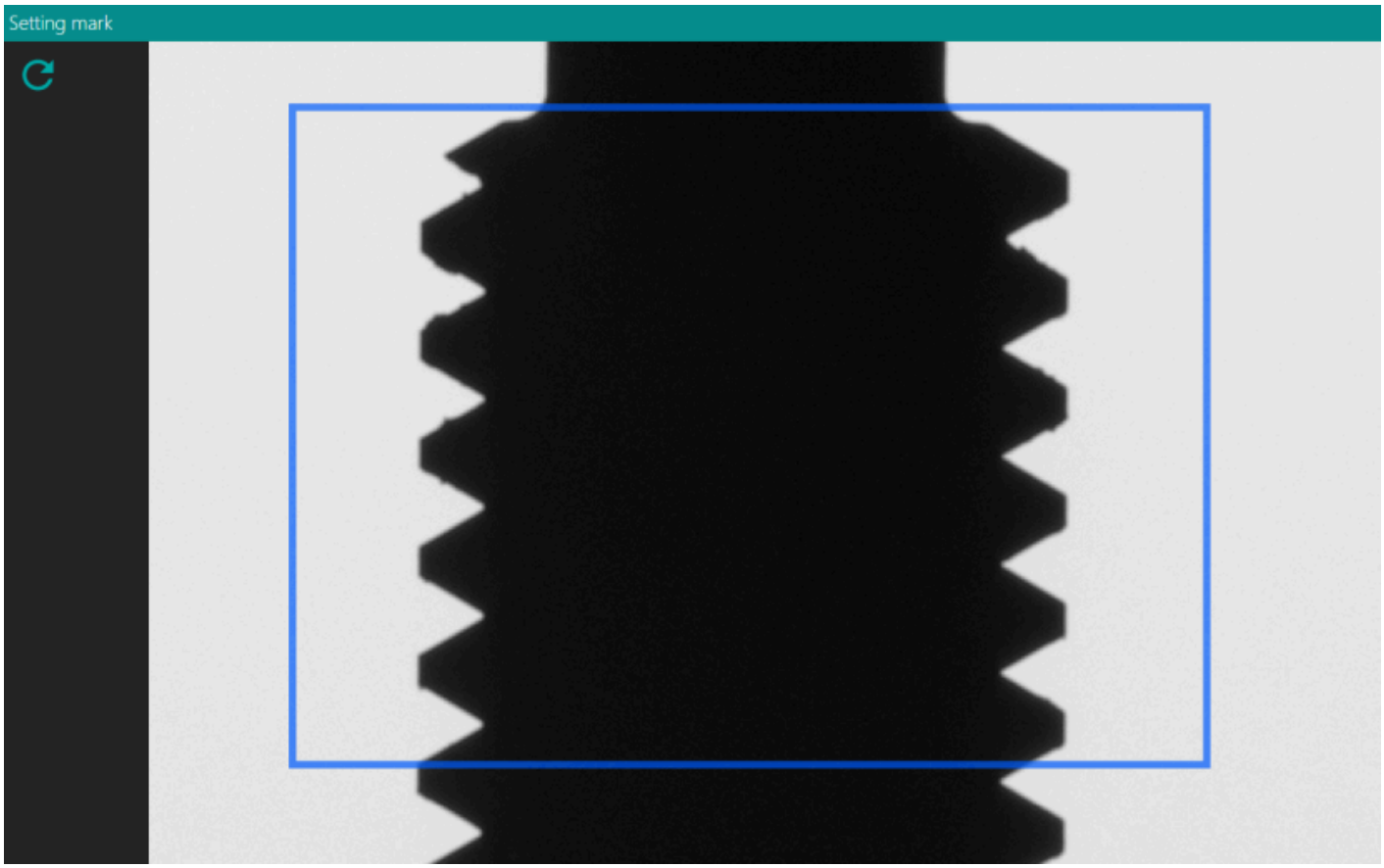


Try to find the right exposure by moving the slider at the bottom of the page or by entering the value in the box next to it. Be careful not to have a part of the histogram above 255 because you are overexposing.

2.5.3 Set Mark

Setting Mark

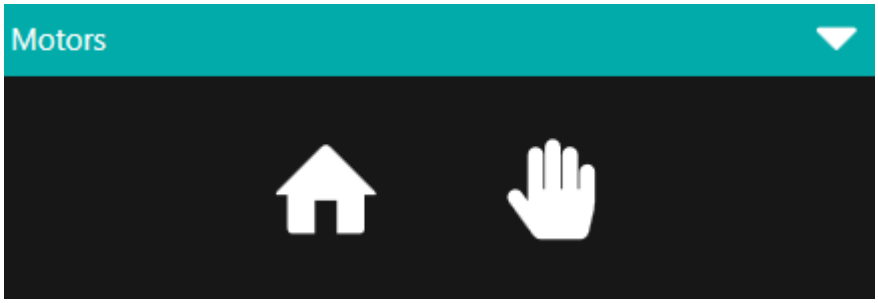
Assign a mark.



With mark you can select a representative part of your image and assign it to the current project, like an icon, to make the project easier to select when you open Horus. Click on the thumbnail next to SetMark to open its window. After pressing the refresh icon, if necessary, move and / or resize the colored rectangle. With the area selected, close the window and press the save button.

2.6 Motors Console

You can control your motor devices from Horus. Before using the motors, configure them in the motor settings menu; if the device has a problem, this will be highlighted by an exclamation point at the bottom right.



At the top of the window you can home and/or stop the motor. Once the homing has been performed correctly, it will be possible to have full access to all the features.

Otherwise check the motor settings menu if there is any error.

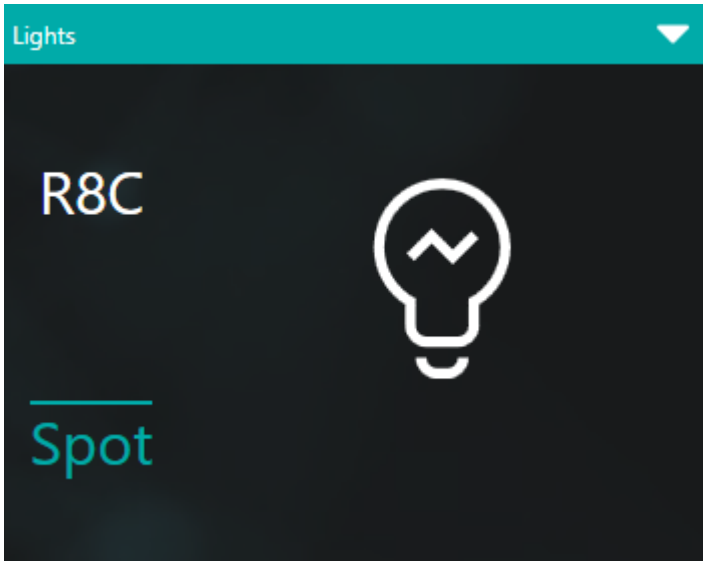


At the bottom you can move the motors in jog or set the position manually.

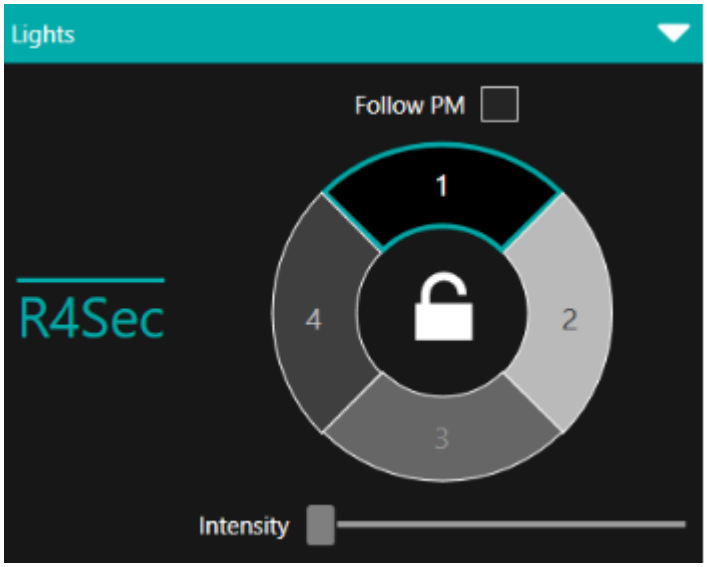
Choose the axis you want to move, use the + or - keys to move manually (the current position is indicated between the two keys) or enter a value and press the GoTo key to go to a specific position.

2.7 Lights Console

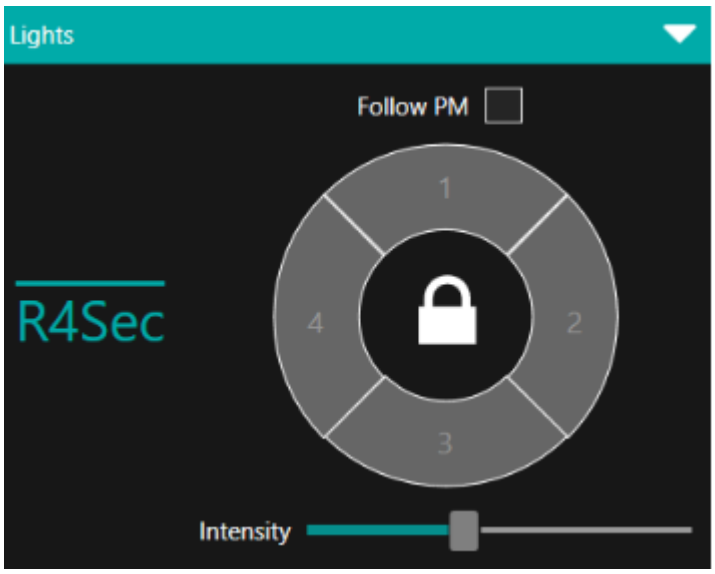
Depending on the lighting device you set, you can turn on/off the lights or the individual sector simply by clicking on it.



If you have a PWM controller, a slider will allow you to adjust its intensity. For multi-sector illuminators, first select the sector to be adjusted.

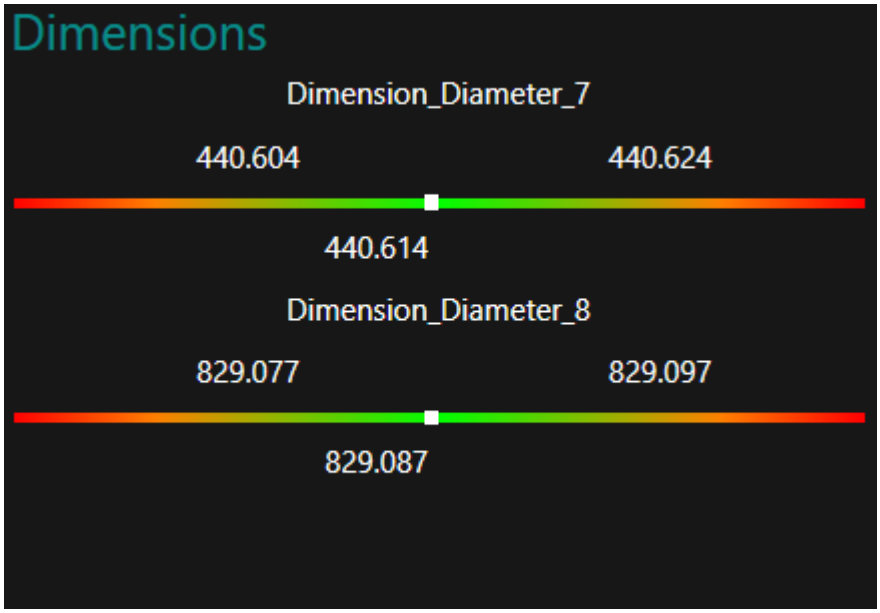


By closing the padlock, the intensity will be adjusted for all sectors.


Lights
Follow PM
1
2
3
4
R4Sec
Intensity

2.8 Dimension Bar

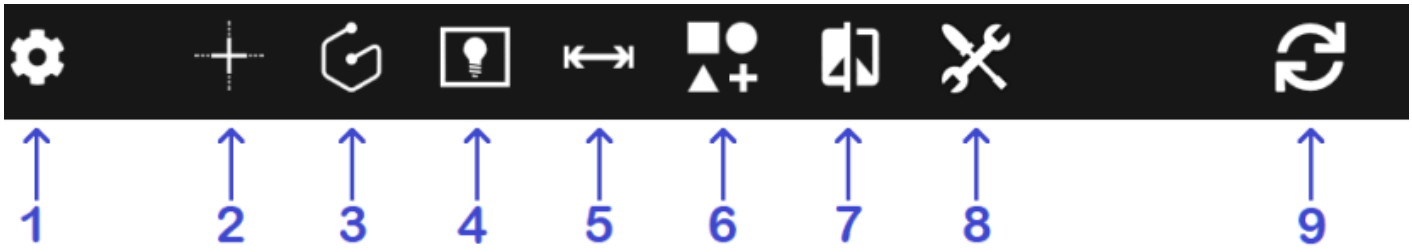
Shows how the measurement values are placed within the tolerance range.



2.9 Main Console

2.9.1 Main Console

The main console includes all the basic functions that are useful for using the program.



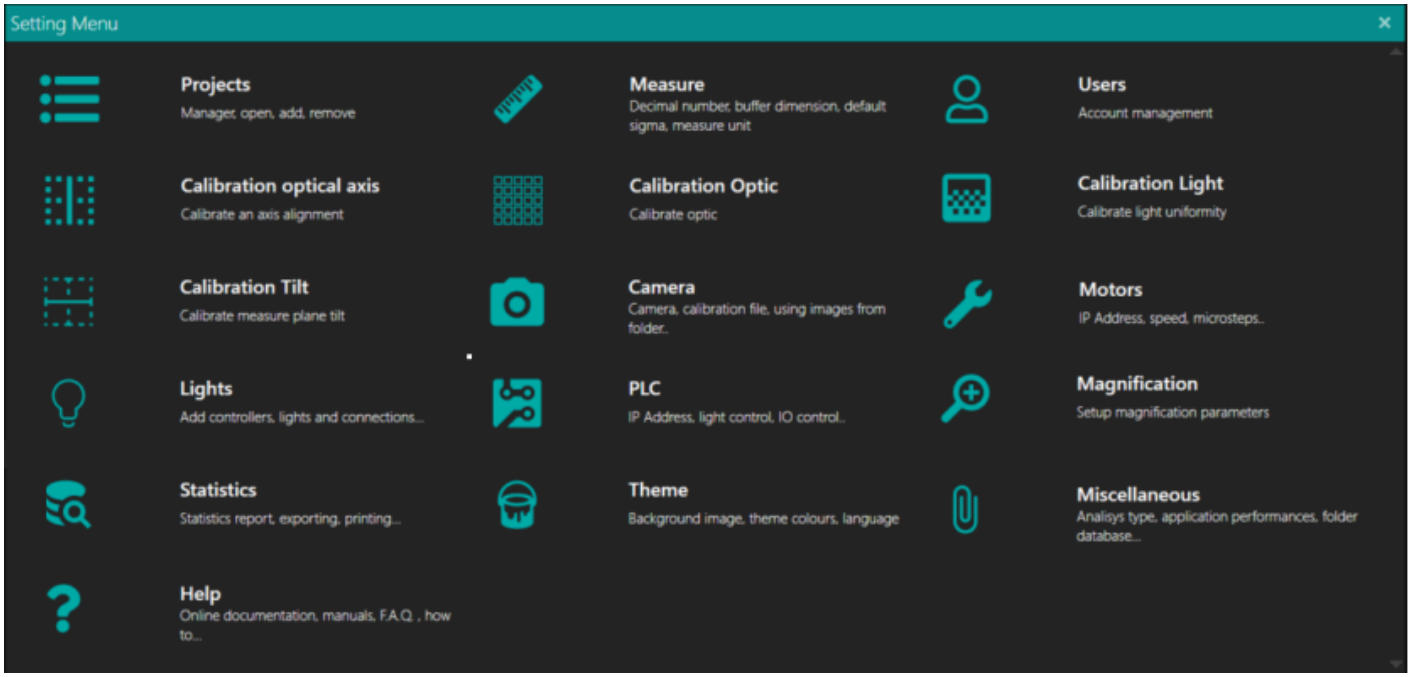
Common functions needed to measure and inspect an object, or in general everything necessary to create a good program, can be found in the main console.

There are several groups, each one dedicated to one particular function.

1. Settings Menu;
2. Pattern Matching;
3. Detection;
4. Gray Scale;
5. Measure;
6. Shapes Construction;
7. Dxf;
8. Advanced Optional Plugins;
9. Statistics.

2.9.2 Settings Menu

2.9.2.1 Settings Menu

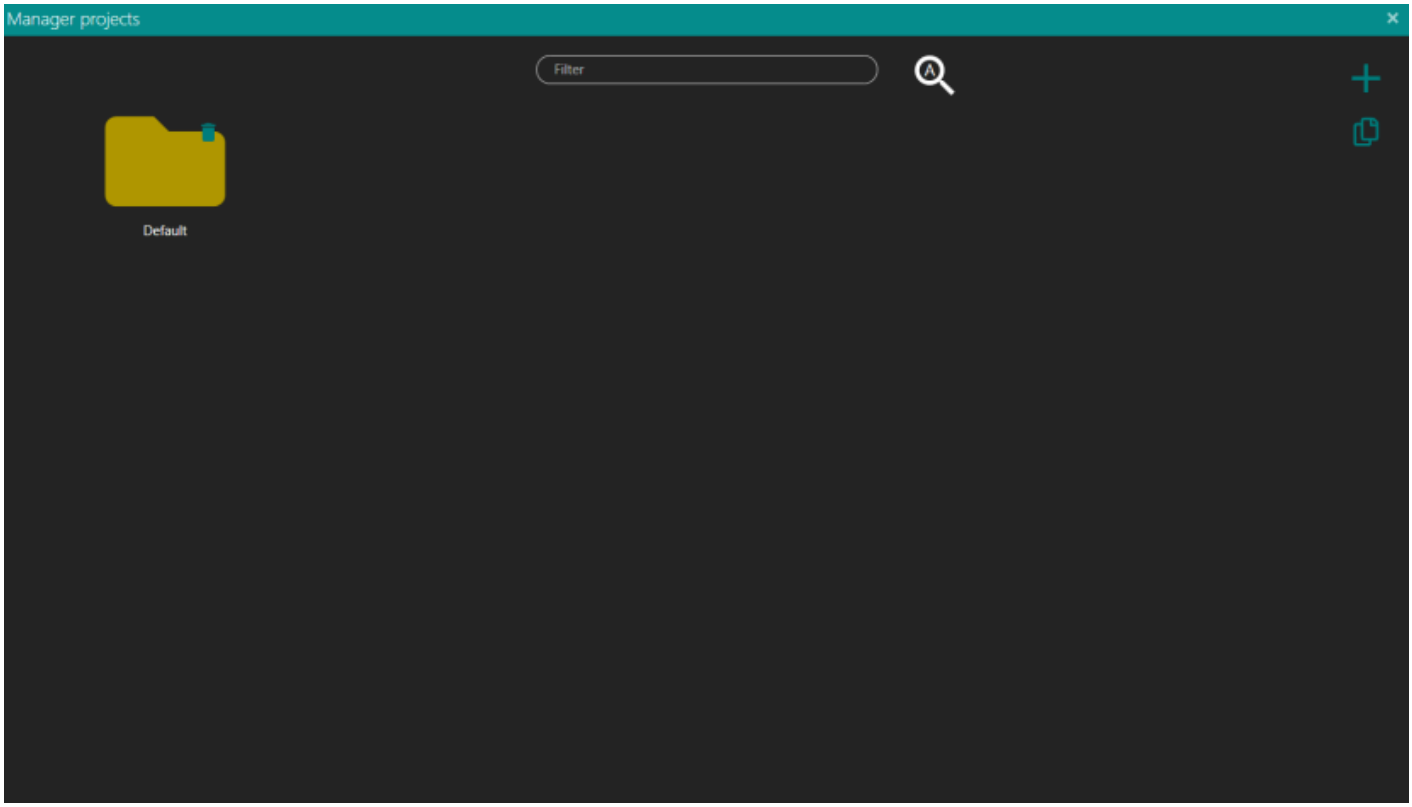


Settings Menu is the general menu where you can find features to personalize or set your application.

- Projects;
- Measure;
- Users;
- Calibration Z-axis;
- Calibration Optic;
- Calibration Light;
- Calibration Tilt;
- Camera;
- Motors;
- Lights;
- PLC;
- Magnification;
- Statistics;
- Theme;
- Miscellaneous;
- Help.

2.9.2.2 Projects

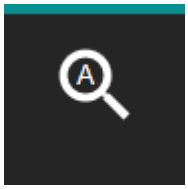
Manage your projects.



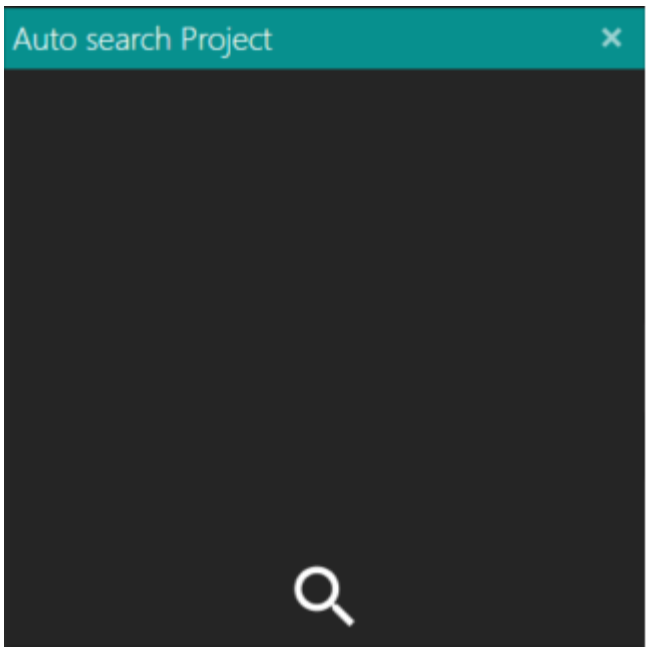
The projects menu allows the user to navigate the projects that are stored in the machine or create/edit them.

On the first level you can organize your folders for the projects that you want to manage. You can add (plus icon button) or duplicate your project folder (double sheet icon button, displayed when a folder is selected). You can also delete the project folder (trash icon button).

At the top you can enter a filter for quick search of a project or proceed to automatic search selecting the lens icon:

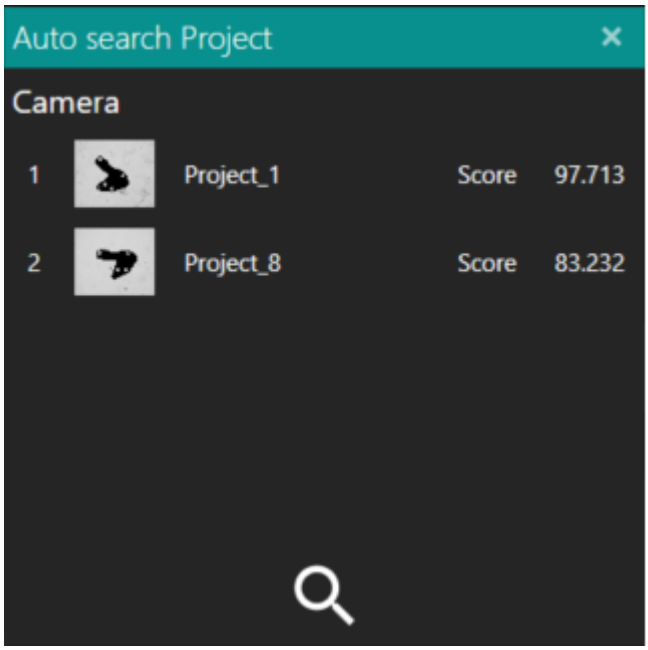


The search feature is a shortcut to open a saved project using the current object under the camera or using the QR Code assigned to the product.



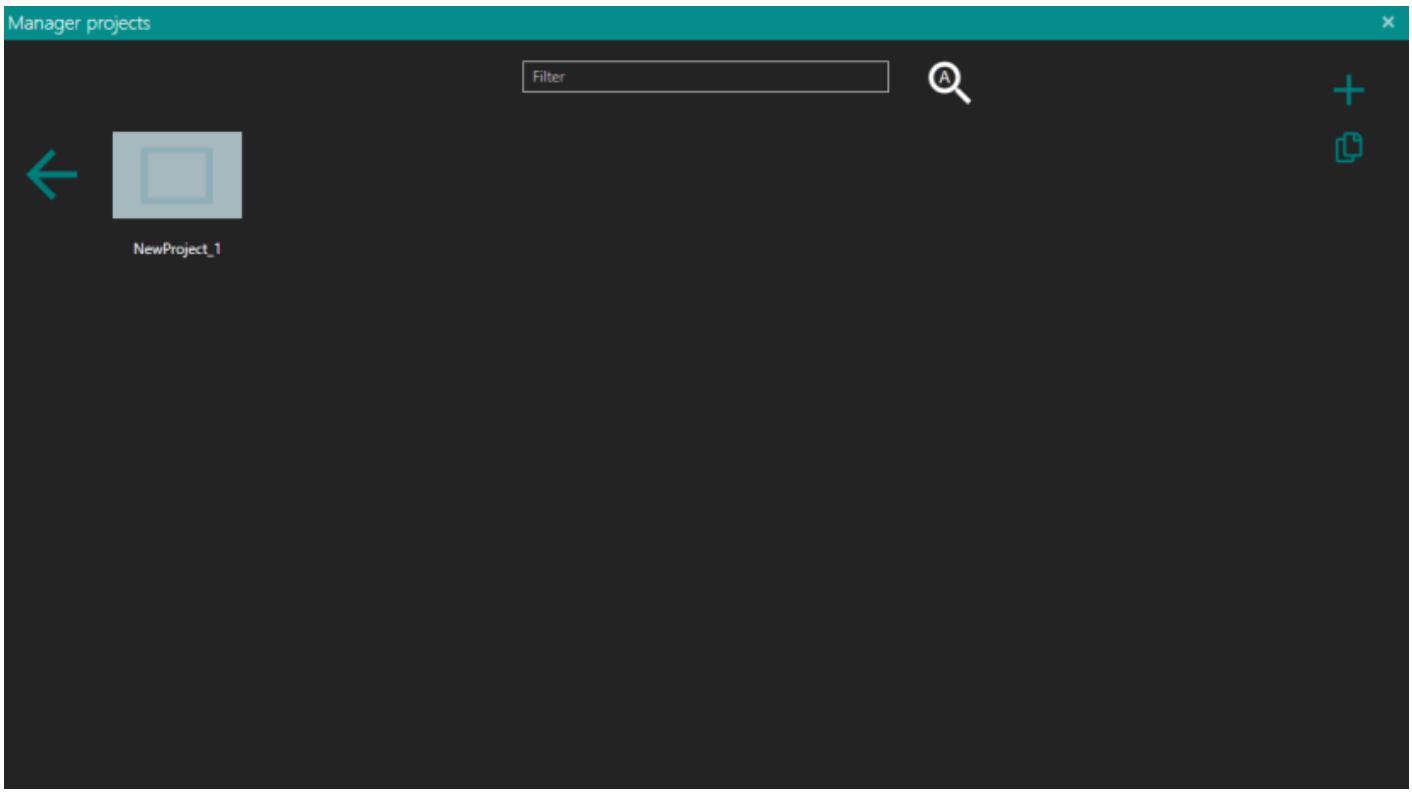
When the object under the camera is set, it is necessary to just click on search.

If the input from the camera matches more than one project, the search feature shows a list of them with the matching score.

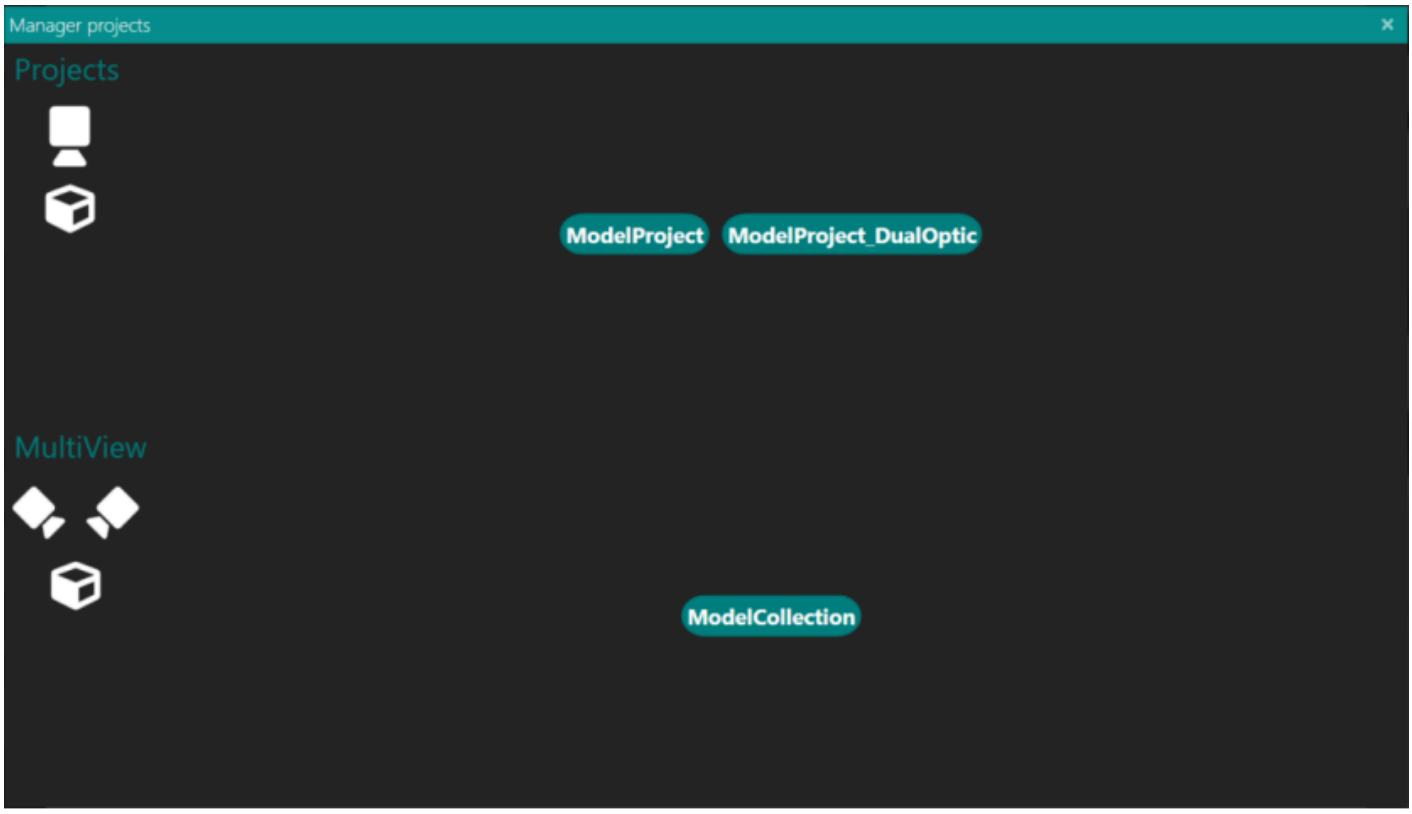


Saving a project created using an ImgFromFile (see Property Bar) makes the search tool not find it if the input comes from a camera. Furthermore, if the input is an uploaded image, it will find only the projects saved with the ImgFromFile enabled.

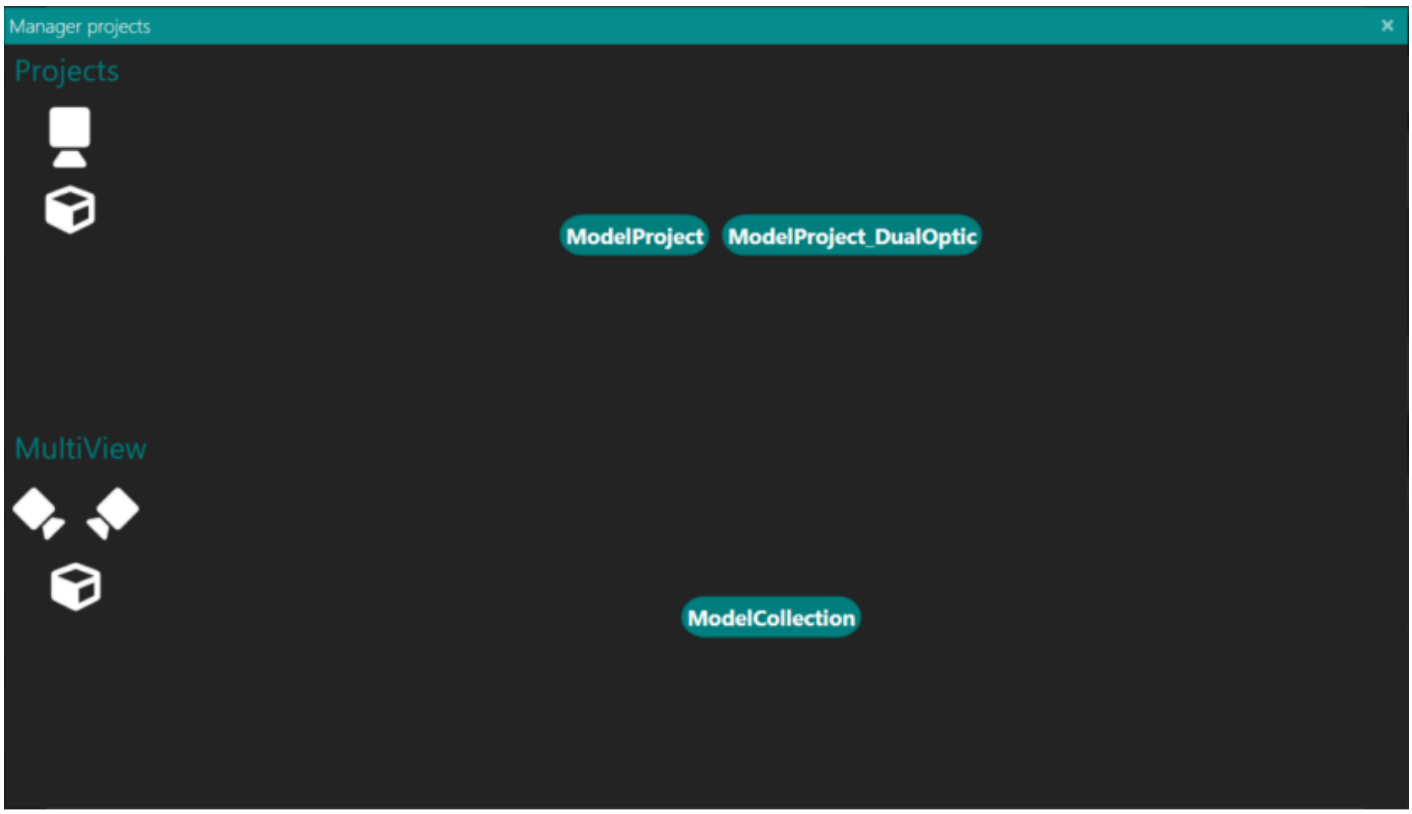
On the second level (inside a folder) you can create or manage projects in the same way as project folders.



By pressing the add button you can choose whether to create a new project (ModelProject) or a collection of projects (ModelCollection).



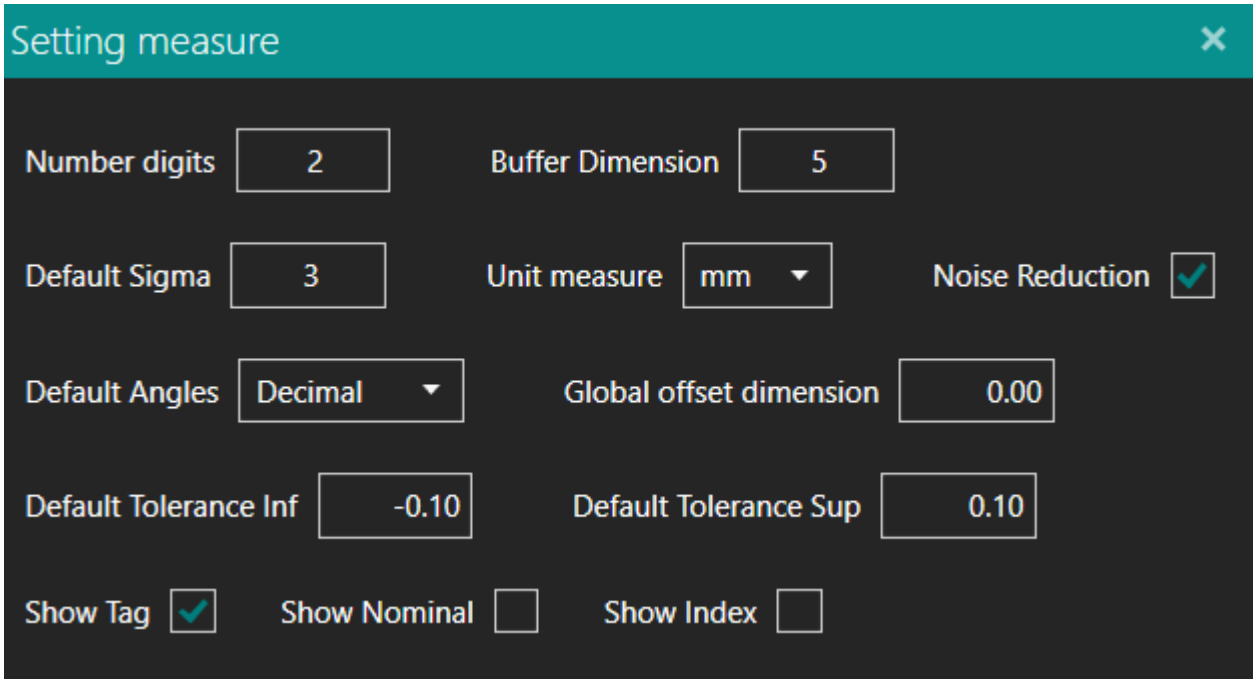
If you choose to create a collection, once opened, the list of projects contained in the collection will appear on the left bar with the possibility of selecting the work project.



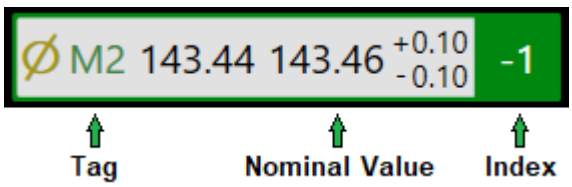
By pressing the add button (+ icon) you can add an existing project (Open) to the collection or add a new project (ModelProject).

2.9.2.3 Measure Setting

Configure dimensions and measures.



- Number of digits after the decimal separator;
- Buffer dimension to stabilize live measurement values by averaging n values;
- Default sigma for fitting the primitives;
- Unit of measure for dimensions;
- Noise reduction to stabilize the measurement result for small value changes;
- Default type for angle measurement (decimal or degree);
- Offset for dimensions;
- Lower and upper default tolerance;
- Show Tag, Nominal Value, Index of dimension:

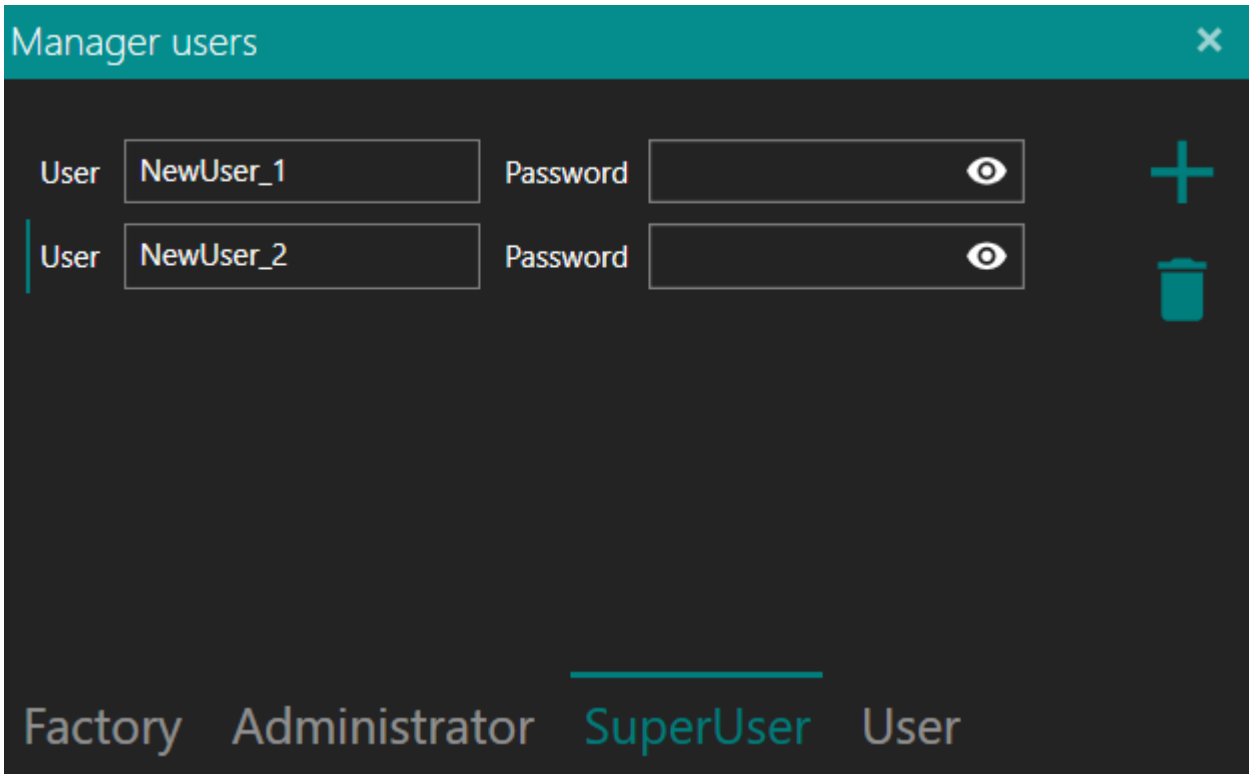


The first two values can be set in the Property Bar; the third is calculated by the system as an index of deviation between the nominal value and the value that is measured, with respect to the lower / upper tolerance values.

2.9.2.4 User

Manager Users

Create and manage users.



Users can be divided into four categories: Factory, Admin, SuperUser and User. The Factory user can administer Admin, SuperUser and User users. The Admin user can administer SuperUser and User users, and so on.

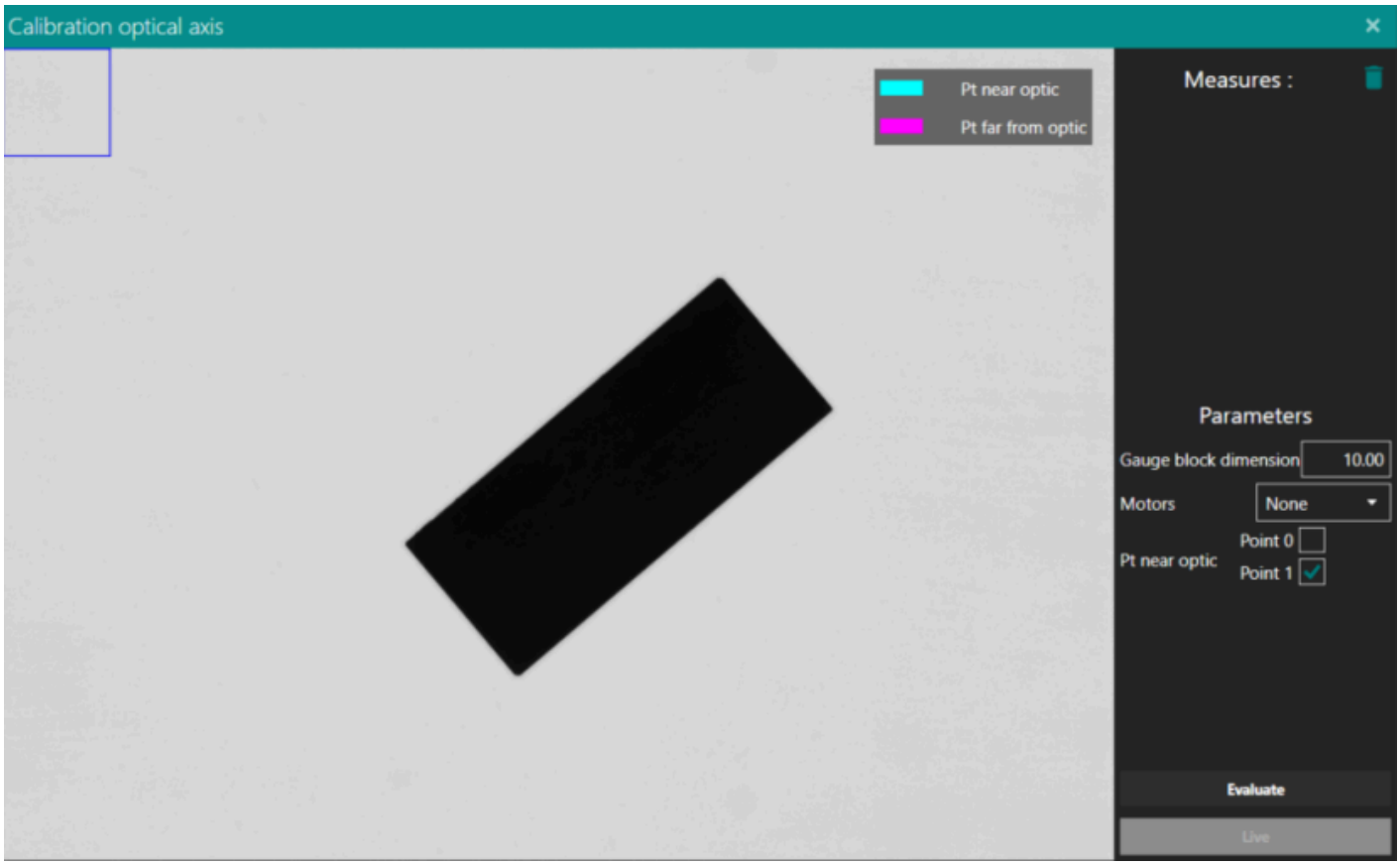
To add a new user, use the + icon buttons on the right side. Each user must have a unique name regardless of the category they belong to.

To remove a user, use the trash icon buttons on the right side.

2.9.2.5 Calibration Z-axis

Calibration Optical Axis

To calibrate.



The optical axis calibration is performed by Johansson gauge blocks. The objective is to make the optical axis as parallel as possible with the Z axis of movement.

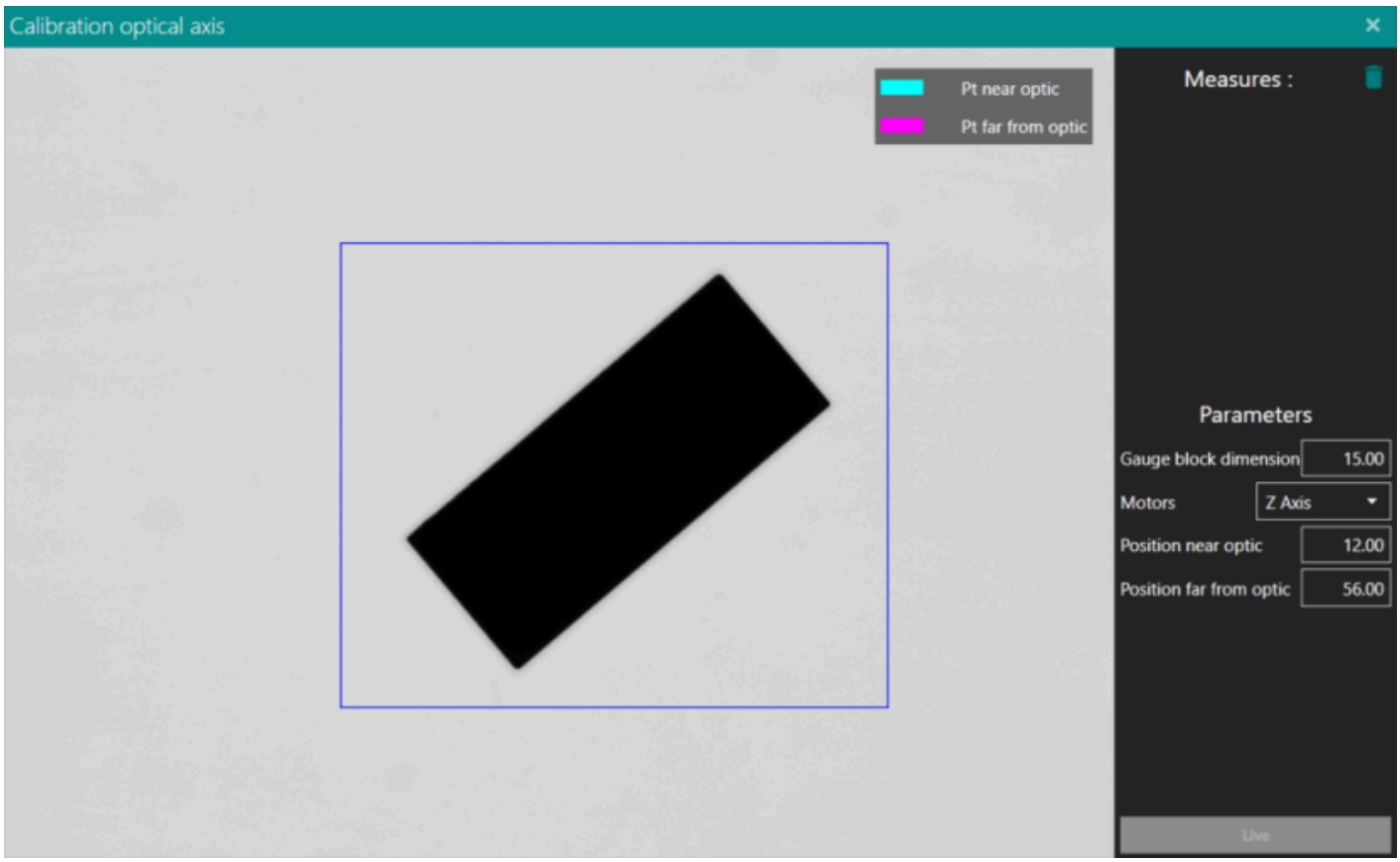
a) Automatic procedure:

Find, by actuating the motor along the Z axis, the two positions at the two ends of the depth of field in which the gauge block is in focus and note the values.

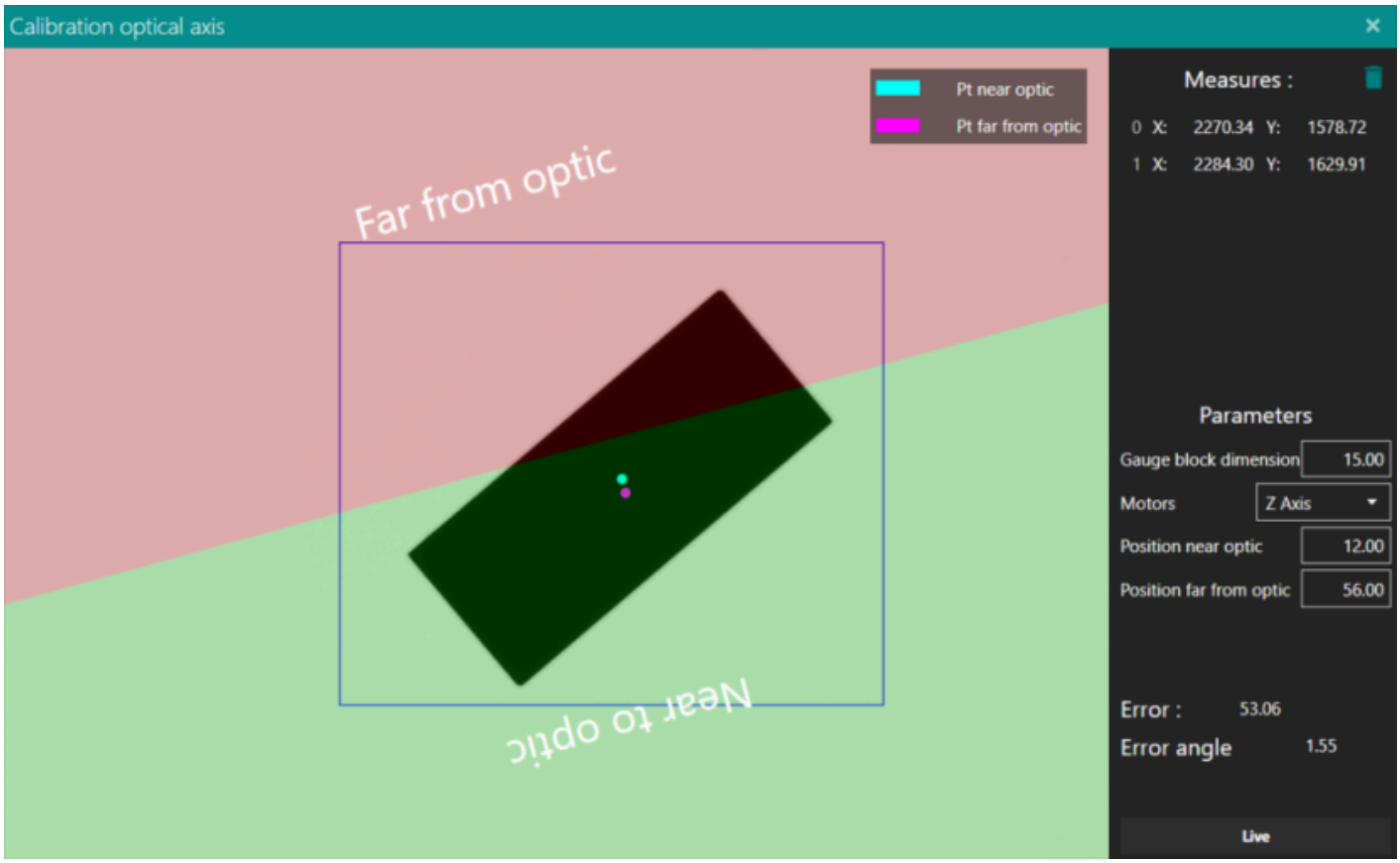
Start the calibration procedure from the Settings Menu, select the Z axis motor from the Motors drop-down box.

Drag and change the size of the rectangle on the top left to include the gauge block and enter its dimensions in the box on the right.

Also in the box on the right, enter the two previously noted positions of the motor.



Press once on the image outside the rectangle containing the gauge block.



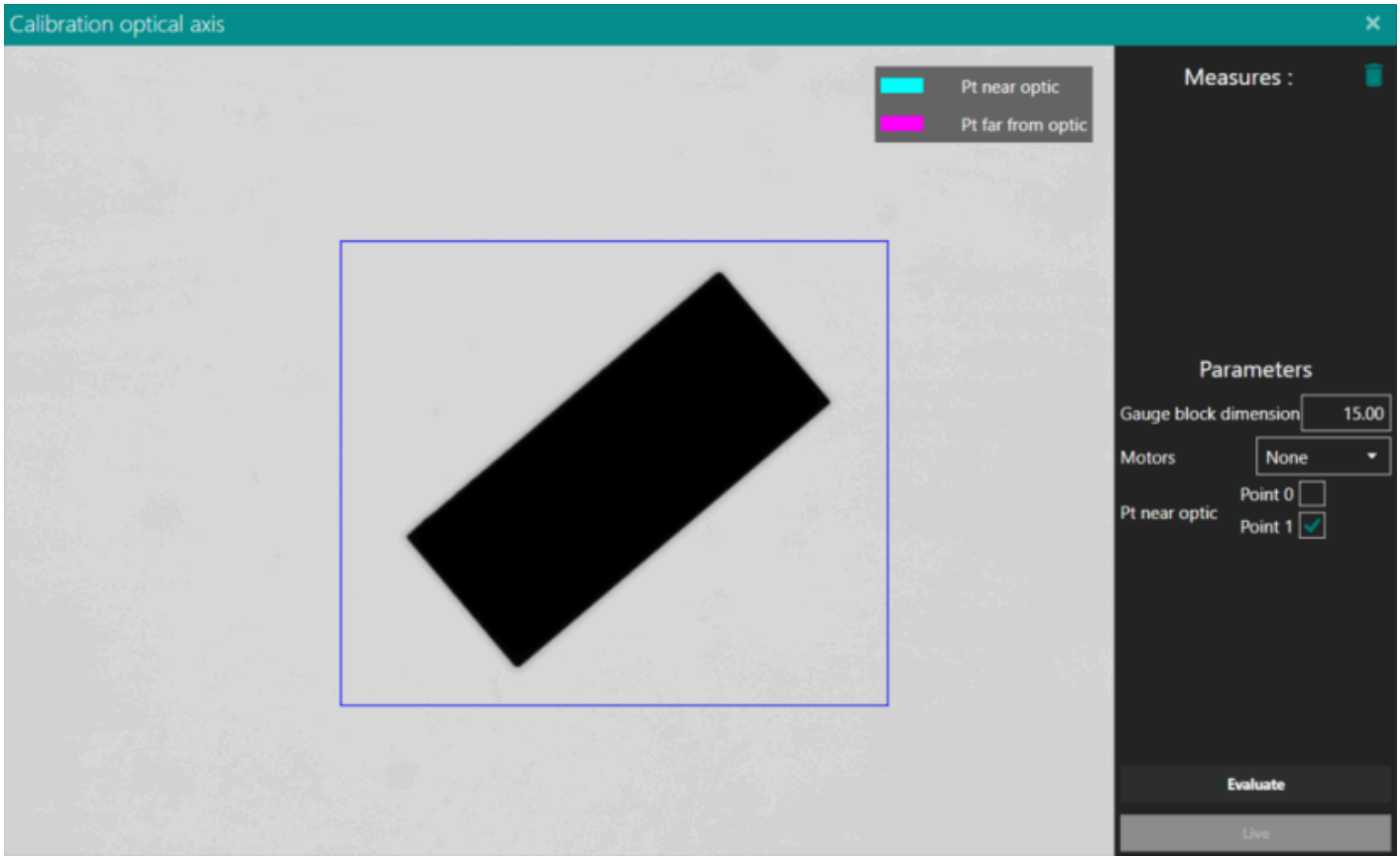
At the end of the two measurements, the value of the error in pixels and the offset angle in degrees will be shown. The image will indicate how to move the plane to correct the error.

b) Manual procedure:

First find, by manually operating the Z axis, the two positions at the two ends of the depth of field in which the gauge block is in focus and note the values.

Start the calibration procedure from the Settings Menu, select None from the Motors drop-down box.

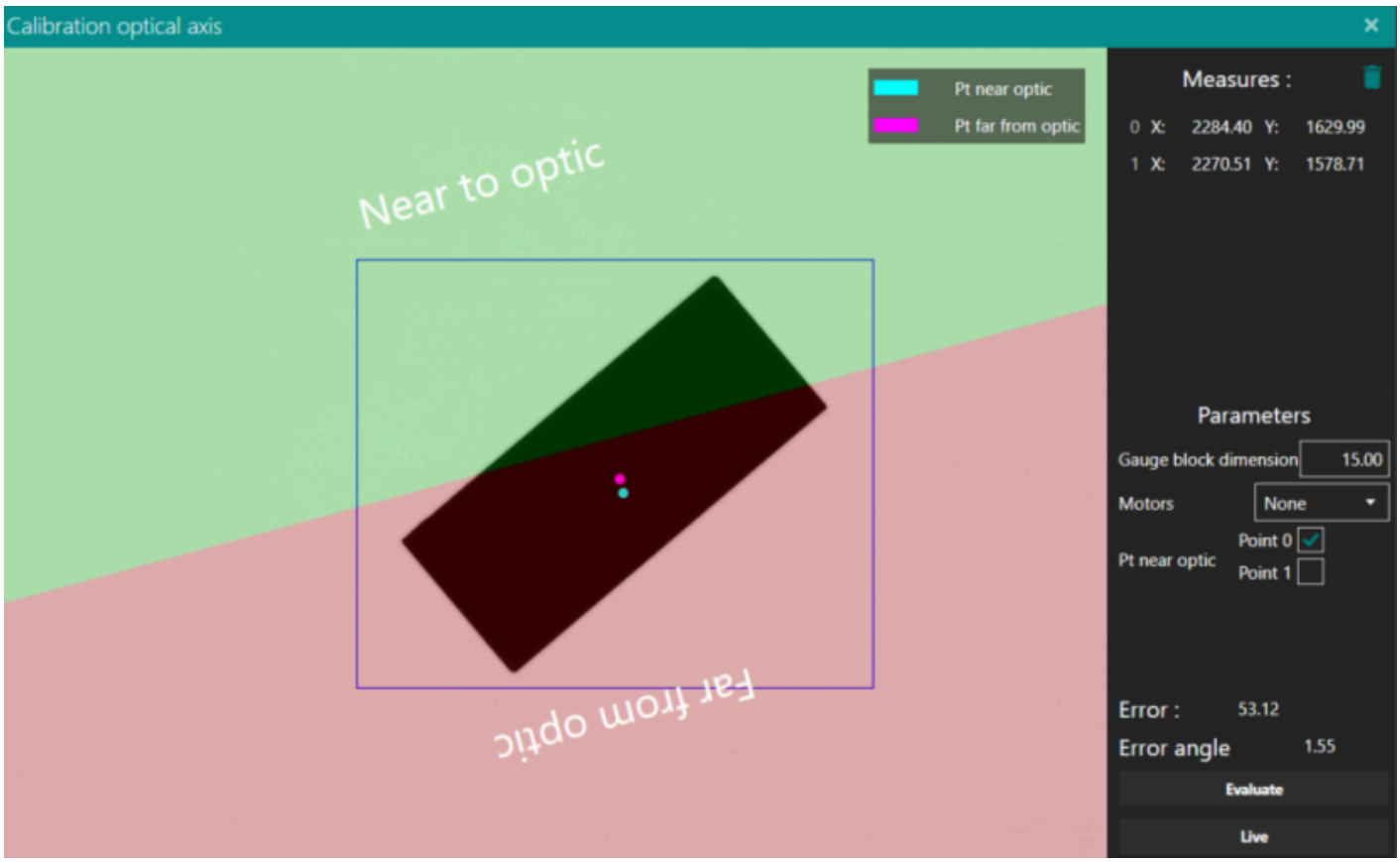
Drag and change the size of the rectangle on the top left to include the gauge block and enter its dimensions in the box on the right.



Using the motor console, position yourself manually on the first position, click on the image outside the selection rectangle to get the first pair of values.

Position yourself manually on the second position, click on the image outside the selection rectangle to obtain the second pair of values.

In the right box Pt (point) near optic, select which of the two points is closest to the optics.



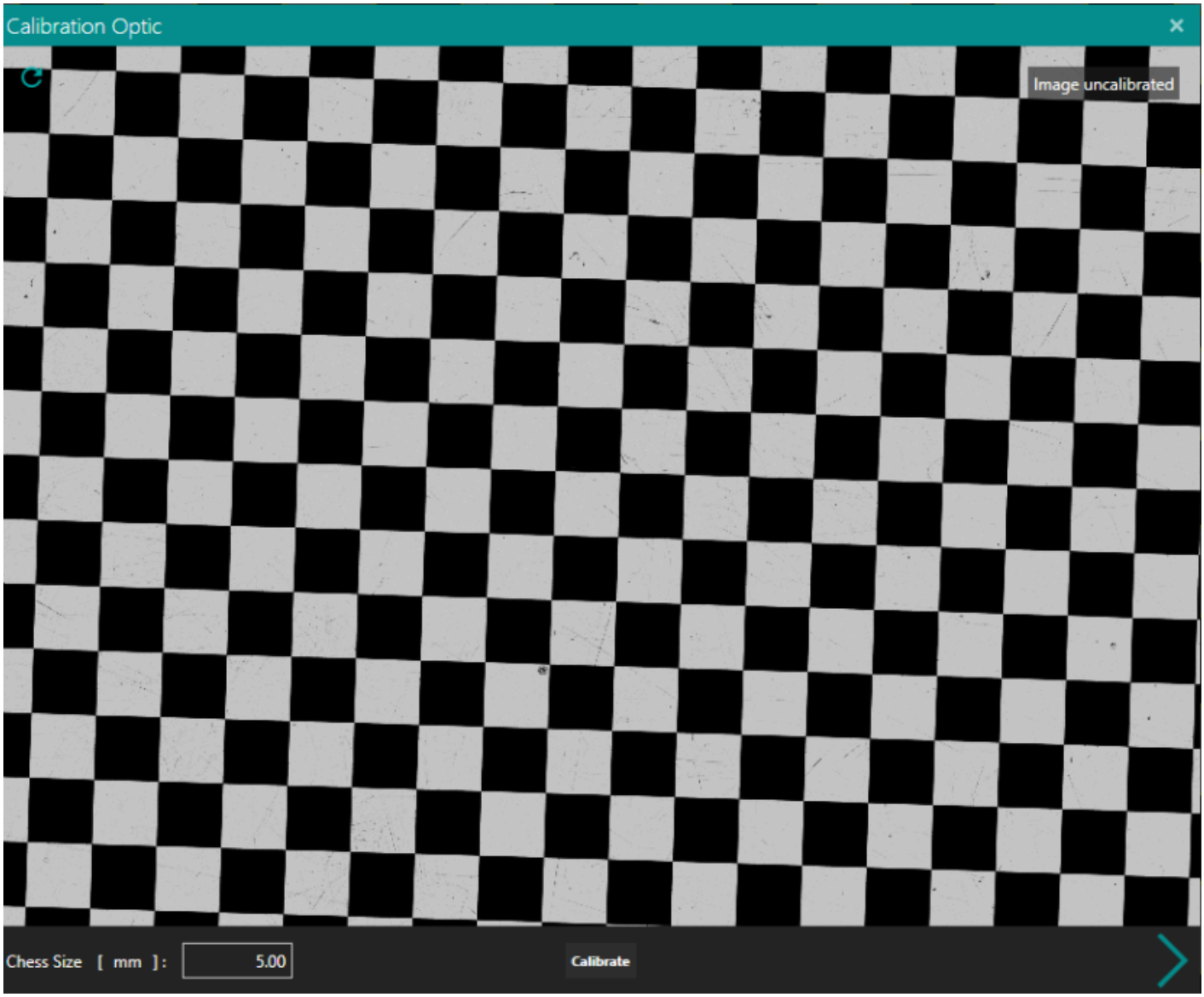
Press Evaluate at the end of the two measurements, and the value of the error in pixels and the offset angle in degrees will be shown. The image will indicate how to move the plane to correct the error.

After adjusting the plane, press the basket icon and repeat the procedure until the error is minimized.

With the Live button, the algorithm continues to calculate the second position, useful to see what happens when adjusting the plane, but not as accurate as repeating the entire procedure.

2.9.2.6 Calibration Optic

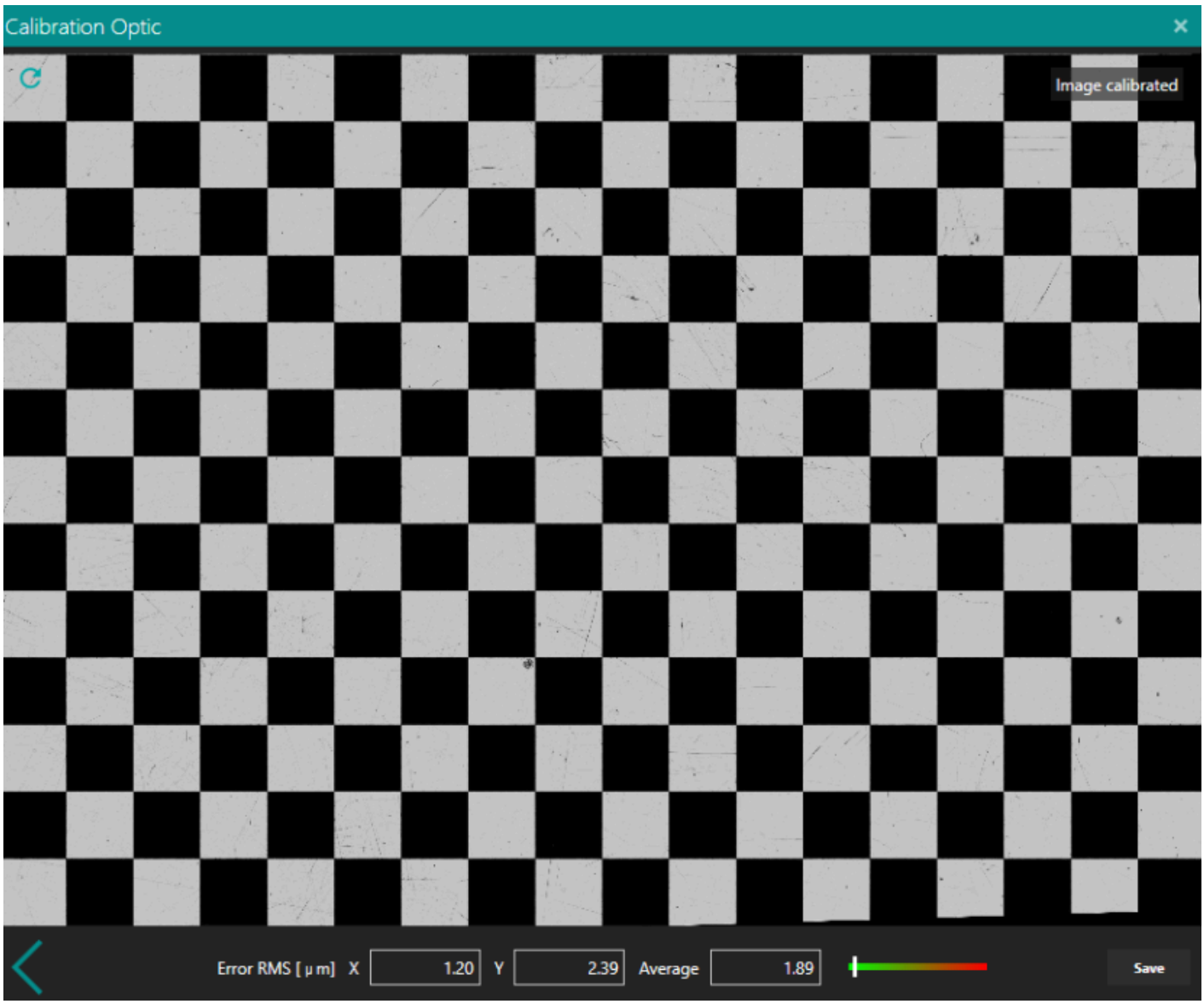
To calibrate.



The optical calibration is performed by a chessboard of at least 5X5 squares within the FOV.

Put the chessboard as straight as possible, make sure that the first column shows only half squares as shown in the image, enter the size of the single square in millimeters or in the unit of measurement set in Measure and then press calibrate; the system will automatically calibrate the image.

In some particularly difficult conditions the operation can take a few minutes.



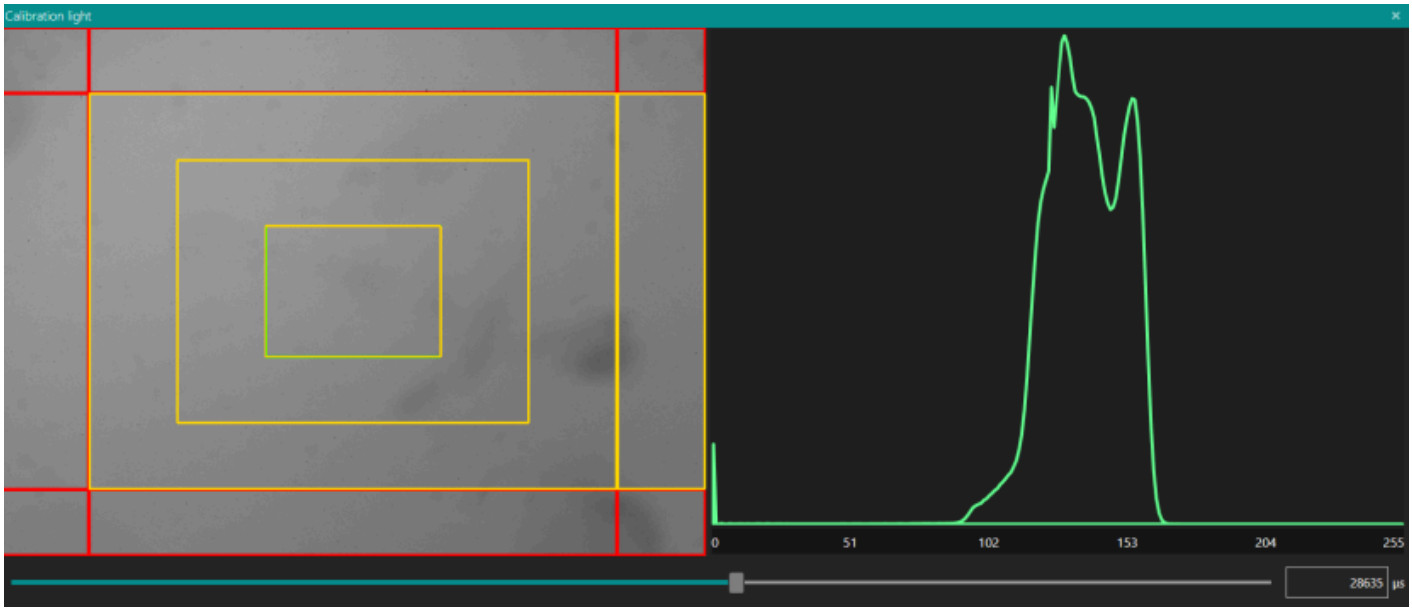
If everything is correct, the rectified image will appear with calibration process errors in micrometers; a cursor indicator will give you a qualitative evaluation of the calibration just done.

Then you can save the calibration as a file to be able to select it from the Camera settings.

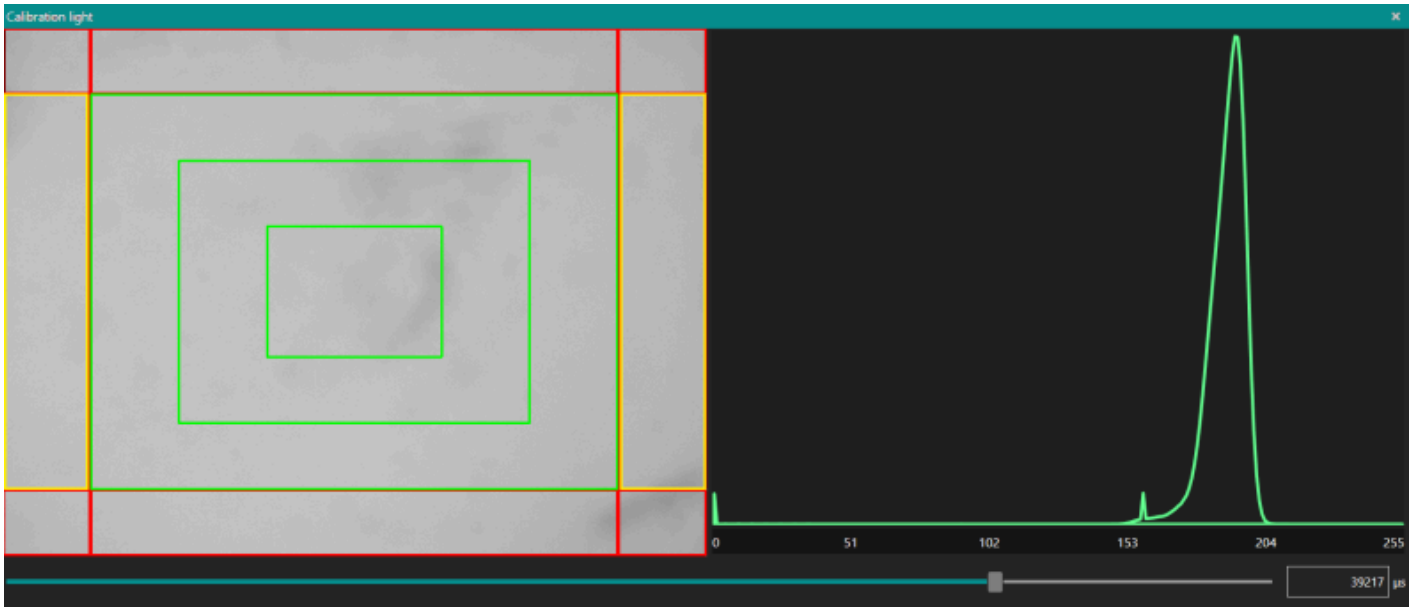
If a zoom lens is used, the procedure must be repeated for each magnification value.

2.9.2.7 Calibration Light

To calibrate.



Calibration Light helps you to find a uniform illumination of your work surface. On the left side, the work area is divided into several panels; by moving the camera or the light source, the ideal condition is achieved when all the squares are colored green. If these are yellow or, worse, red, it means that area is proportionally far from the ideal average value.



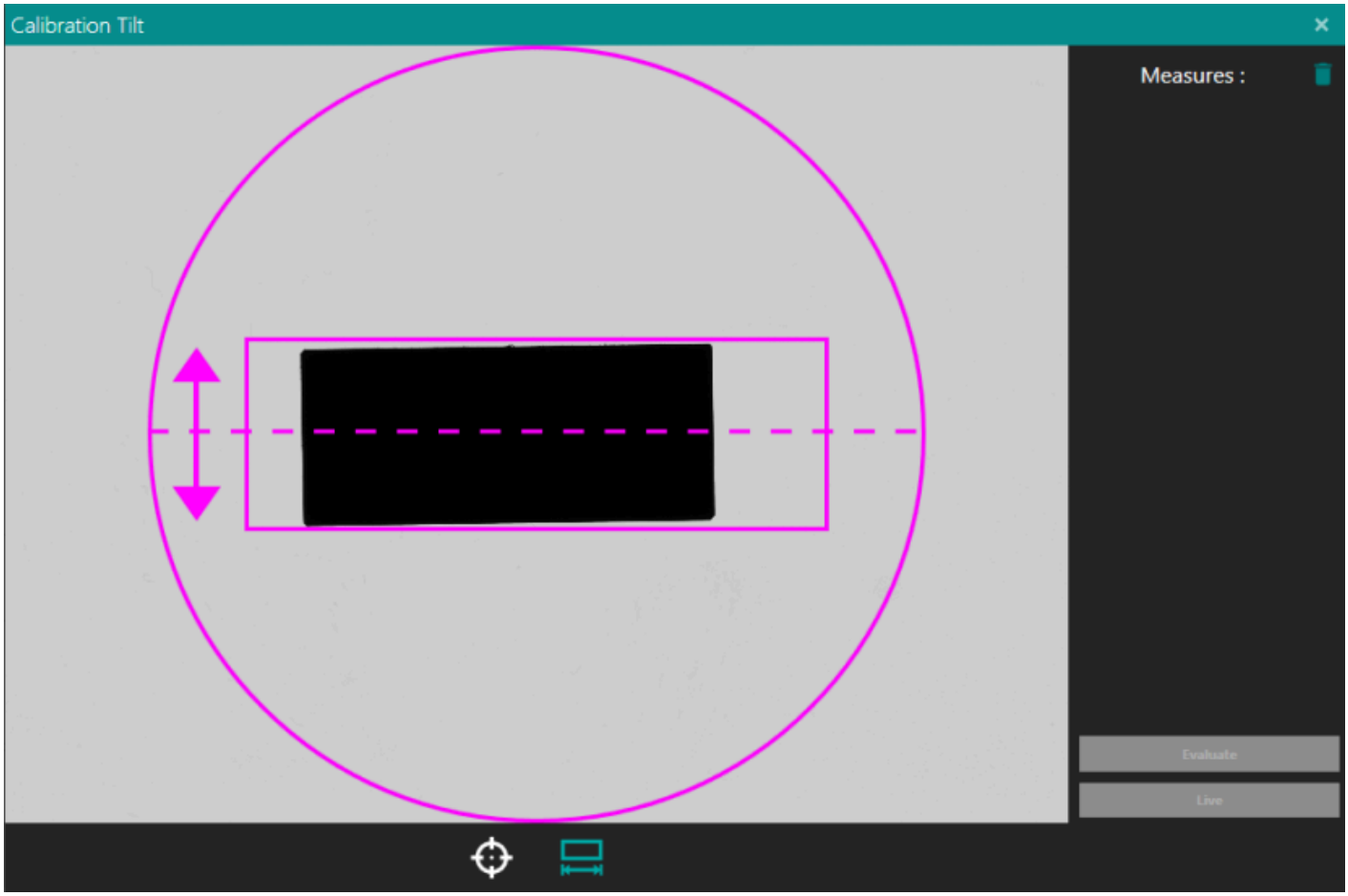
On the right side, an image histogram acts as a graphical representation of the tonal distribution in your image. It plots the number of pixels for each tonal value. By looking at the histogram you will be able to judge the entire tonal distribution at a glance. The ideal condition is realized as all the points are concentrated in the average value (medium gray) in a very narrow Gaussian. The slider at the bottom can help you find the right exposure.

2.9.2.8 Calibration Tilt

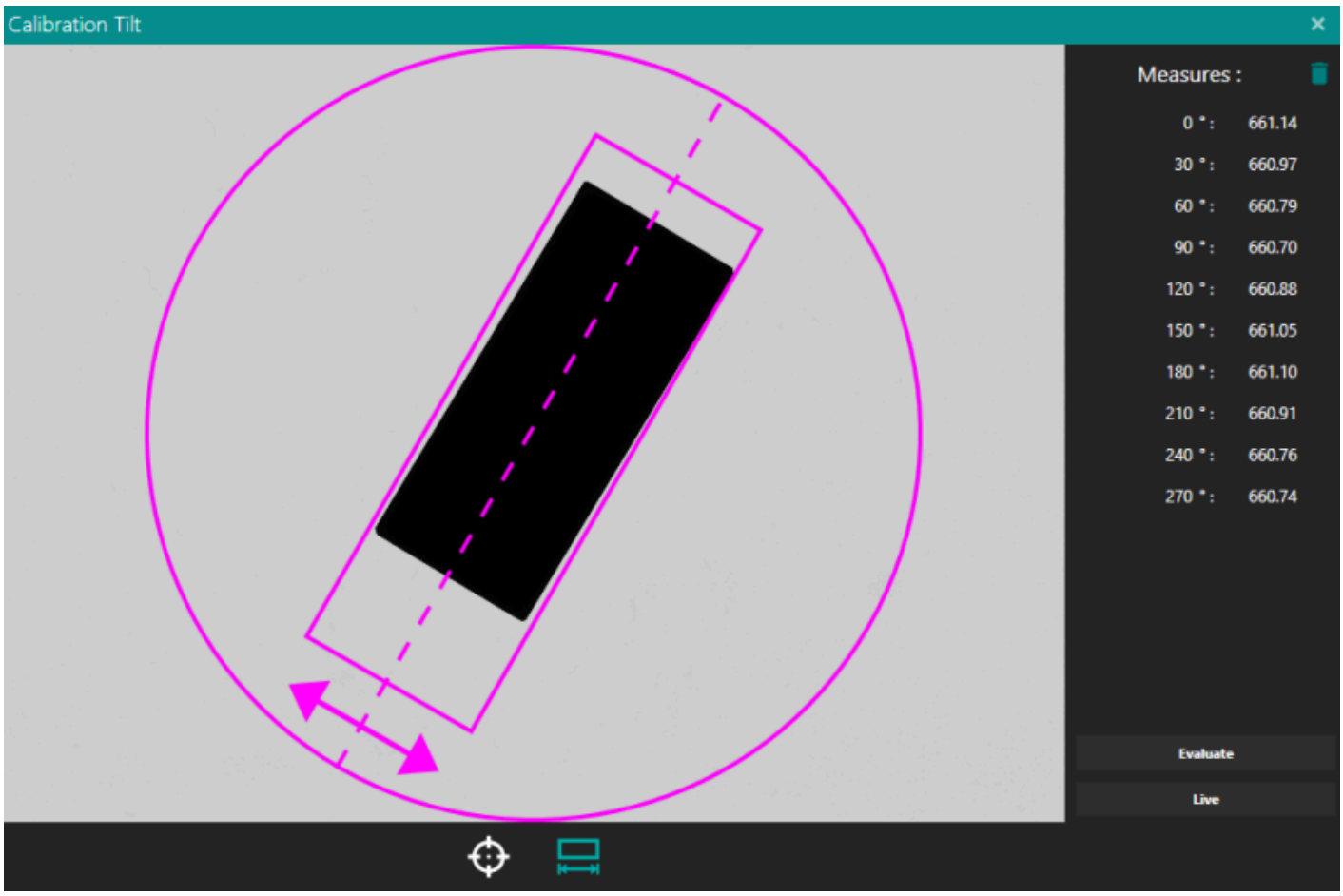


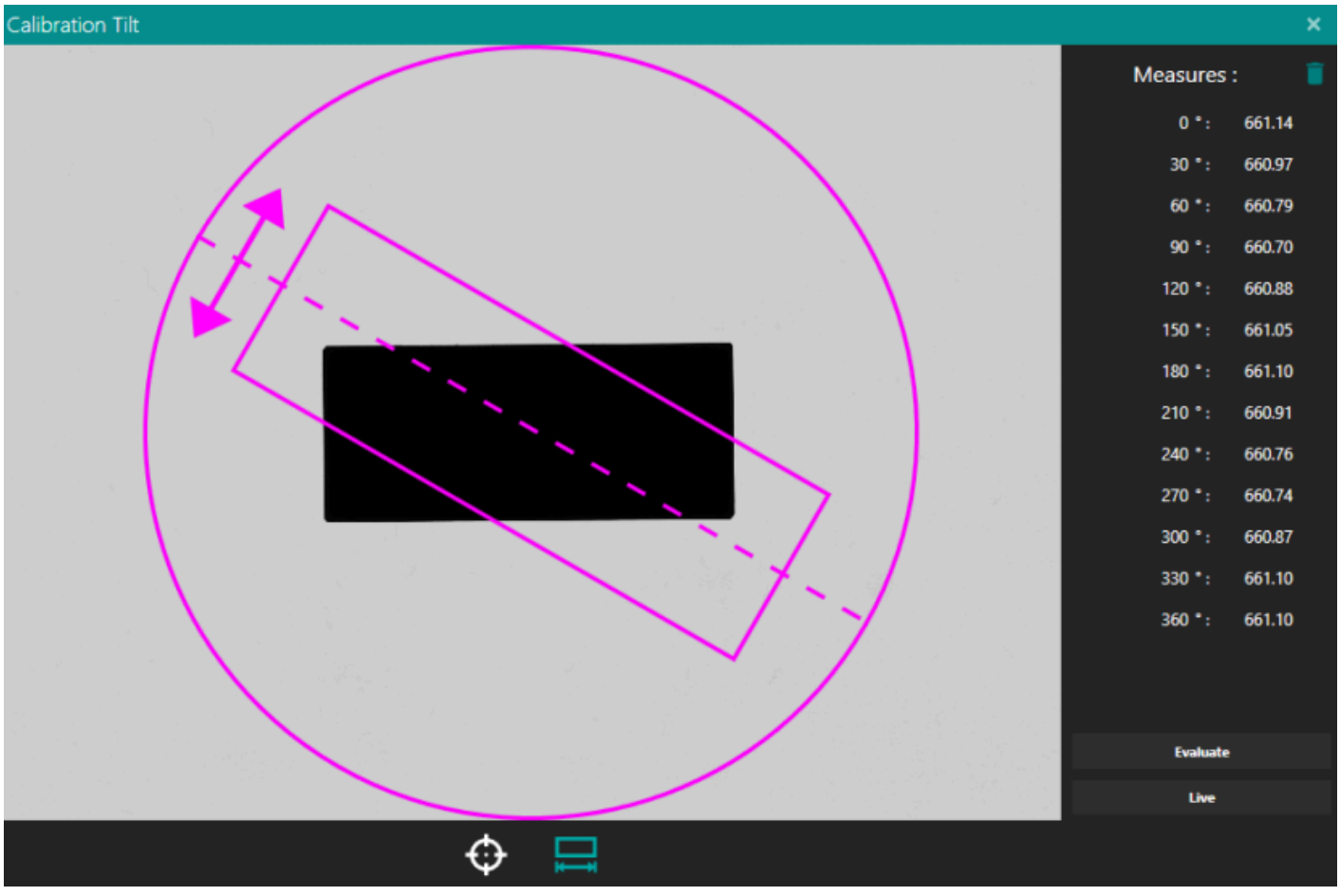
Calibration Tilt helps you to mitigate a possible inclination of the work plane that can lead to an incorrect vision and relative measurement errors.

Position your gauge blocks following the instructions on the screen and click on the image.

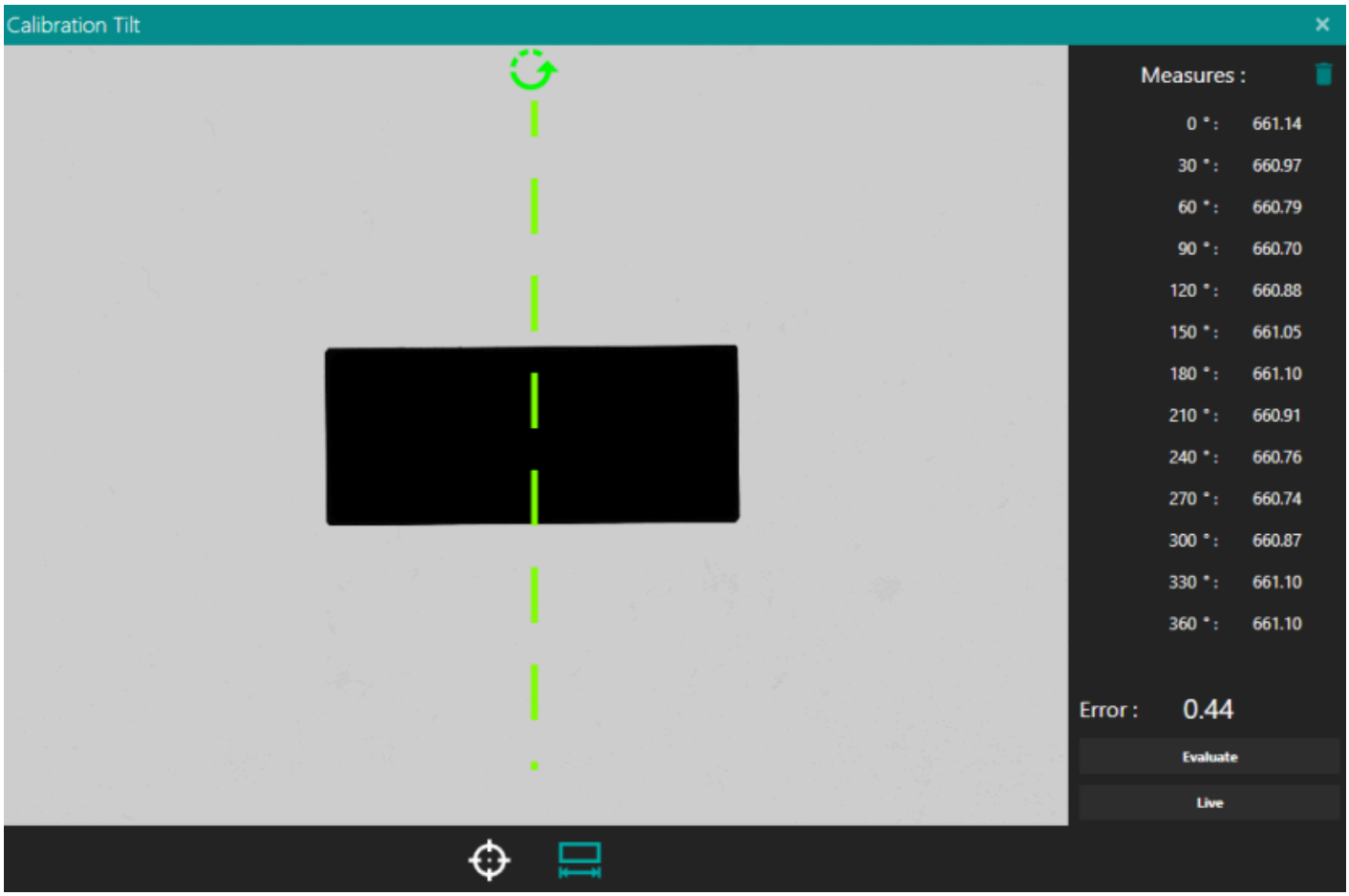


Move the gauge blocks following the proposed track by clicking in the image each time to confirm the position. The individual measures in pixels will appear on the right-hand column.

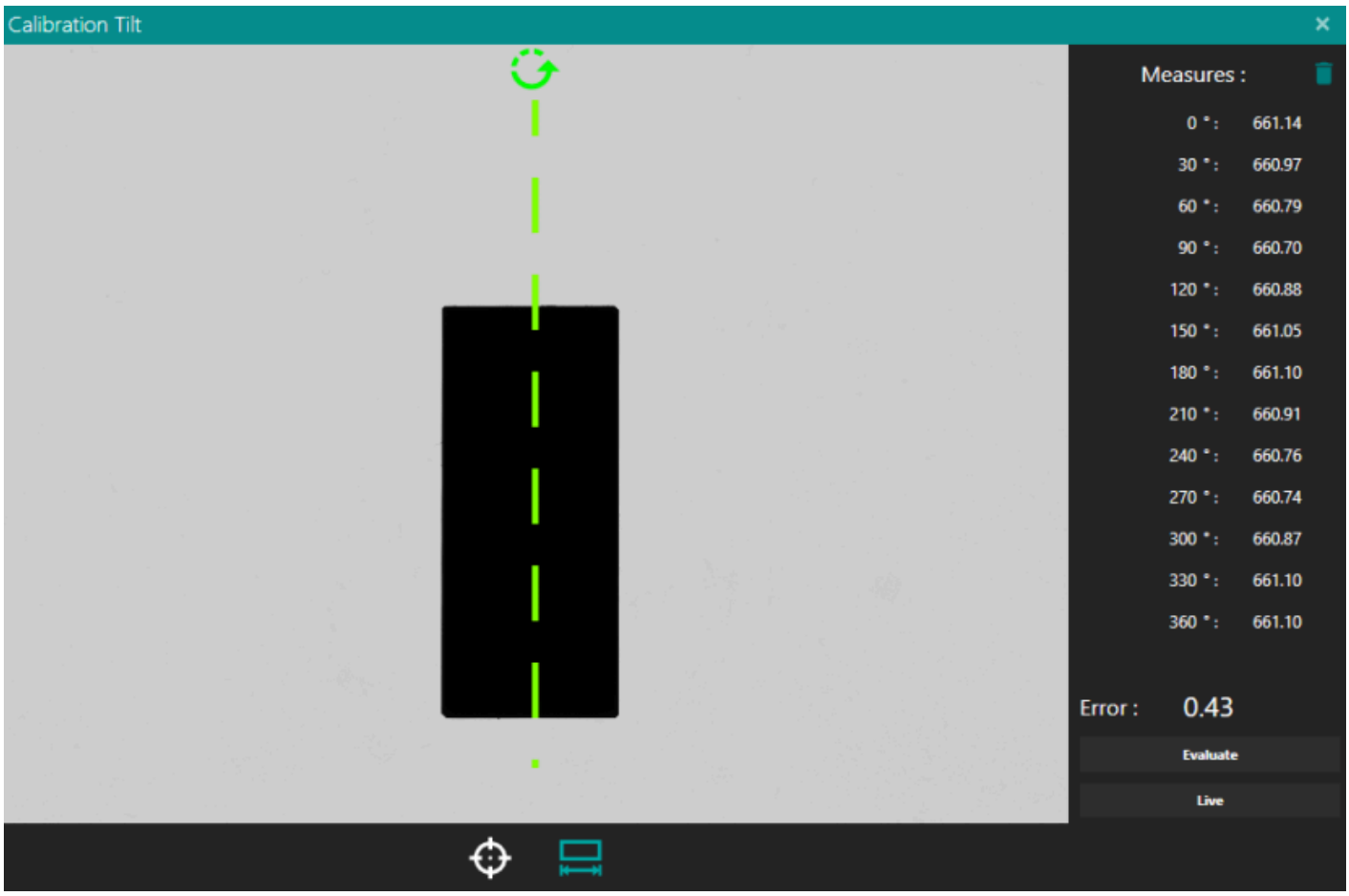

Calibration Tilt
Measures :
0 ° : 661.14
30 ° : 660.97
60 ° : 660.79
90 ° : 660.70
120 ° : 660.88
150 ° : 661.05
180 ° : 661.10
210 ° : 660.91
240 ° : 660.76
270 ° : 660.74
Evaluate
Live


Calibration Tilt
Measures :
0 ° : 661.14
30 ° : 660.97
60 ° : 660.79
90 ° : 660.70
120 ° : 660.88
150 ° : 661.05
180 ° : 661.10
210 ° : 660.91
240 ° : 660.76
270 ° : 660.74
300 ° : 660.87
330 ° : 661.10
360 ° : 661.10
Evaluate
Live

After a few measurements, press the Evaluate button; the program will indicate with a green axis the direction in which the imbalance is present.



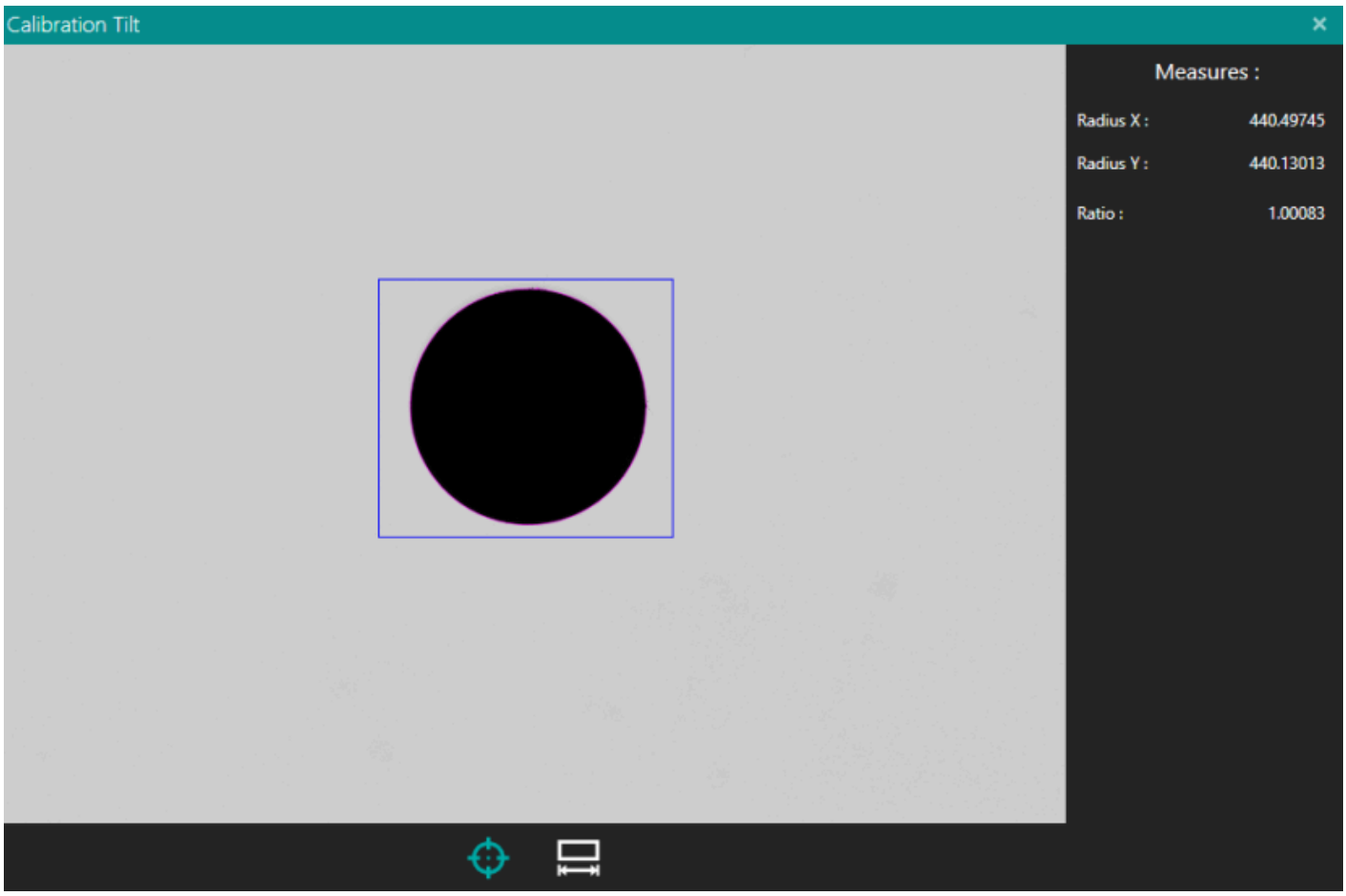
Put your gauge blocks in axis, press the Live button and try to minimize the error by tilting the plane along the indicated axis.



In Pin mode:

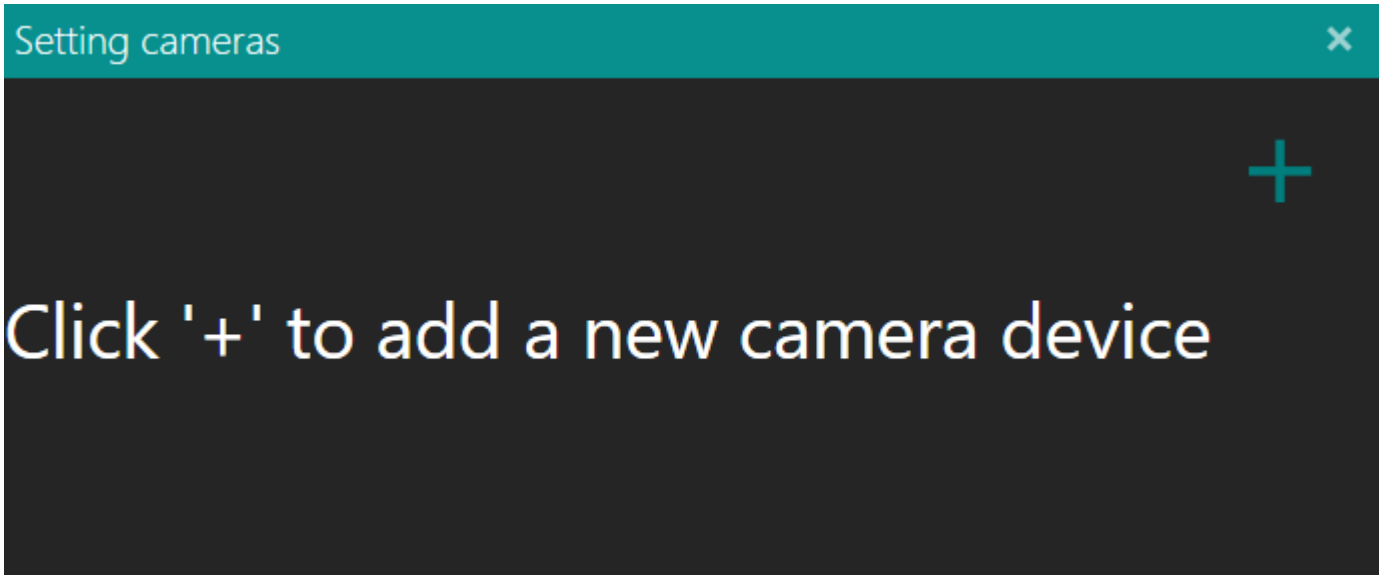


Position the cylinder in the FOV, drag the rectangle to include it, and the system will immediately enter live mode. Change the inclination of the plane until you have a ratio of 1 at least up to the fifth decimal place.

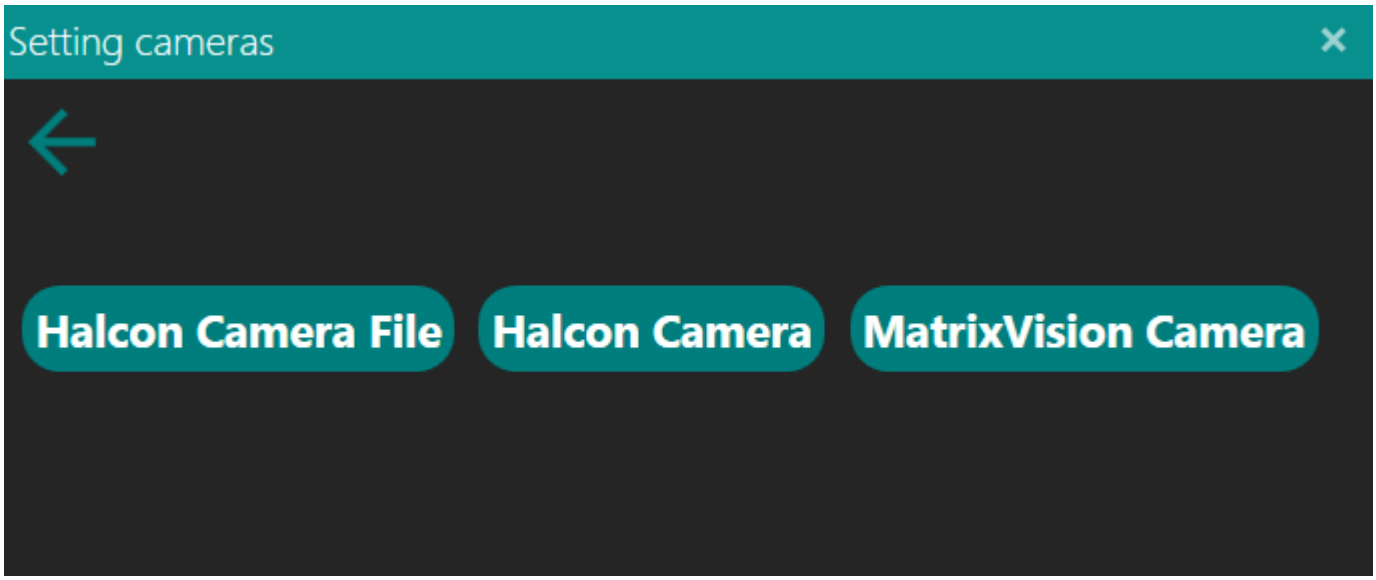

Calibration Tilt
Measures :
Radius X : 440.49745
Radius Y : 440.13013
Ratio : 1.00083

2.9.2.9 Camera

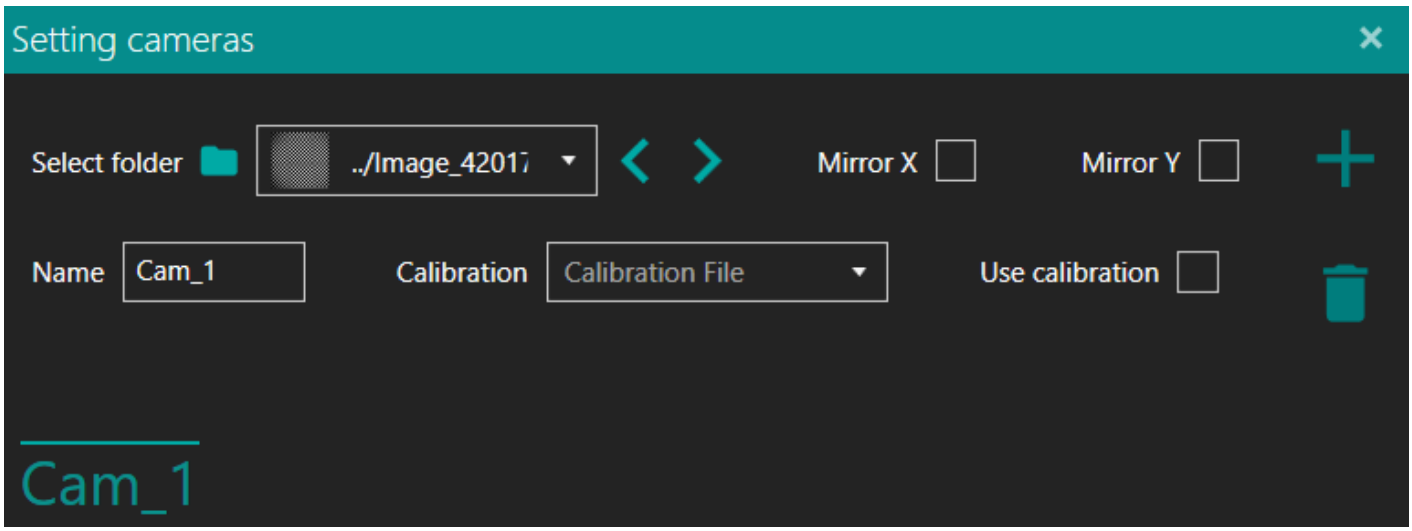
Control the acquisition device.



To add a new camera use the + icon buttons on the right side and make a pre-selection of the family type of camera to use or select 'Halcon Camera File' if you want to use images on disk.



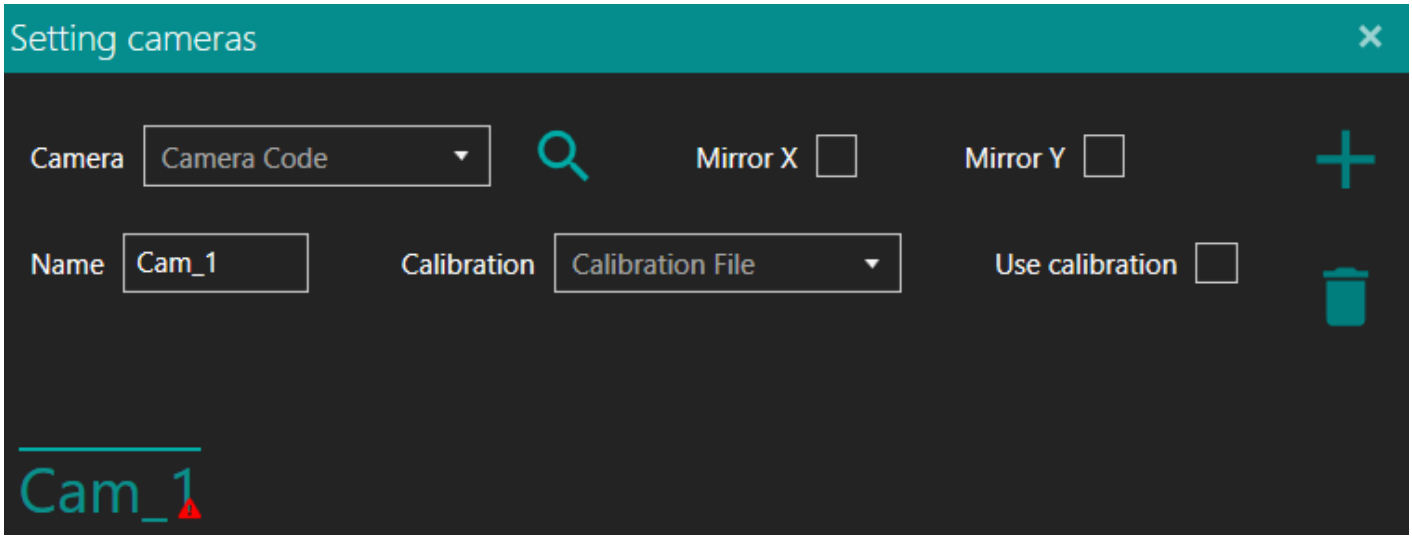
If you select images, you have to select the folder containing the images you want to use (folder icon button). If the folder has multiple images, it is possible to manually switch between images (drop-down curtain or arrow icon button). The other options are the same if you select a camera.



If you select a family type of camera, you can select it or use the automatic search function (magnifying glass).

Through the two check boxes, it is possible to invert the left-right (Mirror X) or high-low (Mirror Y) display.

With calibration, you can select automatic calibration (.dat) or manual calibration (.mncal) to be used after checking 'Use calibration'.

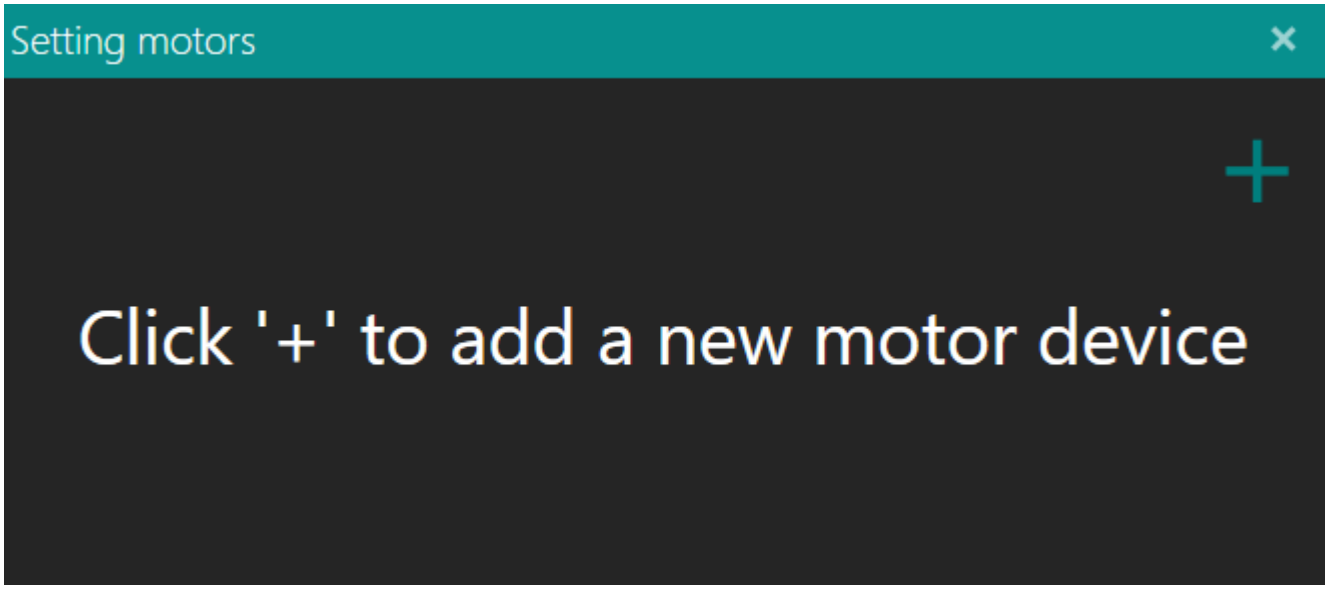


In the last line, the list of the available cameras is shown. To switch from one camera to another, simply select it from the list. To add a new camera or remove the selected camera, use the + or trash icon buttons on the right side.

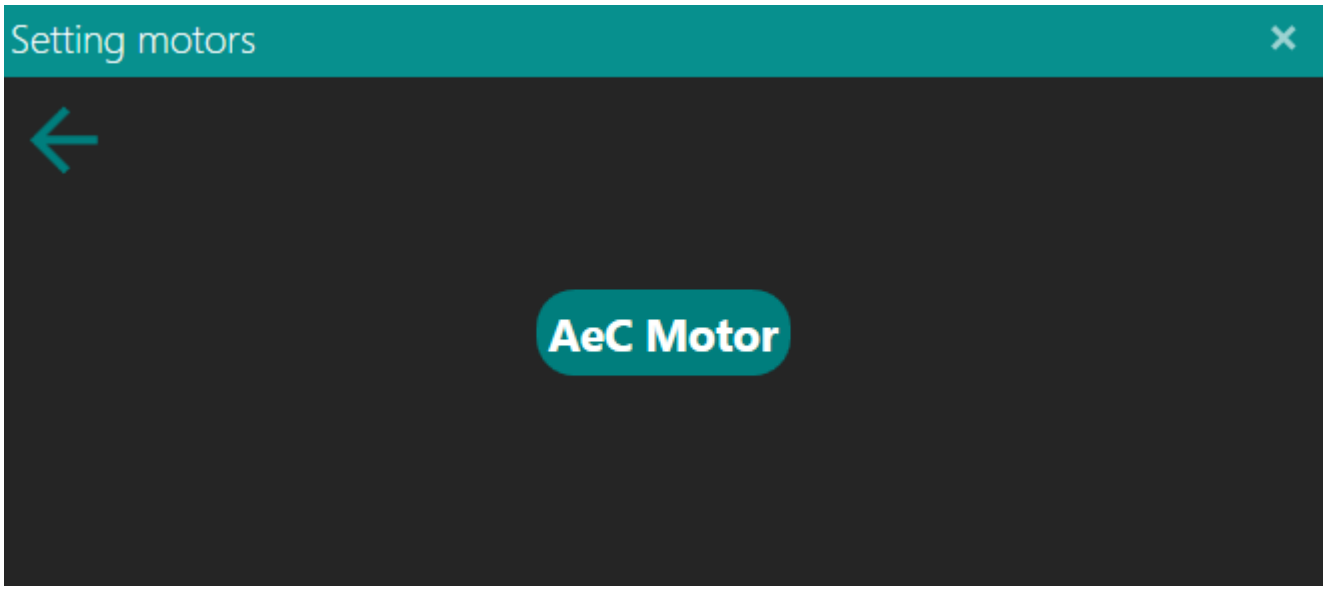
In the event of communication problems with the device, a red triangle with an exclamation mark will appear next to the name of the affected device.

2.9.2.10 Motor

Manage motor drivers.



To add a new motor, use the + icon buttons on the right side and make a pre-selection of the family type of motor.



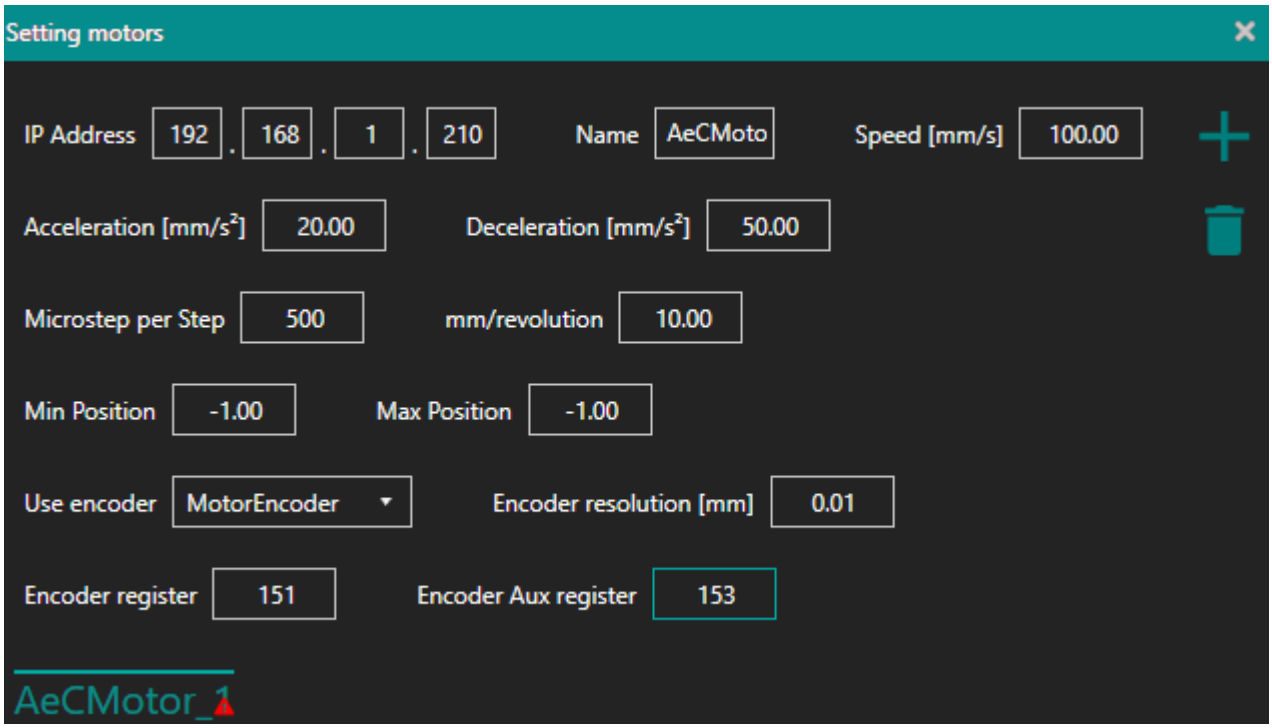
Enter the IP address and optionally change the name of the motor driver.

You may also enter the values of speed, acceleration/deceleration, microsteps per step and mm per motor revolution.

The permitted range of movement must be entered in Min/Max Position (-1.00 function disabled).

If an encoder is used, specify whether it is an integrated stepper motor encoder or an external encoder connected to the drive and its resolution.

In the following fields, you can specify the address of the registry for the motor encoder or external encoder. Check the updated AeC manuals for the correct values.

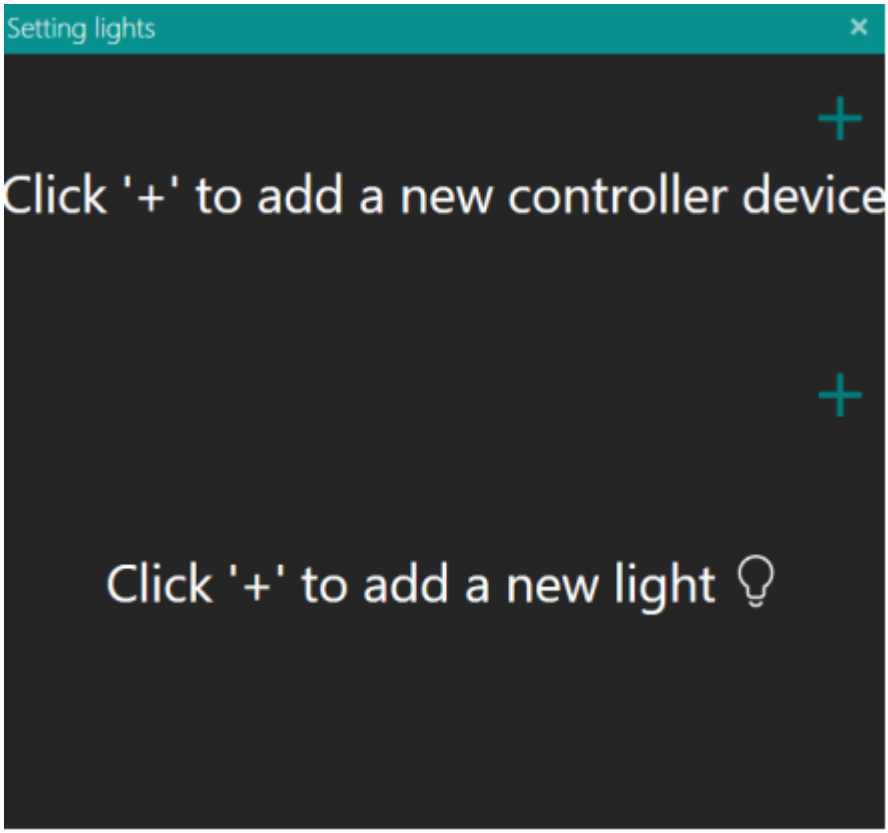


The selected motor controller is highlighted by -. To go to the next one, select its name. To remove the selected motor controller, use the trash icon buttons on the right side.

In the event of communication problems with the device, a red triangle with an exclamation mark will appear next to the name of the affected device.

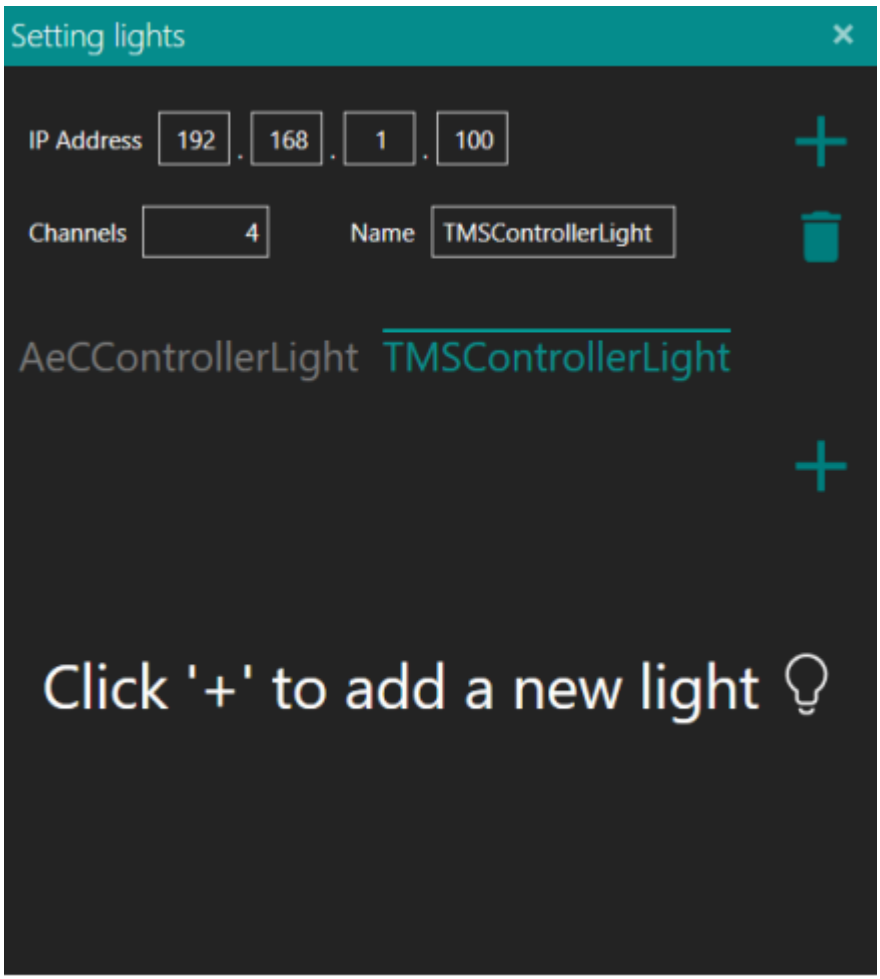
2.9.2.11 Light

Setting light controllers.



Click + to add a new lighting controller and select a model from those available. Enter the IP address, the number of available channels and optionally change the name of the controller.

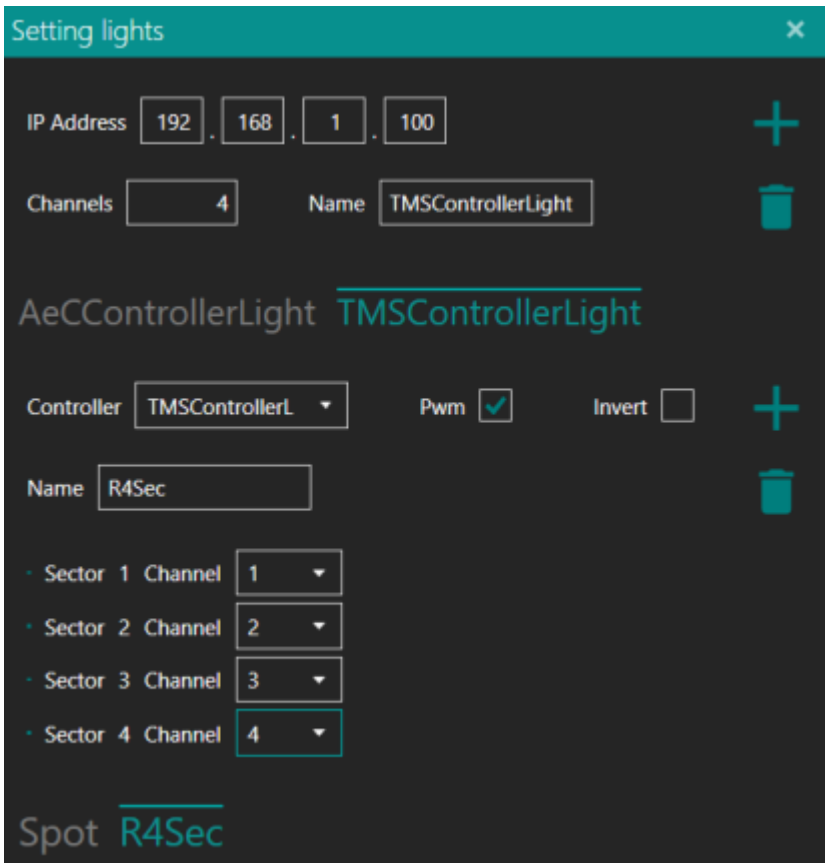
To delete a controller, click on the trash icon. The selected controller is highlighted by -. To go to the next one, select its name.



Click + to add a new light and select the model from those available. Choose the name of the controller from which it is managed, whether the intensity is fixed or PWM, and a name for the light.

The invert option changes the ignition order for the circular illuminators, useful if these are positioned below the object to be illuminated.

For each sector select the channel of the controller to which the light is connected.

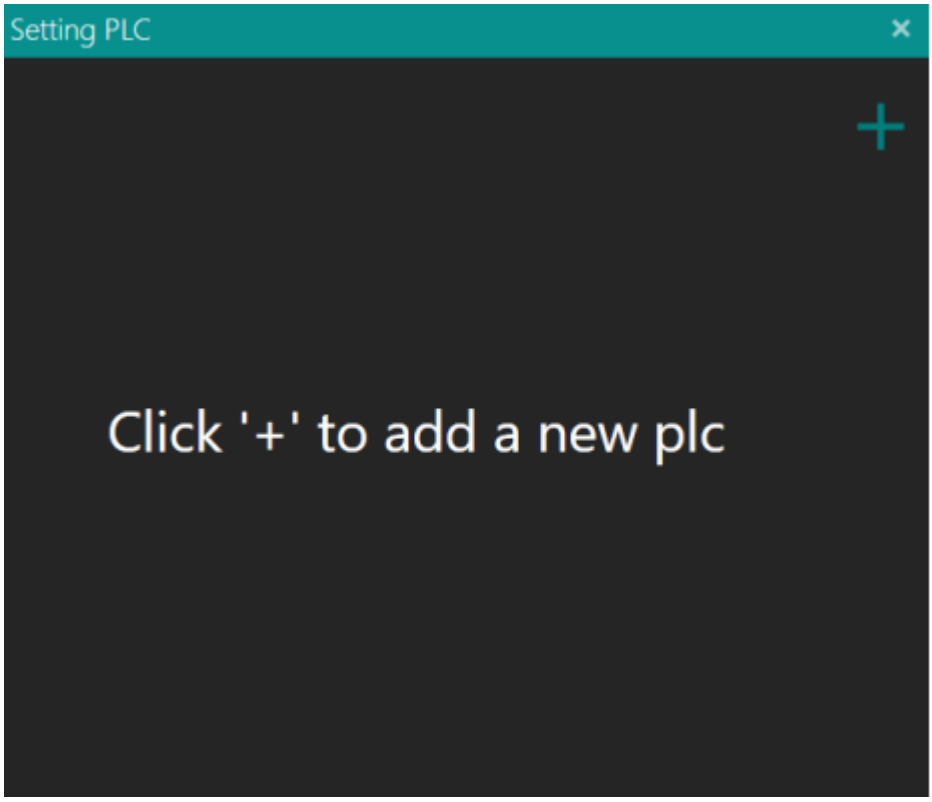


The selected light controller is highlighted by -. To go to the next one, select its name. To remove the selected light controller, use the trash icon buttons on the right side.

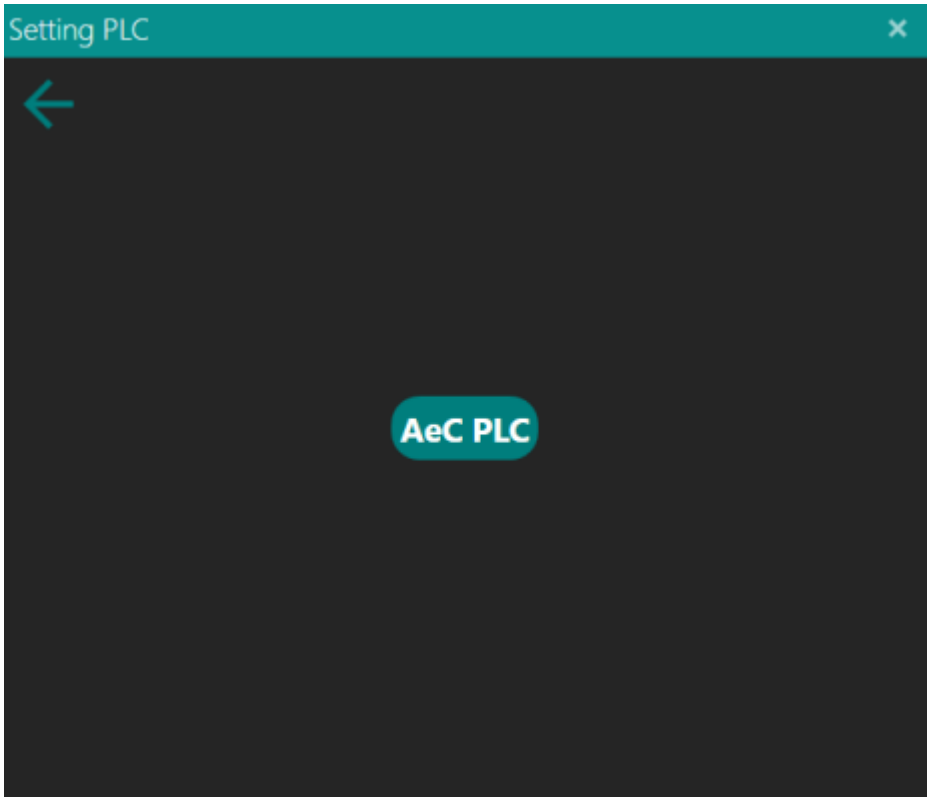
In the event of communication problems with the device, a red triangle with an exclamation mark will appear next to the name of the affected device.

2.9.2.12 Plc

Setting PLC controllers.



Click + to add a new PLC controller and make a pre-selection of the family type of PLC.



Enter the IP address and optionally change the name of the controller.

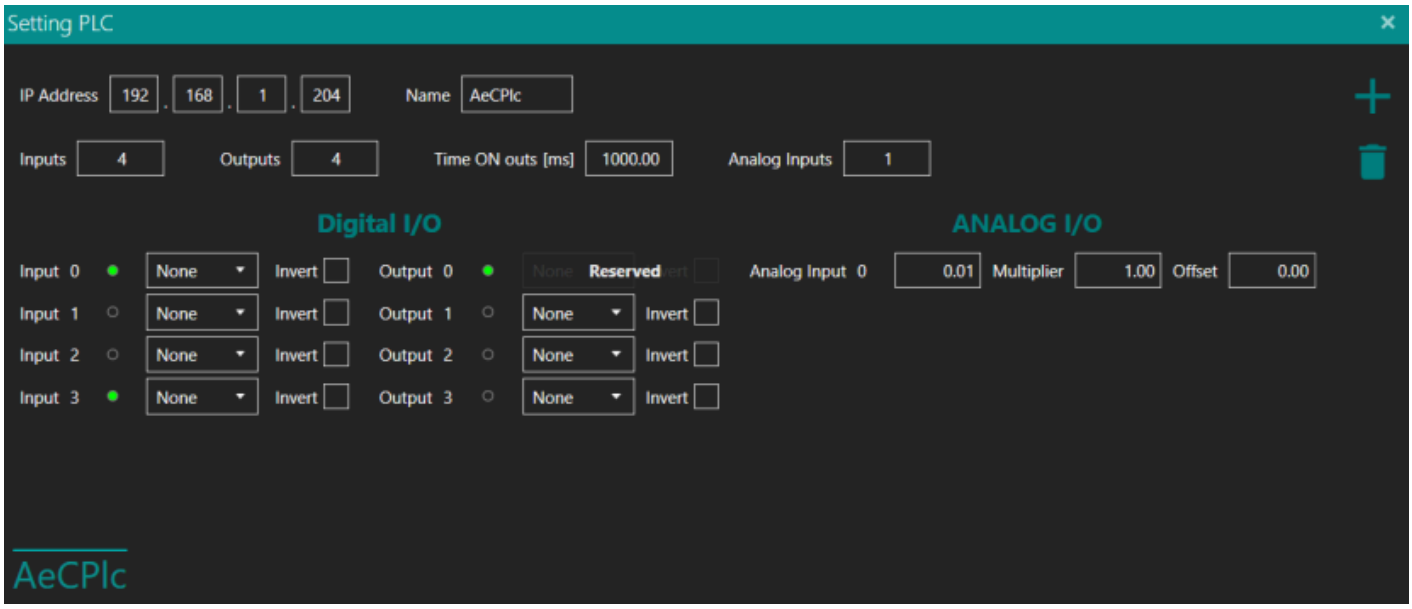
Also enter the number of available digital input and output channels, and finally the number of available analog inputs.

With TimeON you can choose how many milliseconds the output, managed by an event, must remain active.

For each digital input and output you can assign the specific function and check its status; you can also activate or deactivate the outputs by clicking on the small circle.

If the same controller was used to manage n lights in light settings, the first n channels are reserved for them.

You can also read the analog inputs and assign a multiplication and / or offset factor to be applied for each input.

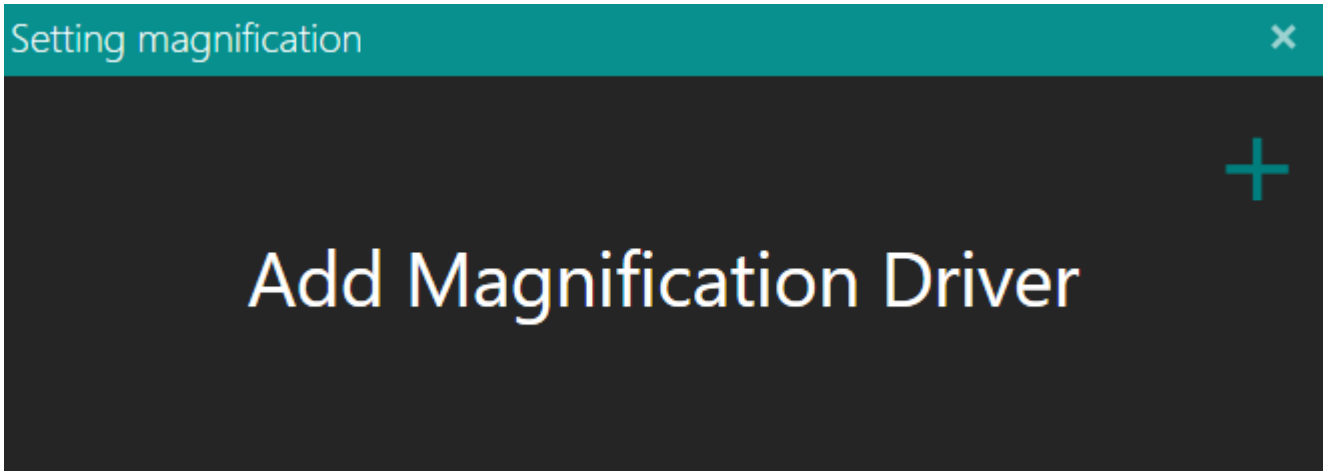


The selected PLC controller is highlighted by -. To go to the next one, select its name. To remove the selected PLC controller, use the trash icon buttons on the right side.

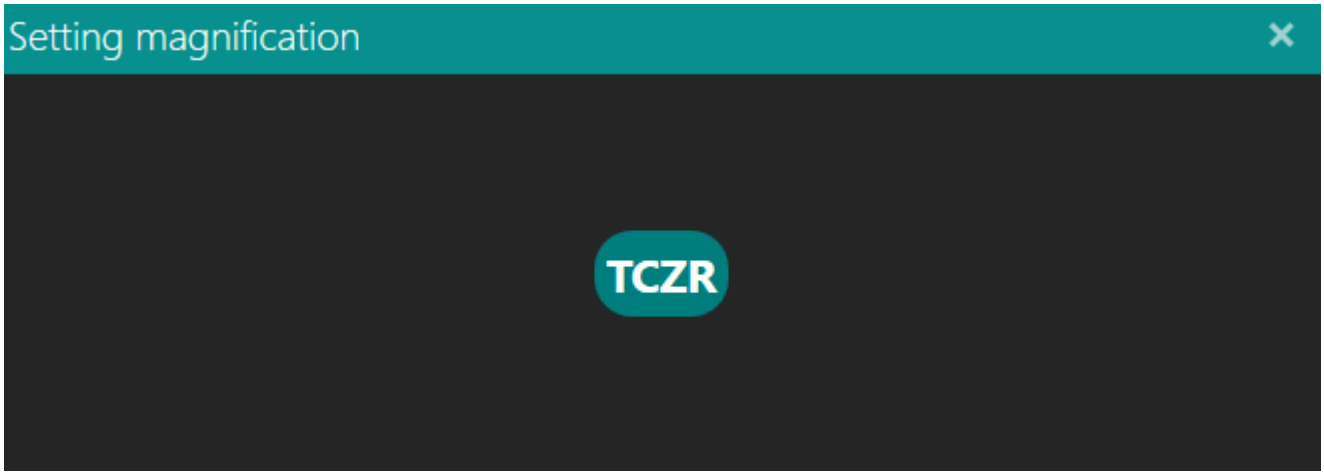
In the event of communication problems with the device, a red triangle with an exclamation mark will appear next to the name of the affected device.

2.9.2.13 Magnification

Manage magnification controllers.



To add a new magnification, use the + icon buttons on the right side and select a model from those available.



Enter the IP address, model and optionally change the name.



The selected magnification controller is highlighted by -. To go to the next one, select its name. To remove the selected magnification controller, use the trash icon buttons on the right side.

In the event of communication problems with the device, a red triangle with an exclamation mark will appear next to the name of the affected device.

2.9.2.14 Statistics SM

2.9.2.14.1 Statistics SM

Statistics

View and filter statistical data.

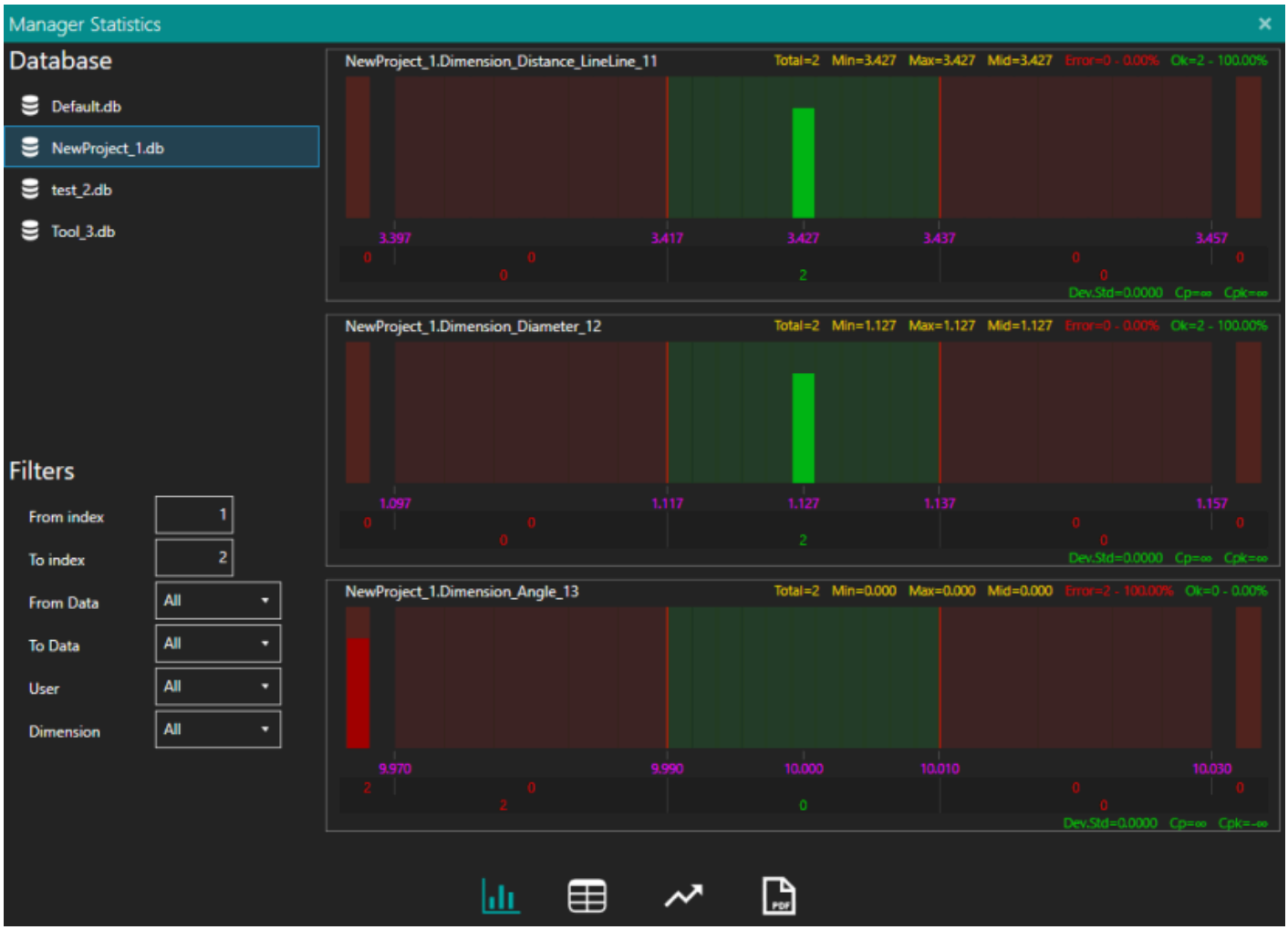


1. Graphic;
2. Table;
3. Capability;
4. Print.

2.9.2.14.2 Statistics SM Graphic

Statistics Graphic

View and filter statistical data.

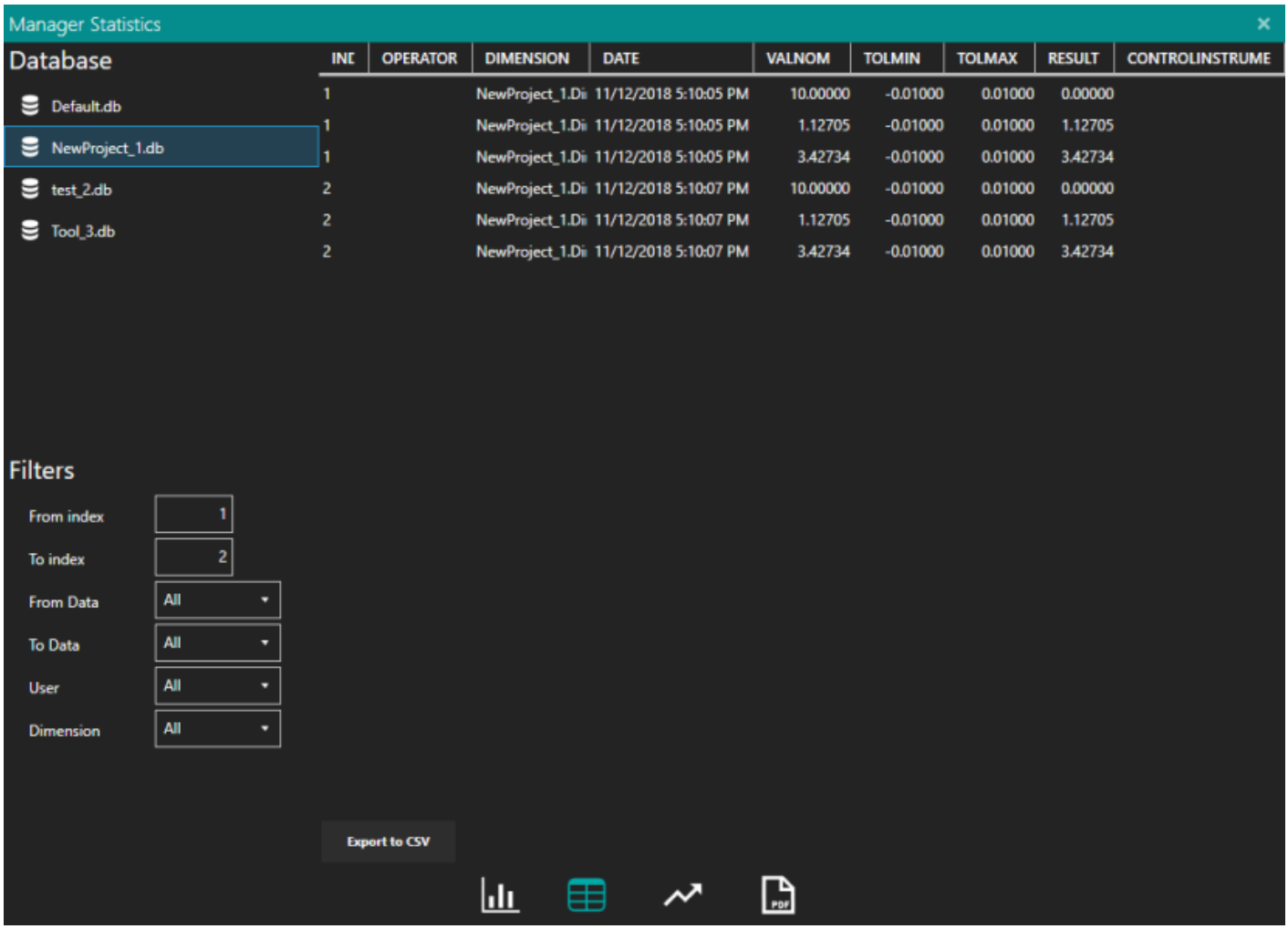


After selecting the reference database and setting a possible filter, the statistical data are graphically displayed within the measurement range set as acceptable.

2.9.2.14.3 Statistics SM Table

Statistics Table

View and filter statistical data.

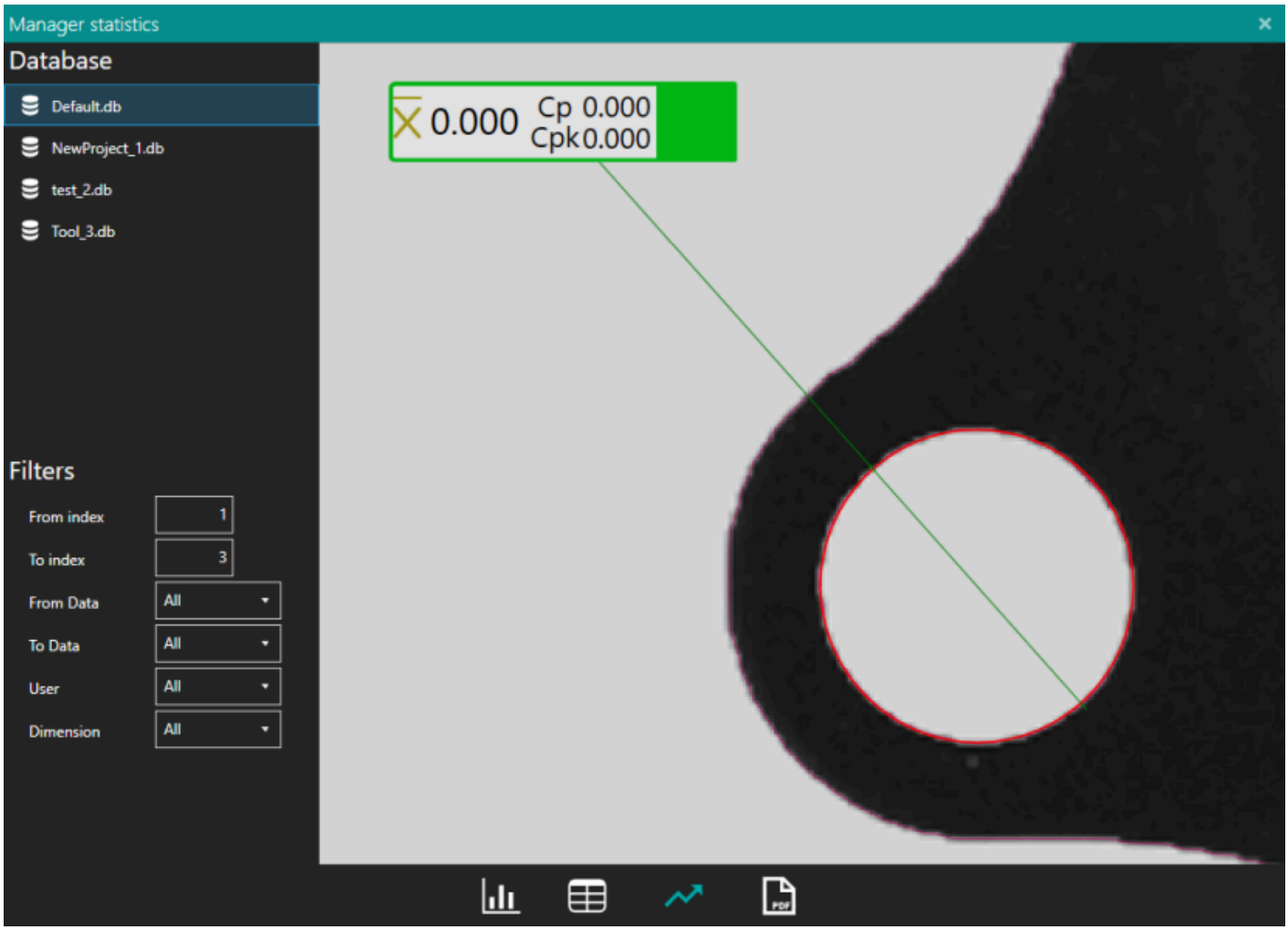


After selecting the reference database and setting a possible filter, the statistical data are represented in tabular form with the possibility of ascending or descending sorting by clicking on the column containing the data of interest.

2.9.2.14.4 Statistics SM Capability

Statistics Capability

View and filter statistical data.

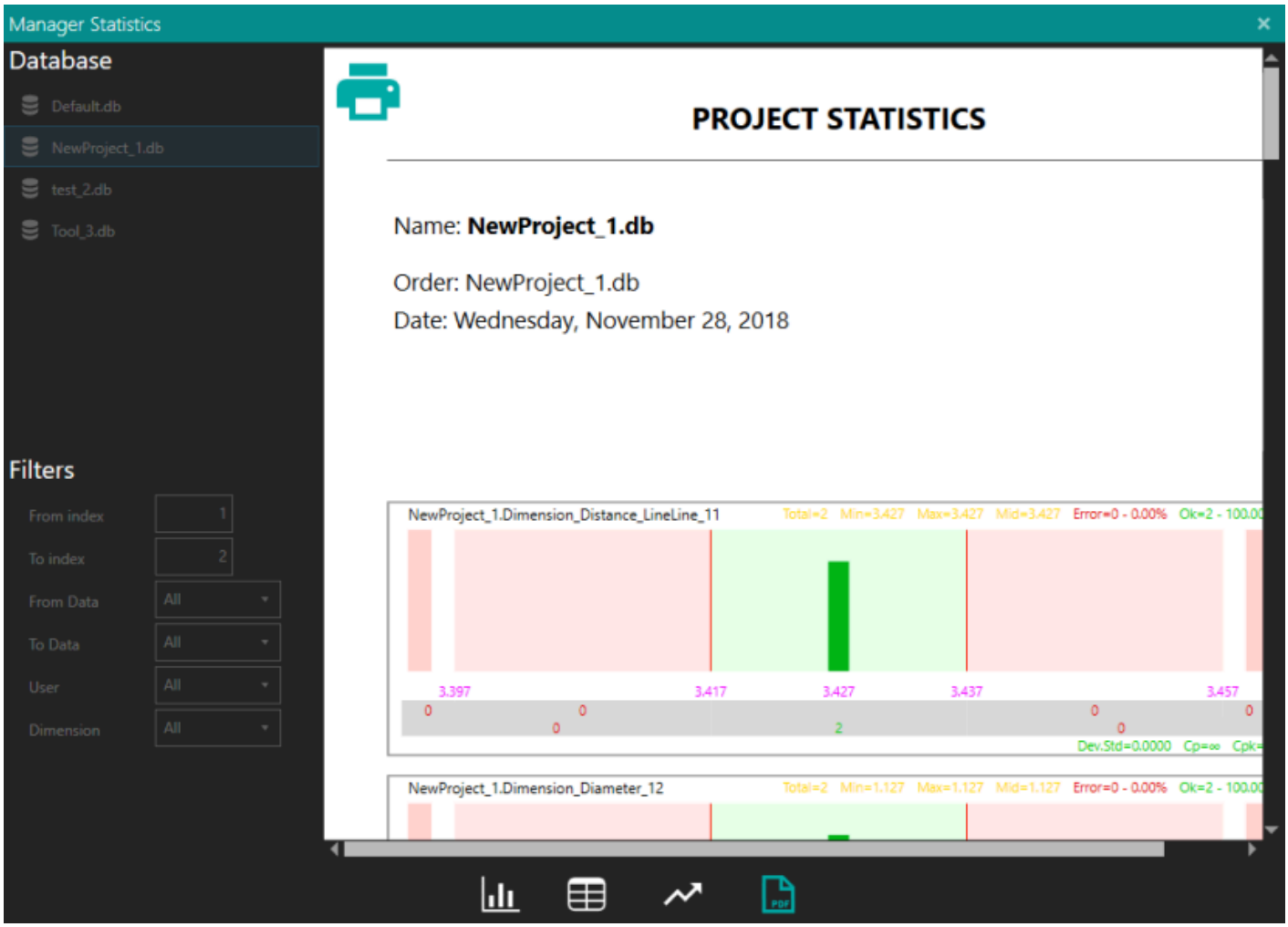


After selecting the reference database and setting a possible filter, the statistical data are represented in terms of target x-bar and process capability rates.

2.9.2.14.5 Statistics SM Print

Statistics Print

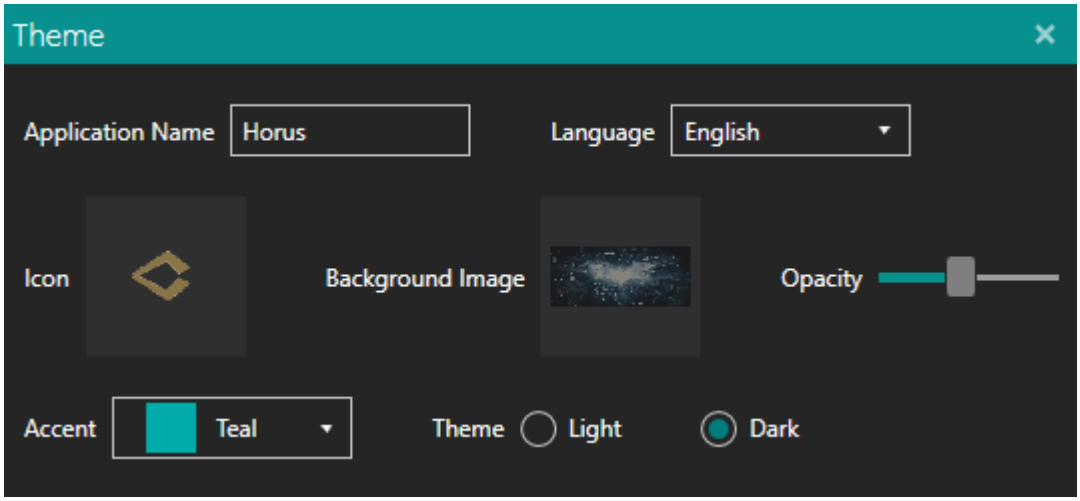
View and filter statistical data.



Convert statistical data to PDF format for printing or saving to a file.

2.9.2.15 Theme

Configure and set Horus.



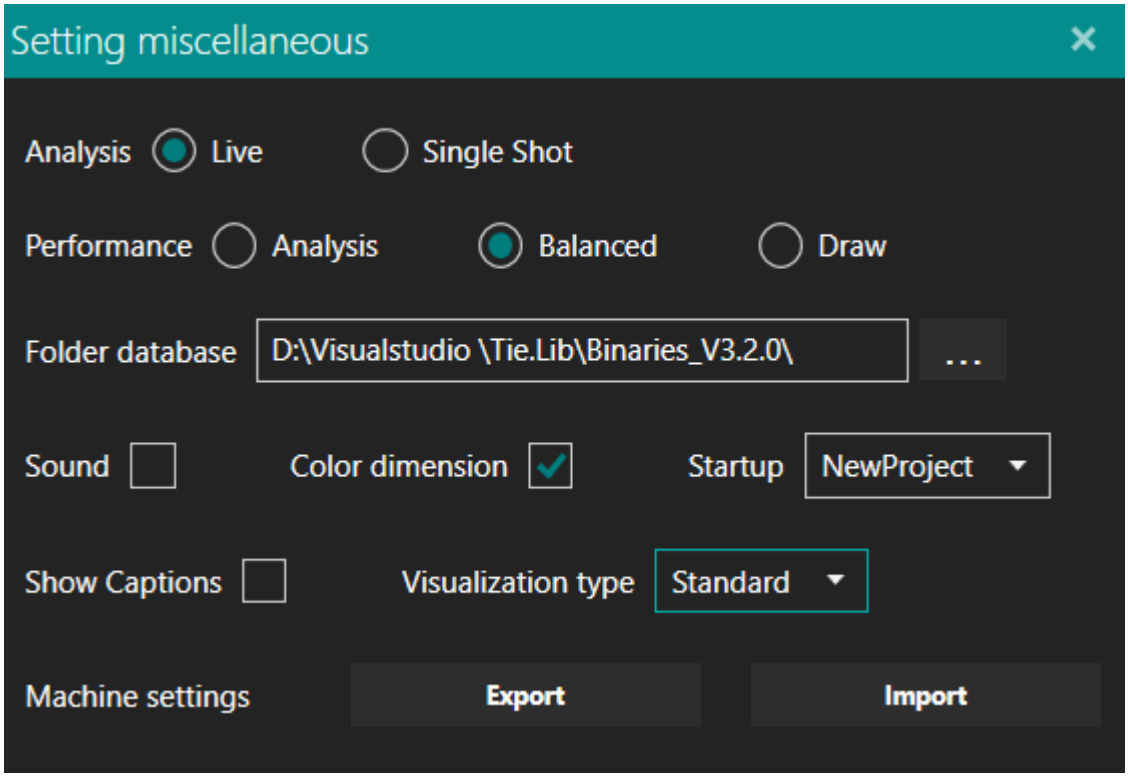
In the demo window you can change the name of the application, the language of the text labels and its icon.

By clicking on the background image, it is possible to modify it and manage its opacity with the cursor.

You can also change the colour scheme (accent) and theme between black (dark) and white (light).

2.9.2.16 Miscellaneous

Adjusts several common features.



You can choose the type of analysis between Live or Single Shot. It is also possible to adjust the performance more oriented to drawing, to measuring or in-between.

The database is used to store the data and report of your measure. You can choose the folder here and the database name on the Object Tree by selecting the project home.

With Sound, you can enable or disable sound feedback on the measurement result.

With Color Dimension you can enable or disable the intermediate gradation in colors on the measurement result.

You can also choose whether to start with the default project, the previously opened project or open the project manager.

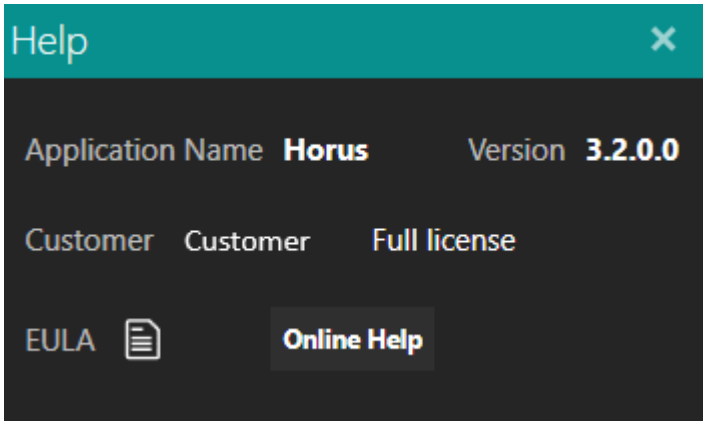
Show Captions makes the labels permanent on the Main Console.

Through the Visualization type you can switch from standard mode to guru mode. In the guru mode further technical parameters are displayed in Calibration Optic / Light to refine the calibration process.

You can also Export or Import the Machine Settings (data of project, collection, users, calibration, camera, motor, light, magnification, theme, global parameters and so on) to/from a single .mch file.

2.9.2.17 Help

Help and information about Horus.

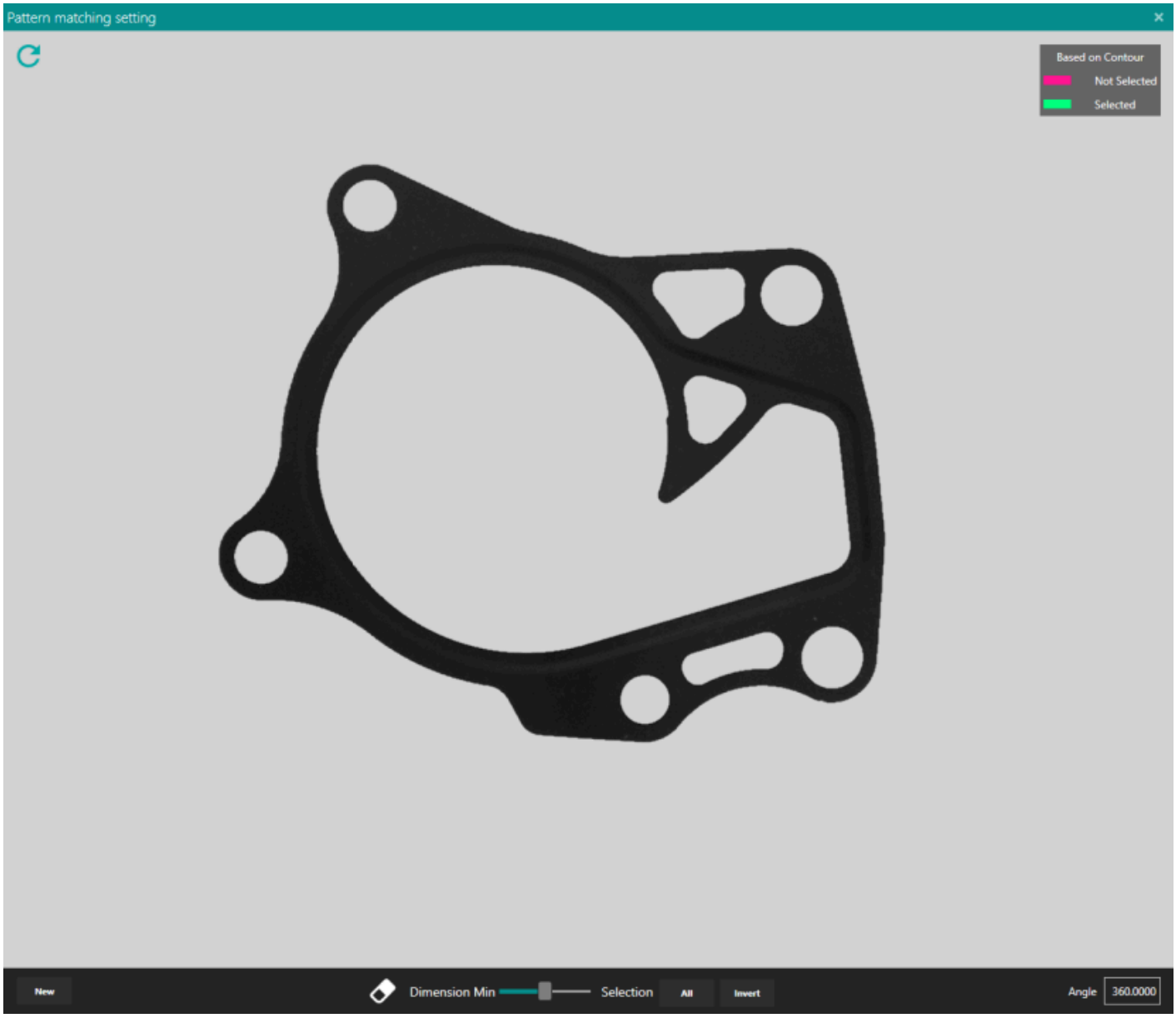


In this menu you will find the current version of Horus, the name of the license holder and the expiration date in case of an evaluation copy. There is also a link to our EULA.

Last but not least, you will find the link to our resource centre, where, in addition to the help, you will find numerous other documentation, videos and tutorials about Horus.

2.9.3 Pattern Matching

Pattern matching allows Horus to track the object and keep measuring it.



In this way, you can create the program and then place the part in every position you want and let the software measure it.

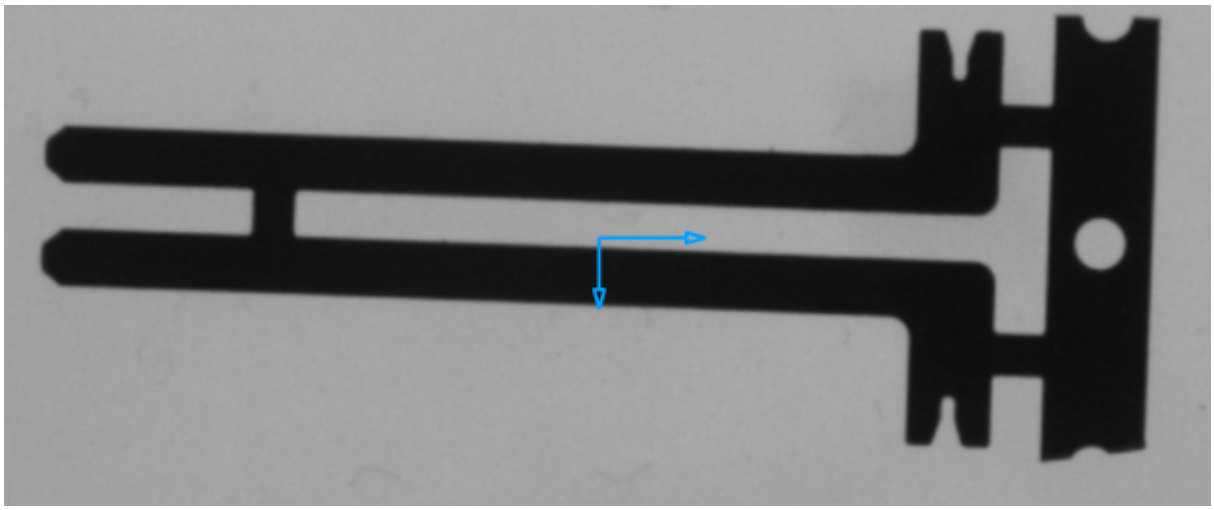
You can create a new model in three different ways:

- Edge: if you have a backlight source and a clear edge.
- Dxf: if you have a dxf drawing of your part.
- Image: if you have light above your object and/or unclear edges.

You select the features you want to be part of the model. You can also delete parts with an eraser or filter some small edges using the dimension tool in the bottom bar.

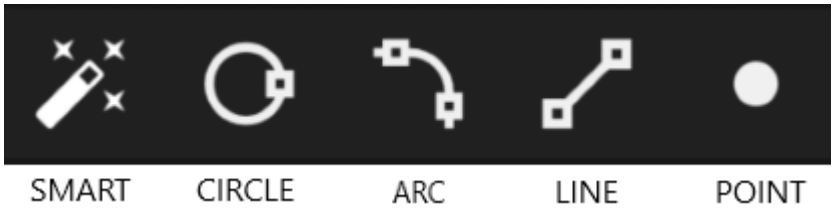
Angle recognition adjusts the angle in order to lock it in a certain range.

Close the window to let the software finalize the model; you can see the software is now detecting the position of the object.



2.9.4 Detection

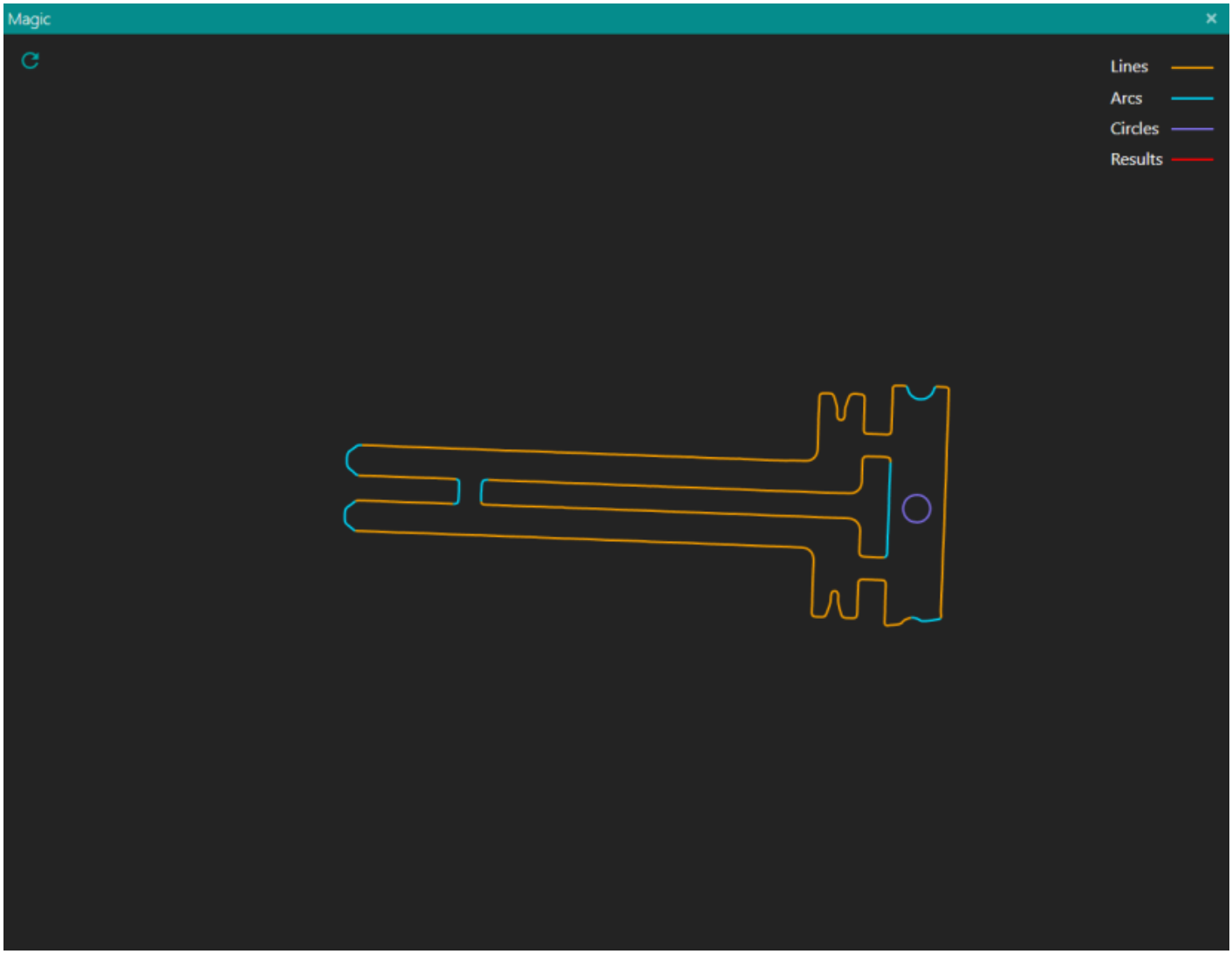
The detection feature aims to detect primitives on the object based on the edge and it has a "smart" mode and different manual modes for different primitive shapes to be found.



- Smart

The "smart" mode detects all the primitives and suggests which primitive is possible to create (color scale to the right).

In order to create the primitives, click on them:



Moreover, it is possible to edit the "smart" mode in order to correct errors in the detection and impose the correct shape.

Select the type you want to use and click on the part to correct the element. The manual commands allow you to select arbitrarily the primitives choosing between circle, arc, line or point, as shown in the following examples.



The detection feature does the analysis, it is possible to verify the matching by clicking on the Primitive Analyze.

- Circle

click inside the primitive to be recognized	click outside the primitive and confirm to obtain it

To discern a primitive with the manual mode, it is necessary to guide the program by clicking inside and outside the supposed circle.

- Arc and Line

click on both sides of the line to set one beginning	click on one side to set the length	click on the other side to set the end of the primitive	confirm to obtain the line

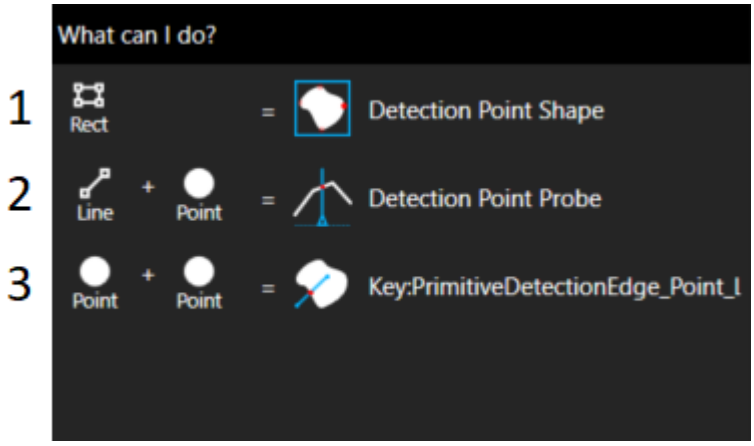
click on both sides of the line to set one beginning	click on both sides to set the end of the primitive	confirm to obtain the arc

To detect Arc and Line, the points to be clicked are four in order to cut the edges of the shape: the first and the last pair of points create an intersection that defines respectively the beginning and the end of the selected primitive.

There is the possibility to draw an arbitrary number of selections, with the aim to avoid parts and connect others.

create an arc or line selection	create another arc or line selection	confirm to obtain a primitive that takes into account all the primitive selections drawn before

- Point



1)		
Select a rectangle	Confirm to find the highest, lowest, leftmost or rightmost point of the primitive inside the border of the rectangle	

2)	
Select a line	Set one point in order to create the orthogonal to the line passing through the point and find the intersection(s) with the primitive (closest, furthest or any)

3)		
Set one point	Set another point	Confirm to find the intersection of the primitive with the line connecting the points (first found or all)

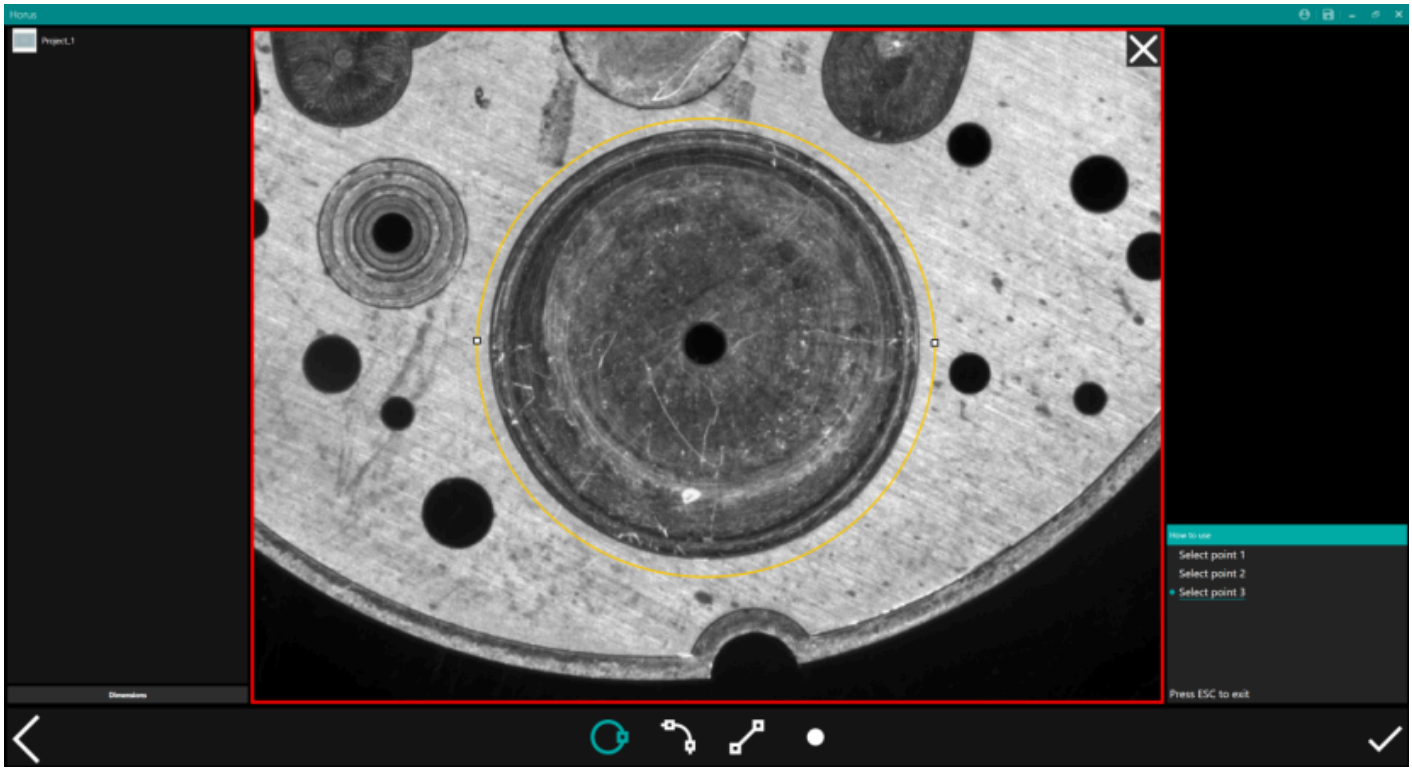
2.9.5 Gray Scale

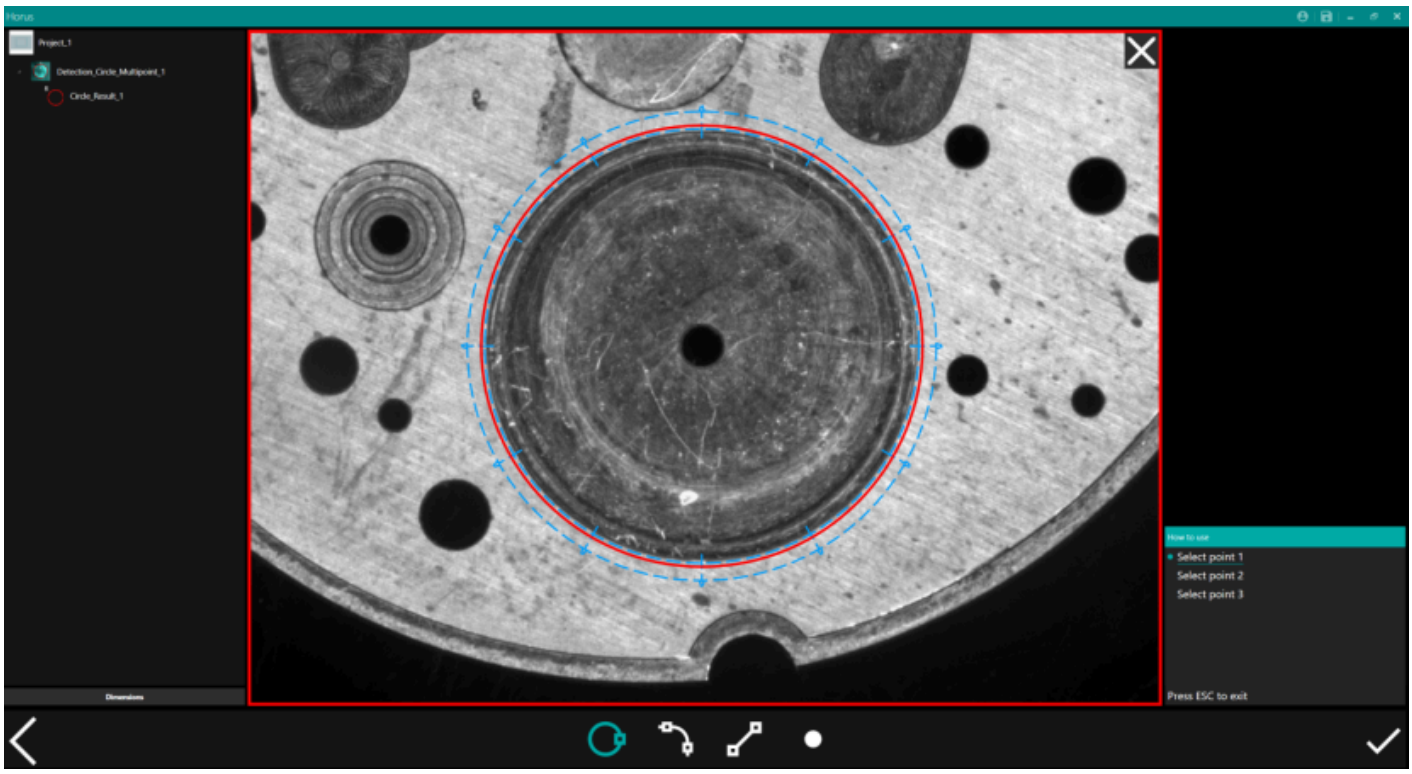
Gray scale tools are developed to detect primitives when edges are not clear and the image has gray tones (such as when front illumination is used).



The tool uses a region to detect the start gray value and then search for the transition in the scan direction.

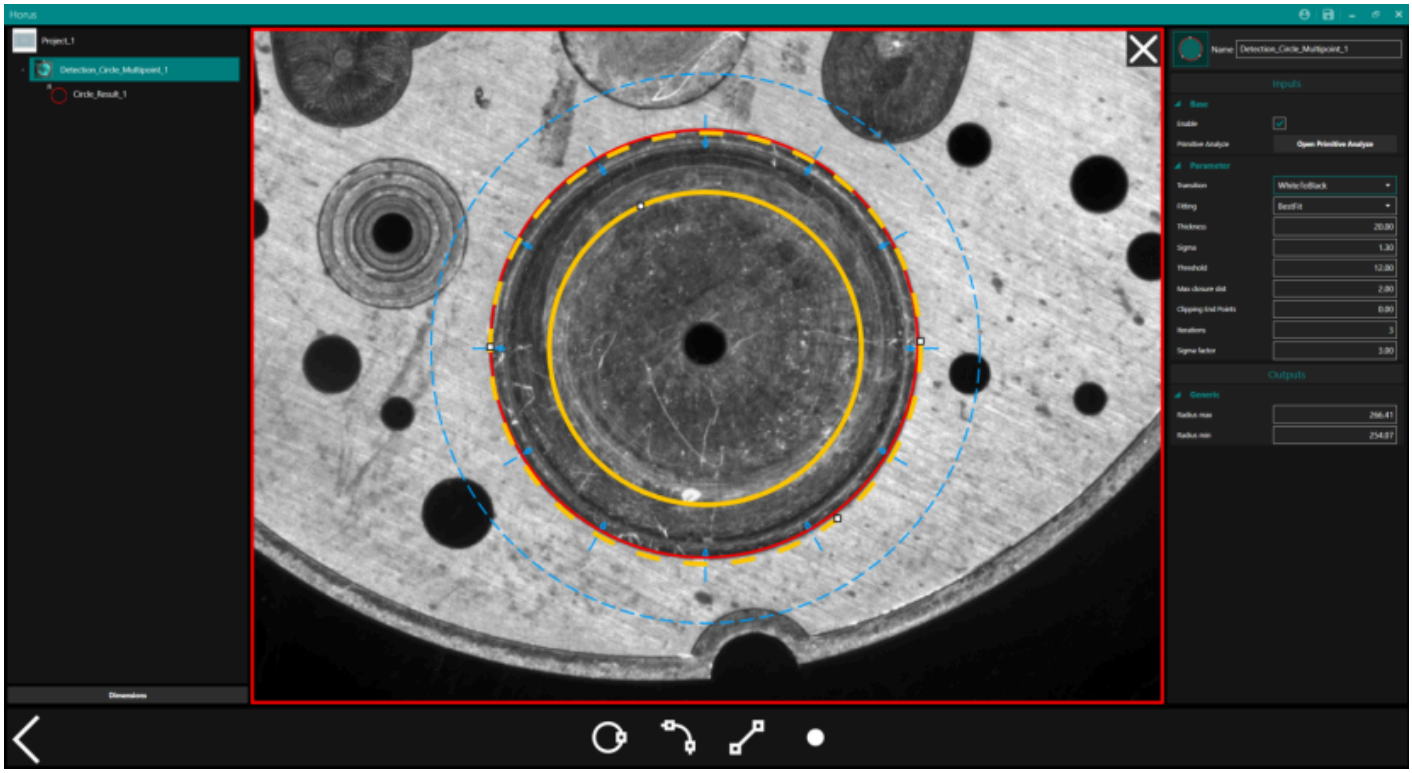
For example, to identify a circle select Grayscale - Circles, click at the two ends of the area where you want to find the primitive, move the mouse outwardly to surround the area, and then click again.



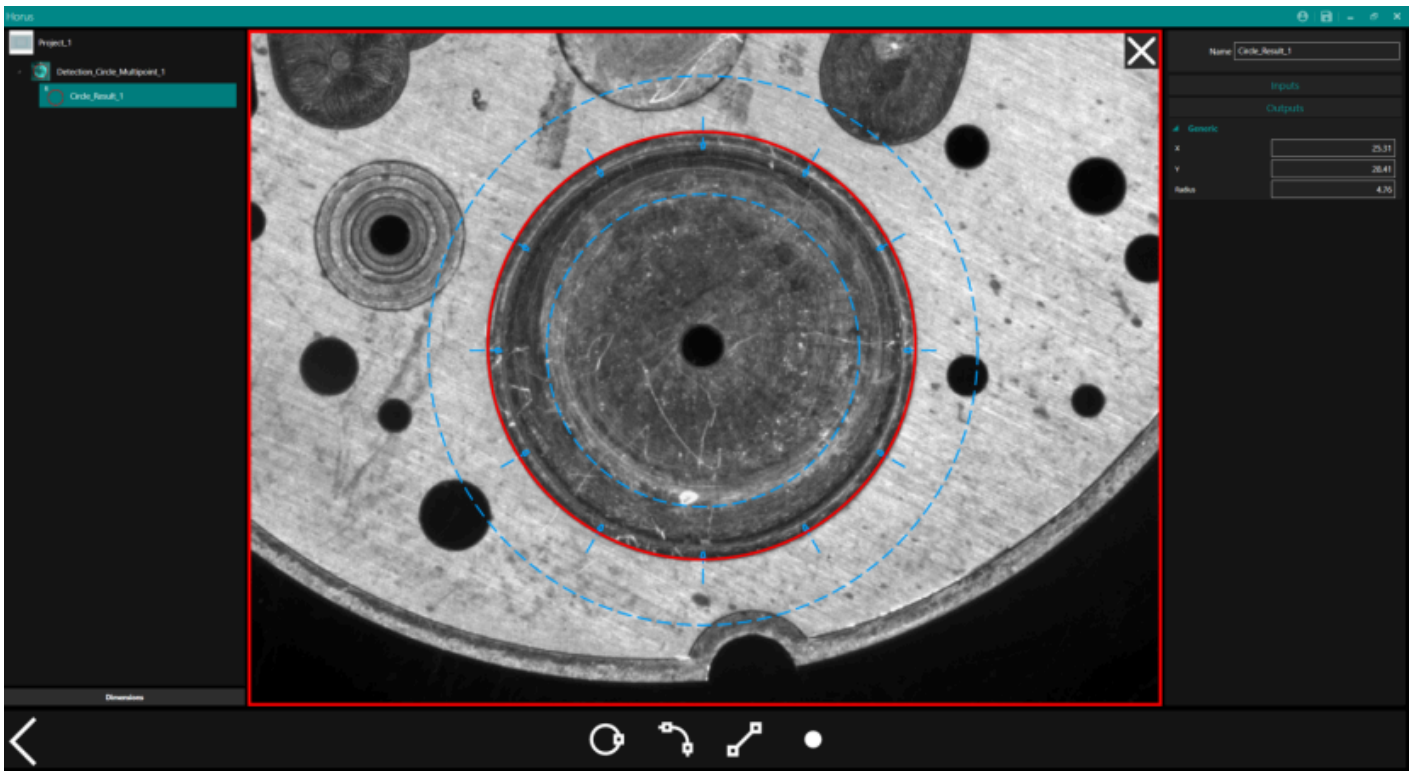


Select the newly generated detection in the object tree.

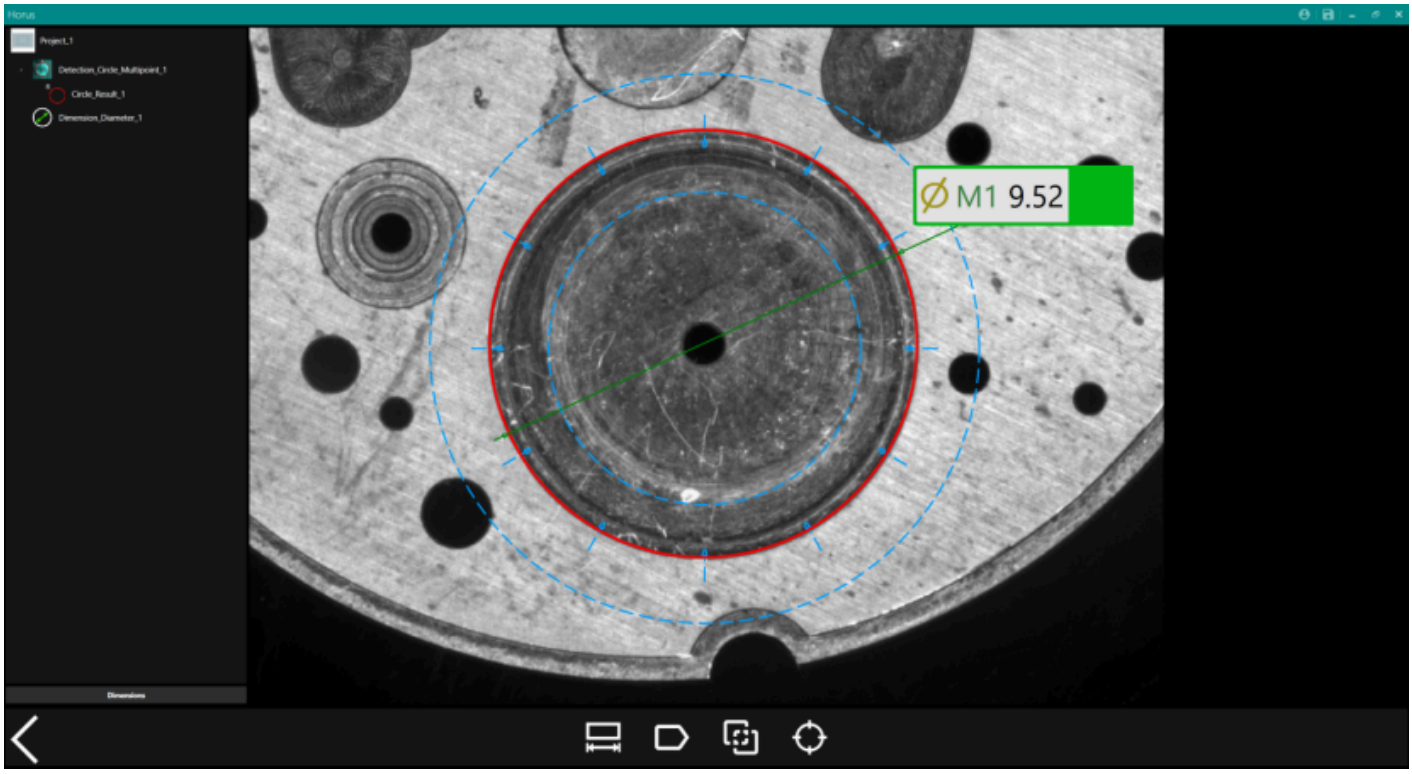
Select the type of transition in the property bar (black to white or white to black), then adjust the outer and inner circle so that the tool identifies the desired circumference (you can also change the values in the property bar for fine tuning).



Check if the resulting circle satisfies you, otherwise repeat the previous procedure.



Now you can proceed to the measurement as usual.

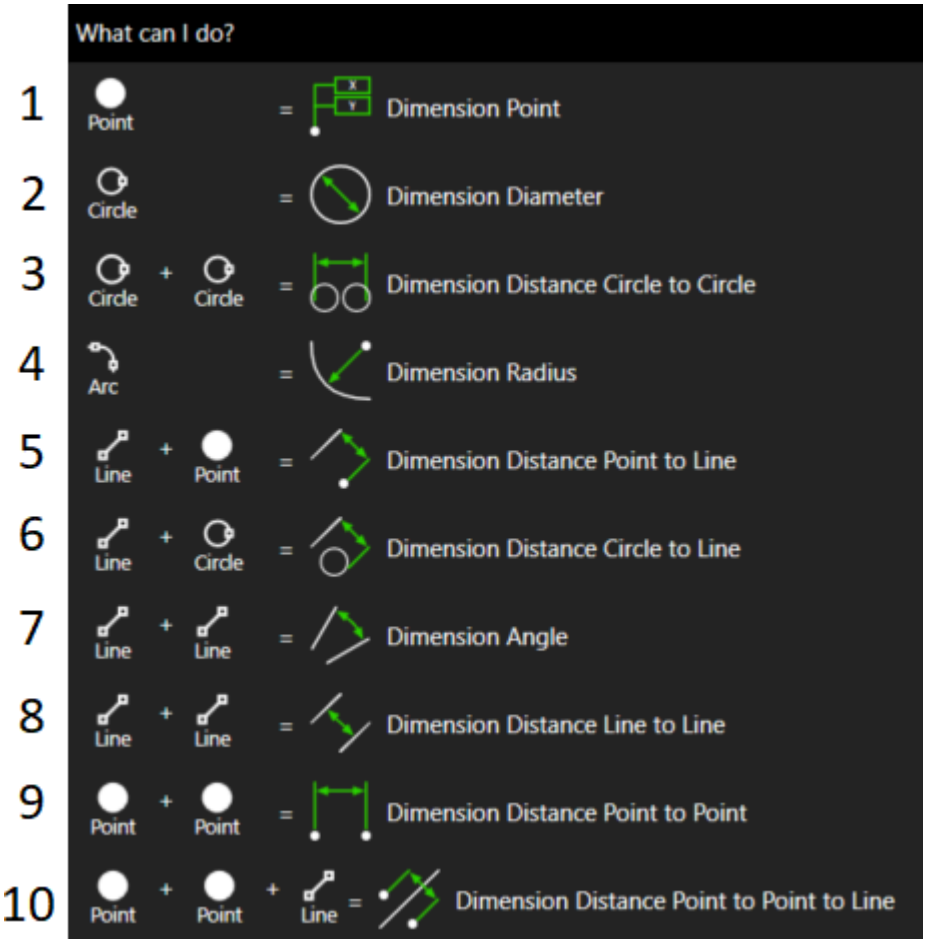


2.9.6 Measure

The measure group allows you to create dimensions, references, geometric tolerances on the primitives and easily create custom measurements in crosshair mode. Once you have created all the primitives you are interested in, you can start adding measurements.



- Dimension: on the right-hand side of the screen appears a guide of the possible combinations for the measurements, as shown in the following picture:



Every case is shown in the following pictures.

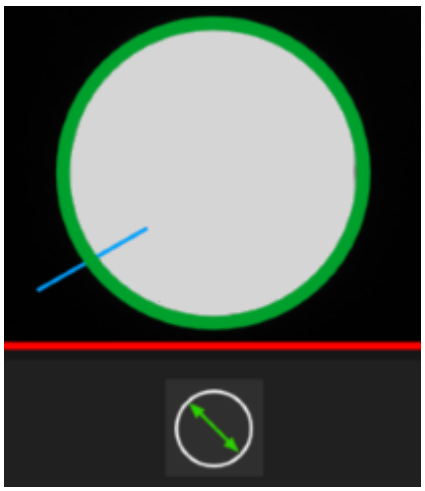
1)

set one point	confirm to obtain the point coordinate		
2)			
select a circle	confirm to obtain the circle diameter		
3)			
select a circle	select a second circle	confirm to obtain the distance between them	
4)			
select an arc	confirm to obtain the arc diameter		
5)			
select a line	select a point	confirm to obtain the distance between them	
6)			
select a line	select a circle	confirm to obtain the distance between them	
7)			

select one line	select another line (not parallel)	confirm to obtain the angle between them	
8)			
select one line	select the other line	confirm to obtain the distance between them	
9)			
select one point	select another point	confirm to obtain the distance between them	
10)			
select one point	select the second point	select a line	confirm to obtain the distance between the points in the direction of the perpendicular to the line

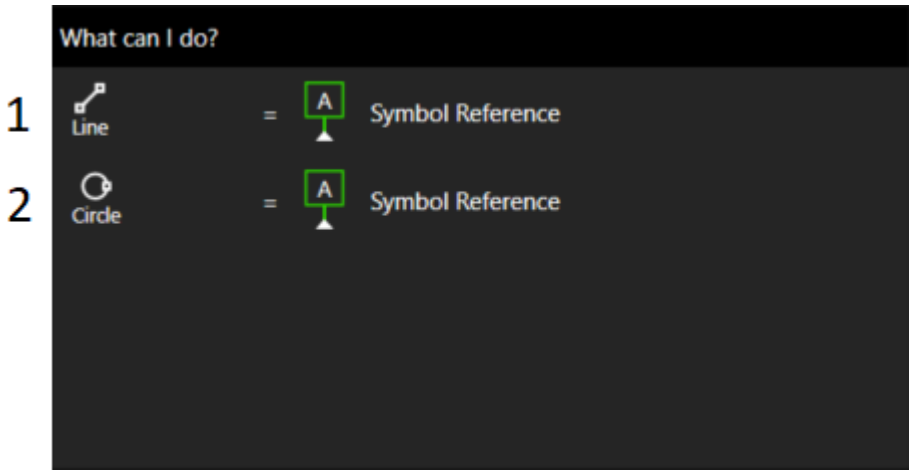
Now, it is necessary to select which kind of measure has to be performed by selecting directly a primitive on the 2DVisualizer or through the Object Tree.

Once you select one primitive, at the bottom of the screen appears which action is possible to perform according to the selected elements.



The labels can be moved by clicking on them, outside the measurement editor, and dragging them.

- References: help the setting of the tolerances by giving a label to the designed primitive.



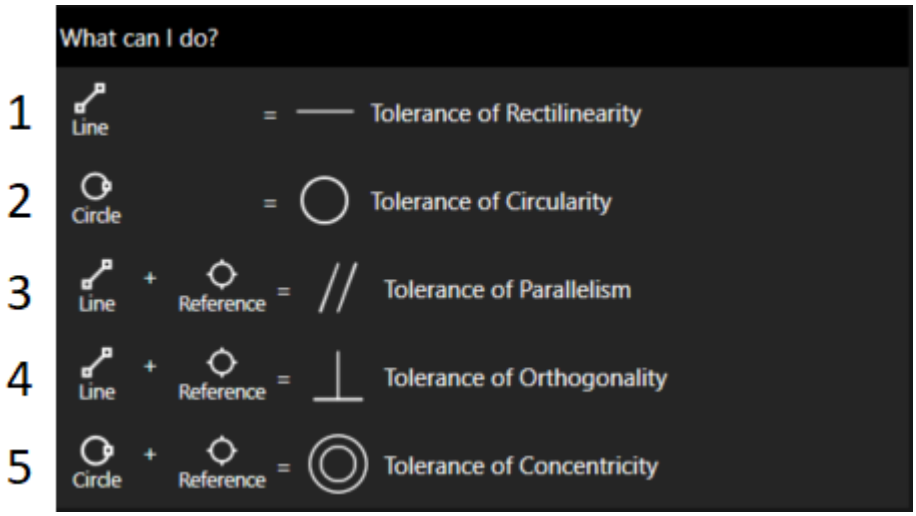
Every case is shown in the following pictures.

1)	
select a line	Symbol Reference (to a line)

2)	
select a circle	Symbol Reference (to a circle)

Select a primitive to attach a label with a letter.

- Tolerances: aided by the right-hand guide, after setting the reference, select the object on which to perform tolerance checks of circularity, parallelism and orthogonality.



As for the dimension, in order to show a tolerance it is necessary to select the right combination of primitives as shown in the following figures.

1)		
select a line	confirm to obtain the tolerance of the line	
2)		
select a circle	confirm to obtain the tolerance of the circle	
3)		
select one line	select a reference of another line	confirm to obtain the tolerance of parallelism
4)		

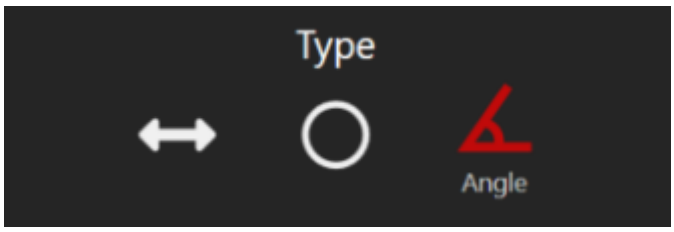
select one line	select a reference of another line	confirm to obtain the tolerance of orthogonality
5)		
select one circle	select another circle	confirm to obtain the tolerance of concentricity

Furthermore, every dimension and tolerance can be edited in the right bar by choosing the nominal value and the upper and lower tolerance.

- Crosshair: allows you to obtain measurements without the support of the primitive. In order to do that, read the following steps:

Select the type of measurement (distance, diameter, angle),





drag (by placing the mouse inside its centre square) the crosshair above the point where to start the measurement.

It is also possible to rotate the crosshair by positioning the mouse above purple outer rectangles and dragging it. Reset the counter,



and move the crosshair over the end point to be measured.

Distance crosshair

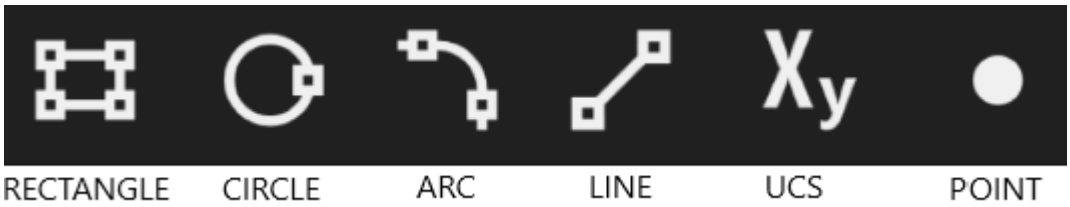
drag the pointer to the zero point	press "Set zero" to set the measure point	move the pointer to have the measurement of the distance shown in the menu
Diameter crosshair		
drag the pointer to the zero point	move the pointer to have the measurement of the diameter shown in the menu	
Angle crosshair		
drag the pointer to the zero point	press "Set zero" to set the measure point	move and rotate the pointer to have the measurement of the angle shown in the menu

On the command bar you can read the measures you are looking for.

2.9.7 Shapes

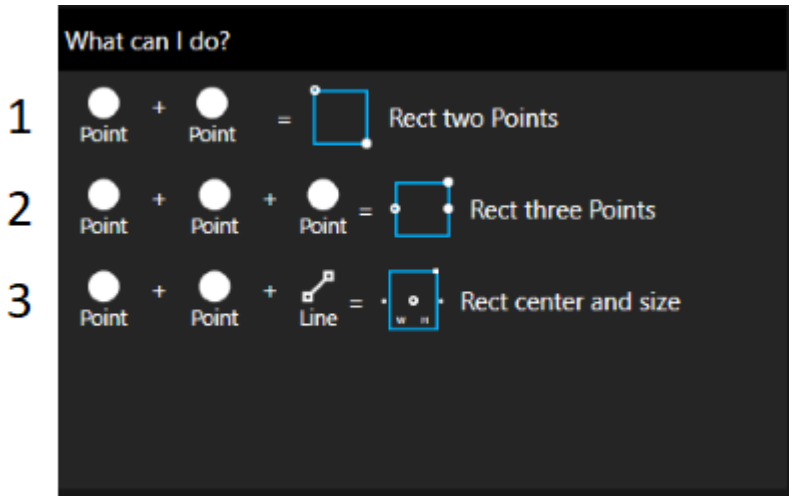
Shapes Construction

The shapes group is used to create and draw shapes and constructions, such as axes, intersections, lines and so on.



There are six possible features, each with a guide that will prompt on the right-hand side of the screen. Points, lines and circles specified on the guides are either primitives or shapes already created on the 2D visualizer.

- Rectangles:

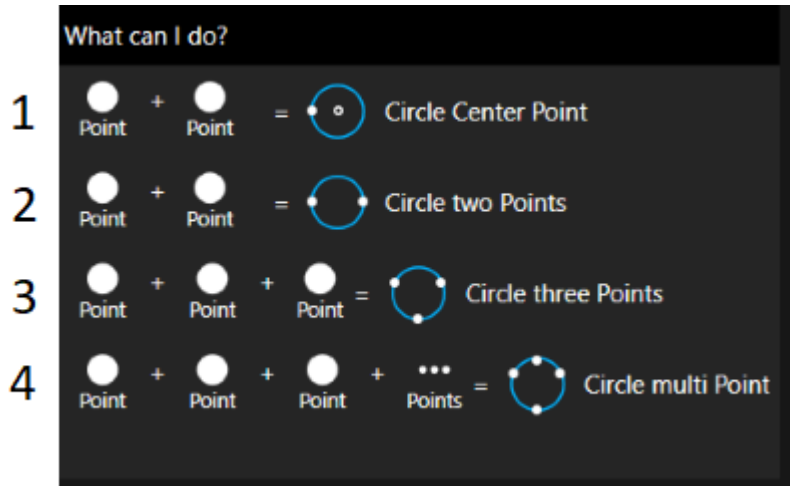


Instructions step by step:

1)		
Set one point	set a second point	confirm to construct a rectangle passing through them
2)		

Set one point	set a second point	set a third point	confirm to construct a rectangle passing through them
3)			
Select a line	set one point	select another point	confirm to construct a rectangle with the first point as centre, the second point as vertex and one side parallel to the line

- Circles:

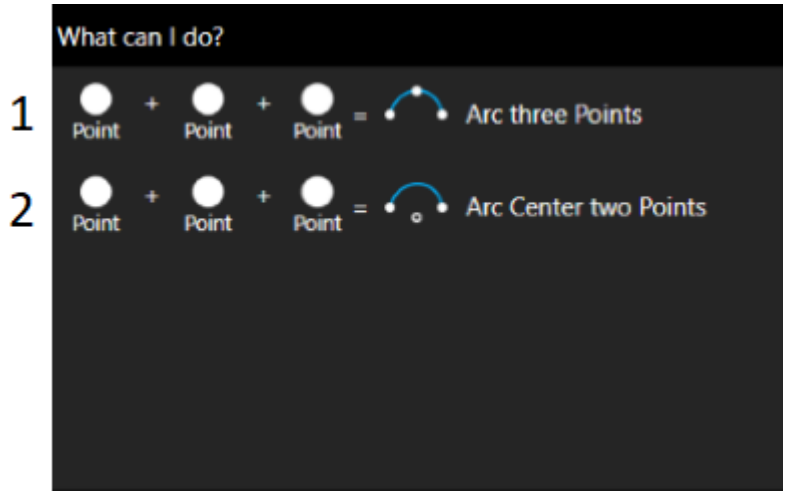


Instructions step by step:

1)		
Set one point	set a second point	confirm to construct a circle with the first point as a centre and passing through them
2)		
Set one point	set a second point	confirm to construct a circle passing through them

3)			
Set one point	set a second point	set a third point	confirm to construct a circle passing through them
4)			
Set one point	set a second point	set four or more points	confirm to construct a circle passing through them

- Arcs:



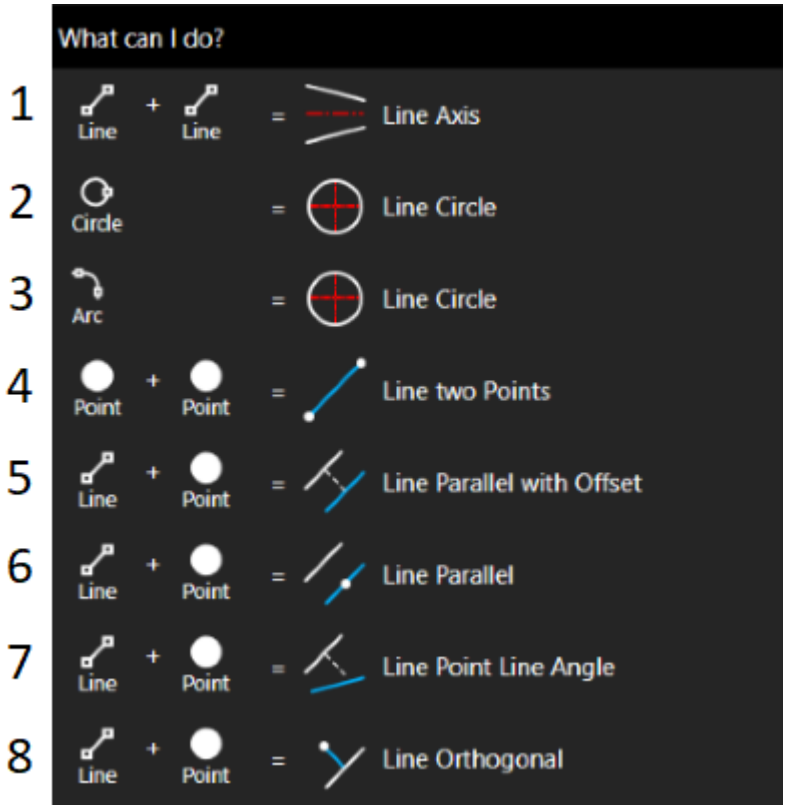
Instructions step by step:

1)			
Set one point	set a second point	set a third point	confirm to construct an arc passing through them

2)

Set one point	set a second point	set a third point	confirm to construct an arc with the first point as a centre and passing through the other two. The construction is done by drawing the line clockwise from the second point to the third.

- Lines:



Instructions step by step:

1)		
Select one line	Select another line	Confirm to construct the bisector of the angle between them

2)	
Select a circle	Confirm to construct the two orthogonal diameters parallel to the axes

3)

Select an arc	Confirm to construct the two orthogonal diameters parallel to the axes

4)		
Select a point	Select another point	Confirm to construct a line connecting them

5)			
Select a line	Set one point	Confirm to construct the parallel of the line passing through the point	The parallel just built is not bounded to the point; the offset can be set manually from the property bar

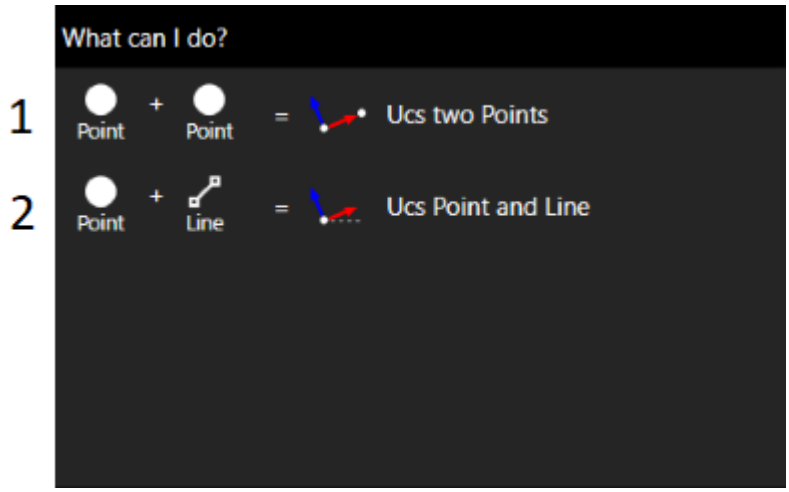
6)		
Select a line	Set one point	Confirm to construct the parallel of the line passing through the point, bounded to it

7)			
Select a line	Set one point	Confirm to construct a line passing through the point; by default, the angle is 0	The angle can be set manually from the property bar

8)

Select a line	Set one point	Confirm to construct the orthogonal of the line passing through the point

- New Ucs (User Coordinate System) Reference:



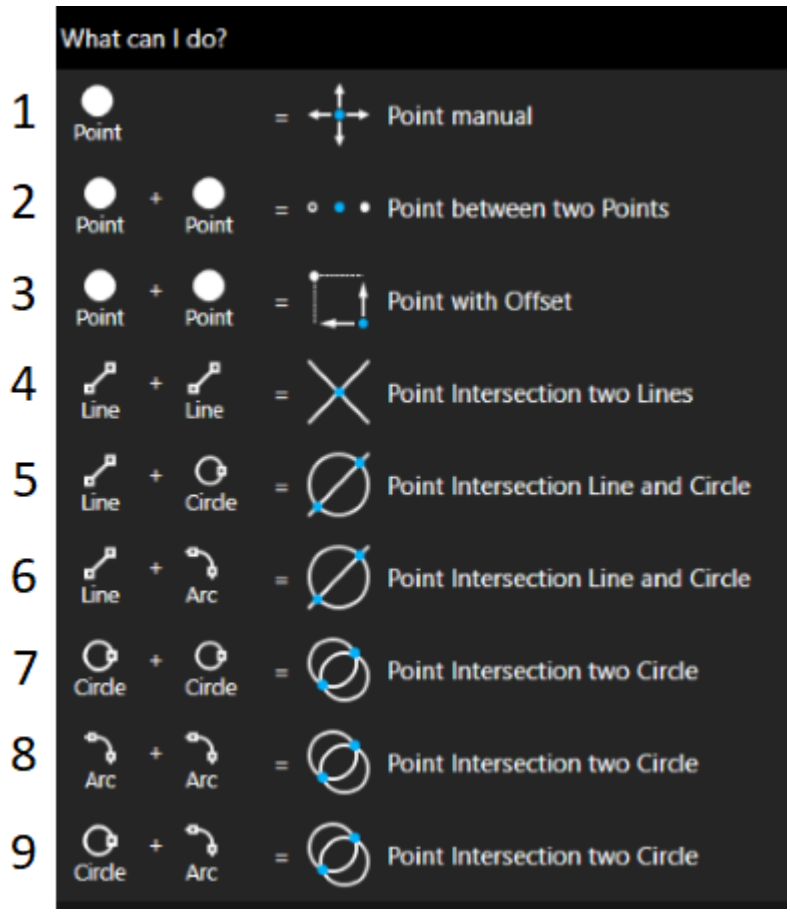
Instructions step by step:

1)	
Set a point	Confirm to set a new Ucs centred in the point

2)	
Select a line	Confirm to set a new Ucs centred in the point, having the parallel of the line as its x axis

- Points:

1)



Instructions step by step:

2)		
set a point		Confirm to make it a part of the object

3)		
set a point	set another point	Confirm to obtain the midpoint

4)

set a point	set another point	Confirm to obtain the vertex of the rectangle built by taking the two points as opposite vertexes

5)

Select a line	Select another line	Confirm to obtain the intersection point (also in the extensions)

6)

Select a line	Select a circle	Confirm to obtain the intersection point(s)

7)

Select an arc	Select a line	Confirm to obtain the intersection point(s) (also in the extensions)

8)

Select one circle	Select another circle	Confirm to obtain the intersection point(s)

9)

Select an arc	Select another arc	Confirm to obtain the intersection point(s) (also in the extensions)

10)

Select a circle	Select an arc	Confirm to obtain the intersection point(s) (also in the extensions)

When you select a shape, a guide will prompt in order to suggest to you what you can do.

Click on the visualizer to start creating shapes. Press ESC to exit.

2.9.8 Dxf

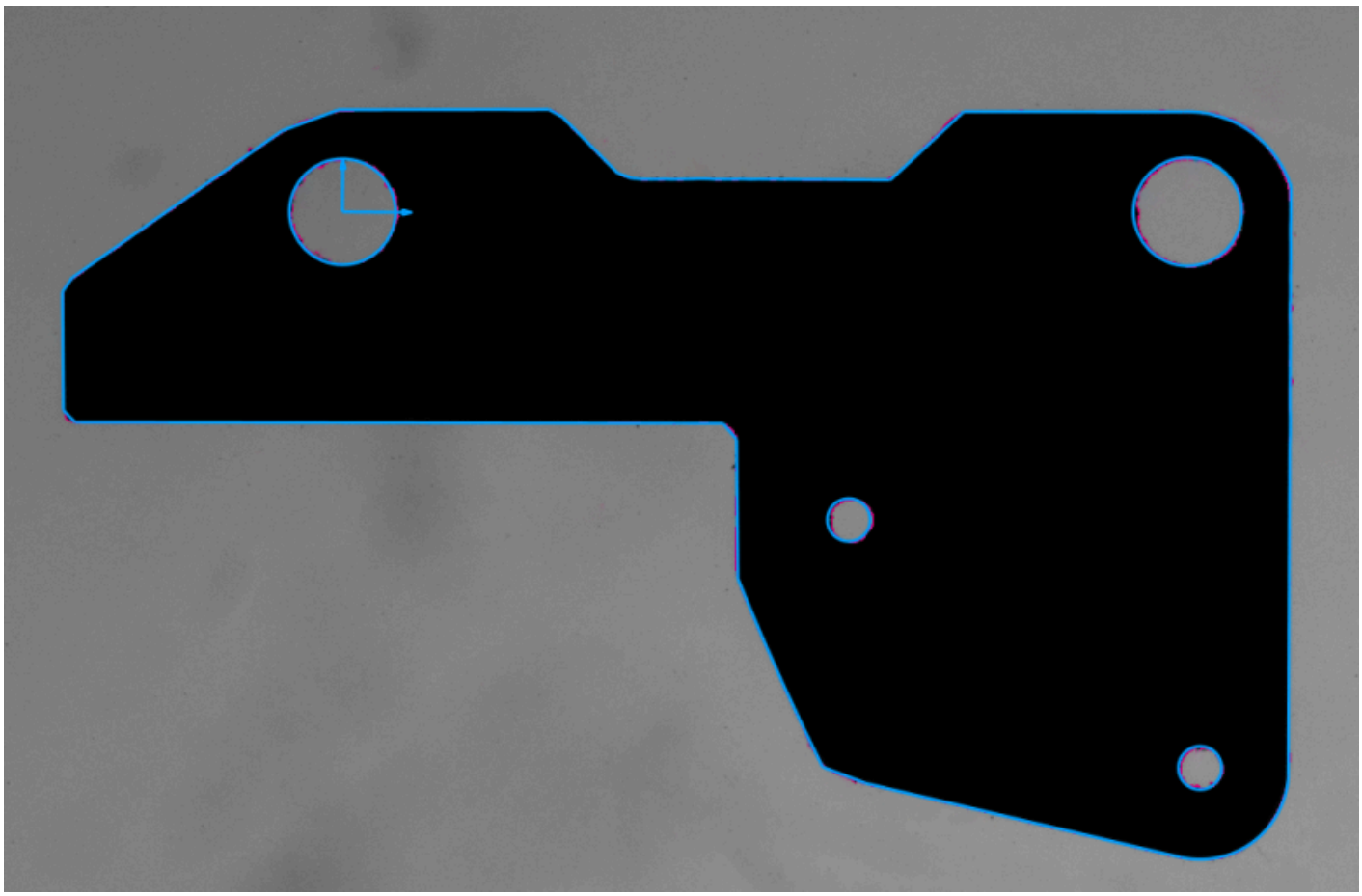
The Dxf menu allows you to import a dxf or export to a dxf.



You can use:

- Base to import the dxf as a list of points;
- Objects to import the dxf as a list of objects (primitive);
- Export in dxf.

After importing, the program will automatically search for the best alignment.



2.9.9 Statistics

Save your measures to the database for subsequent analysis.



This option is only available when all the parameters (camera or file image, engine, light, PLC) are set correctly.