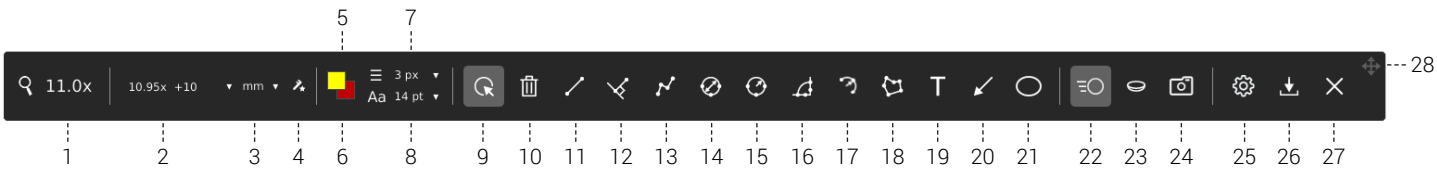# GUIDE | TAGARNO MEASUREMENT APP

VERSION: 2.0 | FIRMWARE 7.00 | 2022.03.10

TAGARNO Measurement application enables you to perform precise measurements directly on your TAGARNO system.

To use the Measurement application, the mouse and keyboard must be connected as described under the section called Connection in the microscope product manual.

1. Magnification level
Use the keyboard to change magnification level. Press the magnication field to state an exact magnification level.

Calibrations
To perform accurate measurements, you need to make a new calibration or recall a previous calibration. Different lenses require different procedures, so please follow the appropriate procedure for the mounted lens. Read more in "You have received" section below.

You have received
When buying the measurement application, you receive calibration sheets from D to I for Dot grid calibration and a ruler for linear calibration. Calibration sheets A, B and C are available at:
www.tagarno.com/download-calibration-sheets-abc

Note: The calibration sheets provided can be used with lenses up to +10. Use the custom Dot grid or linear calibration methods for lenses +25 and higher.

4. New calibration
When performing a calibration the selected close-up lens, zoom and focus value is saved in the application.

When a calibration is recalled the zoom and focus at the time of calibration will also be recalled.

If the image goes out of focus after recalling a calibration, the height of the microscope might have been changed. In this case, adjust the height of the microscope until the image becomes sharp to obtain the highest precision.

Method 1 - Dot grid

Advanced calibration is done automatically by placing a predefined dot grid calibration sheet under the camera and taking a picture.

While running the calibration, the software will automatically compensate for lens curve distortion and non-linearity and carry out calculations with a precision of sub-pixels.
1. Select a suitable magnification level
2. Press the icon New calibration in the top menu bar

A separate window will now appear.
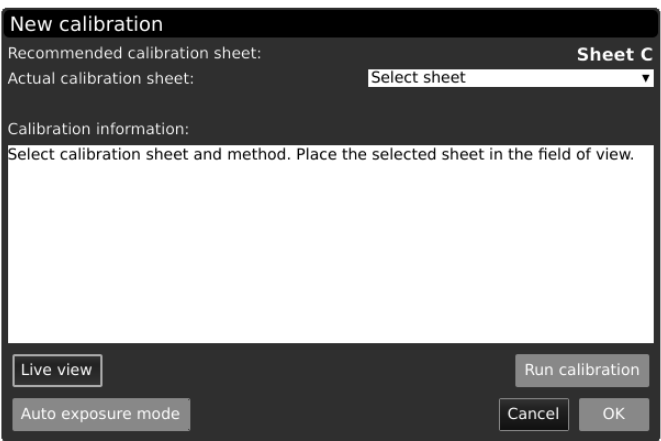
3. Depending on current zoom level and close-up lens, the app will recommend a calibration sheet for the calibration. Place the recommended calibration sheet straight under your microscope, so that the top row of dots is visible.

TAGARNO

Here is the list of the range covered by each TAGARNO calibration sheet.

	Range [mm]		Range [inches]	
Sheet	min	max	min	max
A	204	340	8.03	13.39
B	123	204	4.84	8.03
C	74	123	2.91	4.84
D	44	74	1.73	2.91
E	26	44	1.02	1.73
F	16	26	0.63	1.02
G	10	16	0.39	0.63
H	6	10	0.24	0.39
I	3	6	0.12	0.24

4. Let the app know that the correct sheet has been placed under the microscope by selecting the recommended calibration sheet in the drop down under Actual calibration sheet
5. Click Run calibration and check if the result says PASS.

Note: If the calibration sheet is placed incorrectly, the calibration will fail. If the Result says FAIL, switch to Live view to adjust the position of the calibration sheet and recalibrate by pressing Run calibration again.

Precision, Field of view, Lens and Magnification
After a passed calibration, the Precision, Field of view (FOV), Lens and Magnification of the calibration is stated in the Calibration information window.

For the calibration example above, the precision is 30.89µm.

6. When the calibration is complete, click OK to save the new calibration and close calibration state
7. Click Cancel to close without saving the calibration

Method 2 - Linear calibration

This is a calibration method where you use a reference line and state the line length. The measurement accuracy depends the user's diligence when drawing the reference line.

Linear calibration does not compensate for lens curve distortion.

1. Once again, start by selecting a suitable magnification level
2. Press New calibration
3. Now, choose Linear calibration in the drop down menu under Actual calibration sheet

4. Find an object with measurable distances (eg. a ruler) and place it under the microscope
5. Select Linear calibration in the drop down menu
6. Provide the distance you want to measure and matching unit
7. If needed, zoom in and adjust the end points of the reference line for increased precision

Note: When measuring on a ruler, always measure from forefront to forefront of the lines on the ruler

8. Click Run calibration.

Note: If the markers is placed incorrectly, the calibration will fail.
If the Result says FAIL, switch to Live view to zoom in and adjust the position of the markers and recalibrate by pressing Run calibration again.

9. When the calibration is complete, click OK to save the new calibration and close calibration state
10. Click Cancel to close without saving the calibration

Method 3 - Custom grid

Advanced calibration is done automatically by placing any predefined dot grid calibration tool under the camera and taking a picture. While running the calibration, the software will automatically compensate for lens curve distortion.

The dots should at least have a diameter of 20px on the screen to be recognized by the calibration mechanism.

1. Once again, select a suitable magnification level
2. Press New calibration
3. Now, select Custom dotgrid in the drop down under Actual calibration sheet
4. Provide the dot spacing measure and matching unit
5. Place the calibration grid straight under the microsccope, so that the top row of dots is visible
6. Click Run Calibration and check if the Result says PASS

Note: If the calibration sheet is placed incorrectly, the calibration will fail. If the Result says FAIL, switch to Live view to zoom in and adjust the position of the markers to adjust the position of the calibration sheet and recalibrate by pressing Run calibration again.

7. When the calibration is complete, click OK to save the new calibration and close calibration state. Click Cancel to close without saving the calibration.
8. Click Cancel to close without saving the calibration

Delete a calibration
To delete a saved calibration, click on the Recall dropdown menu and then choose the X icon next to the calibration in question.

A warning dialog box prevents you from deleting a calibration unintentionally. Press "OK" to delete the calibration.

Saving and recalling a calibration
The application will store and recall a calibration, so that you do not have to recalibrate every time the software has been closed. To choose a saved calibration, select it in the Recall dropdown menu in the top menu bar.

Note: When you readjust a calibration, the camera focus locks. This means that you might have to readjust the physical distance between the camera and the object you are looking at (focus height) to display the image sharply.

When recalling a calibration, it is important that you use the same close up lens as during the initial calibration. Only calibrations with the chosen lens will be available in the drop down menu.

All measurement annotations will remain after recalling a calibration. All measurement values will also be recalcuated based on the selected values. If needed, use the Edit function to readjust any measurement. See next page.

Note: You can also use the mouse wheel to recall a calibration. Click on the mouse wheel to open the calibration drop down list where the calibration matching the current magnification level the best is highlighted. Use the scroll wheel to go up/down in the list and click the scroll wheel again to recall the highlighted calibration.
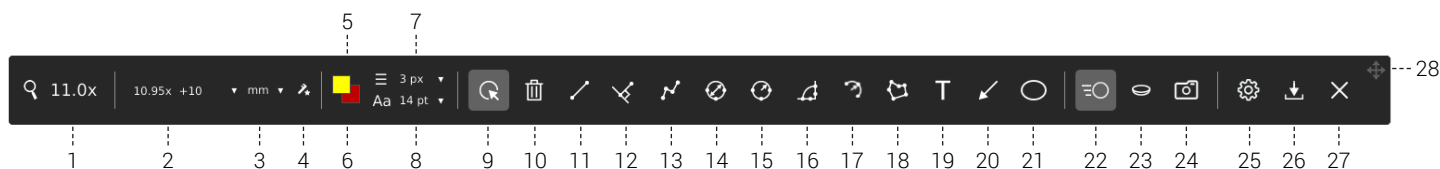
Tool menu

1. Function shortcuts
Function key shortcuts (F1-F12) have been assigned to the drawing and annotation functions. The tool tip shows the assigned function key. See assigned shortcuts at each function below.

Note: When you mouseover a menu point, a text box will show tool tips.

3. Choose measurement units
Choose your prefered measurement units in the dropdown menu. It is possible to choose between mm, cm and inches.

5. Object and text color adjustment
Use this function to set the colors for drawings and texts before using a tool. You are not able to edit the color after using the tool.

Latest settings are persistent during power down. The hue is set to black by default.

6. Background color adjustment
Adjust the color of the text annotation background before using the text annotation tool. You are not able to edit the color after starting using the tool.

Latest settings are persistent during power down. The hue is set to transparent by default.

7. Line width
Choose the line width of your measurement lines in pixels (px). Latest settings are persistent during power down. The width is set to 1 px by default.

8. Text size
State the text size of your measurement units and text annotations in points (pt). Latest settings are persistent during power down. The size is set to 14 pt by default.

9. Edit (F1)
In edit mode, all adjustable points will be shown as a small circle which highlights (red circle) on mouse over.

When a point is highlighted, you can choose and relocate the point. In view mode, the points are hidden. By right-clicking on a point, you are able to delete the point.

10. Clear all (F2)
Use this button to clear all drawings. Then Clear All is selected, a warning dialog enables you to cancel the operation if it was selected by accident.

11. Point-to-point measurement (F3)
With this measurement tool, it is possible to measure the distance between two points. Use left mouse click to place the two end points.

Holding down Shift when placing the end point will make the line go horizontal or vertical.

Holding down Ctrl while placing the start and end points of this tool will make it snap to the center of a measured circle or arc. This can be used to easily measure the distance between the center of two measured circles or arcs.

Press Ctrl to extend the base lines when placing the lines.This can be used for measuring the distance between parallel objects. When the line has been placed, the base lines return to their default length.

Press Alt key while placing the last point of the measurement to offset the measurment line annotation with dash lines. This is useful if the annotation is difficult to read when placed at default.

12. Distance to line measurement (Shift + F3)
Measure the perpendicular distance between a line and a point.

Press Ctrl to extend the base lines when placing the lines. Further, holding down Ctrl when placing the perpendicular line will allow you to do multiple perpendicular measurements from the base line.

13. Polyline measurement (F4)
Place two or more points to get the length of each distance plus the length of the full polyline.

Holding down Shift when placing the end point will make the line go horizontal or vertical.

Holding down Ctrl while placing the start and end points of this tool will make it snap to the center of a measured circle. This can be used to easily measure the distance between the center of two measured circles.

14. Diameter measurement (F5)
This tool enables you to calculate a diameter of a circle. Place three points in the periphery of a circle and it will calculate the diameter. Use left mouse click to place the three points.

15. Radius measurement (F6)
This tool enables you to calculate a radius of a circle. Place three points in the periphery of a circle and it will calculate the radius. Use left mouse click to place the three points.
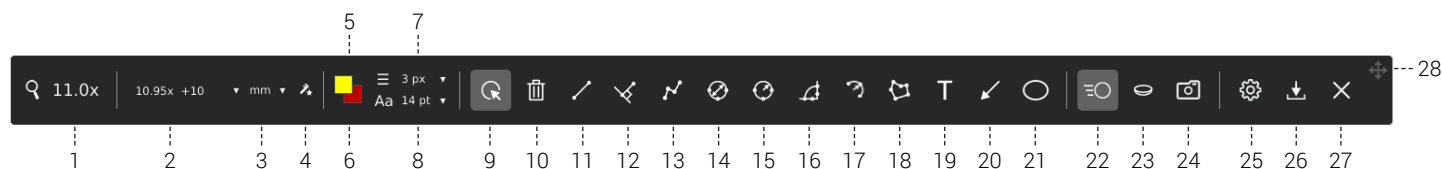
16. Angle measurement (F7)
This function makes it possible to measure any given angle. Use left mouse click to place four points - two on each side of the angle you want to measure.

17. Arc measurement (Shift + F7)
Use this tool to measure the radius, angle and total length of an arc. Place three markers to define the arc using the left mouse button. Abort the process and delete the arc by right-clicking the mouse at any point.

Radius =	Measured from arc center point to arc line
Angle =	Measured from arc center point, using start and end points as markers
Total length =	The total length of the arc line

18. Area measurement (F8)
Use this function to make a polygon area measurement. Use left mouse click to place at least three points. To stop adding points to your polygon right-click on the mouse.

19. Text Annotation (F9)
This function makes it possible to add text annotations anywhere in the window.

Use the Keyboard to type the text. Move the text box to the wanted location and left click the mouse to confirm the position.

The feature includes auto completion allowing you to easily select or delete previously entered text annotations.

20. Arrow Annotation (F10)
With this tool, it is possible to add arrow annotations anywhere in the window. Use the left mouse button to place the endpoints. The second point is the end of the arrow.

21. Ellipse/Circle Annotation (F11)
Use this tool to add ellipse annotations anywhere in the window. Use the left mouse button to place the start and end points of the ellipse. Holding down Shift when placing the end point will create a perfect circle.

Other toolbar features
Use the other features in the toolbar to change image mode, correct lens curve distortion, take a snapshot, change your settings and more.

22. Live View (F12)
Use this button to toggle between live and still image mode. In Live mode, the live camera image is active. In Still image mode, the latest snapshot will be shown.

NB: To replace the latest captured snapshot, use Ctrl + L. Then, press Ctrl + L again to toggle back to Live view.

23. Lens Correction (Shift + F12)
This function takes the calibration data and corrects the image for lens curve distortion. Lens correction can only be processed in a calibrated state, not in lineary calibrated mode.

Moreover, this button can be used to toggle between latest snapshot and a corrected version of the snapshot.

24. Snapshot (Ctrl + F12)
Use this button to take a snapshot of the live image. The snapshot will not be saved automatically.

NB: When using the mouse wheel to zoom digitally on a snapshot, the center of the zoom follows the mouse position.

25. Settings (Ctrl + O)
Once clicking this icon, a pop-up window will allow you to adjust the sensitivity of your mouse and the number of decimals to be displayed with your measurements.

Mouse
Adjust the mouse sensitivity by selecting a point on the bar between slow and fast.

Decimals
Choose the number of decimals you want your measurements to be displayed with by using the drop down menu.

Text
Choose how line length annotations should be displayed: Select All text horizontal to have the text displayed horizontally on the monitor. When unselected (default), the text will be parallel to the line. All previous length annotations will change to the selected setting.

Also select or deselect Show arc length, angle and/or radius to show or hide these arc measurements.

Toolbar numbered labels: 5 7 28 1 2 3 4 6 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
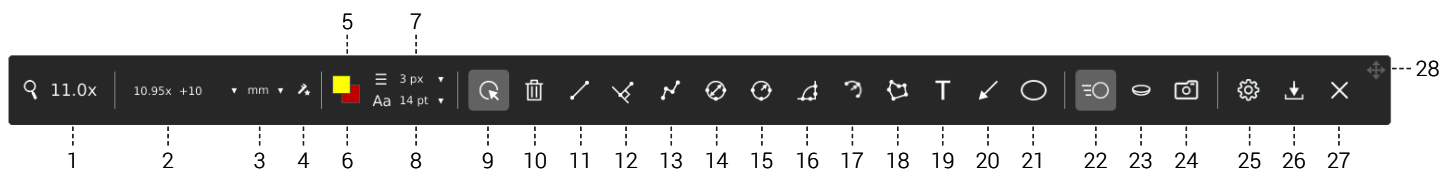
File menu (Ctrl + D)
Once clicking this icon, a pop-up window will allow you save your image with or without graphics, save your measurements with our without the microscope image and load previously saved measurements.

Save image (Ctrl + S / Ctrl + W)
Choose between saving your image with graphics (Ctrl + S) or without graphics (Ctrl + W). In this regard, graphics refer to any measurements or annotations added to the image.

When taking a picture, an information window will appear for a few seconds showing the file name and storage location.

The image will be saved on the inserted USB memory stick. If a USB memory stick is not attached, the image is saved internally on the microscope, provided the share file mode is turned on. Otherwise an error message will appear and you are not able to save images. Read more about how to access saved files in the user guide for your microscope.

NB: You can also use the control box to save images with the tool box on the image. Read more about this in the user guide for your microscope.

NB: When saving .jpg images, annotations added to the image will be available in the EXIF comments field. Read more about this in the user guide for your microscope.

Save measurements
To reuse measurements for future inspections, measurements can be saved with or without the microscope image included in the file

Load measurements
Previously saved measurements can be loaded from a dropdown menu during future inspections.

Any additional measurements or alterations to existing measurements will not be saved automatically. In this case, make sure to save the measurements again.

NB: To delete saved measurements, click the cross icon next to the measurement in the Load measurement menu tab.

27. Close (Ctrl + Q)
Use this function or hold center button down for a few seconds to close the measurement application.

28. Move Toolbar
Press and hold left mouse button down to move the toolbar around the window and place it by releasing the mouse button.