Struers
Ensuring Certainty

DuraSoft

Instruction Manual

Original Instructions

CE

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1 About this manual

This software manual contains an outline of the basic functionality in the Dura series. The manual is to be read together with the Instruction Manual for the machine, as both contain important information concerning your safety and how to use the machine.

CAUTION
Read the machine manual also
Struers equipment must only be used in connection with and as described in the Instruction Manual supplied with the equipment.
The machine manual also contains important warnings to the use of the machine.

Note
Read the Instruction Manual carefully before use.
Information about the available hardware controls to create a safe situation, like moving spindle, is described in the dedicated machine user manual.

Note
The software can change due to continuous development. We reserve the right to make any necessary modifications in the software without prior notice.

For a more advanced use of the software, contact your local Struers application representative.

2 Safety

2.1 Intended use

This main control software is intended for use with machines for hardness testing of specimens in the Struers Dura series.

The intended use of the machine is the hardness testing of mainly ferrous and non-ferrous metals and ceramic specimens.

The machine is to be used in a professional working environment (e.g. a materialographic laboratory or industrial setting).

The machine is intended to be used by adult qualified personnel.

The machine must only be operated as described in the DuraSoft Instruction Manual and the Instruction Manual for the machine.

Struers is not responsible for the damage caused by incompetent use (unintentional use). Only use the machine when it is technically in good working order, and use it according to the intended use, paying attention to the safety and potential hazards referred to in the DuraSoft Instruction Manual and the Instruction Manual for the machine.

Note
See the specific Instruction Manual for your machine.

2.2 Emergency stop

CAUTION
Before you release the emergency stop, investigate the reason for activating the emergency stop and take any necessary corrective action.

CAUTION
Make sure the situation is safe before you restart the testing software.

Note
Do not use the emergency stop for operational stop of the machine during normal operation.



1. In case of an emergency, press the emergency stop on the machine.See the Instruction Manual for the machine you are using.
2. The machine stops immediately.

When you release the emergency stop

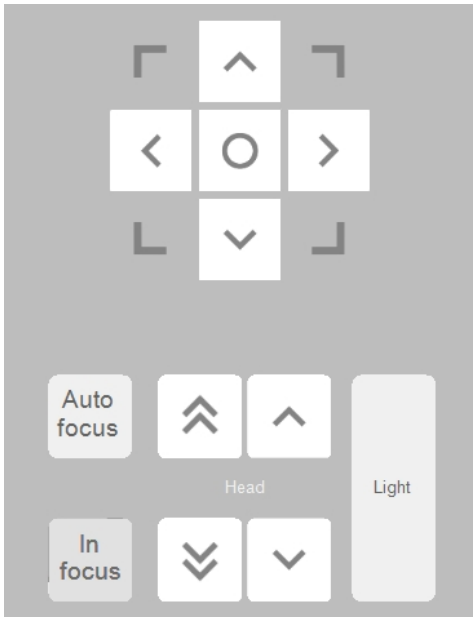
1. The software shows an emergency stop message:



2. The software goes into an emergency state where you can only control the machine movements manually.

   If needed, use the controls to bring the machine into a safe state.

Depending on your hardware and motorized configuration of the tester, you see the following controls in the **Control panel** of the display (see Control panel ► 89):



3. Select **OK** to leave the emergency mode and return to Windows.

To restart the software, see Start and exit the software ► 16

2.3 Safety messages for software

Struers uses the following signs to indicate potential hazards.

WARNING
This sign indicates a hazard with a medium level of risk which, if not avoided, could result in death, or serious injury.

CAUTION
This sign indicates a hazard with a low level of risk which, if not avoided, could result in minor, or moderate injury.

Emergency stop
Emergency stop

General messages

Note
This sign indicates that there is a risk of damage to property, or a need to proceed with special care.

Hint
This sign indicates that additional information and hints are available.

2.4 Safety messages in this manual

CAUTION
Read the machine manual also
Struers equipment must only be used in connection with and as described in the Instruction Manual supplied with the equipment.
The machine manual also contains important warnings to the use of the machine.

CAUTION
Before you release the emergency stop, investigate the reason for activating the emergency stop and take any necessary corrective action.

CAUTION
Make sure the situation is safe before you restart the testing software.

CAUTION
If you use a network location as an export destination, the machine performance can be affected if the network connection is lost.

WARNING
Do not turn off the machine after exiting the software. Follow normal procedure to shut down Windows.

CAUTION
If you skip the procedure for changing the indenter, you could increase the measuring time or damage the system during the next measurement.

CAUTION
Dismantling of any part of the equipment, during service or repair, must always be performed by a qualified technician (electromechanical, electronic, mechanical, pneumatic, etc.)

CAUTION
A wrong retraction setting may damage your part or the machine.

WARNING
When you change the camera view, it may involve a movement of the XY stage if available, and/or the test head.

CAUTION
Always make sure that the turret is free to rotate.

3 Get started

3.1 Description of DuraSoft

The DuraSoft software is an advanced user operating system for machines in the Dura series. It is a tool for setting up and performing manual and automatic hardness testing for common hardness methods, and for handling image detection, manual and automatic focusing, file storing, image storing, report print-outs, turret operation, and a range of advanced functions.

The DuraSoft software combined with an XY stage make it possible to run case depth hardness programs, pre-defined testing patterns, and a range of user-defined tasks.

The DuraSoft software can convert hardness values to 5 different hardness scales complying with international standards (ISO/ASTM).

Test data can be stored and exported as CSV, PDF and with the optional module to Q-DAS® formats. Test data can be accessed via USB or network connections.

3.2 Installation

3.2.1 Struers Service

We strongly recommend that installation of DuraSoft and training is conducted by Struers Service.

Note
See the specific Instruction Manual for your machine.

3.3 Network connection

To share results and reports, you can connect the hardness tester to a network. The machine supports both wired and wireless network connections.

If you require network access for results and reports, Struers recommends that you map the **Saved Measurements** folder or the entire D: drive to the network.

CAUTION
If you use a network location as an export destination, the machine performance can be affected if the network connection is lost.

- Use the Wi-Fi dongle supplied with your machine to connect to a wireless network.
- Use the Ethernet port on the rear of the machine for a wired network connection.
- If a network connection is available, Struers can provide technical support via remote machine access using the pre-installed TeamViewer QuickSupport.
- If you have a network connection, remote control of test execution can be implemented. This requires a Remote Control Module (Item number 06703007). Contact your Struers representative for further information. See Add software modules ► 14.

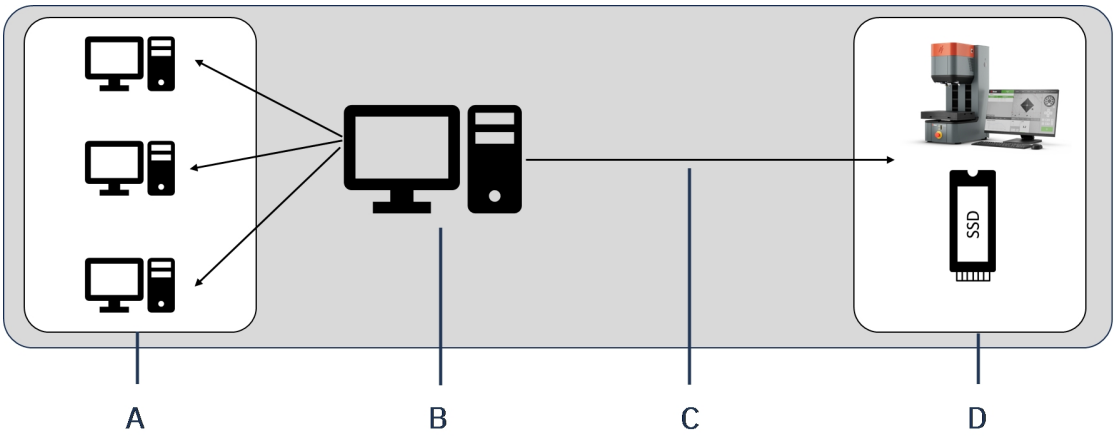
3.4 Network integration

Third-party applications, such as office applications and virus scanners, are not permitted to be installed on DuraSoft. However, operators or cybersecurity requirements may require such programs.

This paragraph describes how to integrate DuraSoft into a company network in a secure, yet flexible, way. Common objectives include accessing data from any network computer, storing data centrally alongside other relevant information (material, operator, etc.), and enabling easy documentation, searching, and trend analysis.

The advised approach involves creating a separate network segment (subnet) for the DuraSoft hardness tester, similar to printer network connections. This allows for easy data transfer from DuraSoft to any network computer via a shared drive. Alternatively, local IT can set up an automated service to transfer hardness data from Duramin to the central data store, ensuring data accessibility for all network users.

Company Network



A **Subnet**

B **Bridge-PC**
File service for retrieving files from Duramin

C Via VLAN or via 2. network card in Bridge-PC.
Ports: TCP 445, UDP137, UPD138, TCP139

D **Subnet**
D:\Saved measurements.CSV and .PDF files
D:\Duramin\Programs.prg files (JSON)

3.5 Operating system

The internal PC of the hardness testers is delivered with Microsoft Windows pre-installed.

The Microsoft Windows installation is based on a single-purpose license. This means that you are not allowed to install any other application on the PC.

The Microsoft Windows installation (located on the C: drive) is protected by UWF (Unified Write Filter). This means that all changes made to the C: drive, including the desktop, are removed every time you restart the system.

Your test results, reports, etc. are as default saved on the D: drive on the PC.

If you have any questions regarding the software, contact Struers Service.

3.6 Add software modules

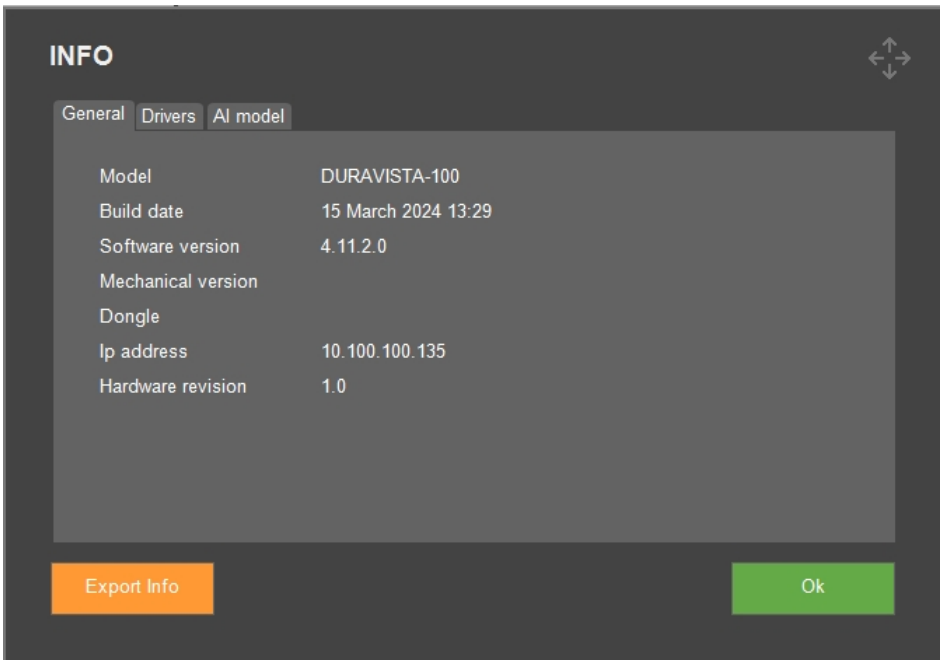
Adding an additional software module to the software of your machine may require an additional license.

Find information before you order

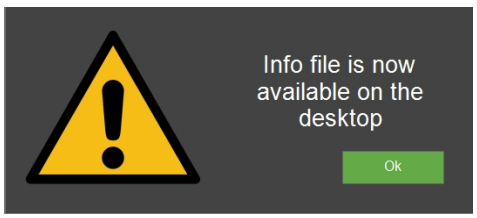
When ordering a license for a software module, you must provide information about the machine. To find this information, follow these steps:

1. In the **Top menu bar**, select **Tester** > **Info**.

   Example:



2. Select **Export info** to export the info file to the desktop on the hardness tester.



3. Include the info file (info.tar) when you order new software modules.

Available software modules

The following software modules are available. Depending on the type or model of the hardness tester, some of these modules are installed by default. Contact your Struers representative for further information.

Item no.	Name	Description
06703001	**Weld Measurement Module**	Dedicated Weld Hardness measurement module for defining patterns according to base material, HAZ and Weld zone.
06703002	**Fracture Toughness (Kc) Module**	Module for measuring Fracture Toughness Kic using Niihara's formulation.
06703003	**Cartridge Testing Module**	Module for testing shells/casings according to ammunition industry demands.
06703004	**CHD Testing Module**	CHD test module for machines with automatic stages. Enables CHD, SHD and NHD testing patterns.
06703005	**Test Point Editor**	Module for defining and setting up basic test patterns (line, square, zigzag, triangle) on testers with a motorized stage.
06703006	**(De)-carb test acc.to ISO898-1**	Module for detection and analysis of fastener threads in order to find appropriate test locations for a three-point ISO 898-1 pattern.
06703007	**Remote control module**	Module for enabling remote control of the hardness tester using TCP/IP.
06703008	**Automatic edge detection**	Module for edge recognition for creating test pattern parallel to the specimen edge.
06703009	**Automatic contour scanning**	Module for scanning the full contour of the specimen.
06703010	**Automatic mapping module**	Module for 2D or 3D hardness mapping over areas or scanned contours.
06703012	**Q-DAS certif. Connect.Protocol**	Module for exporting test results in QDAS format (Aq def or Dfd/Dfx).
06703013	**Duramin utility software**	Module for exporting test results, scale and time stamp directly into Microsoft Excel on an external PC.
06703015	**CHD Test.Module, Man. XY stage**	Module for enabling CHD, SHD, NHD patterns on manual stages.
06703016	**Test Point Editor, manual XY stage**	Module for creating test point patterns (includes +CHD, SHD, NHD) on manual stages.
06703017	**Drawing and Measurement Module**	Module for annotations and manual measurements for simple non-hardness measurements (distances and angles).

Item no.	Name	Description
06703018	**Image Stitching Module**	Module for scanning and stitching for a full stage overview or detailed images of larger areas of a test specimen.
06703019	**Force/Depth/Time Diagram**	Module for showing the force/depth/time diagram for an indentation (only for testers with Rockwell capabilities).
06703021	**Tap screw meas. (ISO2702)**	Module for fully automatic testing according to ISO 2702 for screw thread measurement of (de)-carbonized parts.

3.7 Start and exit the software

When you switch on the machine, the software starts up automatically.

If the software has been started with activated emergency stop, see Emergency stop ► 9.

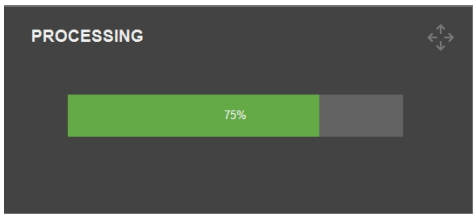
Start the software manually

If the software was not started automatically, or after an emergency stop, manually start the software.

1. To start up the software, select the Struers icon located in the Windows task bar, or in the Windows **Start** menu.

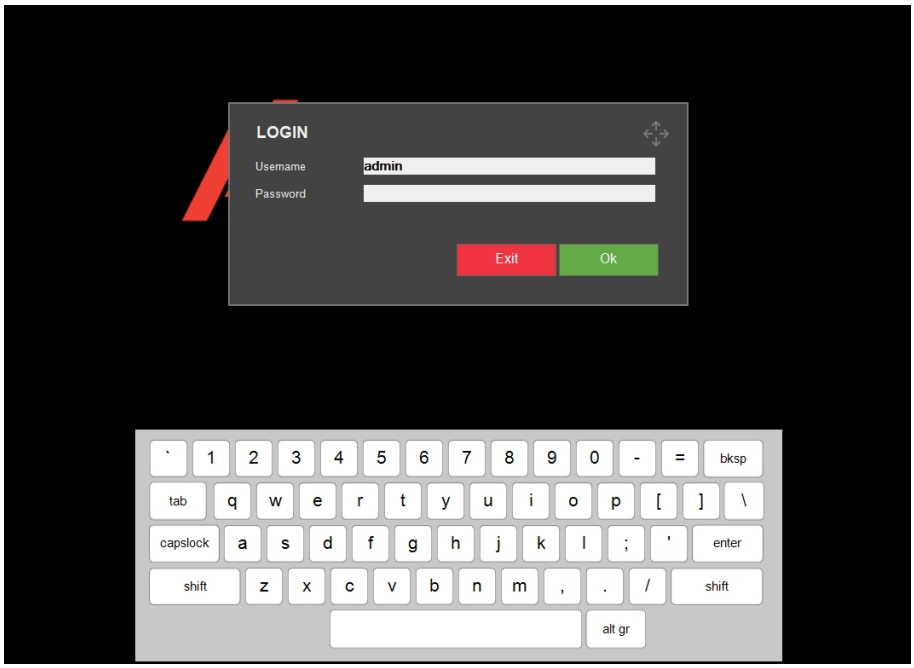


2. Several system functions and parameters are now checked.



In case there are any problems, an error message appears (see Messages and errors ► 164).

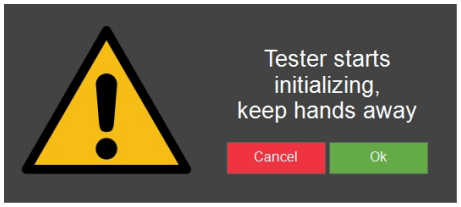
3. Enter **Username**.



Note
The default credentials are:
Username: "admin" (not case-sensitive)
Password: Leave this field empty (the default username has no password).

4. Select **OK** to continue or **Exit** to exit the program.

   If you select **OK**, the following warning is shown:



5. Select **OK** to start the initialization process.

   The machine starts moving to find its reference positions.

   The parts that move are axes in XY stage, the spindle and the head.

Ready for testing

The machine is ready for use when **Start/Stop** is green.



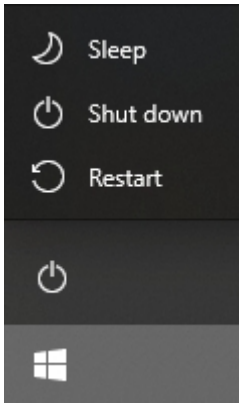
This can take a while depending on the active processes.

Exit the software and switch off the machine

1. In the **Top menu bar**, select **System** > **Exit** to return to Windows.

> **WARNING**
> Do not turn off the machine after exiting the software. Follow normal procedure to shut down Windows.

2. To shut down the PC, select **Power** and **Shut down** in the Windows menu.



3. Wait for the PC to power off.
4. When the PC is powered off, **No Signal** is shown on the display.
5. Switch off the machine using the power switch on the machine.

3.8 Set up the software the first time

> **Note**
> This manual covers the software for several machines, and some parts may therefore differ or be disabled.

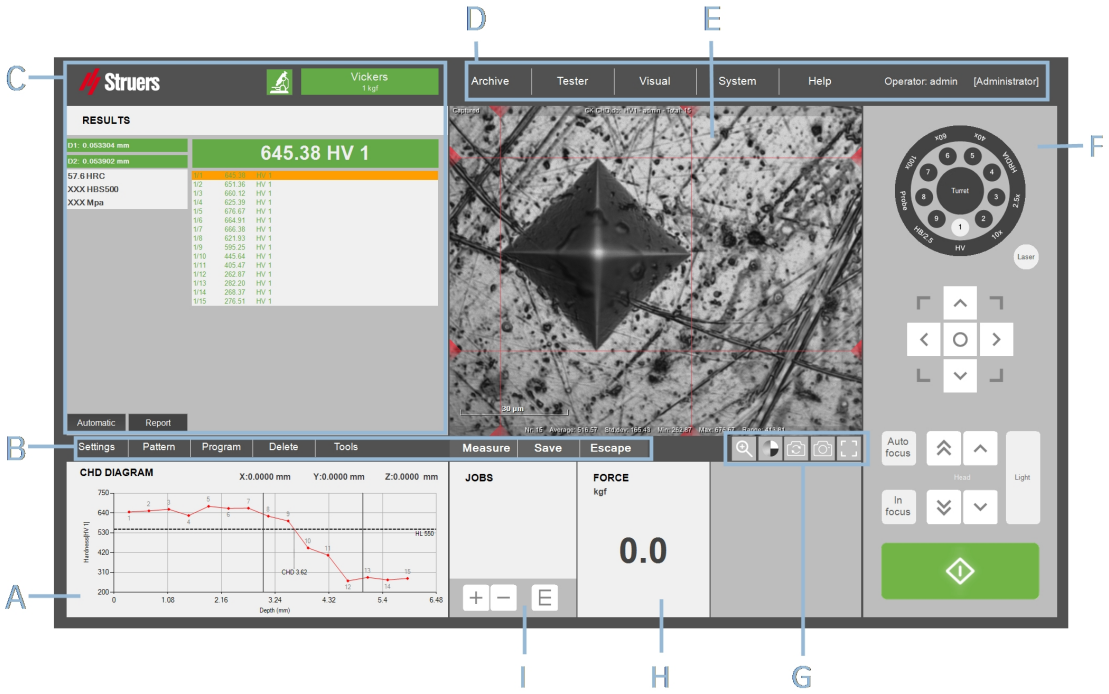
3.8.1 System settings

To set up language, user level, new users and other system settings, see System ► 45.

4 Navigation

4.1 Display overview of DuraSoft

> **Note**
> The screens shown in this manual may differ from the actual screens in the software.



A	Diagram	**F**	Control panel
B	Test menu	**G**	Camera control buttons
C	Test method area	**H**	Applied Force indicator
D	Top menu	**I**	Jobs
E	Main view		

4.2 Shortcuts

You can use a range of shortcuts to access several functions.

Focus

Shortcut	Function	Application
Shift + **Autofocus**	• Only visual auto-focus (no touch focus). Applies only to machines with a descending turret.	The button GUI **Autofocus**
Mouse scroll wheel	• Fine adjustment of focus for the **Objective camera**.	Place the mouse cursor over the **Objective camera** view.
Mouse scroll wheel	• Fine adjustment of focus for the **Overview camera**.	Place the mouse cursor over the **Overview camera** view.

Pattern

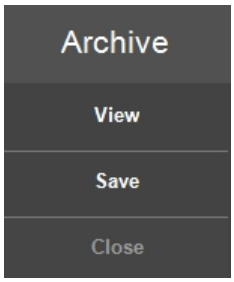
Shortcut	Functionality	Application
Ctrl + left-click	• Add point to a custom point pattern. Add points directly in the editor or in the live view (**Objective**, **Overview**).	Pattern editor/Live view
Ctrl + Left-click on blue line	• Add a point between existing custom points. Add points directly in the editor or in the live view (**Objective**, **Overview**).	Pattern editor/Live view
Right-click	• Delete a custom point. Delete points directly in the editor or on the live view (**Objective**, **Overview**).	Pattern editor/Live view
Shift + Left-click + Drag	• Move the entire pattern. Click anywhere on the pattern itself.	Pattern editor/Live view
Left-click on point + drag	• Move point within custom points pattern.	Pattern editor/ Live view
Shift + Ctrl + drag	• Zoom to selected area. Zoom will be applied for the area contained in the created box.	Pattern editor
Left-click + scroll wheel	• Zoom to a specific point. Zoom will be centered around the selected point.	Pattern editor

Settings

Shortcut	Functionality	Application
F12	• Hide/show the mouse cursor.	GUI
Click the mouse scroll wheel	• Toggle between the red dot/green crosshairs measuring point. The red dot/green crosshairs is shown in the zoom window of the measuring window.	GUI

5 Archive

In the **Top menu bar**, use the **Archive** function to save test results, snapshots and test settings for later review.



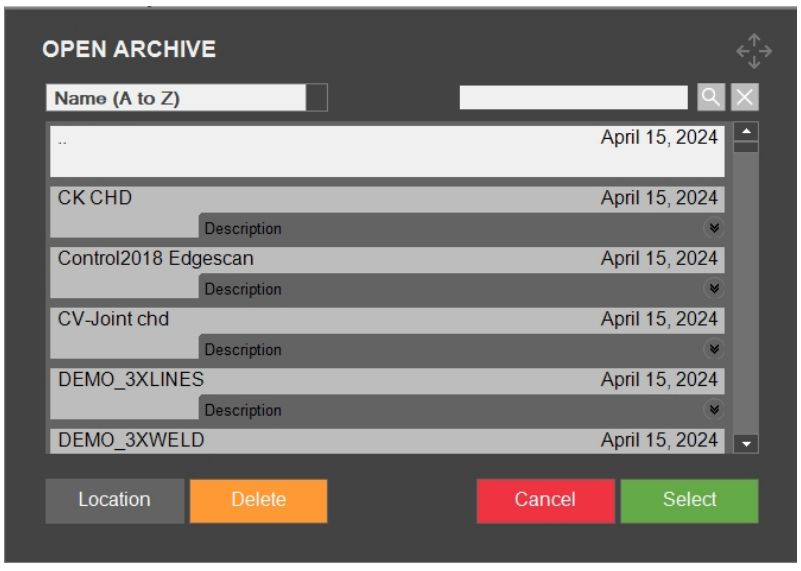
You can view, save and delete an archive.

Note
Save up to 70 archives in one folder.

Open an archive

Note
You cannot perform a test while an archive is open.

1. In the **Archive** menu, select **View**.
2. The archive list is shown.

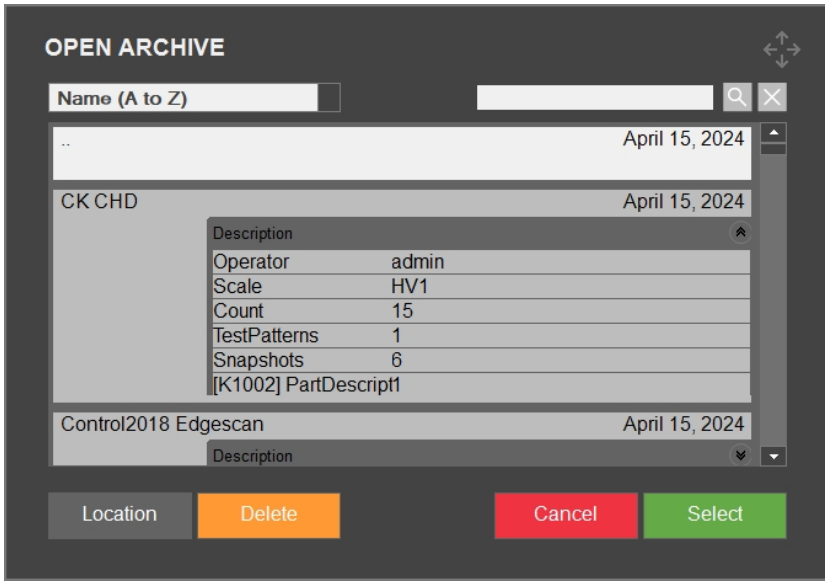


From this menu, you can also:

- open an archive from another location, select **Location**, or

- delete an archive, select **Delete**.

3. If needed, select the double arrow on the archive entry to see more details (operator, method, number of measurements, etc.).



4. Choose **Select** to open the archive.

   The **Archive** button flashes to indicate that an archive is open.

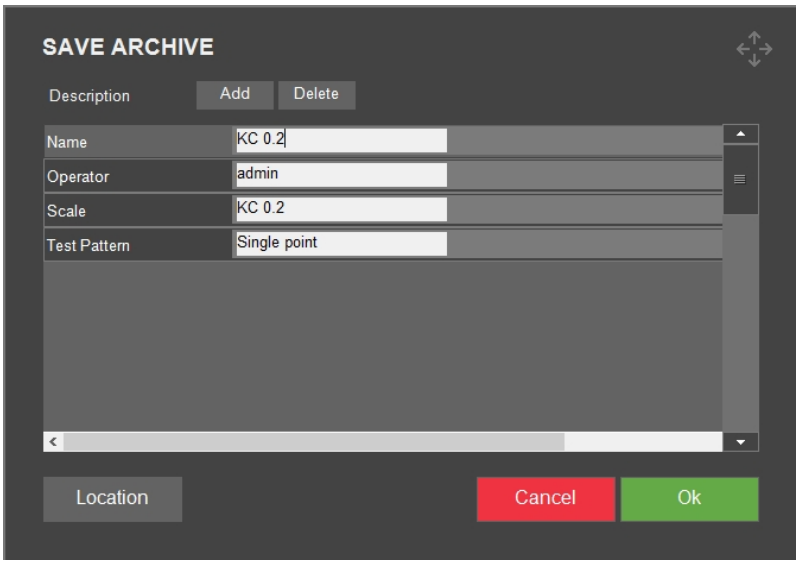
5. You can manually review the results from the archive, and export and report them as needed.
6. To close the archive, tap **Close**. The archive button stops blinking.

Save an archive

You can save measurements in an archive.

> **Note**
> You cannot save a changed archive under the same name. This is to protect the initial data in the archive.

1. In the **Archive** menu, select **Save**.
2. Enter a unique name for your archive.

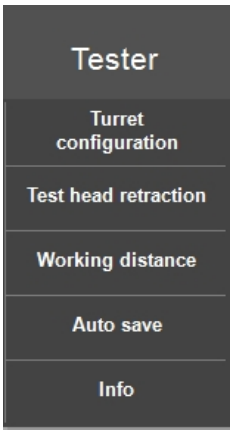


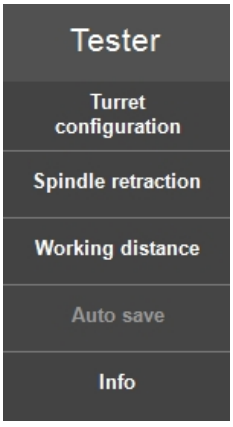
3. Select **OK** to save the archive.
4. You can add a description to your archive. Tap **Add**. To delete the description, tap **Delete**.
5. If needed, browse to select another folder.

6 Tester

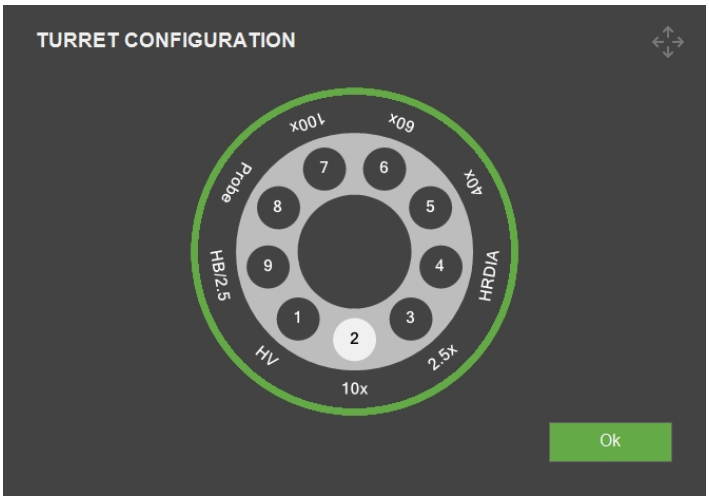
This menu (**Top menu bar** > **Tester**) enables the general setup of the machine.

Dependent on which machine you have, it is equipped with either a motorized **test head** or a **spindle**.





6.1 Turret configuration



Here you must change the configuration after you change or add an indenter or objective.

Note
For detailed instructions on how to change or add an indenter or an objective, see the Instruction Manual for the specific machine.

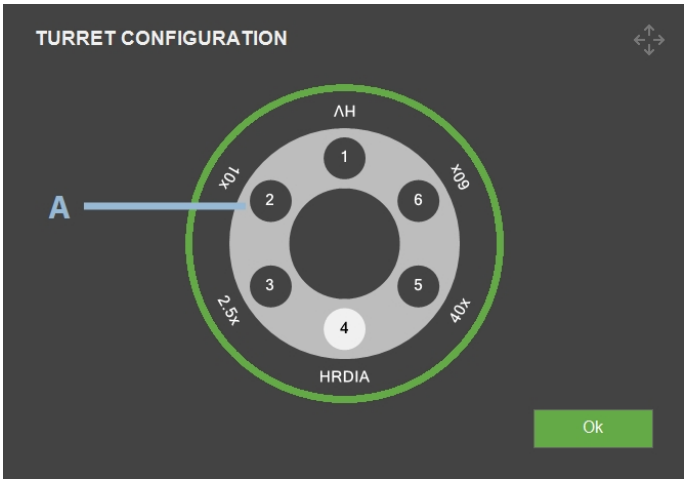
Change an indenter

CAUTION
If you skip the procedure for changing the indenter, you could increase the measuring time or damage the system during the next measurement.

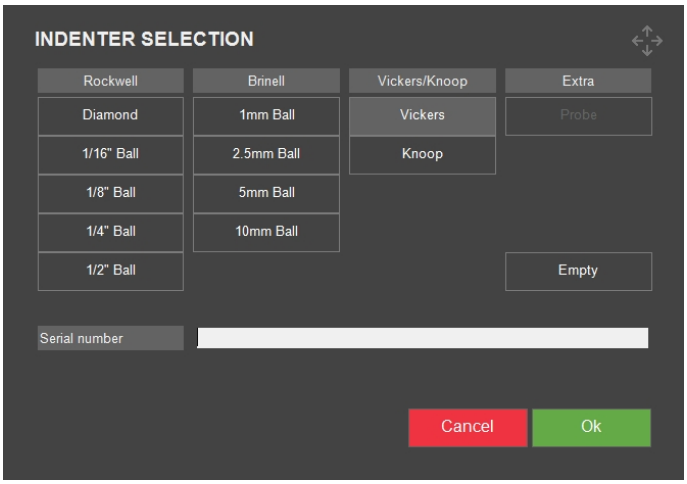
CAUTION
Dismantling of any part of the equipment, during service or repair, must always be performed by a qualified technician (electromechanical, electronic, mechanical, pneumatic, etc.)

1. Place a test block or any other perfectly flat specimen on the anvil or stage.
2. Bring the surface in focus with the highest power objective.

3. Click on the indenter you wish to change to, for instance (A).

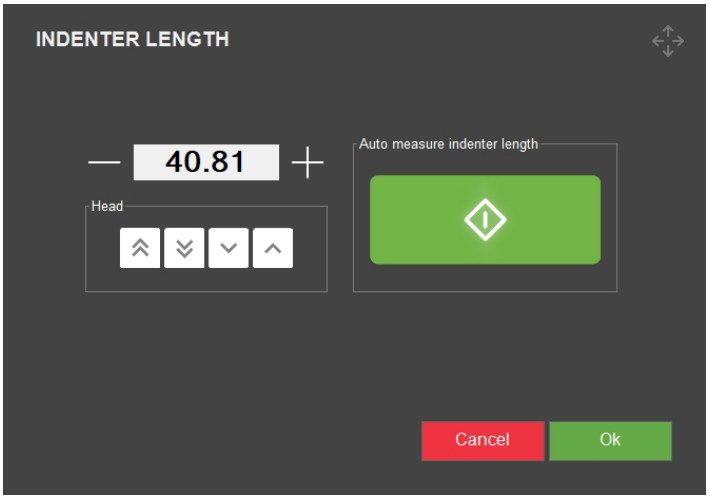


4. Select the new indenter type in the **Indenter selection** menu that pops up.



5. Select **OK**.

6. In the **Indenter length** dialog, select **OK**.

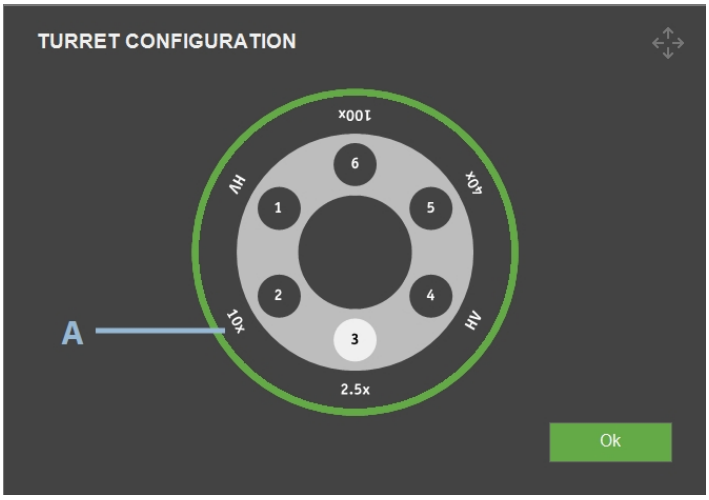


7. Select **OK** in the **Turret configuration** dialog.
8. Select the **Start** button and wait until the procedure is finished.

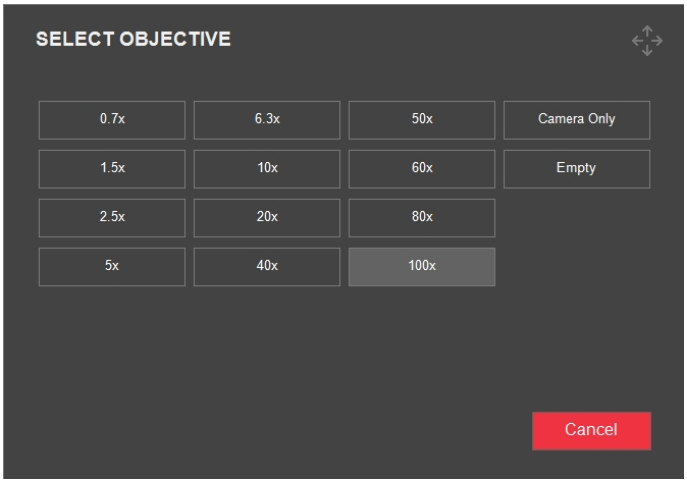
Note
The machine will perform an indent as part of the length measurement process.

Change an objective

1. Select the objective you wish to change to, for instance (A).



2. Select the objective again in the pop-up dialog **Select objective**.



3. The turret positions the selected objective to the front position.

Note
To replace the objective, see the machine manual.

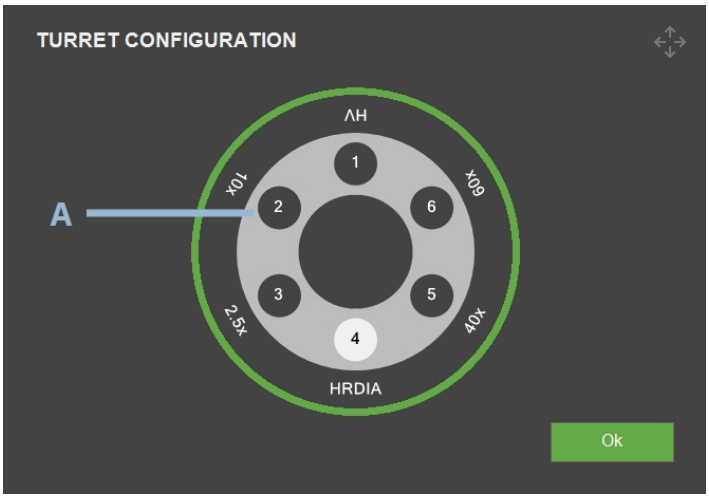
6.2 After mounting an indenter

Note
For detailed instructions on how to mount an indenter, see the Instruction Manual for the specific machine.

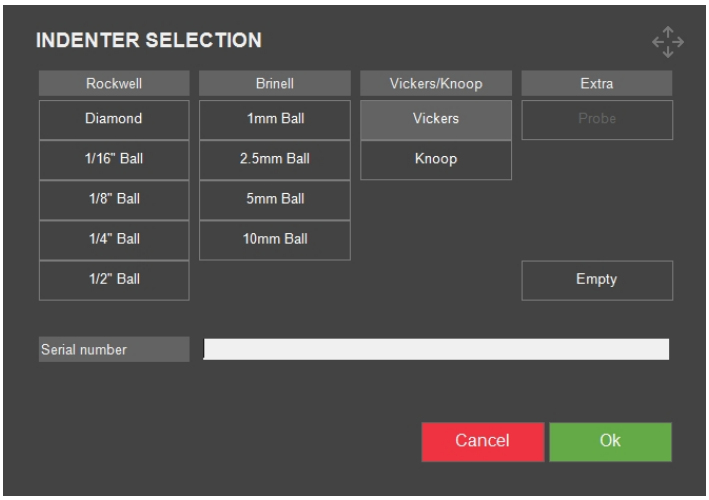
When you have mounted the indenter, follow these steps:

Check the indenter length

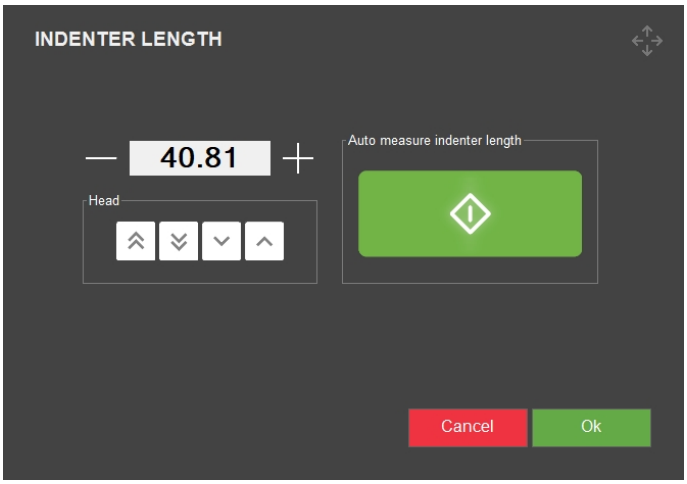
1. Start the software.
2. Focus on a smooth test specimen using the highest magnification available.
3. Select **Tester** > **Turret configuration**.



4. Select the desired indenter position, for instance (A).



5. Select the new indenter type in the **Indenter selection** menu.
6. Select **OK**.



7. In the **Indenter length** dialog, select **OK**.
8. Select **OK** in the **Turret configuration** dialog.
9. Select the **Start** button, and wait until the procedure is finished.

6.3 Test head retraction or Spindle retraction

CAUTION
A wrong retraction setting may damage your part or the machine.

Note
Dependent on which machine you have, it is equipped with either a motorized **test head** or a **spindle**.

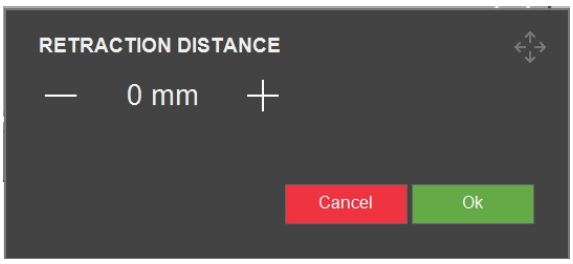
The retraction distance is the distance the head moves up or the spindle moves down to a position where the turret can rotate freely.

This feature is for measuring nonparallel parts, irregular shaped parts or holes.

- Set the retraction distance of the head or spindle when you change a turret position.

For machines with a fixed turret, the stage moves this distance down before the turret rotates.

1. From the **Top menu bar**, select **Tester** > **Test head retraction** or **Spindle retraction** dependent on the machine you have.
2. Set the retraction distance, and press **OK**.

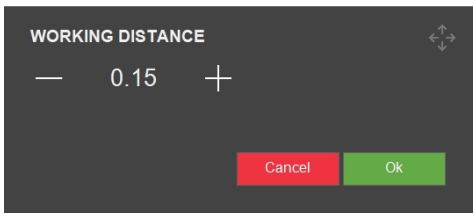


3. Remove any specimen from the tester and try the newly set retraction distance. Adjust if necessary.

6.4 Working distance

This parameter is used for testing on non-parallel or irregular shaped objects - to set the working distance of the spindle between indentations.

1. **Top menu bar** > **Tester** > **Working distance**.
2. Set the distance, and select **OK**.

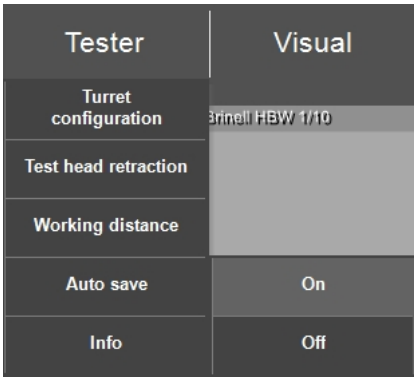


When you subsequently select **Start**, the indenter moves down in high speed at first, then in low speed. The working distance is the distance the indenter travels in low speed.

In normal operation, the indenter never touches the object on high speed. If it does, you will see the message "**Object detected**". Then you must increase the working distance.

Note
When you increase the working distance, you increase your test time.
For safety reasons, the minimum distance is set to 0.10 mm.

6.5 Auto save

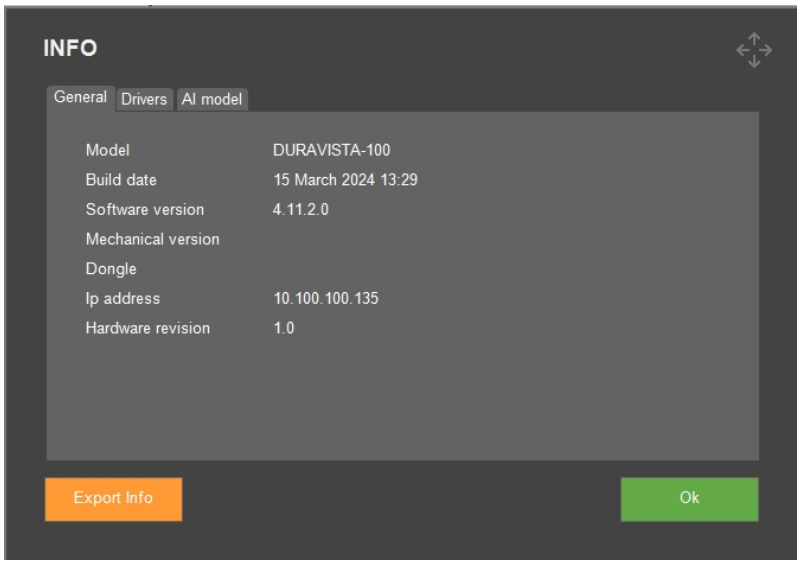


1. To enable **Auto save**, select **On**.
2. Now measurements in a batch are saved immediately after completion of a test.

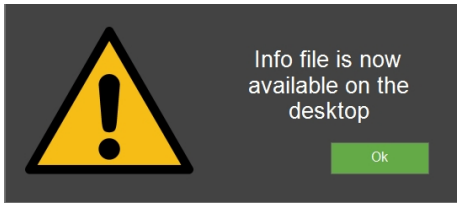
We recommend that you enable **Auto save** during Rockwell testing.

6.6 Info

Via **Top menu bar** > **Tester** > **Info**, you find information about the machine's hard- and software.



- To export the info file to the desktop on the hardness tester, select **Export info**.



This is relevant if you with to order extra software, see Add software modules ► 14.

7 Visual

Do all camera view settings in the **Top menu bar** > **Visual**.



7.1 Contrast

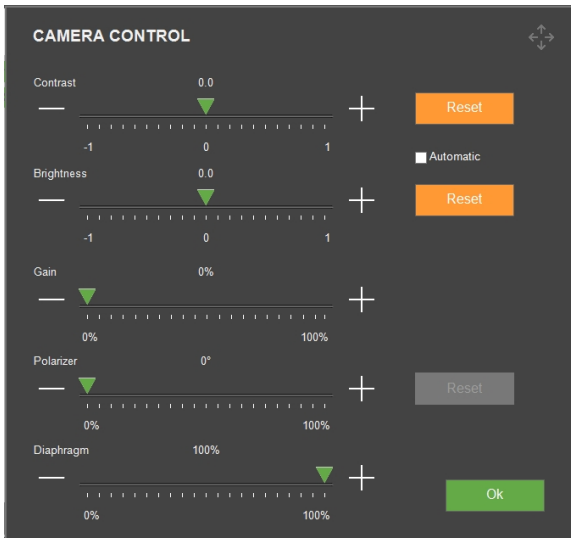
Here you set the contrast level of your camera.

- When the workpiece is in focus, select your camera, **Objective** or **Overview camera**, on the overview button:



When the Objective camera is live

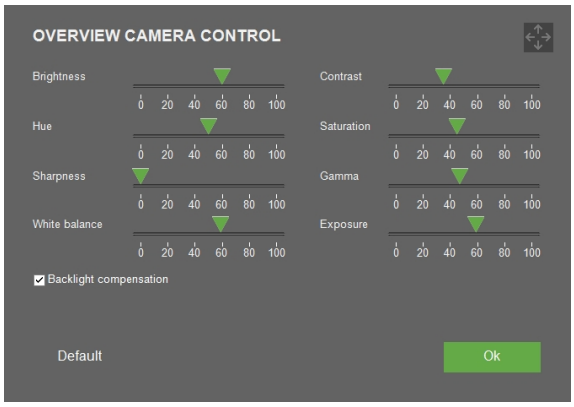
- With the sliders, you can change the contrast and brightness of the **Objective camera**. You see all changes in the live image.



- Check **Automatic** if you want the system to determine the best settings.

When the overview camera is live

- With the sliders, you can change the visual settings for the **Overview camera**. You see all changes in the live image.



- Select **Default** if you wish to set all parameters back to the default settings.

For light setttings, see Light ► 93.

7.2 Autofocus

With this feature, the camera image finds the optimal focus.

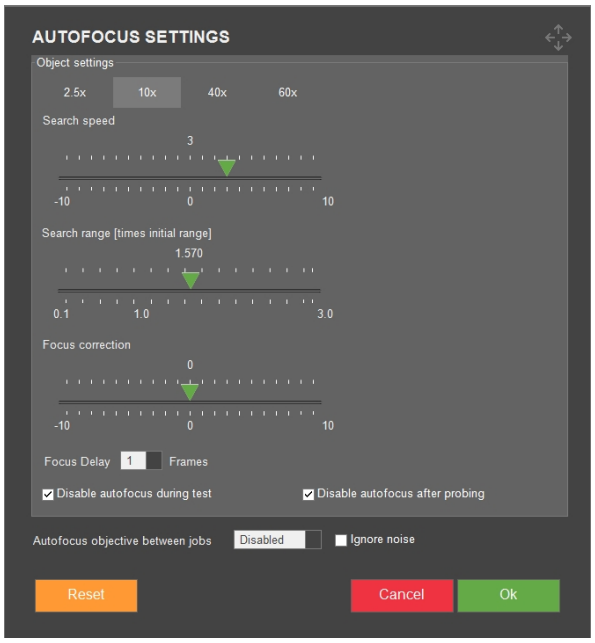
Note
The optical auto focus only works when you are close to the focus plane.

Each objective has its own auto focus settings. Select the correct objective to be modified. The active objective is always selected.

Touch focus

Machines with a descending turret can perform touch focus. This function uses the 10x objective or a probe to touch the surface, and automatically calculates the focus distance. Touch focus is automatically followed by optical auto focus.

Autofocus settings

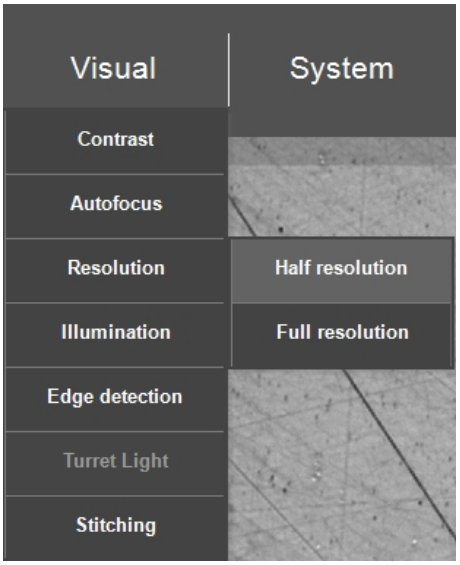


Parameters	Description
Object settings	Select the objective.
Search speed	Define the size of the step the **Z** axis moves to find focus. Lower values increase accuracy but increase time to find focus.
Search range	Limit the focus search range of the **Z** axis. An increased value does not increase the autofocus time. If the best focus is found before the end of the range, the search stops. Increase the search range if initial scans frequently fail to find an optimal focus, indicating that the optimum might lie outside the current range. Decrease the search range if the results are often inaccurate or if you are working with combinations that are known to require precise focusing within a smaller **Z** range.
Focus correction	Use this setting if there is a static offset between the actual focus and the focus defined by the **Autofocus** function. It is not recommendable to set this parameter. If you need to make a focus correction, decrease the search range instead.

Parameters	Description
Focus Delay	Increase to compensate for small vibrations. Increasing will slow the autofocus down.
Disable autofocus during test	Only recommended for single indents and low magnification objectives.
Disable autofocus after probing	Only recommended for low magnifications where the probe or touch focus gives a good enough result. 'Disable' reduces the focus time but might lower the focus quality.
Autofocus objective between jobs	Select the objective to be used for an initial autofocus between each job that is executed.
Ignore noise	Compensate for random variation of brightness or color information in the camera image. Only recommended for very dark samples where the camera's brightness levels are forced to maximum levels.
Reset	Return to default settings.

7.3 Resolution

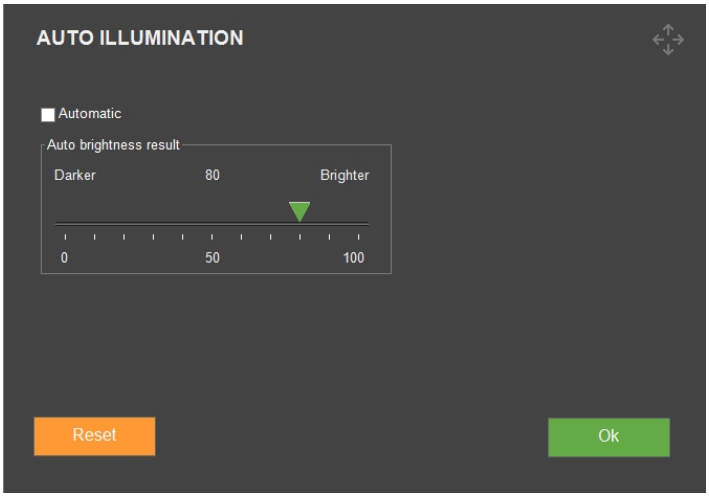
- Select the resolution.



Parameters	Description
Half resolution	Standard mode
Full resolution	Slow mode

7.4 Illumination

1. Make sure **Autofocus** is set before you proceed (see Autofocus ► 33).
2. Then select **Visual** > **Illumination**.



3. Do manual settings or set the light level/brightness to **Automatic**.

> **Note**
> If you select **Automatic**, this can affect the value of the hardness reading. A better alternative is to have good homogenous finish of the test surface and adjust the light manually with the buttons on the **Control panel**.

7.5 Edge detection

The effectiveness of **Edge detection** is determined by several factors. Most relevant are lighting and good surface finish.

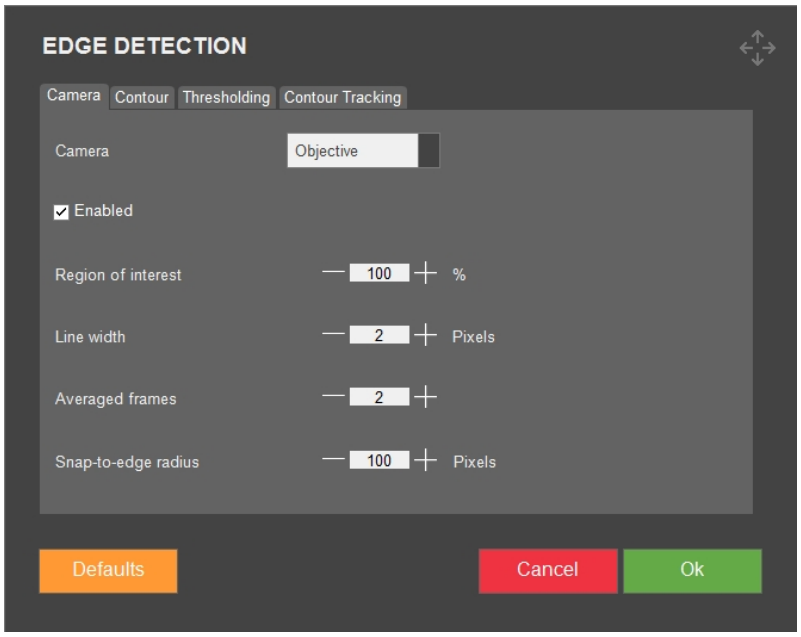
The detection method is based on a robust global thresholding algorithm. This algorithm works best if the specimen is light gray against a black background. The 2.5x or the 5x objectives are the best for edge detection/scanning.

> **Note**
> Changing the edge detecting parameters is only recommended for users who are familiar with computer vision parameters.

> **Note**
> You can always return to factory settings by pressing the **Defaults** button.

The 'Camera' tab

- Configure the camera settings for edge detection.

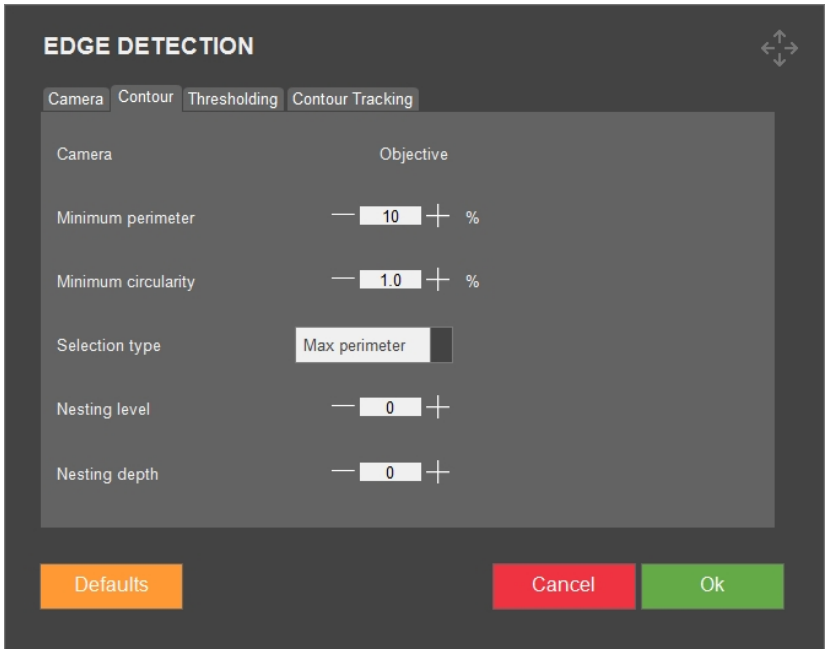


Setting	Description
Camera	Select camera, either **Objective** or **Overview** in the dropdown. The settings in the other tabs apply the camera you select here.
Enabled	Enable or disable edge detection for the selected camera. The **Overview** camera is disabled by default
Region of interest	Decrease the value to limit edge detection to the inner part of the image (which is less deformed).
Line width	The width of the detected edge.
Averaged frames	Average subsequent camera frames to reduce noise.
Snap-to-edge radius	An anchor on the screen shows the snap location.
Defaults	Restore the factory values of the settings in this tab.
Cancel	Select this button to abort.
OK	Select this button to accept.

The 'Contour' tab

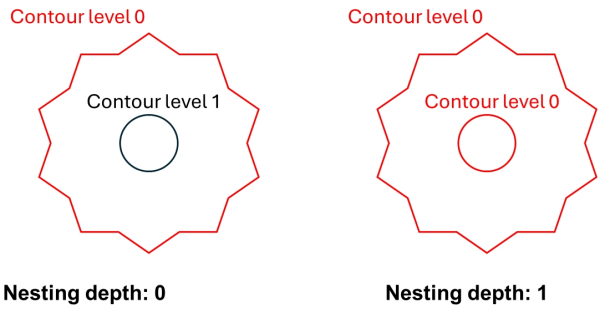
- Configure the contour selection for edge detection.

A contour is defined as a closed boundary. An image can contain more than one contour, and the image boundary can be part of the contour (i.e. black stains on the specimen are in general regarded as a contour). Therefore, it is essential to ignore irrelevant contours in the image.



Setting	Description
Camera	You already did this setting in the tab **'Camera'**.
Minimum perimeter	A selection criteria for the size. Expressed as a percentage of the image circumference.
Minimum circularity	A selection criteria for the shape. Expressed as percentage of a perfectly round circle (100%).
Selection type	In the dropdown, choose a selection type. **None**: Selects all contours fulfilling the minimum criteria. **Max perimeter**: Default setting. Selects the contour having maximum perimeter. **Max Area**: Selects the contour the with largest area. **Minimum Distance**: For service only (not for testing).
Nesting level	Contours can be enclosed by other contours. Enclosed contours have a higher level. An external contour has level 0 (= default).
Nesting depth	A **Nesting depth** equal to 0 (= default) selects contours having the same level.

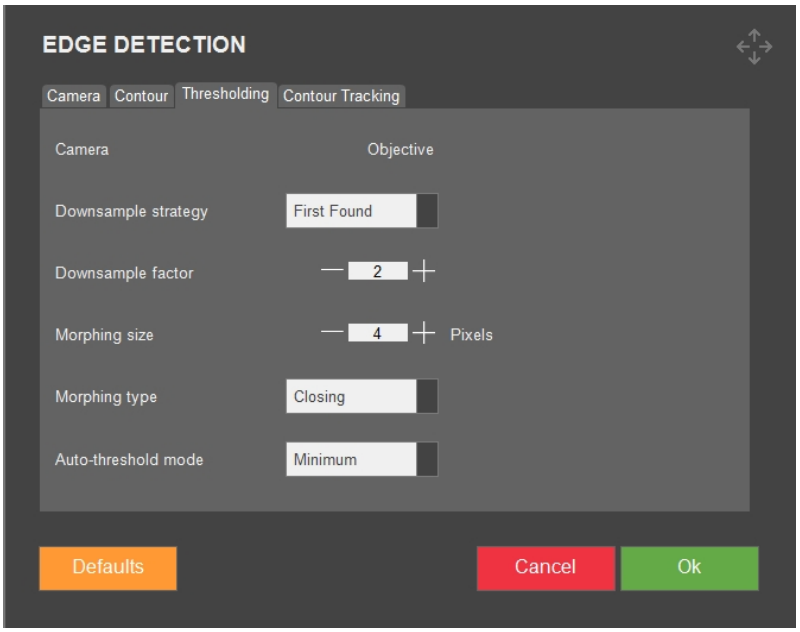
Summarized, all contours are selected that satisfy: **Nesting level** < **Nesting level** + **Nesting depth**.



The 'Thresholding' tab

- Set up the edge detection algorithm, and adjust the light source according to the global thresholding.

This is based on global thresholding which assumes that the specimen is light gray against a dark background or vice versa.

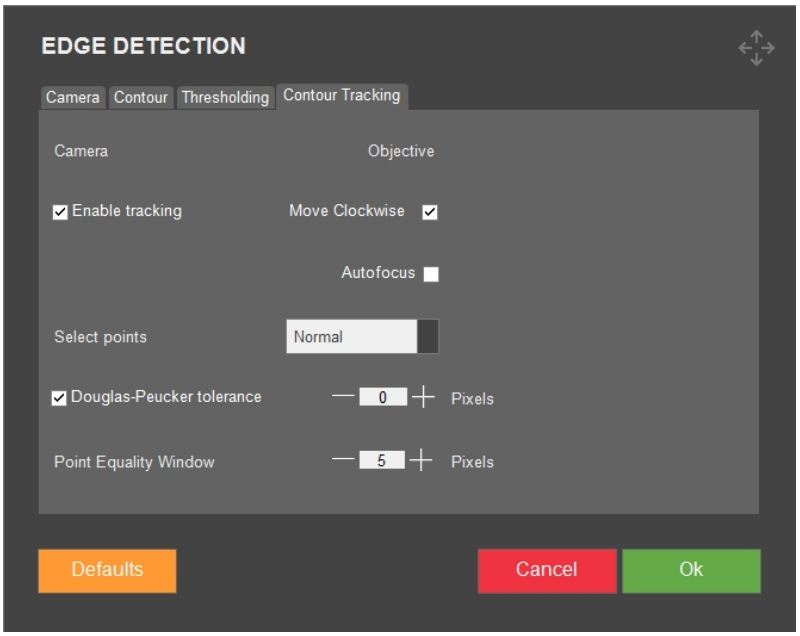


Note
Even if the lighting is optimal, an uneven surface finish of the specimen can cause problems.

Setting	Description
Camera	You already did this setting in the tab **'Camera'**.
Downsample strategy	Choose the right **Downsample strategy** to compensate for a bad surface finish. **None**: The specified **Downsample factor** is applied to the image. This is the fastest method, but it can fail. **First Found**: Downsampling is continued until a contour has been found that satisfies the criteria. **Matching Shape**: Like **First Found** but does one more downsampling and demands that thecontour looks like the previous one.
Downsample factor	Sets the level of the selected down-sample strategy. Increasing can improve performance, but will slow down the system.
Morphing size	The surface finish may be so bad that additional morphing of the downsampled image is necessary. A large **Morphing size** deforms the edge. This is not desired in **Snap-to-edge mode**.
Morphing type	Adjust the **Morphing size** to get good results. **Closing**: Closes dark scratches on a light specimen. **Opening**: Opens dark scratches on a dark specimen.
Auto-threshold mode	If the lighting is set so that the image has a bimodal histogram,set the **Auto-threshold mode** **Minimum**: Default for the **Objective camera**. **Bimodal**: Force the algorithm into bimodal mode to identify 2 distinct peaks in the histogram, allowing the separation of foreground and background elements. This can enhance object detection and segmentation. **Iso Data**: Recommended setting for the **Overview camera**. **Otsu**: Recommended setting for the **Overview camera**.

The 'Contour tracking' tab

- Set up how to track contours of the specimens.



Setting	Description
Camera	You already did this setting in the tab **'Camera'**.
Enable tracking	Activate contour tracking.
Move clockwise	Activate contour tracking in either clockwise or counte-clockwise mode.
Autofocus	Disable **Autofocus** if surface elevation of the specimen contour is within focus depth of the **Objective camera**. Do not use autofocus for the **Overview camera**, as this is very time consuming.
Select points	**Normal**: If **Douglas-Peucker tolerance** is disabled and **Select points** is set to **Normal**, all pixels are converted to points of the contour. The number of contour points can be huge if the **Douglas-Peucker tolerance** is disabled. **Exit points**: Mode **Exit points** stores only the last pixel of each part.
Douglas-Peucker tolerance	The Douglas Peucker algorithm straightens contours by checking the distance of a pixel to the line connecting the neighbor pixels. Pixels with a distance less than or equal to the tolerance are removed.
Point Equality Window	Increase the **Point Equality Window** if tracking fails to stop at the start location.

Contour-tracking procedure

1. Make sure the XY stage is positioned at the area where the contour to be scanned is located.
2. The spindle/head is adjusted if **Autofocus** is enabled.
3. A snapshot is taken at this location and scanned for an edge.
4. The result is stored as part of the contour, and the XY stage moves to the location where this part of the contour ends.
5. Tracking stops when the last scan is close enough to the very first scanned edge. At the end of tracking, all parts of the contour are assembled and all temporary snapshots are removed.

7.6 Turret light

- Switch the extra Rockwell light on and off, if the machine has one.

7.7 Stitching

Some machines have the image stitching function which enables you to combine several images to create a larger view of the specimen.



Note
This module is a licensed option.

Image stitching using the Overview camera

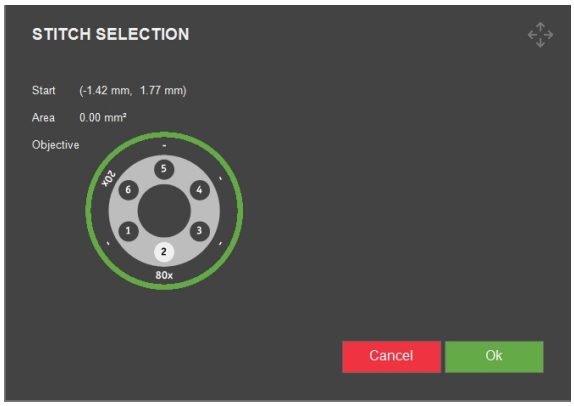
1. To create an image of the full motorized stage, select **Yes** in the dialog box that appears when you select **Overview**.



2. The machine then uses the **Overview camera** to create the image.
3. To see the latest stitched overview image, select **Last Overview Stitch**.

Image stitching using the Objective camera

1. To create an image of part of the specimen, select **Stitch selection**.



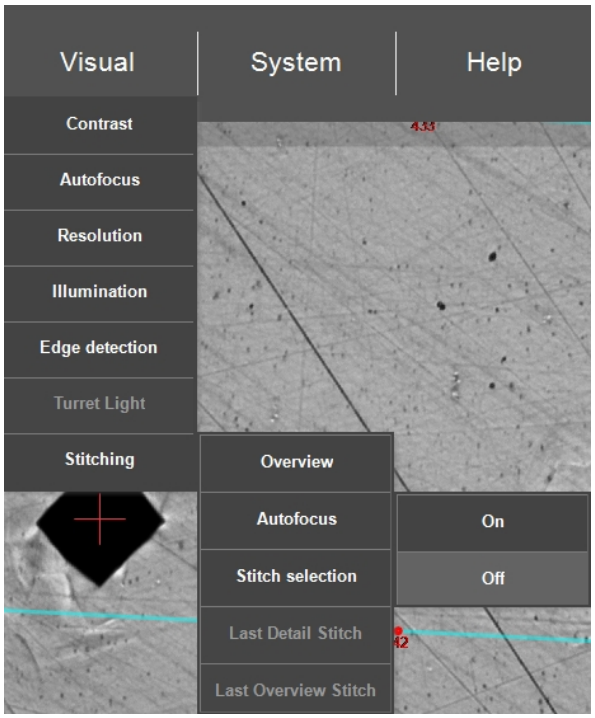
2. The machine uses the **Objective camera** to create the image.
3. Select the objective you wish to use.
4. To select the desired range to be stitched, click and drag on the objective view.
5. To start stitching the desired area of the specimen, select **OK**.
6. To see the latest stitched image, select **Last Detail Stitch**.

Note
Only the latest stitched image is saved. Snapshot the stitches if you wish to save it or include it in a report. See Snapshot button ► 88

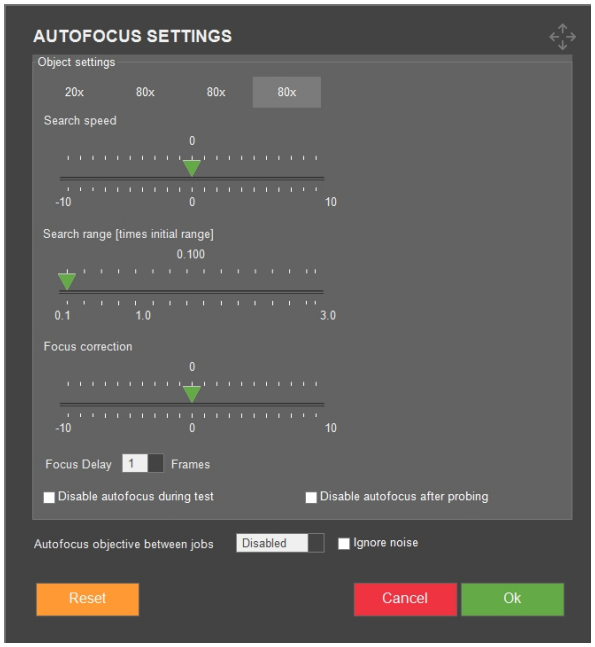
Autofocus – stitching

If the surface of the specimen is not plane enough, the stitch function can lose focus.

- Enable the **Autofocus** function (**On**) to trigger the autofocus for each image capture and ensure a sharp composite image.

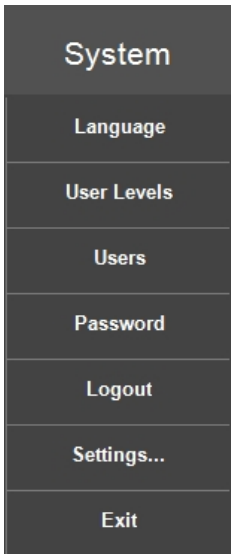


Note
The process time is remarkably increased when the autofocus for the stitch function is enabled.



See also Autofocus ► 33.

8 System

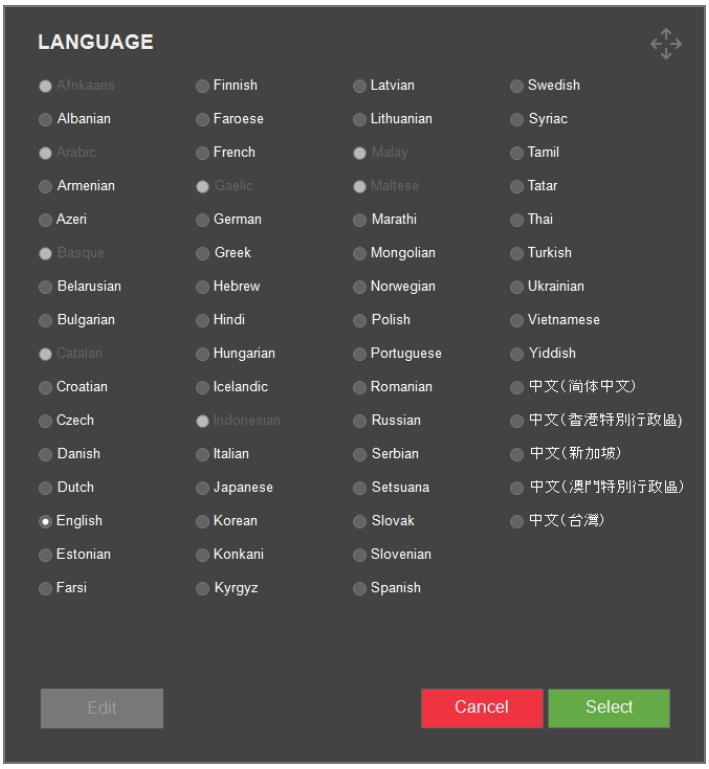


- To configure the software, go to the **Top menu bar** > **System**.

8.1 Language

Change to a different language setting

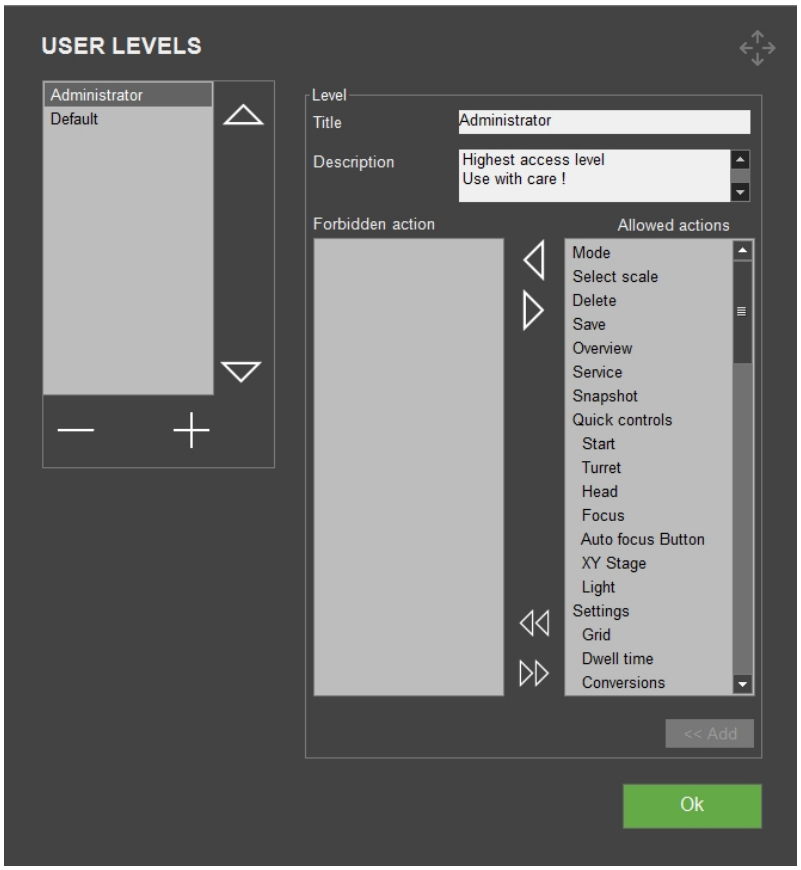
1. To select the language you wish to use in the software, go to the **Top menu bar** > **System** > **Language**.



2. Note that only the following languages are available as default:
   - **English**
   - **French**
   - **German**
   - **Spanish**
   - **Chinese**
   - **Japanese**
3. Click **Select** to close the dialog box.
4. Restart the system.

Hint
The on-screen keyboard changes according to the selected language.

8.2 User levels



- To manage the user levels, go to the **Top menu bar** > **System** > **User levels**.

Certain user actions are grouped under a parent user action. For example, **Grid** and **Dwell time** are grouped under **Settings**.

If a parent action is disabled, all under-laying actions are disabled too.

If an under-laying action of a parent action is enabled, its parent action is also enabled, since this is mandatory to access the under-laying action.

Create user levels

1. Select the **+** button, and the keyboard opens.
2. Enter the name of the user level in **Title**.
3. Select allowed actions and forbidden actions:
   - Select the single arrows to move single actions as needed to and from the **Forbidden actions** and **Allowed actions** columns.
   - Select the double arrows to move all actions to the other column.
4. Add the new user to the list: Select **Add**.
5. Select **OK** to save your changes and exit the dialog.

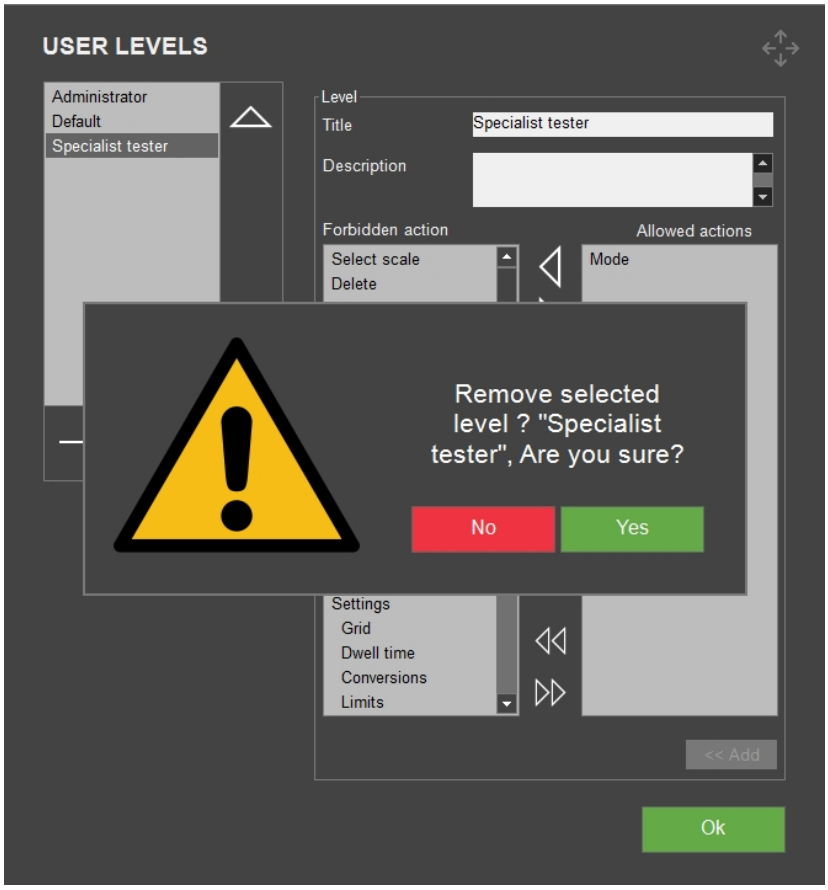
Edit user levels

1. Select the user level you wish to edit.
2. Select **Forbidden actions** and **Allowed actions**:
   - Select the single arrows to move single actions as needed to and from the and columns.
   - Select the double arrows to move all actions to the other column.
3. Select **OK** to save your changes and exit the dialog.

Delete user levels

Hint
You can only delete unused user levels.

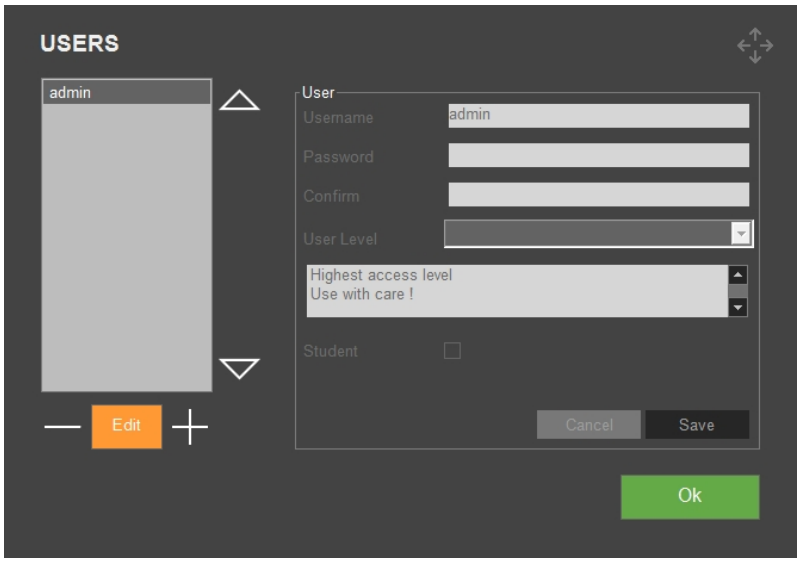
1. Select the user level you wish to delete.
2. Select the **–** button.
3. Select **Yes** to delete the selected user level.



4. Select **OK** to save your changes and exit the dialog.

8.3 Users

- To manage users in the system, go to the **Top menu bar** > **System** > **Users**.



Create users

1. Select the **+** button.
2. Enter the user name and password for the new user.
3. Select the user level from the drop-down menu.
4. Select **Save** to add the new user to the list.
5. Select **OK** to exit the dialog.

Edit users

1. Choose the user you wish to edit, e.g. user level, and select **Edit**.
2. Select **Save** when you have edited the user information.
3. Select **OK** to exit the dialog.

Delete users

Note
You cannot delete the **Admin** user.

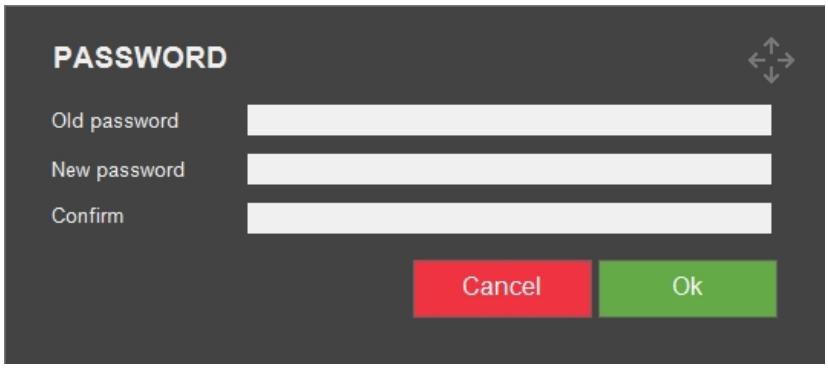
1. Select the user you wish to delete.
2. Select the **–** button.

3. Select **Yes** in the pop-up to delete the selected user.



4. Select **OK** to save changes and exit the dialog.

8.4 Password



1. To create or change your password as an active user, go to the **Top menu bar** > **System** > **Password**.
2. Type in your **Old password**.
3. Type in your **New password** and repeat in **Confirm**.

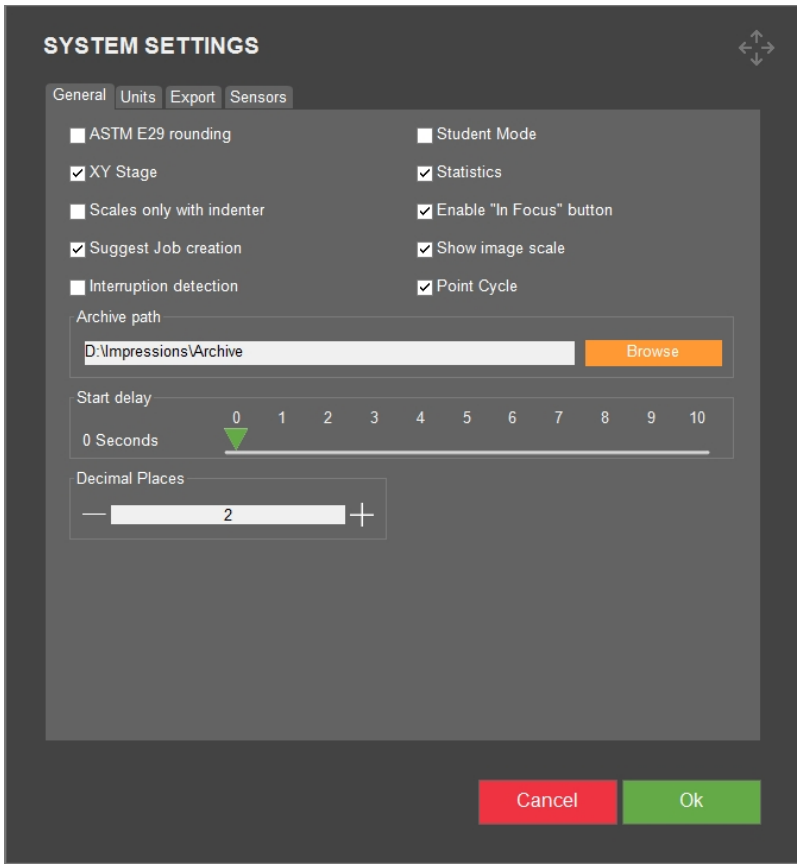
8.5 Logout

1. To log out, go to the **Top menu bar** > **System** > **Logout**.
2. You are logged out, and the login window will appear.

8.6 Settings – system settings

- To customize the settings, go to the **Top menu bar** > **System** > **Settings**.

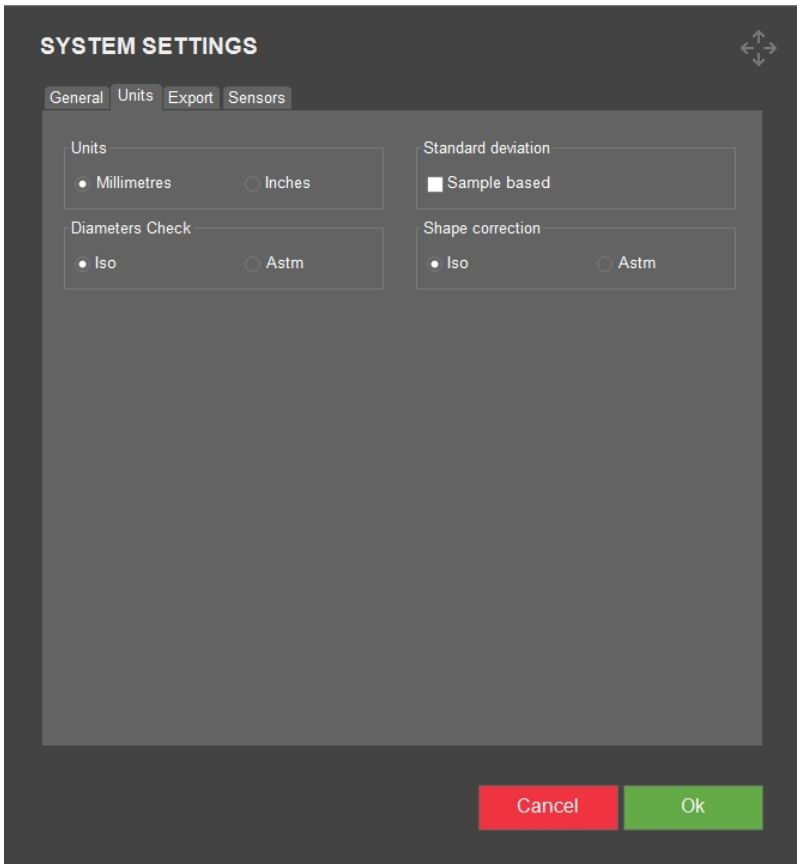
8.6.1 General



Setting	Description
ASTM E29 rounding	The hardness values are rounded based on the method described in ASTM E29. By default, the hardness value is presented with 2 decimal places. Checked = 1 decimal place.
XY stage	Enable this item if the machine is equipped with a motorized XY stage. Checked = The XY stage is motorized/activated.
Scales only with indenter	If an indenter is not installed in the system, the scale is not selectable in the scale selection. Checked = the scale is not selectable if the indenter is not present.
Suggest Job creation	When enabled, you are prompted to clear your measurements as soon as the data is saved into an archive. If disabled, you need to clear the data for a new job manually.
Interruption detection	When enabled, the machine detects sudden decreases of the test load, as can occur during testing of brittle specimens. In the event of a breaking specimen, the tester will stop the test cycle and discontinue applying the selected test load.

Setting	Description
Student mode	This mode is for educational purposes. Only the length of the diagonals are visible. No hardness results are shown, and you must calculate the hardness value yourself.
Statistics	Turns on the statistics line in the live view of the camera. This doesn't affect the statistic's calculation in the report.
Enable "in focus" button	This gives you the possibility to determine the focus (Z = 0) by hand without using the auto focus which can take more time than manual focusing.
Show image scale	Add an image scale in the live view of the **Objective camera**.
Point cycle	Enable the use of the keyboard arrow keys to quickly jump from one point to another in a pattern.
Archive path	Define the path where you wish to save archived files.
Start delay	Define how many seconds the start must be delayed before testing starts. The value you choose, is the number of seconds you must press and hold the start button to start the test. X seconds = Press and hold the start button for at least X seconds to start the test. This feature is convenient if the start button is pressed accidentally but it is mainly intended for when you work with a footswitch.
Decimal places	By default, the hardness tester is set to 2 decimal places. Set the number here if you wish to change this. See also about **ASTM E29 rounding** above.

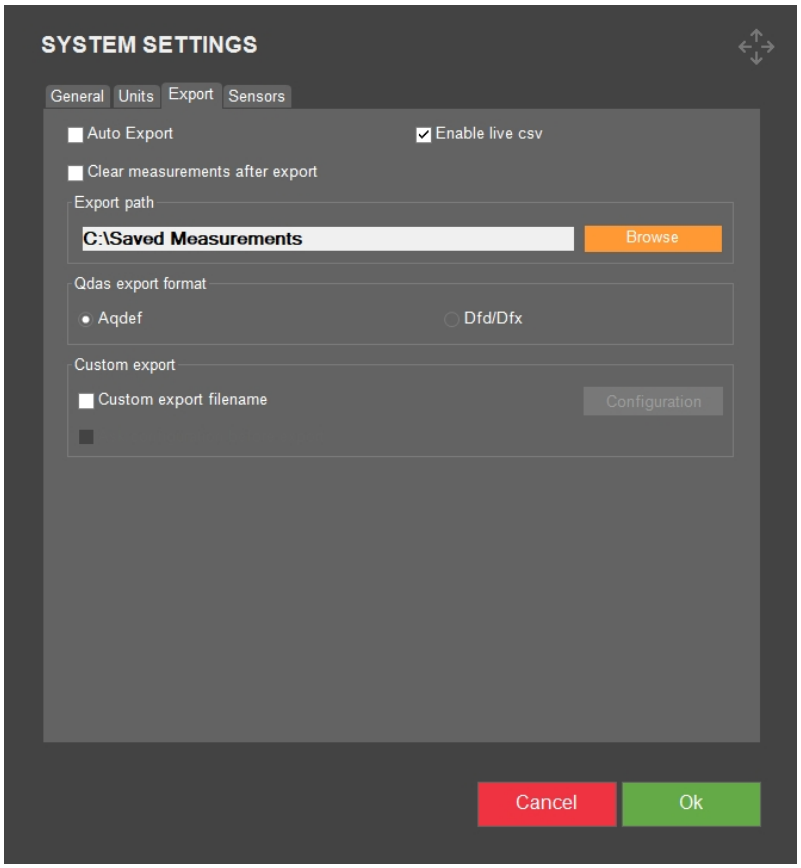
8.6.2 Units



Setting	Description
Units	Select the unit of measurement you wish to use. If you change from mm to inches, the diagonals of the indents are still in mm.
Diameter check)	Diameters are checked according to ISO or ASTM standards. The diameter check for Vickers is not the same for ISO and ASTM. **ISO diagonal check:** The difference between the lengths of the diagonals should not be greater than 5 %. If it is, you must state this in the test report. **ASTM diagonal check for a Vickers indentation:** If one half of either diagonal is more than 5 % longer than the other half of that diagonal, or if the 4 corners of the indentation are not in sharp focus, the test surface may not be perpendicular to the indenter axis.

Setting	Description
Standard deviation	You can select 2 different methods of calculating the standard deviation, specimen based (**Sample based**) or non-specimen based. **Non-specimen based (Sample based is not selected):** A measurement of the spread between numbers in a data set. The variance measures how far each number in the set is from the mean. Variance is the differences between each number in the set and the mean, squaring the differences (to make them positive) and dividing the sum of the squares by the number of values in the set. **Specimen based (Sample based is selected):** Identical to **Sample based** not selected but dividing the sum of the squares by the number of values in the set minus 1.
Shape correction	Choose which **Shape correction** to use, ISO or ASTM.

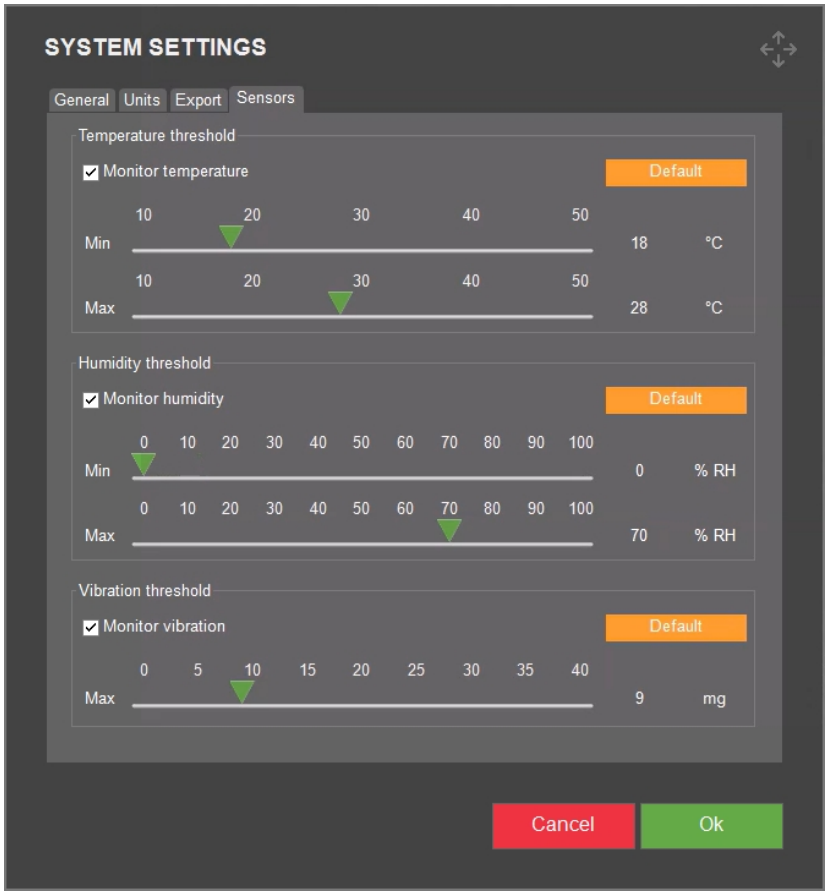
8.6.3 Export



Setting	Description
Auto export	Export the results automatically to the export path when the test is completed.
Enable live CSV	Export measurements to the file LiveExport as soon as the individual measurement is completed. The file is located in the specified export path.
Clear measurements after export	The measurements are automatically cleared after export.
Export path	Define the path where you wish to save exported data. This can also be a network location.
QDas export format	Select the format you wish to use, either **Aqdef** or **Dfd/Dfx**.
Custom export filename	Enable the selection of a custom file name when test results are exported.

8.6.4 Sensors

> **Note**
> The settings that are available in this tab depend on the machine, model and the software modules installed.



Setting	Description
Temperature threshold	Sets the specific temperature points, minimum and maximum, that triggers the temperature alarm.
Humidity threshold	Sets the specific humidity points, minimum and maximum, that triggers the humidity alarm.
Vibration threshold	Sets the specific vibration level that triggers the vibration alarm.

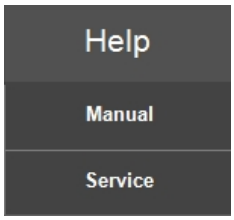
8.7 Exit

- To exit the software and return to Windows, go to the **Top menu bar** > **System** > **Exit**.

WARNING
Do not turn off the machine after exiting the software. Follow normal procedure to shut down Windows.

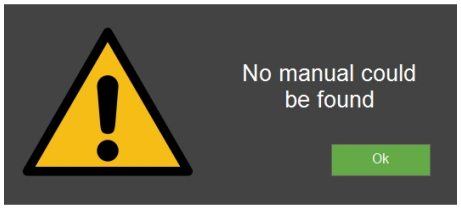
See more in the section Start and exit the software ► 16.

9 Help



Manual

- To open the Instruction Manual, go to the **Top menu bar** >**Help** > **Manual**.



Service

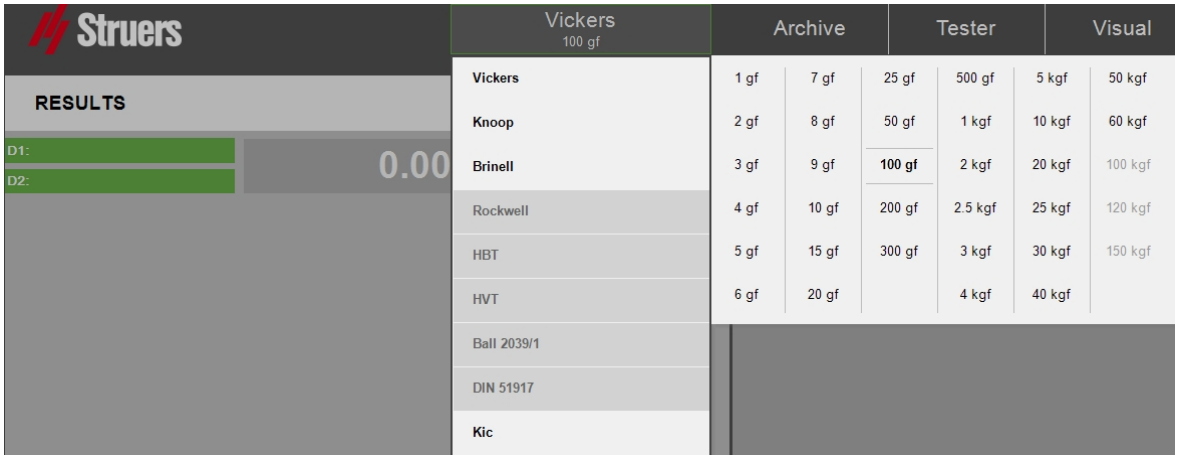
- For service only: To open the service menu, select **Service** and log in with your password.



10 Test method area

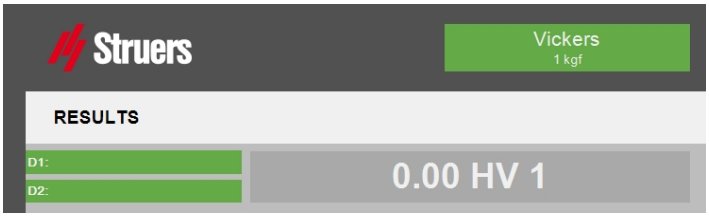
10.1 Test method and scale selection

1. In the **Test method area**, select the **Test method** field. The method list is shown.



Note
The available methods depend on the machine, model, indenters and the software modules installed.

2. Select the method and scale you wish to use.
3. You now see your choices in the **Test method** field.

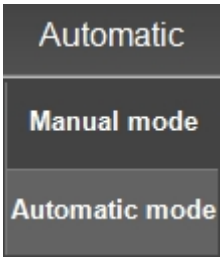


Note
When you change the hardness scale, we recommend that you review the test settings (see Settings – test settings ► 67).

On measurements with the KC scale (fracture thoughness), see Fracture toughness tests ► 132.

10.2 Automatic or manual measurements

- To shift from automatic to manual mode, go to the **Test method** > **Automatic**.



Note
Automatic or manual setting does not affect Rockwell testing.

Manual mode

When you have made an indentation, the diameter measurement of the indentation must be done manually.

1. Make a hardness indentation according to the entered requirements.
2. Position the turret with the correct objective for indentation viewing over the indentation.
3. Focus until the image is sharp.
4. Now select **Measure**.
5. After a short while, 4 cross-lines appear in the view.
6. Manually position the cross-lines on the edges of the indentation.
7. After processing the 4 cross-lines, the hardness value appears on the screen.

Automatic mode

When you have made an indentation, the diameter measurement of the indentation is done automatically.

1. Make a hardness indentation according to the entered requirements.
2. When the indentation is done, the turret positions to the objective for image viewing.
3. After a short while, 4 cross-lines appear in the captured objective view.
4. The cross-lines then automatically position on the edges of the indentation.
5. After processing, the hardness value appears on the screen.

10.3 Report

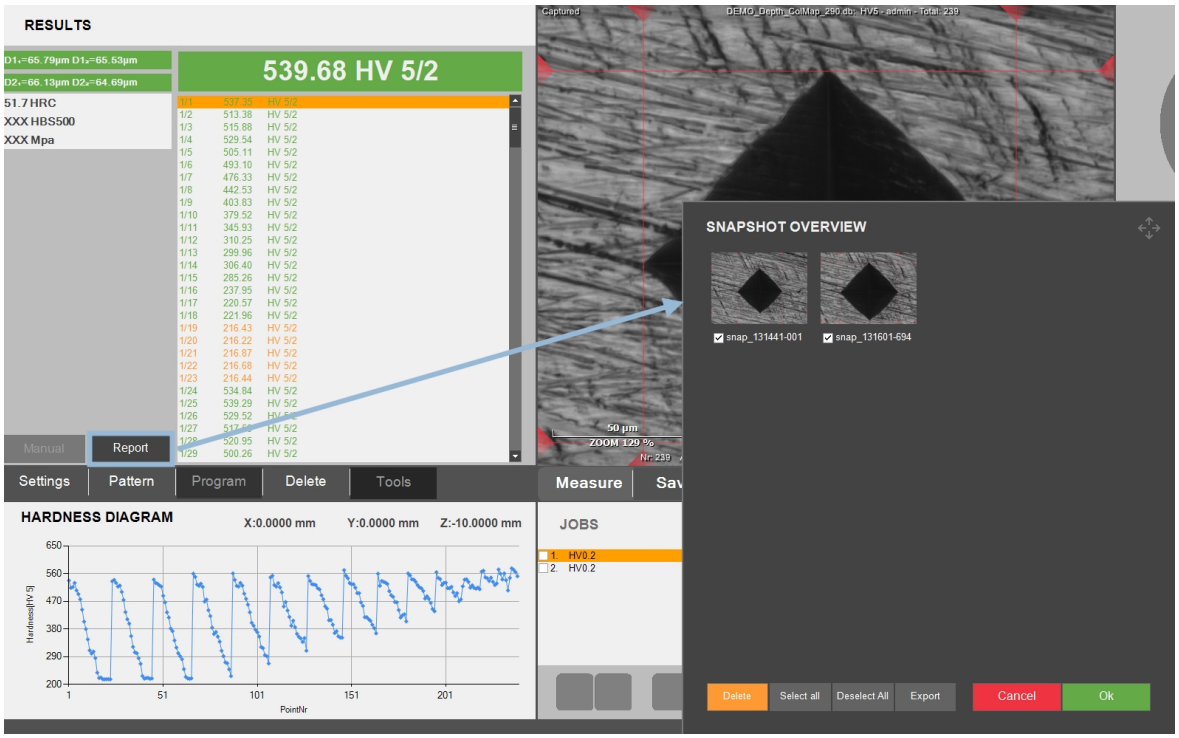
A report can contain statistics, diagrams, tester settings, measured values, snapshots, etc.

- Configure, print or export a report via the **Test method** area > **Report**.

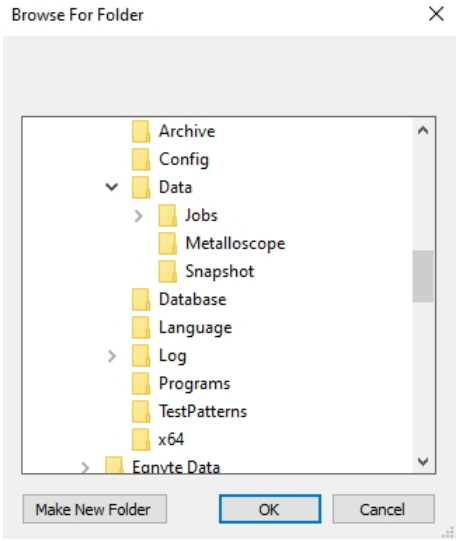


10.3.1 Snapshots

1. To manage your snapshots, select **Snapshot** in the menu.
2. Now you can select snapshots you want to include in the report, and delete unwanted snapshots.



3. You can also export the snapshots to a directory.

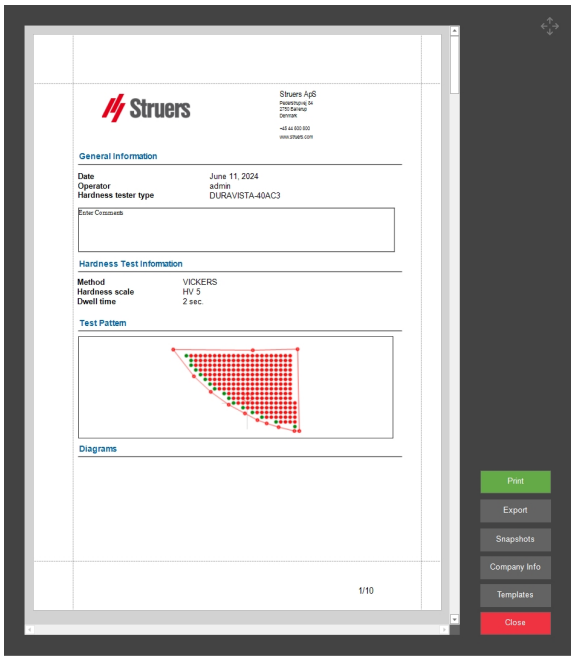


Note
There is a limitation of 12 snapshots per job.

See how to create a snapshot via the **Snapshot** icon in the **Camera controls toolbar**, Snapshot button ► 88.

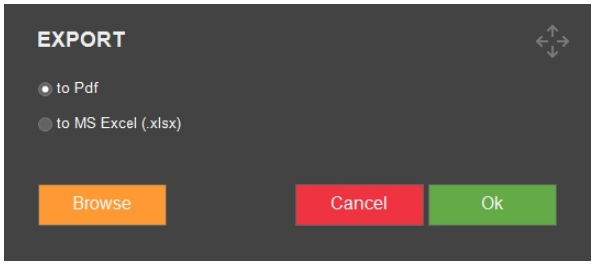
10.3.2 Print

1. To open a print preview of the report, select **Print**.

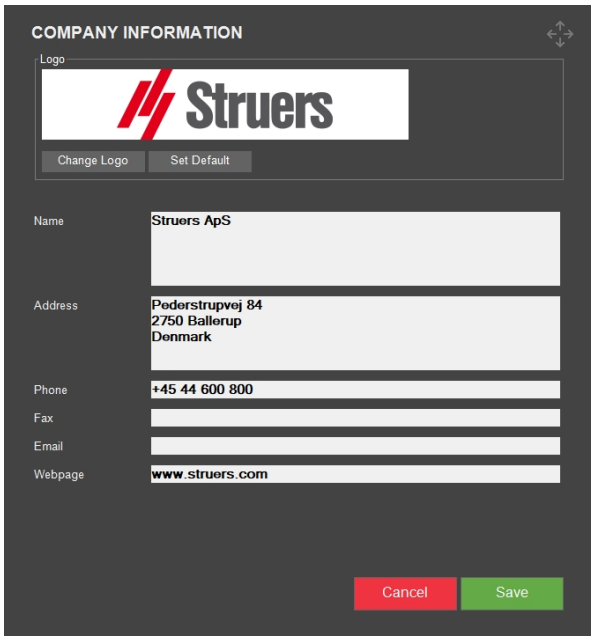


2. Select **Print** to send the print job to a printer.

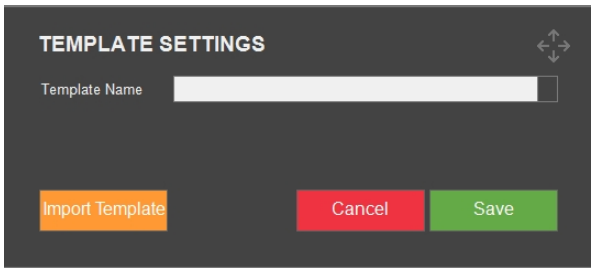
3. Select **Export** to generate the report in .PDF or .XLSX format.



4. Select and edit **Company Info**.

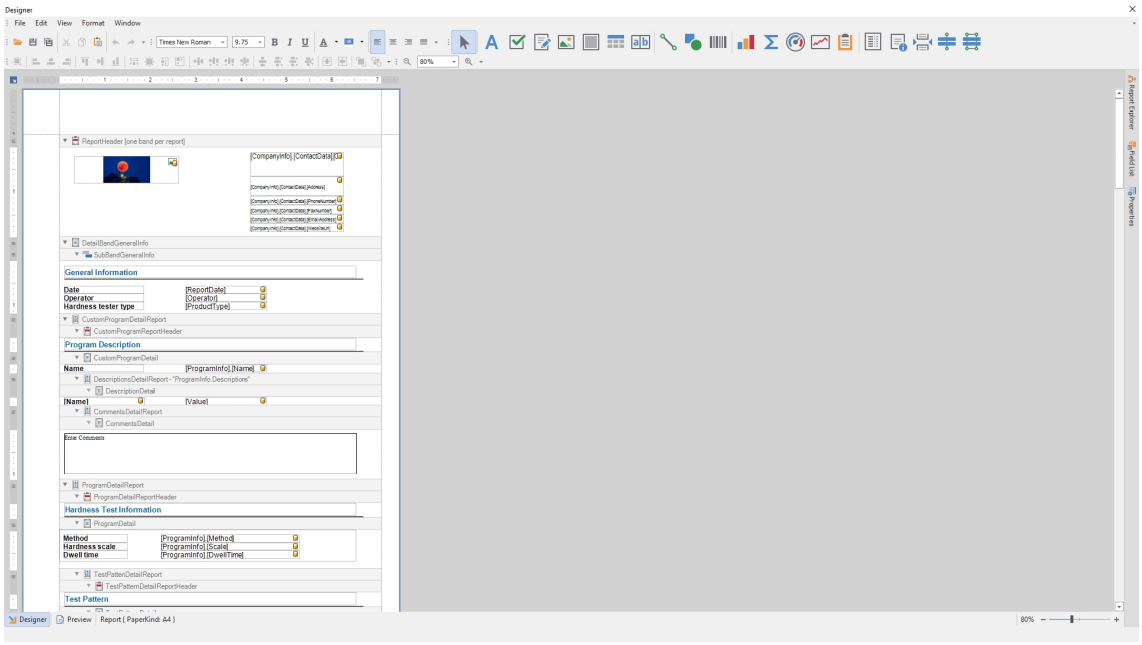


5. Select **Templates** to name and save your report as a template. Or you can import a template from a directory.



10.3.3 Template Editor

- To customize the report template, select **Template Editor**. The template then opens.



In the editor, you can modify layout, content etc. in the template.

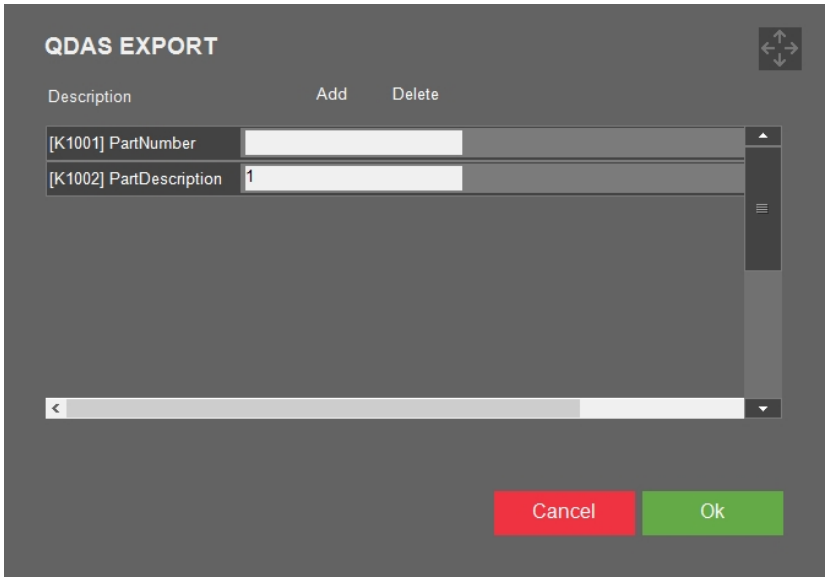
Hint
Struers can help you customize your reports. Contact your Struers representative for further information.

Hint
The two default templates [**Main**] and [**Basic**] cannot be deleted.

10.3.4 Export

Note
The available option depends on the machine, model and the software modules installed.

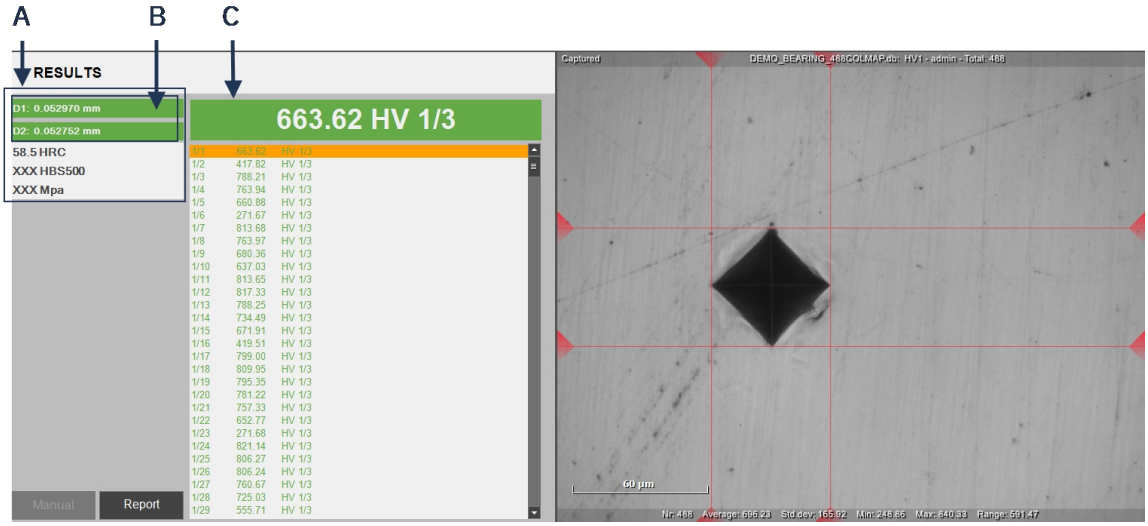
1. Select **Export** to export a report with the measurements in Q-DAS format. To change settings for the report, go to system settings for export: Export ► 55



2. Find your report in the location as defined in your system settings (see Export ► 55

10.4 Results

In the **Test method** area, you see results and measurements:



A	Recent results list =	Displays the results of the last measurement.
B	Diameter box =	Interchangeably shows the diameter values and the average diagonal.
C	Batch list =	Shows all other measurements. This tab enables viewing and modifying individual measurements.

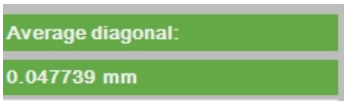
Values

Toggle between 3 views by clicking on the **Diameter box**:

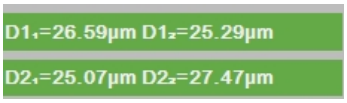
1. ISO view with D1 and D2 diagonal values in millimeters.



2. Average ISO view, showing the average D1 and D2 diagonal values in millimeters.



3. ASTM symmetry view, showing the diagonal lengths in microns from the center and guarding the ASTM symmetry requirements.



Examples of descriptions	Definitions
D1	Diameter 1 of indentation
D2	Diameter 2 of indentation
HV	Hardness value
Mpa	Converted value

Hint
To see the average diagonal, select D1 or D2.

Color codes



- **Green**: the result is within the set limits and the diagonal ratio complies with the standards.



- **Orange**: the diagonal ratio is outside the standards.



– **Red**: the result is outside the set limits.

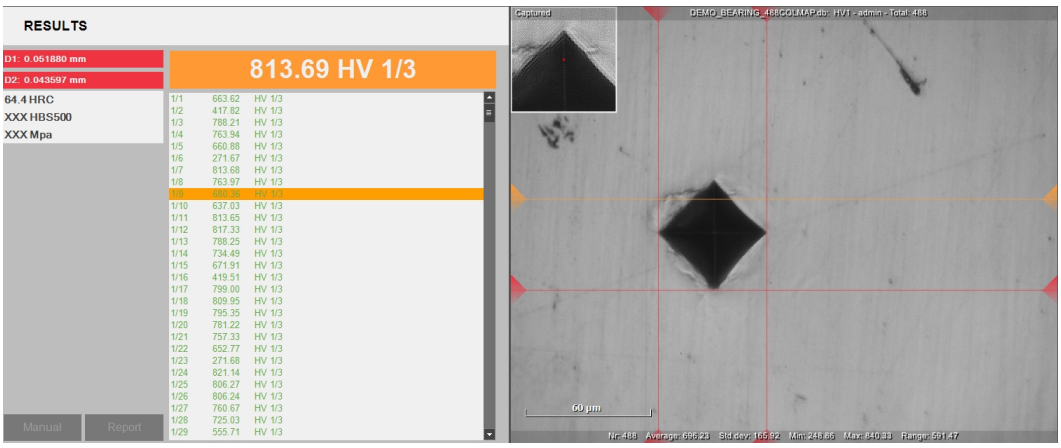
Viewing indents

– Click on a result from the batch list to see the captured measurement image.

– Double-click on a result from the batch list to get a live view of the indent.

Modify a measurement

1. Select a result from the **Batch list**.
2. Select a cross-line in the **Objective camera** view and move it to a new position. Whenever the length of a diagonal results in an incorrect ratio according to the used standard, the **Diameter box** turns red.



3. When the modification is done, select either **Save** or **Escape**.

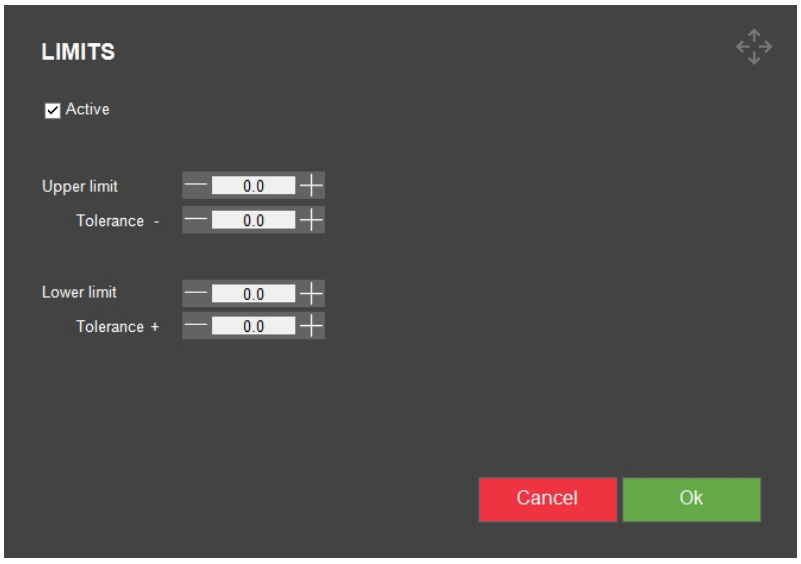
11 Settings – test settings

All specific test settings are configured in the **Test menu bar** > **Settings**. These settings can be stored in a **Job** (see Jobs ► 95) or in a **Program** (see Program ► 77).



11.1 Limits

1. Select **Settings** > **Limits**, and check **Active** to activate the limit settings.



2. Set the **Upper limit** and **Lower limit** settings.

   The last measured values and the values in the batch list turn red if the value is outside of these limits. See color codes in section Results ► 64.

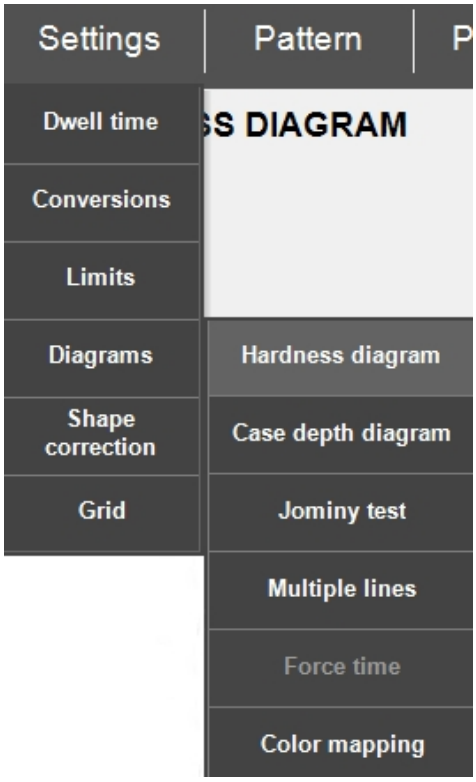
When the limits are set, an upper and lower limit bar appears in the diagram.

3. You can also set a tolerance to these limit settings.

The hardness value turns orange if the measured hardness is within this tolerance, indicating that the value is close to the limit settings as a pre-warning. See color codes in section Results ► 64.

11.2 Diagrams - test settings

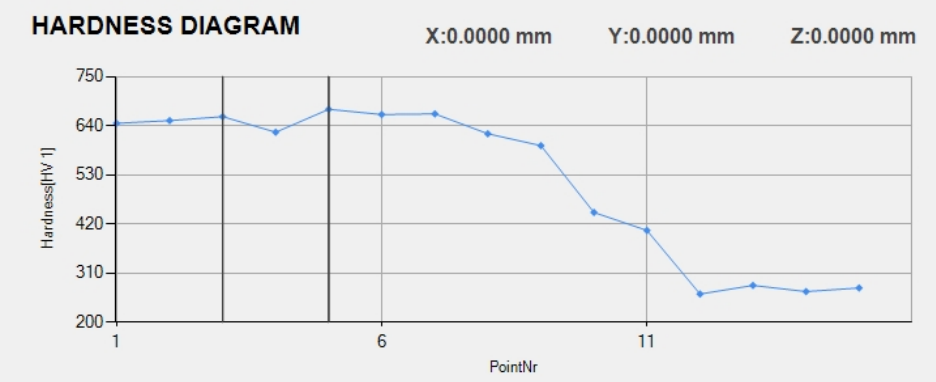
- To choose how you wish to see hardness values, select between the different diagram types and settings.



Hardness diagram

Shows the hardness values for all subsequent test points.

Example:

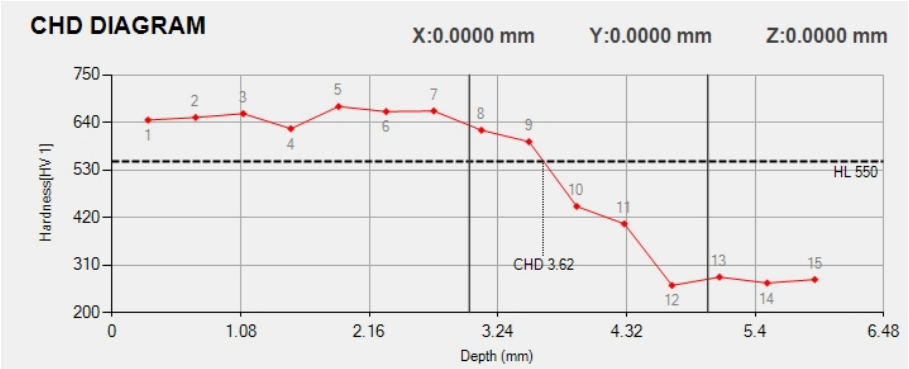


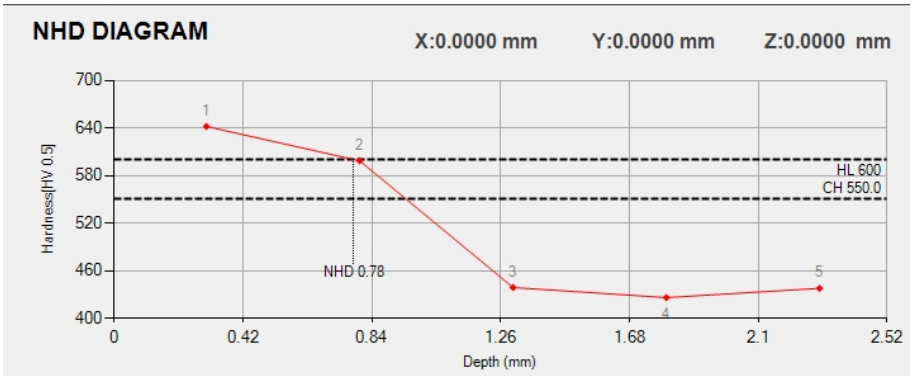
Case depth diagram

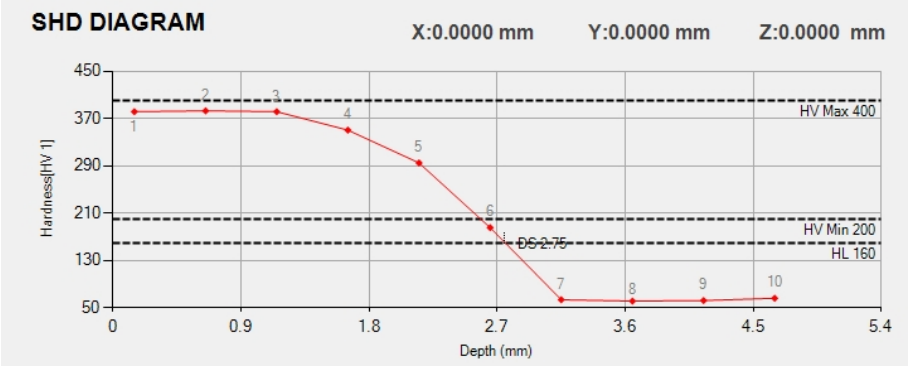
Shows the hardness values as a function of depth.

The depth value is the distance to the edge of the object under test.

Examples:



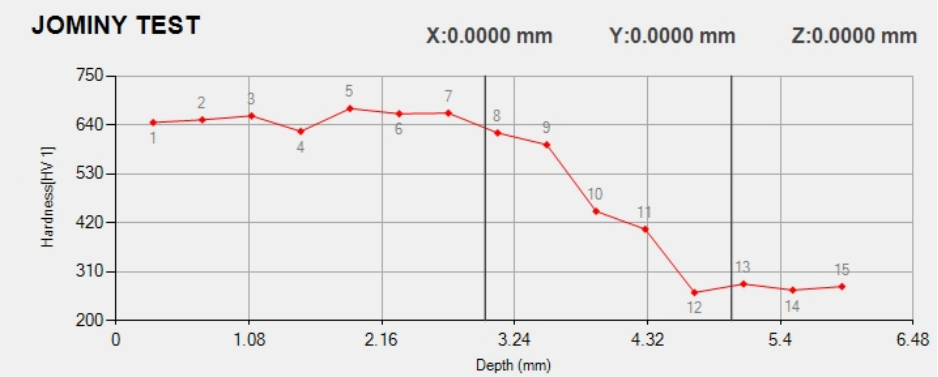




Jominy test

If a test has been executed according to ISO-642, this diagram is appropriate.

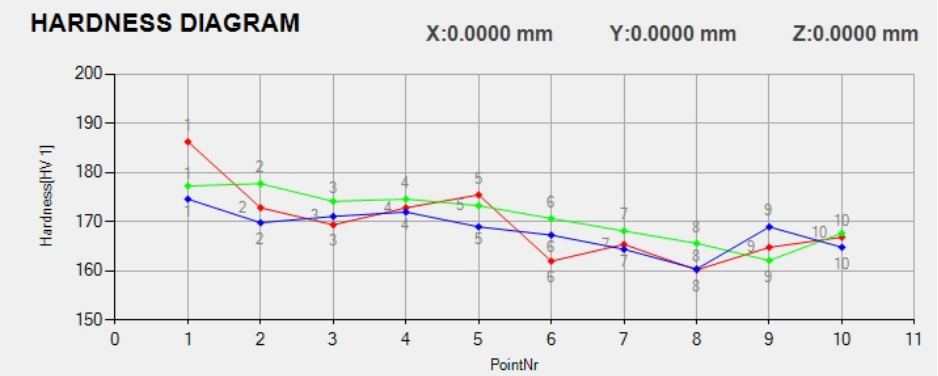
Example:



Multiple lines

For the visualisation of multiple patterns in one graph.

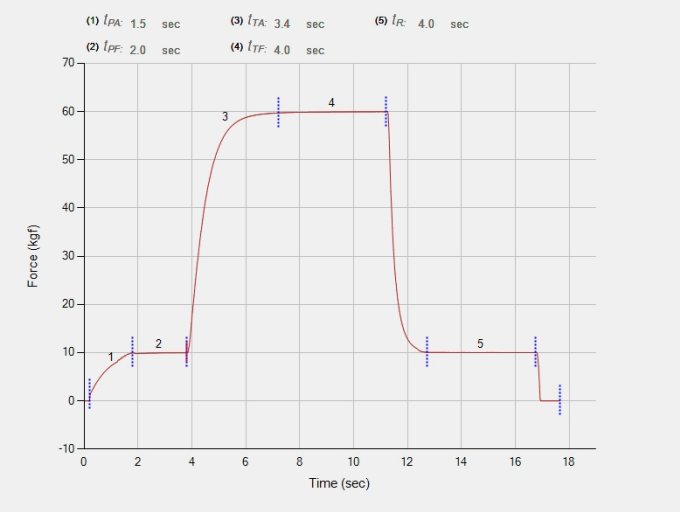
Example:



Force time

Displays, in 2 separate lines, the course of test force on the indenter and depth of the indentation (for Rockwell).

Example:

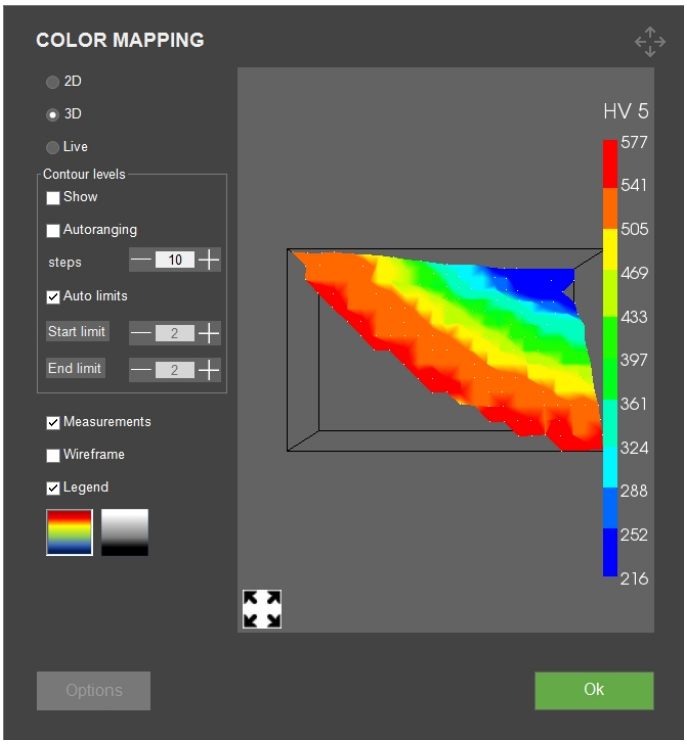


Color mapping

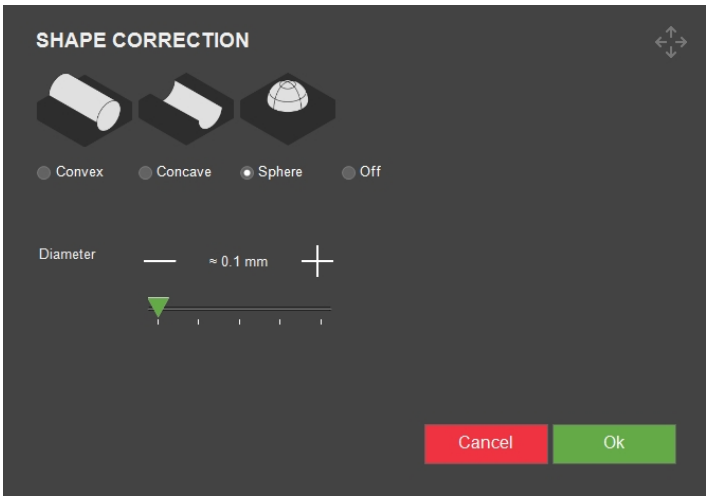
Displays the course of the hardness values of an area test pattern, making use of a colormap.

Measurements with test pattern type **Area** can be shown in a 2d/3d diagram with color mapping (see Area patterns ► 120).

Example:

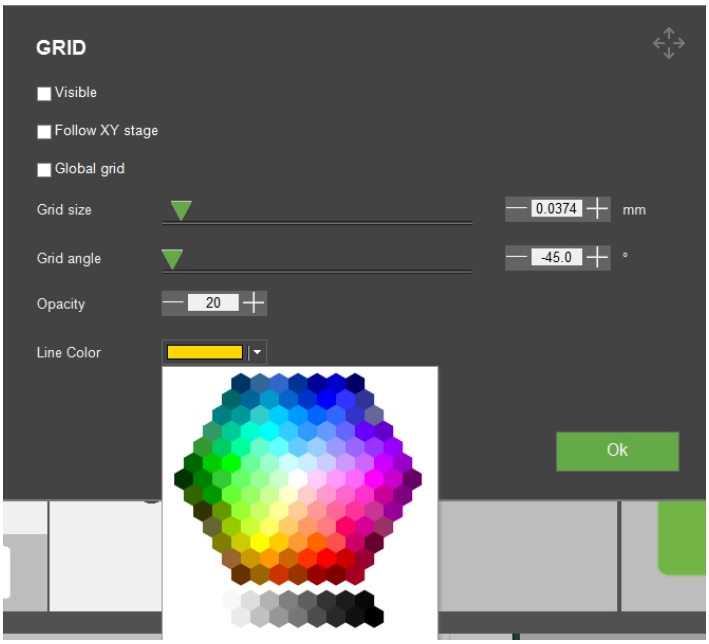


11.3 Shape correction



- Set the shape correction to either convex, concave or sphere-shaped materials.
- When the material you test has one of these shapes, you can enter the radius in mm. This radius is then taken into account when the hardness value is determined.

11.4 Grid

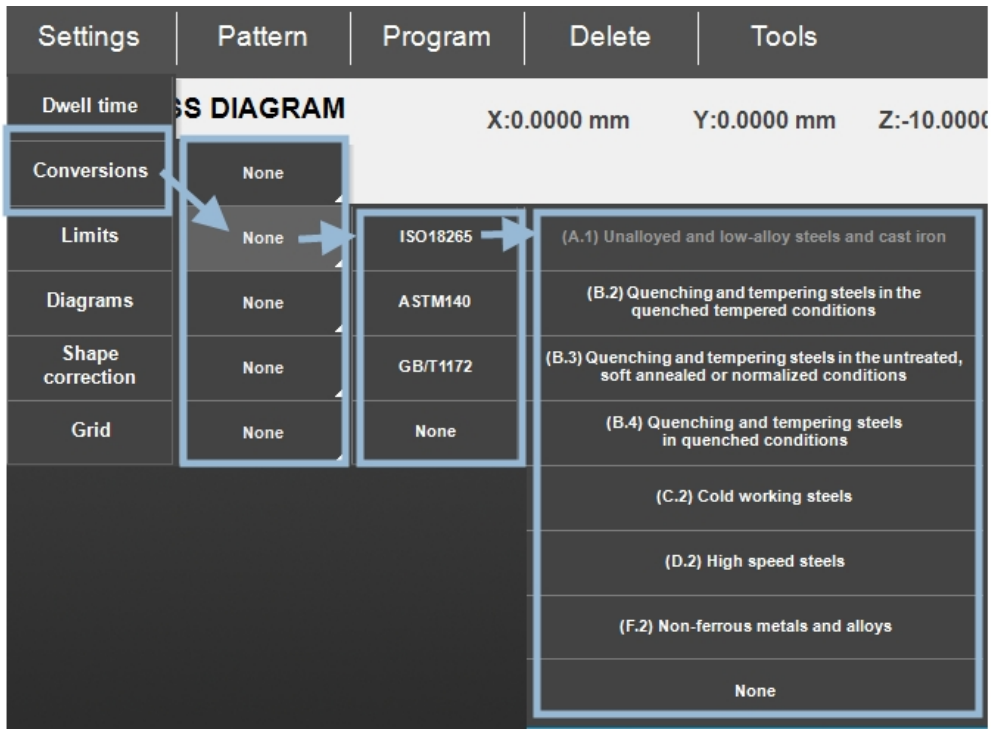


- Adjust settings for the display of a grid in the objective camera view.

Setting	Description
Visible	Toggles the visibility of the grid.
Follow XY stage	The grid will follow the XY-stage movement as if the grid was part of the specimen. When disabled, the gird will stay static within the camera view.
Global grid	When enabled, the grid settings will apply for all magnifications.
Grid size	Use the slider or **–**/**+** buttons to adjust the grid size.
Grid angle	Use the slider or **–**/**+** buttons to adjust the grid angle.
Opacity	Set the transparency level of the grid lines.
Line color	Set the color of the grid lines.

11.5 Conversions

- Select one or more conversions of the results to different standards/scales.



- In the results list, you see the conversions beneath the actual measurement result (see Results ► 64).

Make custom conversions

1. Create a file named **Conversions.txt** in the DuraSoft folder on the D: drive of the hardness tester.
2. Enter the conversions you wish to add.

   Conversion values must be formatted as follows:

– A headline describing the scale (HV, HB, HR, HK) to be applied followed by a semicolon.
– The values you wish to add. Each value in a column must be separated by a semicolon.

```
HV1;MAR;
164;2
171;4
179;6.5
188;9
```

Accessing custom conversions

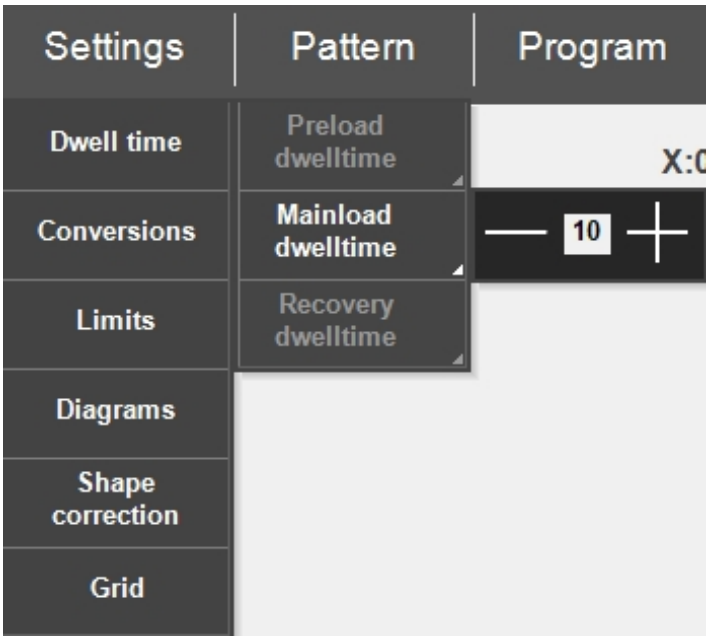
1. Select **Settings** > **Conversions**.
2. Select one of the empty conversion fields (**None**).
3. Select a conversion to assign it to custom conversions.

11.6 Dwell time

Configure all dwell time settings, **Preload**, **Main load**, and **Recovery**.

Preload dwelltime is only enabled for all depth scales (HR, HBT, HVT), where **Main load** is available for all scales. The minimum set time is 1 second, and the maximum is 999 seconds in steps of 1 second.

- Select the **+** or **–** button to increase or decrease the dwell time value.



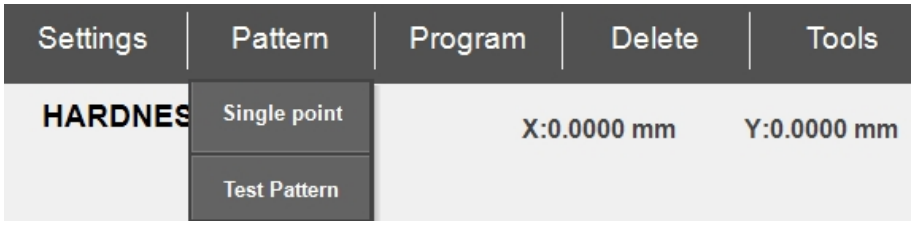
12 Pattern – Pattern editor

Note
The **Pattern** feature (optional) is available if it is supported by the hardness tester, and if the module has been added to the software.

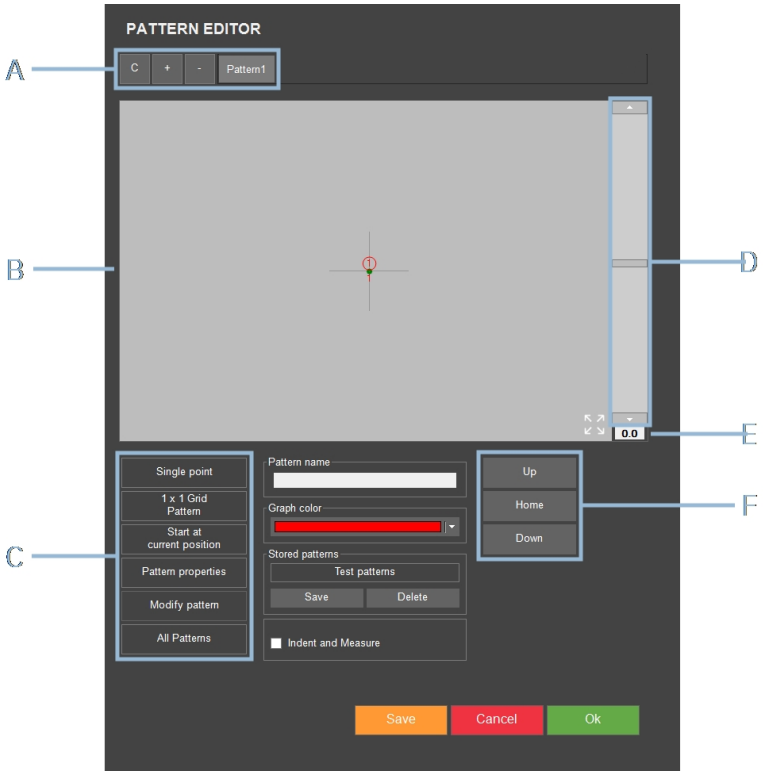
Use the **Pattern editor** to create test patterns from a range of predefined patterns.

To access the **Pattern editor**:

- Go to the **Test menu bar** and select **Pattern** > **Test pattern**.



Overview



A	Pattern management	**D**	Rotation scrollbar
B	Pattern viewer	**E**	Rotation angle
C	Pattern settings	**F**	Z-axis control

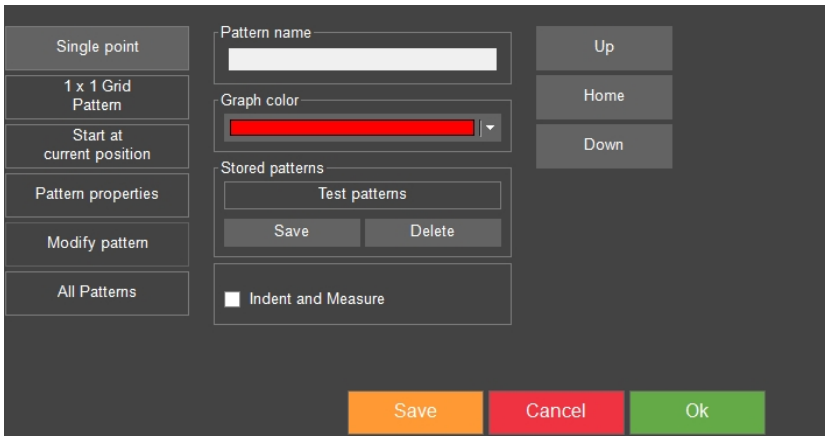
12.1 Pattern type

For simplification, this section will only describe the Line pattern. For all the other patterns, see Testing ► 102.

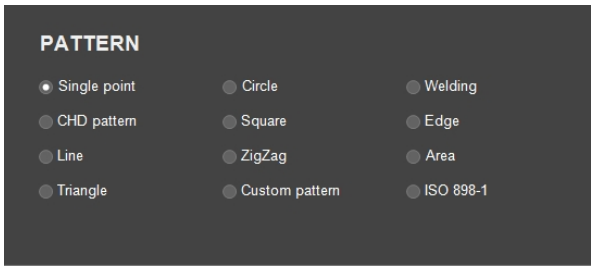
To choose your pattern type:

1. Go to **Pattern** > **Test pattern** > the top field in the **Pattern editor**, for example **Single point**.

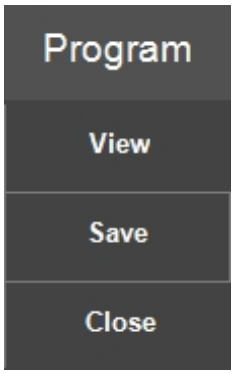
   The text in this field changes if you choose another pattern type in the next screen.



2. In the dialog that appears, **Pattern**, choose the pattern type you wish to use.



13 Program



A program is a template for testing that contains all test settings (objective settings, patterns, light settings, etc.) A job is an instance of a program.

Note
You can save up to 70 programs in a folder.

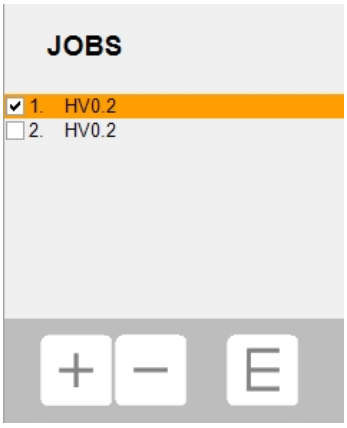
Create a program

If you perform a series of tests frequently, you can save those tests and their settings as programs.

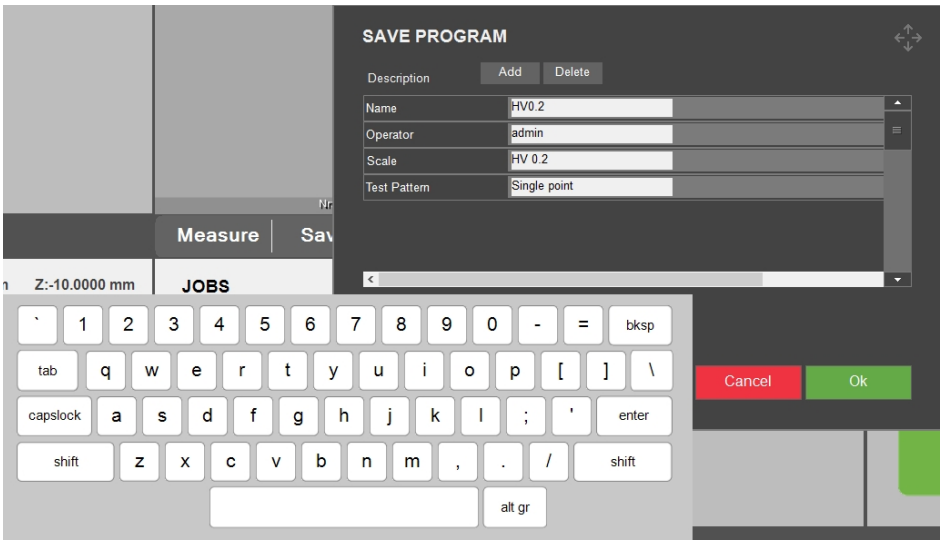
If there are already jobs active in the software, you can use the program to create a new job. If not, the active job is overwritten.

We recommend that you start by creating a job, and then save it as a program. See Jobs ► 95.

1. In **Jobs**, enable the check box indicating the job you wish to use to create a program.



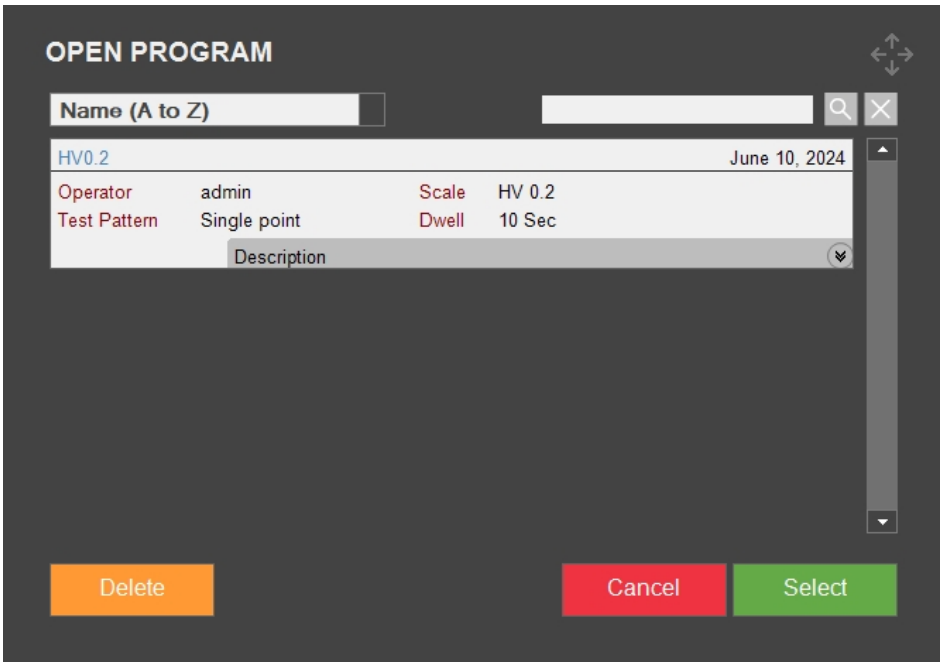
2. To save the program, select **Program** > **Save**.



If the program already exists, you are prompted to overwrite or cancel.

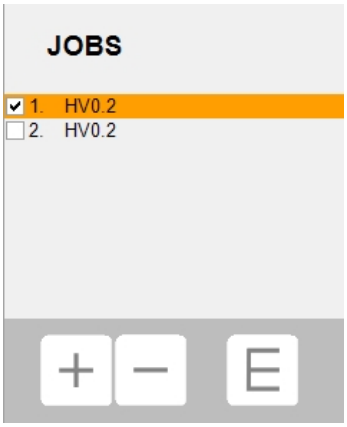
Load a program

1. To open the program list, select **Program** > **View**.



2. Use the scroll bar to navigate the list.
3. Use the double arrow on the program to see default objective and descriptions.
4. Select the program you wish to load and choose **Select**.
5. Select **Yes** in the dialog to create a job based on the selected program.

   The job is added to the **Job list**.



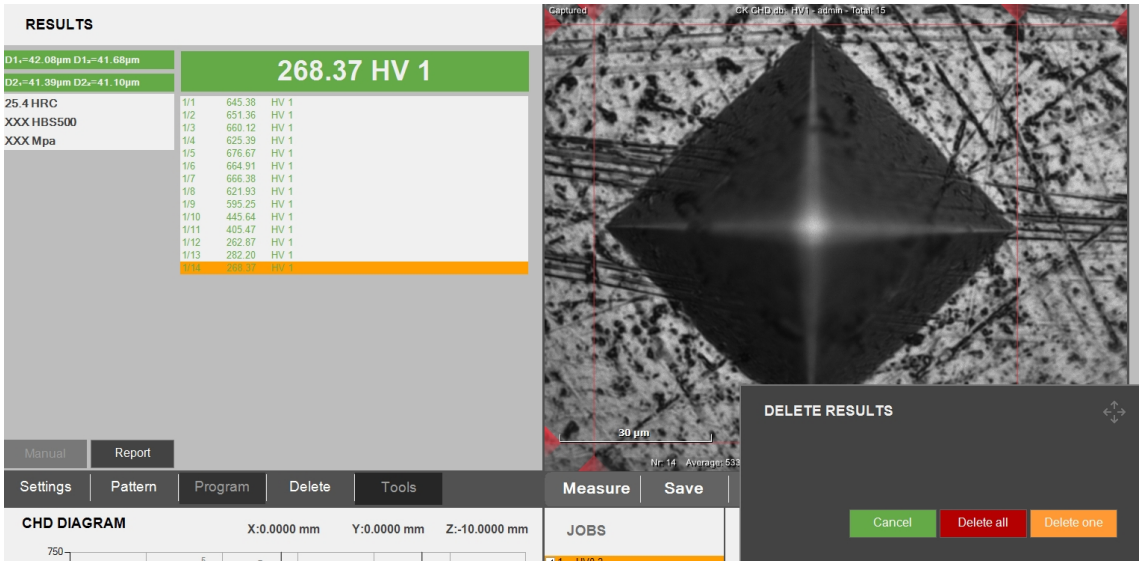
Delete a program

1. View the program list in **Program** > **View**.
2. Use the scroll bar to navigate the list.
3. Choose the program you wish to delete and select **Delete**.
4. Select **Yes** to delete the program.

14 Delete

After a measurement has been made, it is listed in the **Batch list** of measurements (see also Results ► 64).

In the **Test menu bar** > **Delete** > **Delete results**, you can remove individual or all measurements from the **Batch list**.

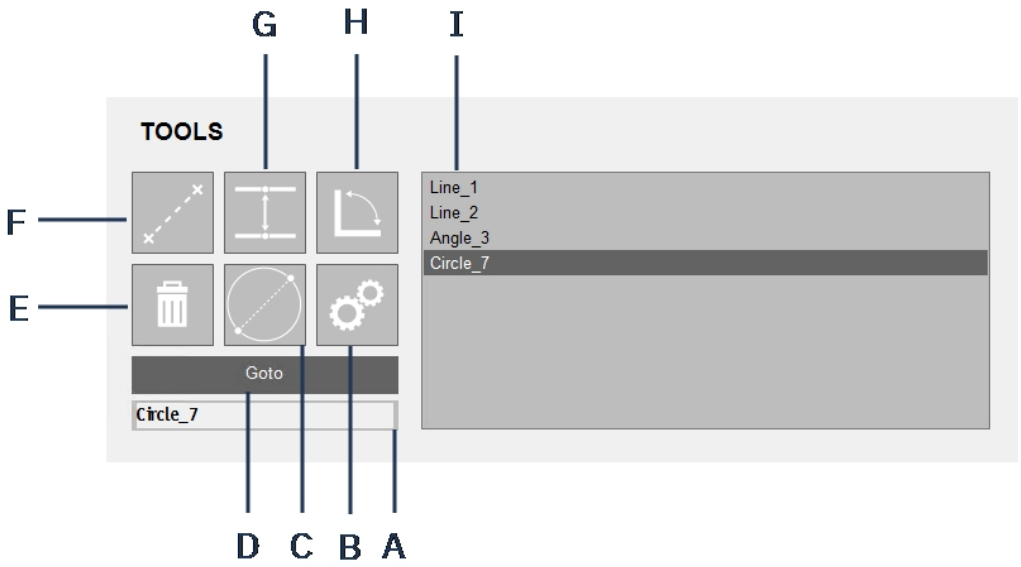


- To delete a selected individual measurement from the **Batch list**, select this from the list, and press **Delete one**.
- To delete all measurements in the **Batch list**, select **Delete all**.
- To leave the menu without deleting a measurement, select **Cancel**.

15 Tools

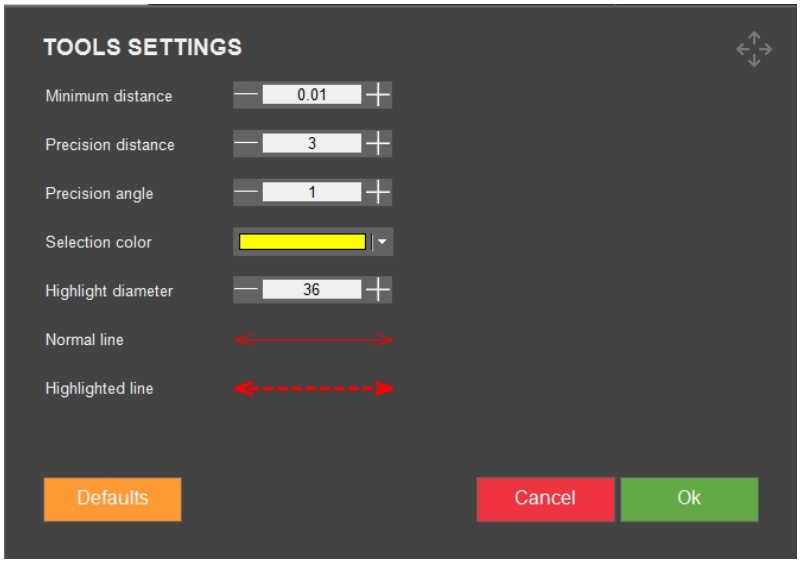
Use the features in the **Test menu bar** > **Tools** to make distance and angle measurements, and annotations on the image.

Note
This module is a licensed option.



A	Selected/entry field (you can change the name of the selected measurement)	**B**	Opens the tools settings (see The tools settings ► 81)
C	Circular measurement	**D**	Go to selected measurement in the objective view/test pattern editor
E	Delete selected measurement	**F**	Distance measurement
G	Line-to-line measurement	**H**	Angle measurement
I	Choices		

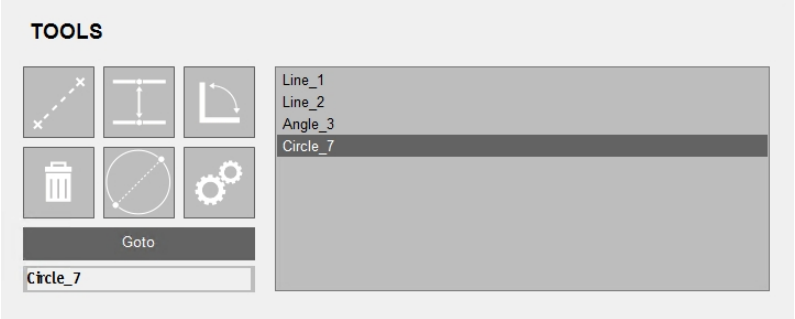
The tools settings



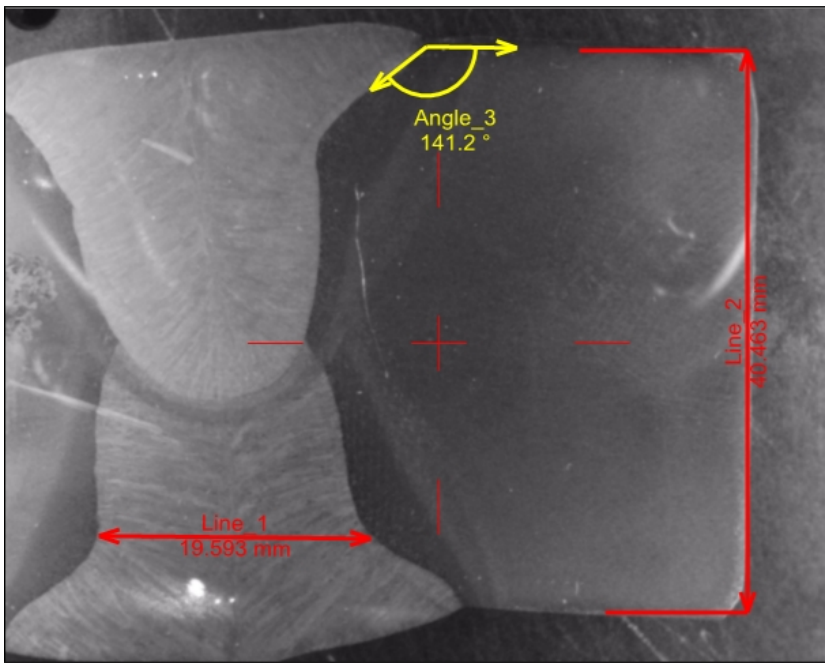
Tools settings	Description
Minimum distance	Set the minimum distance to be measured.
Precision distance	Set the number of decimals you wish to use.
Precision angle	Set the number of decimals you wish to use.
Selection color	Set the color you wish to use for the selected measurement.
Highlight diameter	Set the diameter for the selected measurement point.
Normal line	Configure the normal line.
Highlighted line	Configure the highlighted line.

Work with tools

1. In the **Test menu bar**, select **Tools**.
2. Select the tool you wish to use.



3. The distance or angle measurements are shown in the objective view.



4. Place the cursor on the end of the line. A red-dotted circle is shown on the end of the line.

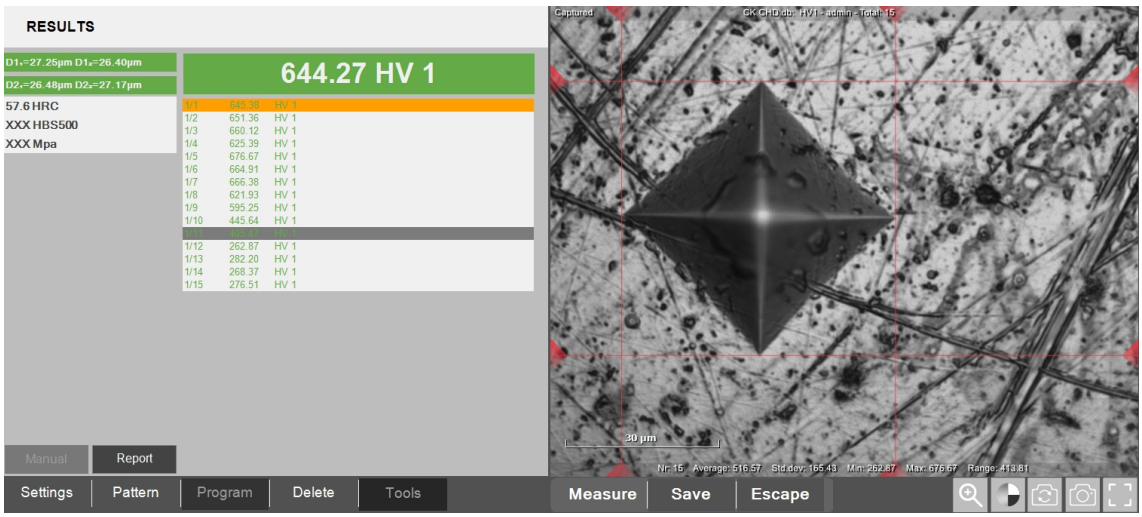


5. Drag the line to the desired position.

16 Measure

- Start an optical measurement in the **Test menu bar** > **Measure**.

The optical measurement mode is indicated by four cross lines.



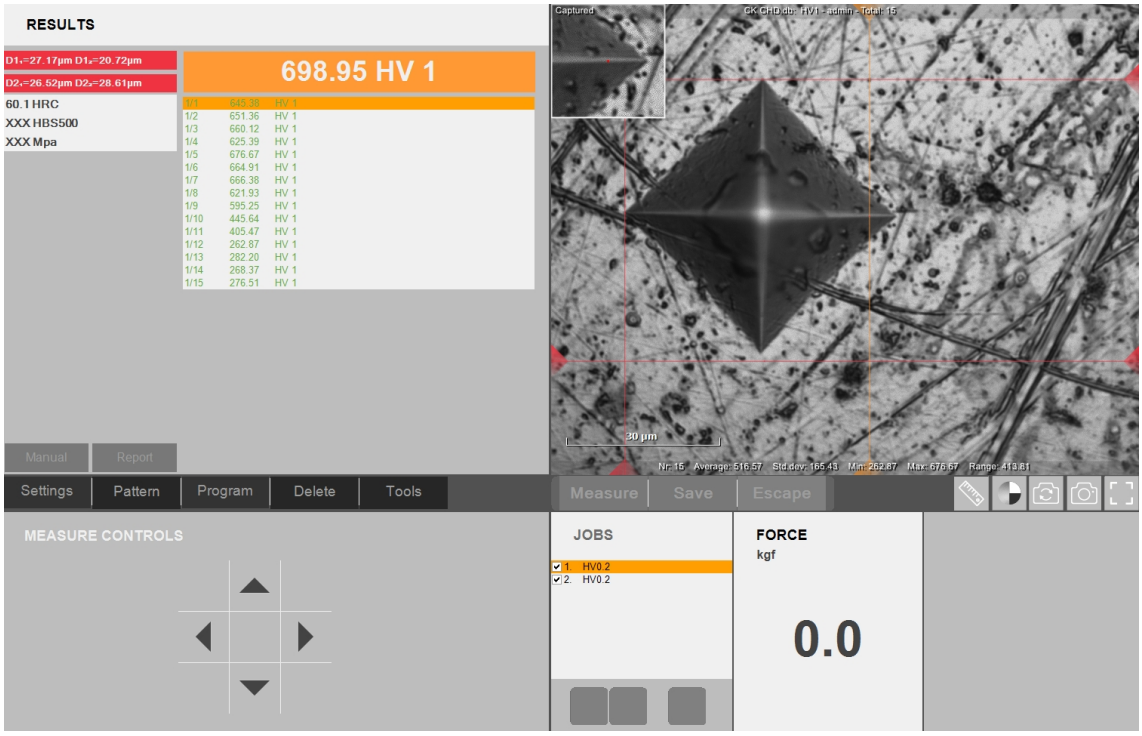
The cross lines are automatically placed at the correct positions.

If the measurement has to be done manually or if the automatic result is not satisfying, you must place the cross lines manually.

- In the **Test menu bar**, select **Escape** to stop measuring or **Save** to save the measurement.

Modify a measurement

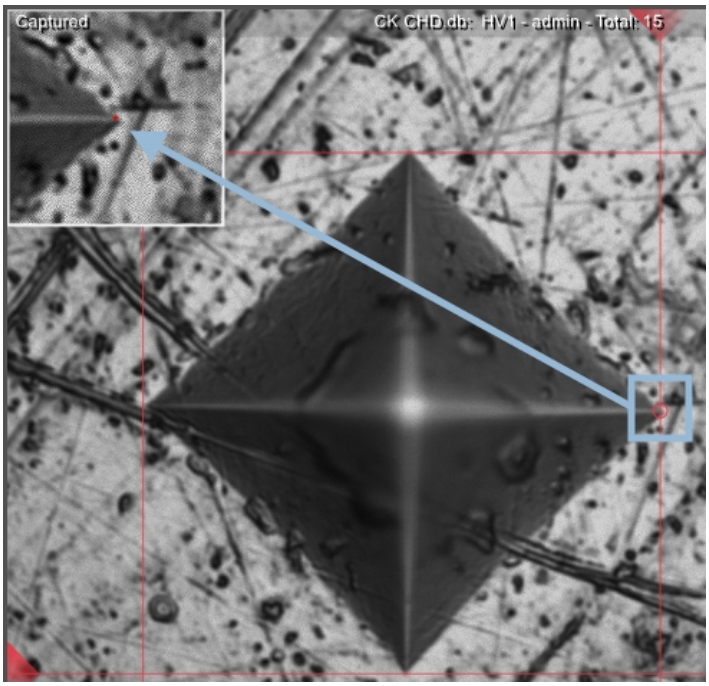
In this example, the right cross line is not at the correct position:



Diagonal D1 and D2 have an incorrect ratio according the used standard, indicated by the red color in the results bar.

In **Measure controls**, you can move the marked cross line with the cursor control with 4 arrows.

A cross line has a marker in the form of a little red dot. This is also shown in the magnification in the upper left corner of the camera view.



The red dot can be positioned on the corner of the indentation with the 4 arrows in **Measure controls**, with the mouse wheel or by dragging it with the mouse.

17 Save

Use **Save** to keep:

- the result of a measurement in the **Batch list** (see Results ► 64)
- the active job
- the new results of a re-measurement of an indentation (replace former results).

18 Escape

- Select **Escape** to return to the main screen after or during a measurement.

19 Camera control buttons

Use the **Camera control buttons** to modify what you see when you use the **Objective camera** view and the **Overview camera**.



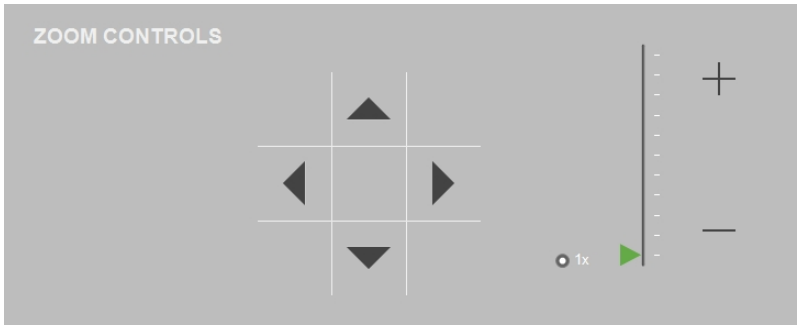
You can either use the zoom function, the color view, change the view, do a snapshot or enhance the view in the display.

19.1 Zoom button

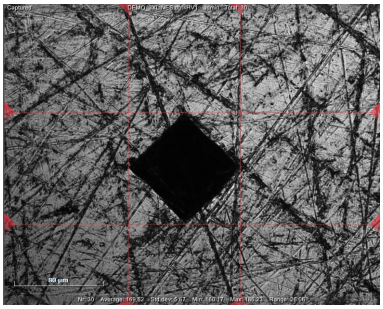
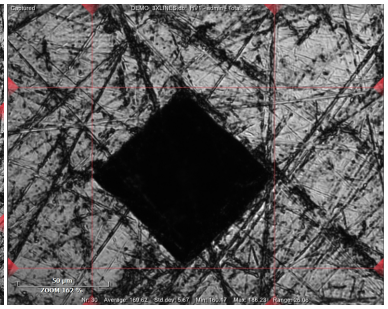
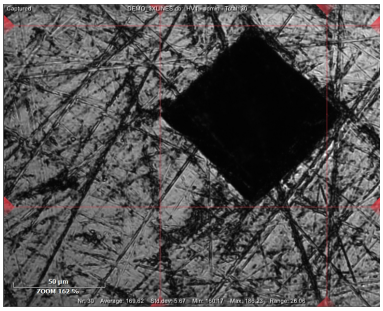
1. Select the **Zoom** button in the **Camera controls toolbar**.



2. The **Zoom controls** view opens.



3. A slider allows you to magnify the camera view. The **+** button enlarges the image, and the **–** button reduces the image.
4. The arrows enable you to scroll through the image when this is enlarged.
5. To go back to the original view, select the predefined zoom level 1x.
6. Select the **Zoom** button to exit the zoom mode.
   The last set zoom level stays active in the current image, as long as it is active.

Predefined view	Magnified view	Scroll to change position
		

19.2 Color view button

	
Color	**Gray scale**

- Select the **Color view** button to toggle between a camera view in color or in gray scale.

19.3 Overview button (Licensed option)

WARNING
When you change the camera view, it may involve a movement of the XY stage if available, and/or the test head.

Struers hardness testers are equipped with an **Objective camera**. Some hardness testers are also equipped with an **Overview camera**. The camera view is shown in the **Main view area** (see Display overview of DuraSoft ► 18).

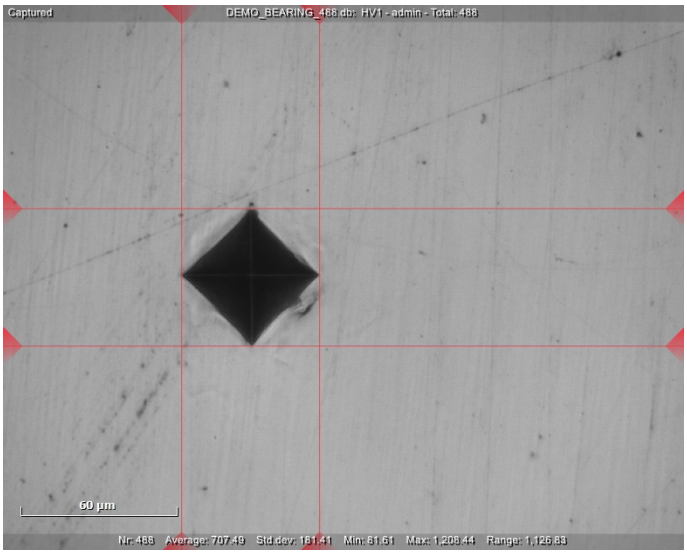
- Select the **Overview** button to toggle between **Objective camera** and **Overview camera**.



Note
On a dual screen configuration, the **Overview camera** view is always shown on 2nd screen.

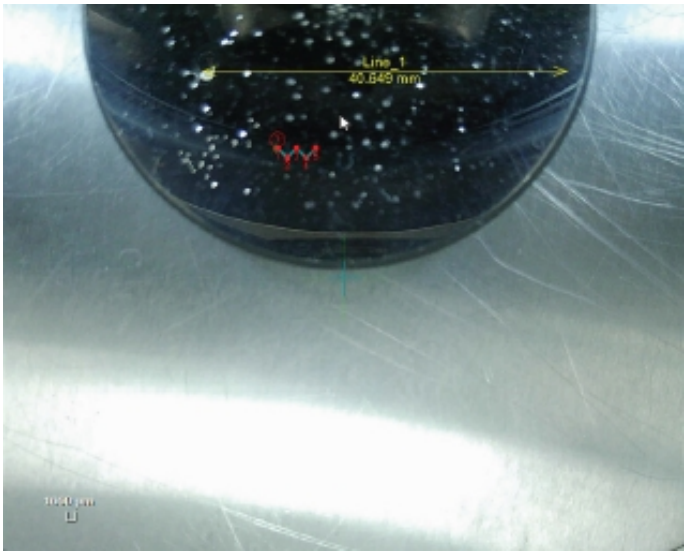
19.3.1 Objective camera view

- The specimen is visible through the selected objective (with magnification).
- Select the **Objective camera** view for both live and captured measurement images.
- Use this view to bring the specimen into focus, i.e. to bring the specimen into the correct distance and position from the indenter.
- In the upper part of the objective camera view, the view and the selected hardness scale are visible.



19.3.2 Overview camera view (option)

- Once the specimen is in focus, you can select the **Overview camera**.
- The specimen is visible through the **Overview camera** in a macro view which, in most cases, shows the entire specimen, or a large part of it.
- Select this view to easily find the correct position to perform the measurements.
- Movement of the camera can be done by dragging the cross hair to the desired position (a red arrow will indicate the movement) or by double-clicking the desired position.



19.4 Snapshot button

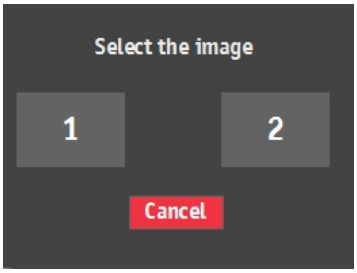
Create a snapshot

1. Use the **Snapshot** button to capture an image from a live or captured image from the **Objective camera** or the **Overview camera**.



2. If you are working with a single monitor, the snapshot of the live view is automatically captured.
3. If you are working with 2 monitors, you can select which view to capture:

   1 = **Objective view**
   2 = **Overview view**.



Snapshots are saved within the active **Job** and/or the installation directory, for instance D:\DuraSoft\Data\Snapshots\.

Note
There is a limitation of 12 snapshots per job.

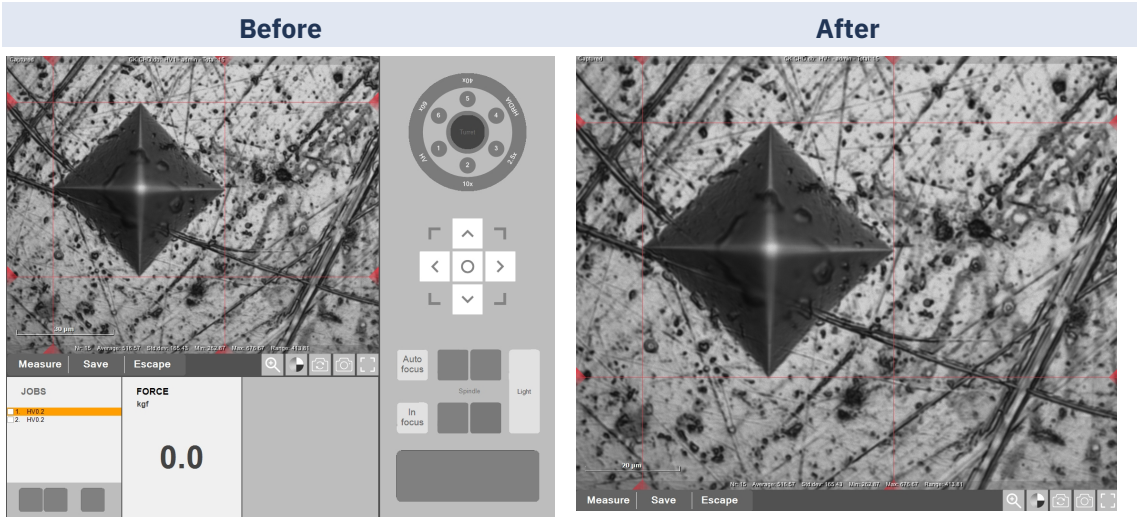
See how to manage snapshots in Report ► 60).

19.5 Magnify button

1. To magnify the camera view, select the **Magnify** icon.

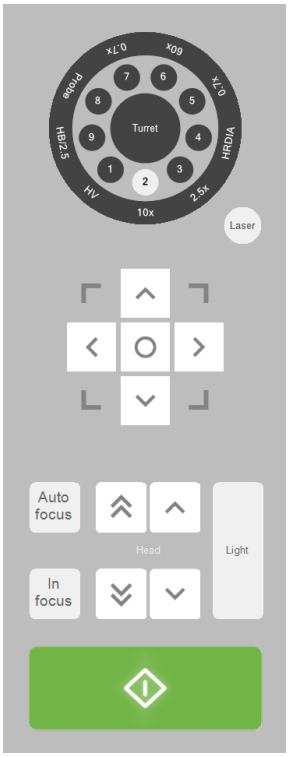


2. The camera view is now magnified and covers the **Control panel**.



20 Control panel

Use the controls on the **Control panel** to control the movements and lighting of the hardness tester.



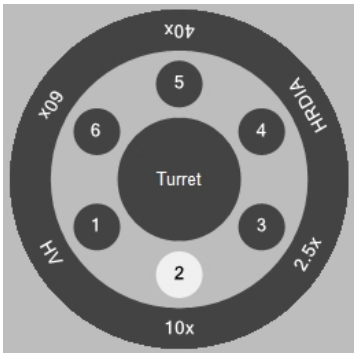
20.1 Turret controls

CAUTION
Always make sure that the turret is free to rotate.

With the turret you can control the position of the indenter/the test head.

- Define the contents of the turret (and the test head) in Turret configuration ► 24

Test head with multiple location



The example shows that the test head has the objective 10x on position 2.

- Select **Turret** in the center, and the turret rotates to the next position.
- Select an objective or indenter, and the turret moves to that position.

Note
The software assumes that the indicated indenter is installed. If it is not, incorrect hardness values will be calculated.

20.2 Laser

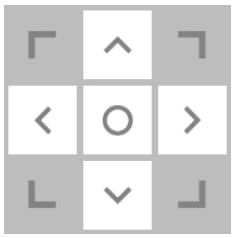
Note
The laser function is not included in all our hardness testers.

- Select the **Laser** button to activate the positioning laser (if present) which indicates the center of the camera view.



20.3 Virtual joystick

- Use the virtual joystick to control the motorized XY stage.



Means	Action
Arrow buttons	Move the stage in all directions (motorized stage movement)
Home button (center)	Select and hold to return to home/the center position
Physical joystick (if available)	Move the stage with the joystick

Note
The home button (center) is disabled in emergency mode.

Note
Motorized stages are not included in all our hardness testers.

20.4 Focus

For correct operation of the tester, it is essential that the camera is always in focus.

- To make the machine focus on the specimen, either use **Autofocus** or do a manual focus followed by a confirmation with the **In focus** button.



20.4.1 Autofocus

1. First, select the objective you wish to bring in focus in the turret control.
2. Then apply **Autofocus**.
3. Do a manual focus.
4. Confirm with the button **In focus**.

The machine applies auto focus by moving the stage up and down in steps over a certain range.

If the machine has a descending turret, the focus is adjusted by moving the turret up and down.

The **Autofocus** button starts the autofocus cycle with the selected objective.

20.4.2 In focus

Out of focus

When you move the Z-axis manually, the camera view is out of focus. **In focus** starts blinking, and **Start** is disabled.

To focus on the specimen

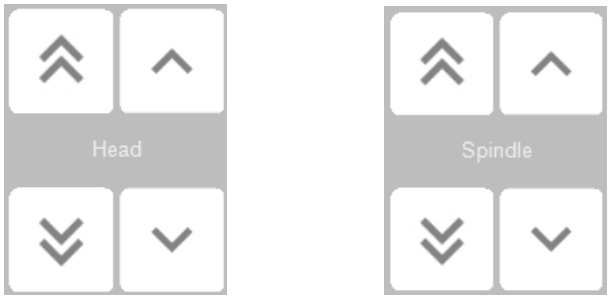
1. Adjust the position of the Z-axis manually until the workpiece is in focus.
2. Then select **In focus** to manually confirm that the camera image is in focus.

If you use **Autofocus** instead, **In focus** stops blinking.

Hint
To find focus manually, always start with the lowest magnification.

20.5 Head/Spindle controls (Z axis)

Dependent on which machine you have, these up and down buttons control the movement of the **Head** or the **Spindle**.

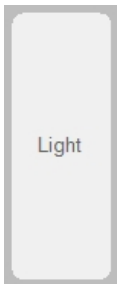


Means	Action
Double arrows	Move spindle/head up/down in large steps/high speed (rough focus)
Single arrows	Move spindle/head up/ down in small steps/slowly (fine focus).
Mouse wheel	Move spindle/head up/ down in small steps/slowly (fine focus).

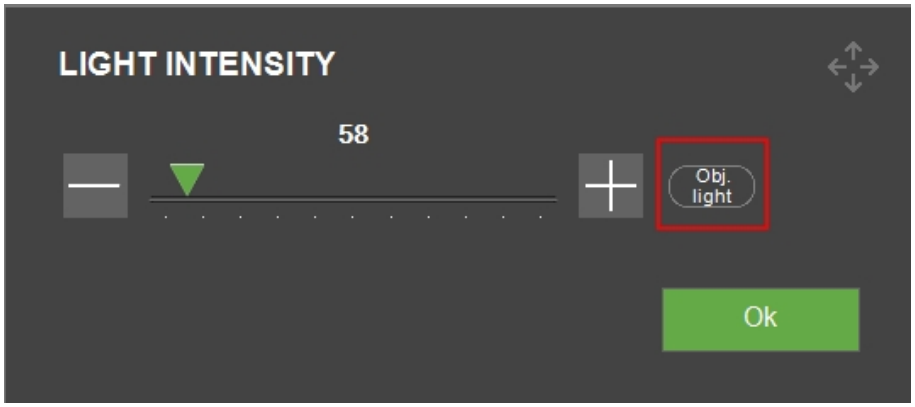
Note
Some hardness tester models have additional hardware controls for the **Z** axis. Please refer to your hardware manual for more details.

20.6 Light

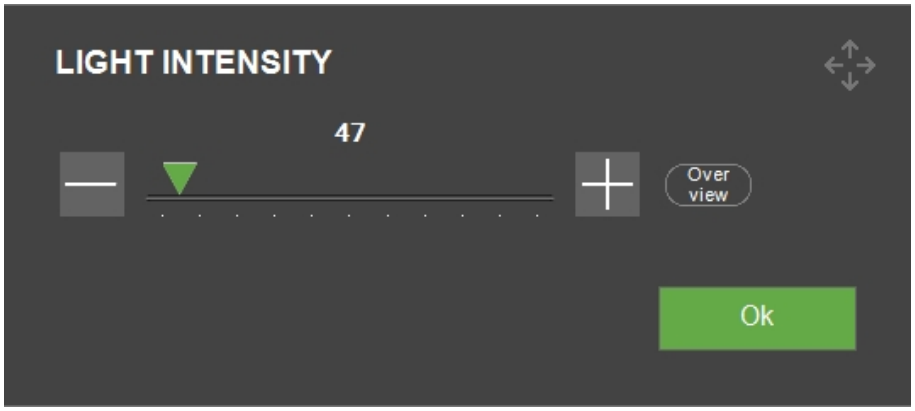
1. Set the light source and intensity of objectives and cameras via **Light**.



2. Set the light intensity for the **Objective light** (direct light aims at the specimen through the objective). Use + or - to adjust the value.



3. To switch to **Overview light**, select **Obj. light**.



4. Now set the light source and intensity for the **Overview light** (ambient light lights up the stage. Only available when the overview camera is active). Use the **+** or the **–** button to adjust the value.

20.7 Start/Stop

This button changes from **Start** to **Stop** and vice versa dependent on the situation.

- Green means **Start**. Select this to start the test.



- Red means **Stop**. Select this to stop the test and the activity of the machine.

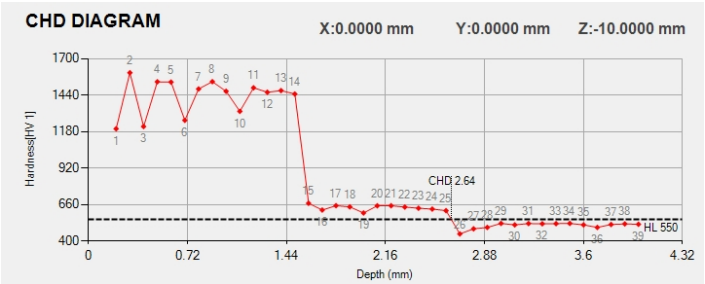


- Gray means that the machine is not ready to start. Check focus, settings, etc. to prepare the machine for the test.



21 Diagram

The **Diagram** area shows a visual representation of the test results.



You can select from a series of predefined diagrams (see more in Diagrams - test settings ► 68).

XY stage – change the coordinates

You change the **X**, **Y**, and **Z** coordinates of the stage in the upper part of the diagram.

1. Select the **X** or **Y** value on the screen.
2. A text box appears, and you can fill in the new position of the stage.

3. When you select **OK**, the stage moves to the new position.



22 Jobs

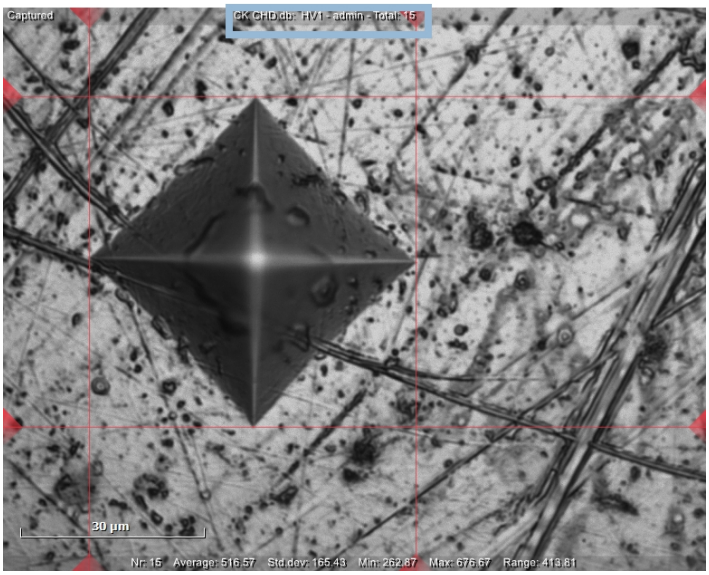
In **Jobs** you can select, edit, delete and create new jobs.

A job contains all settings you need to perform measurements. You can also create a job from a program (see Program ► 77).

The active job is marked in orange. Selected jobs are marked with a check-mark in the **Job list**.



Also, the active job is indicated in the upper part of the **Objective camera** view.





When you select **Start** in automatic mode, all measurements of the active job are executed.



When you exit (**System** > **Exit**), the current jobs are stored on the hard disk and loaded at next start up.

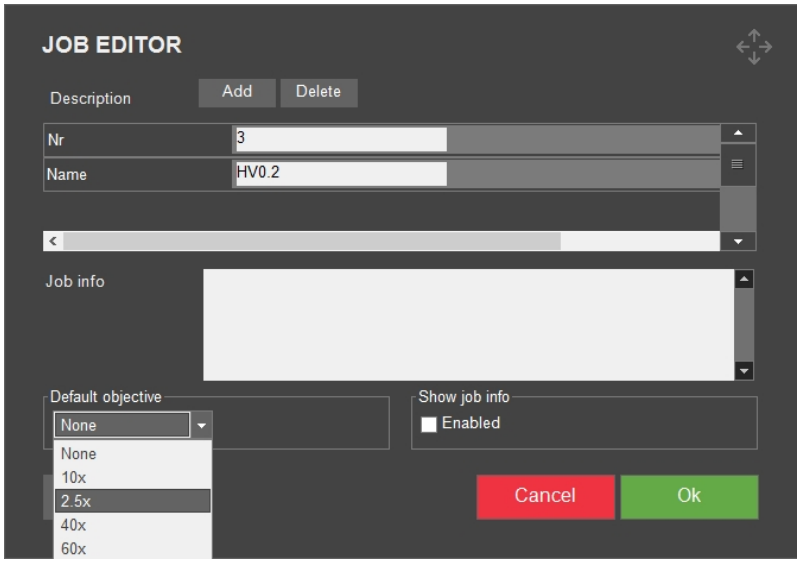
After the next start-up, the first job in the list is active. You can use this job, select a job from the list, or create a new job.

Create a job

1. In the **Test method** area, select the test method you wish to use. See Test method area ► 58.
2. In the **Job list**, select the **+** button.

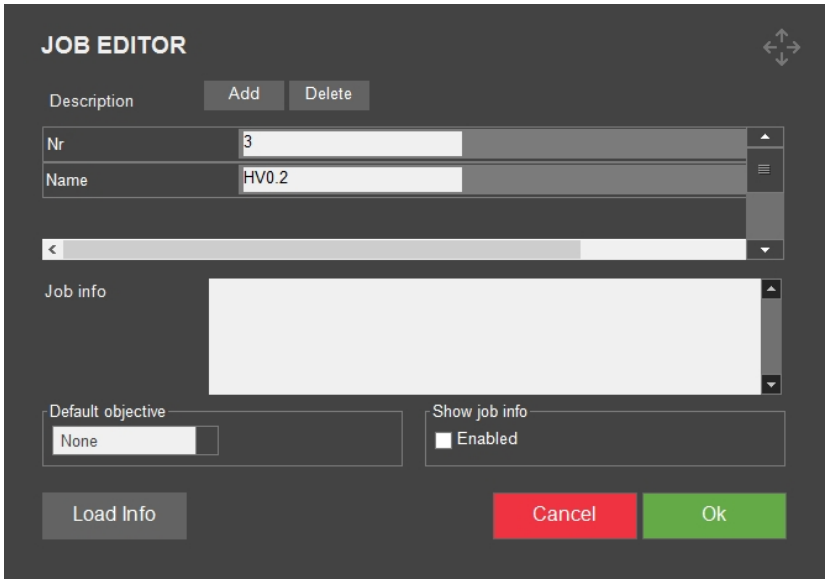


3. The **Job editor** opens.



4. In the **Default objective** drop-down menu, enter the objective you wish to use.
5. If needed, change the job name and add descriptions.
6. If needed, add additional information in the text field **Job info**.

7. Select **Load info** to load the contents of a text file to the **Job info** field.



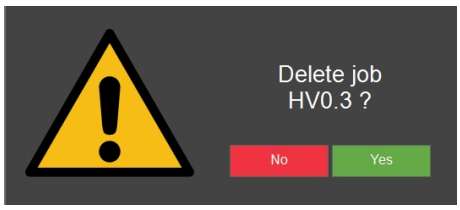
8. Enable **Show job info** to show all job descriptions before the job is started.
9. Select **OK** to save the changes.
10. The job is now created, and you can define the test settings (objective settings, patterns, light settings, etc.) which are saved in the job. See Testing ► 102.
11. If you use the job frequently, save it as a program. See Program ► 77.

Delete a job

1. In the **Job list**, enable the check boxes of the jobs you wish to delete.



2. Select the **–** button, and the screen **Delete job** appears.

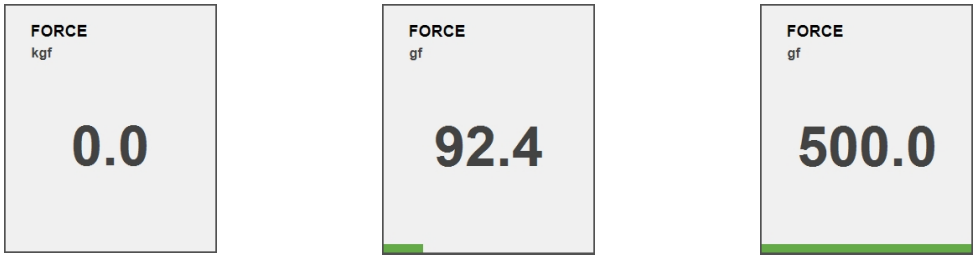


3. Select **Yes** to confirm that you wish to delete the selected jobs.

Edit a job - Job editor

1. In the **Job list**, check mark the job you wish to edit.
2. Select **E** (for 'Editor') to open the **Job editor** and edit the job.
3. Edit the job, as needed.
4. Select **Add** to add a description.
5. Select **Delete** to delete the selected description.
6. If needed, add additional information in the text field **Job info**.
7. Select **Load info** to load the contents of a text file to the **Job info** field.
8. Enable **Show job info** to show all job descriptions before the job is started.
9. Select **OK** to save the changes and exit the dialog.

23 Applied force indicator

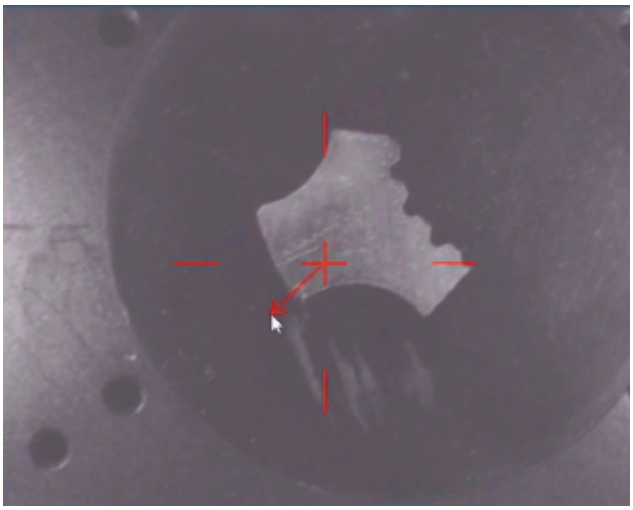


When the indenter is active, the **Applied force indicator**, **Force**, shows the force that is applied to the indenter. This gives an indication of the actual force on the indenter during preload, main load and recovery for depth scales, and only main load for all other scales.

24 Operate the automatic XY stage

There are several methods to operate the automatic XY stage:

- The onscreen virtual joystick (see Virtual joystick ► 91).
- With a physical joystick if your tester is equipped with one.
- Change the X or Y coordinates (see Diagram ► 94).
- Double-click in the live view on the desired position, and the XY stage moves to that position.
- Click and drag with the mouse over the live view. The XY stage follows the direction of the cursor. The longer the arrow, the faster the stage moves.



25 Measurement algorithms for Brinell testing

To determine the location of the edges of an indentation, the hardness tester software uses a computer vision algorithm on the captured image.

The 3 measurement algorithm buttons appear next to the **Camera control buttons**.



For Brinell indentations, depending on the specimen surface roughness/reflection, a different algorithm must be used to get correct indentation detections, that is indentation detections with the measurement lines placed on the edge of the indentations.

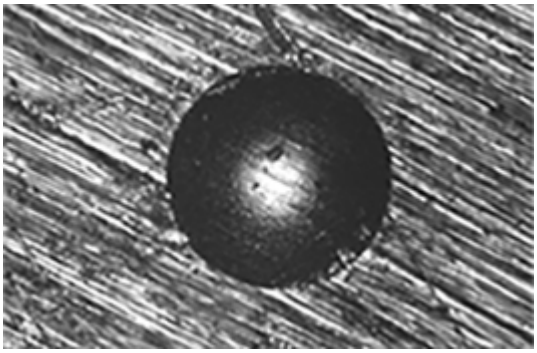
Objective light or Ringlight algoritms

By default, DuraSoft-Met has 2 algorithms you must set before you do a visual measurement. These algorithms, **'Objective light'** and **'Ringlight'**, depend on the look/result of the indent in the image as a consequence of the material reflectiveness and type of light used.

Objective light



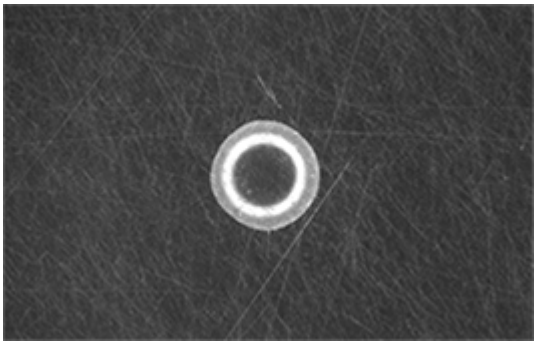
This algorithm uses the **Objective light**, or inner measurement detection algorithm, for dark indents with a small glare in the center of the indent.



Ringlight



This algorithm uses the **Ringlight**, or outer measurement detection algorithm, for indents that are brighter illuminated as the base material and have the typical bright ringlight reflection.



AI algorithm



This algorithm is created gradually by learning when you do indentations. **AI** will try to find the edges of the indent using a neural network.

Availability of this module is depending on the configuration of the instrument.

26 Testing

26.1 Performing simple tests

You can carry out single indents with simple, geometrical patterns.

1. Place the specimen on the stage.
2. Select the test method and the scale you wish to use
3. Select the objective.
4. Focus on the specimen surface.
5. To apply a pattern to the hardness test, select **Pattern**. See Pattern – Pattern editor ► 75.

   By default, the **Single point** pattern is selected. This pattern consists of a single test point.
6. To select another pattern type, see Pattern type ► 76.
7. Select the settings for the selected pattern type. See General pattern settings ► 125



8. When the test setup is completed, select **Start**.

   When the test is finished, the hardness values are shown in the result list.
9. Save or export the test results in a report. See Export ► 63

26.2 CHD (Case Hardening Depth) tests

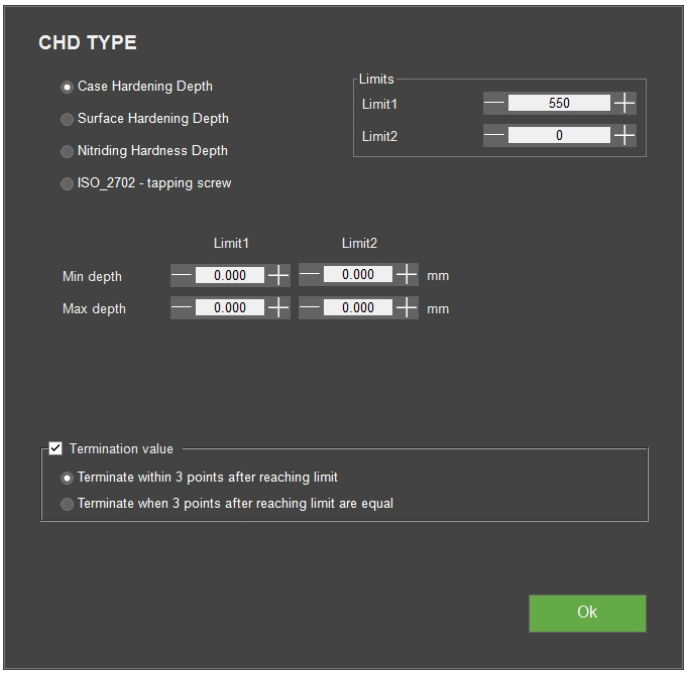
CHD patterns are intended for testing the depth profile of surface hardness.

Prepare for testing

- Create a job. See Jobs ► 95.

Create the pattern

1. In the **Test menu bar**, select **Pattern** > **Test pattern** > **CHD pattern**.

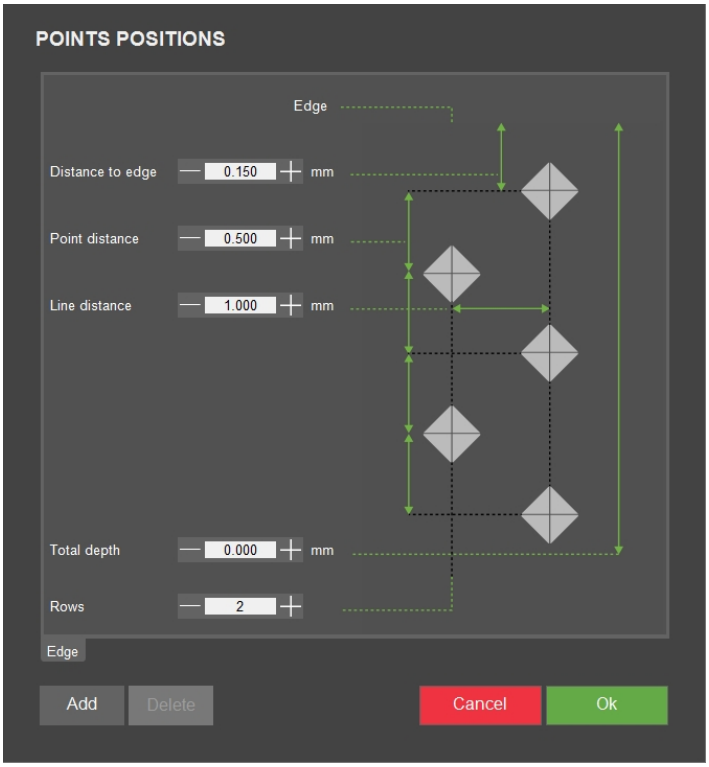


2. Select a **CHD type**:
   - **Case Hardening Depth**
   - **Surface Hardening Depth**
   - **Nitriding Hardness Depth**
   - **ISO_2702 - tapping screw**
3. In the **Limits** fields, set the hardness limits.
4. In the **Termination values** field, define when the hardness tester stops:
   - **Terminate within 3 points after reaching limit**

     The hardness tester stops after a maximum of 3 indents, when the limit that was set in **Limit1** has been reached.
   - **Terminate when 3 points after reaching limit are equal**

     The hardness tester stops when the hardness values no longer change (+/- 3%) within a range of 3 indents.
5. Set the depth limits (**Min depth**/**Max depth**).
6. Select **OK**.

Customize the pattern



1. In the **Pattern editor**, select **Points positions**.

   In the **Points positions** dialog, the pattern is created based on a number of parameters:

   - **Distance to edge**
     The distance from the starting point to the first indent.
   - **Point distance**
     The vertical distance between each point.
   - **Line distance**
     The horizontal distance between each line in the pattern.
   - **Total depth**
     Determines the total depth of the pattern, and accordingly how many points the pattern contains.

   The above settings are applied to each section of the pattern.

   - **Rows**
     Select the number of rows the pattern should consist of.
2. If needed, use the **Add** button to add more sections to the pattern.

   Each section can be configured with it's own **Point distance**, **Line distance**, and **Total depth**.
3. Select **OK** to create the pattern.

   The pattern is shown in the **Pattern editor** and on the live camera view.

Hint
Select the magnifier icon to see all points in the pattern.

4. Select **Save** to save the settings.

Select the starting point

1. In the **Pattern** menu, select **Start at current position**.
2. To select the starting position, click **Select edge**.
3. Select the desired starting point on the objective view or the overview view. This places the pattern starting point at the selected location.

Perform the test

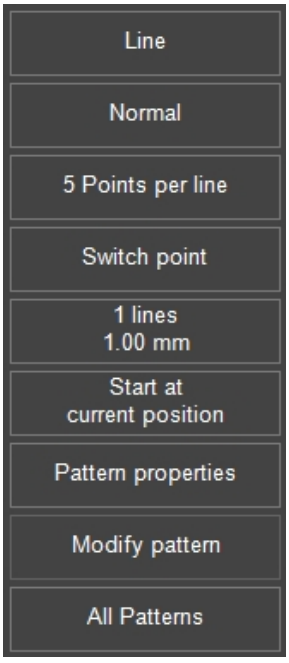


- Select **Start** to start the test.

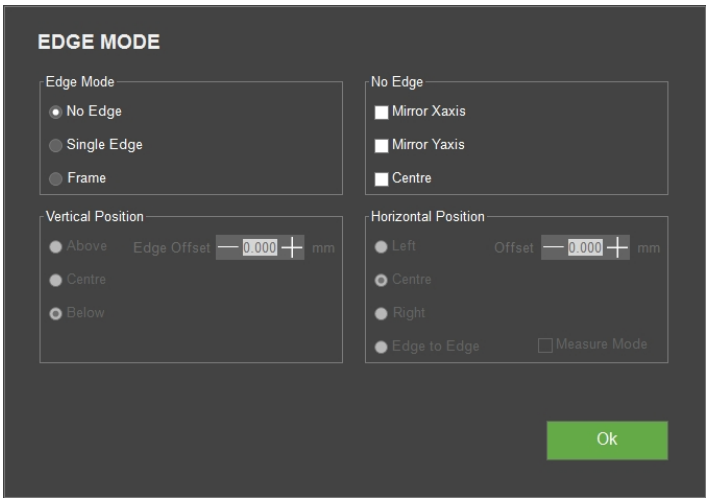
The test results are shown in the **Diagram** area. See Diagram ► 94.

26.3 Line patterns

1. Select **Normal** in the **Pattern editor**.



2. Set the generic line pattern to the following edge modes:



No edge

This is the default option, setting a line pattern consisting of 5 test points.

Single edge

Use this mode if the pattern must have a certain offset from the edge of the sample.

To position the edge:

- In the pattern viewer, drag the start or end point of the edge reference line (red circle).

Note
When using **Edge to edge** as horizontal position, the **Point distance** changes if the edge reference line is stretched.

Frame mode

Use this mode to evenly distribute the lines of the pattern between two edges of the specimen.

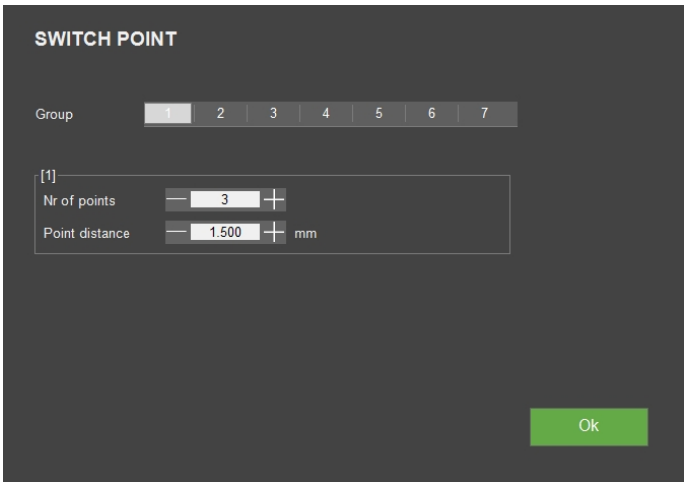
To modify the frame:

- In the pattern viewer, drag one of the corners (red circle).

  The line will move and scale with the frame.

Switch point

1. From the **Pattern editor**, select the **Switch point** menu.



2. Choose a **Group**.
3. Set the **Nr of points** and **Point distance**.

> **Note**
> A section becomes inactive if the number of points is zero.

Nr of lines

This menu is to set the number of lines in the pattern and the distance between the lines.

Further settings

Starting position ► 127

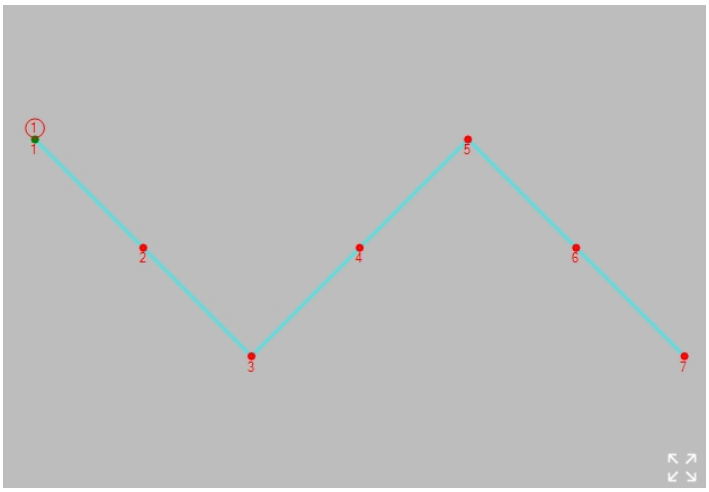
Point settings ► 128

Modify a pattern ► 130

All patterns ► 131

26.4 Triangle patterns

Use the **Triangle** pattern mode to set a path of equidistant test points.



The example shows a pattern of 3 line pieces with 4 points on each line piece.

A single line piece is defined by the horizontal line distance between the first and the last point, and the vertical point distance between them.

> **Note**
> Do not confuse **Point distance** with the actual point distance. The actual point distance is equal to (x2 + y2) / (n - 1) where n = **Points per line**.

Further settings

Mirror settings ► 129

Point settings ► 128

Number of lines ► 128

Perform the test

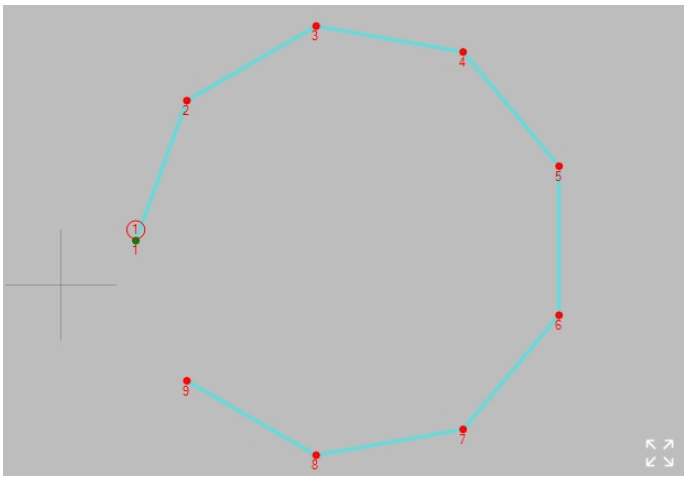


- Select **Start** to start the test.

The test results are shown in the **Diagram** area. See Diagram ► 94.

26.5 Circle patterns

Use the **Circle** pattern mode to arrange equidistant test points in a circle shape.



The path of the circle pattern is set by the number of **Points per line**" ($n \geq 3$) and the **Point distance** (d) between them.

The diameter of the circle equals: $d / Sin (180^{o} / n)$.

Further settings

Point settings ► 128

Mirror settings ► 129

Grid settings ► 129

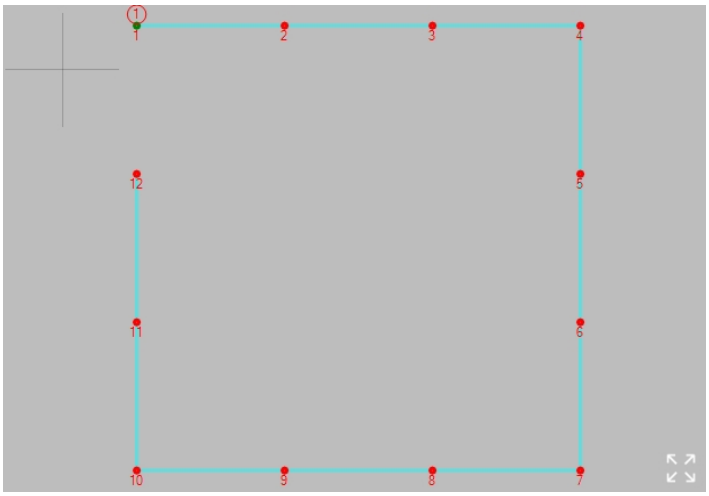
Perform the test



- Select **Start** to start the test.

The test results are shown in the **Diagram** area. See Diagram ► 94.

26.6 Square patterns



Settings

Point settings ► 128

Mirror settings ► 129

Grid settings ► 129

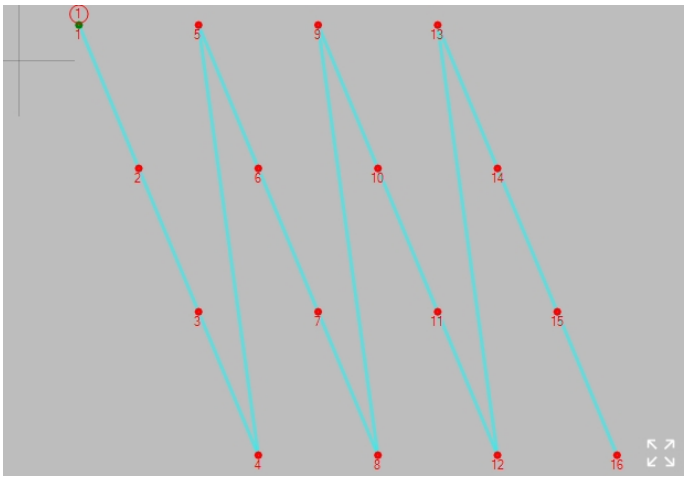
Perform the test



- Select **Start** to start the test.

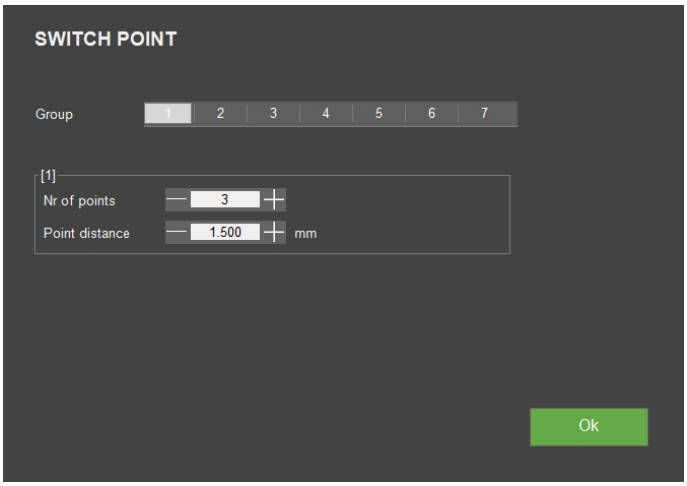
The test results are shown in the **Diagram** area. See Diagram ► 94.

26.7 Zigzag patterns



The **Zig-zag** pattern arranges test points in parallel but shifted lines.

Switch point



1. Select the **Switch point** menu.
2. Choose a **Group**.
3. Set the **Nr of points** and **Point distance**.

> **Note**
> A section becomes inactive if the number of points is zero.

Further settings

Mirror settings ► 129

Starting position ► 127

Point settings ► 128

Number of lines ► 128

Modify a pattern ► 130

All patterns ► 131

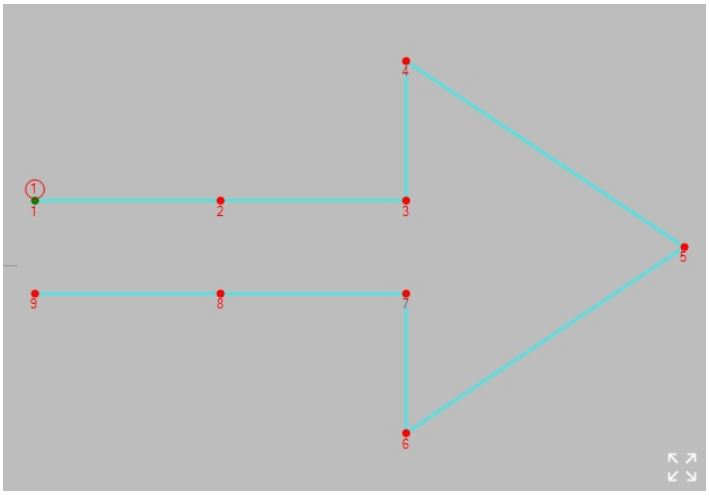
Perform the test



- Select **Start** to start the test.

The test results are shown in the **Diagram** area. See Diagram ► 94.

26.8 Custom patterns

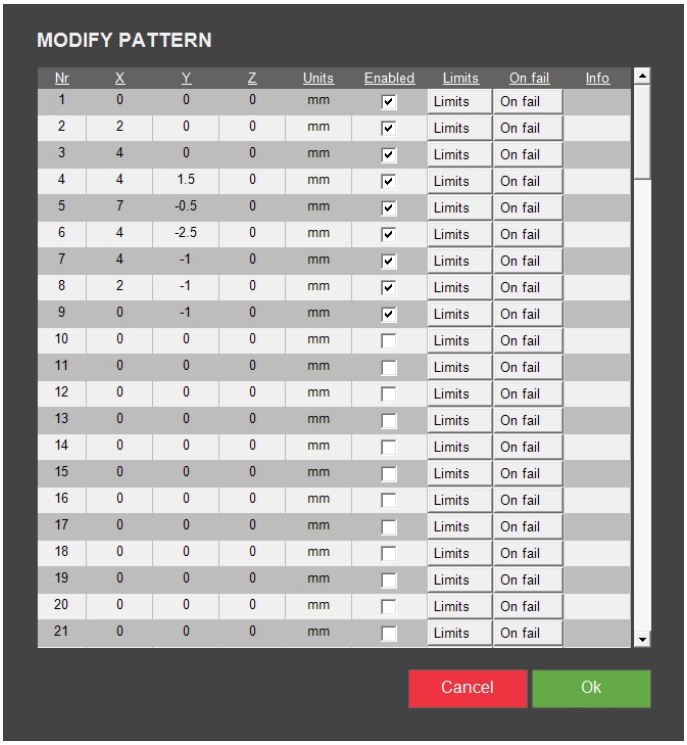


The test points in a **Custom pattern** must be placed one by one.

A newly created **Custom pattern** starts with a single test point at the current position.

Actions	
Add a new test point	Hold down Ctrl and click on the target location.
Add a test point between two existing points.	Hold down Ctrl and click on the line between two existing test points. The test points are renumbered.
Move a test point	Drag the test point.
Move the whole pattern	Hold down Shift and drag the pattern.
Remove a test point	Right-click a test point and click **Yes**.

Modify pattern



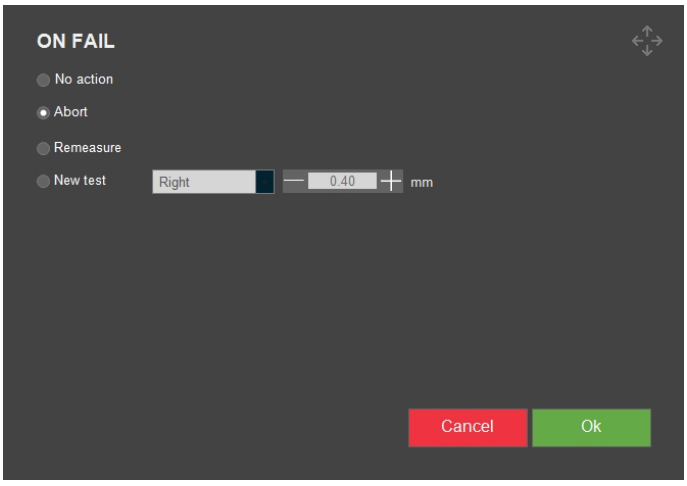
Use the **Modify pattern** to enter the coordinates manually:

1. Enter the coordinates for each individual test point.
2. Click the **Enabled** check box to either include or exclude each test point.

Limits

See Settings – test settings ► 67.

On fail



Use the **On fail** menu to determine the action to be taken in case the test fails.

Further settings

Mirror settings ► 129

Point settings ► 128

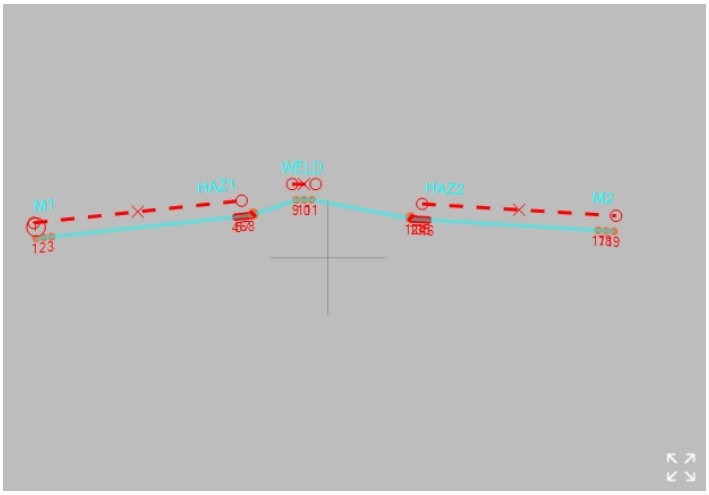
Perform the test



- Select **Start** to start the test.

The test results are shown in the **Diagram** area. See Diagram ► 94.

26.9 Welding patterns



The welding test pattern is designed according to the ISO 9015 standards:

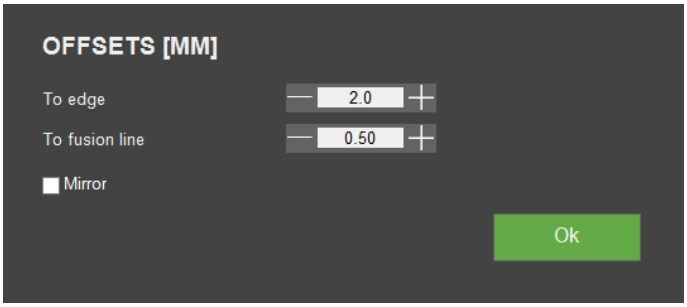
- ISO 9015-1: Hardness test on arc welded joints.
- ISO 9015-2: Micro-hardness testing on welded joints.

Prepare for testing

1. Create a job.See Jobs ► 95.

Note
We recommend that you select the lowest magnification available in order to clearly see the fusion lines and the Heat Affected Zone (HAZ) on the specimen.

Offset

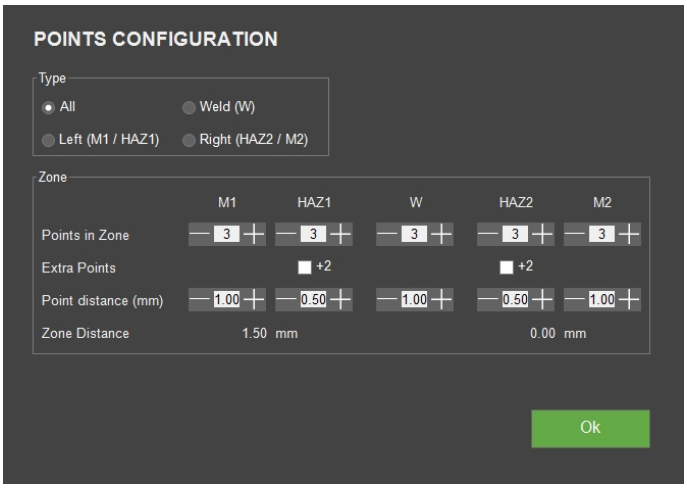


- Use the **Offsets** menu to set the edge and fusion line offsets.

The ISO standards define two maximum offsets for test points:

- 2 mm from the edge of the welded object.
- 0.5 mm from the fusion line.

Type



- Use the **Points configuration** menu to set the pattern **Type**.

Parameters	
All	Used for welds along a straight edge. In this case, the pattern stretches from side to side of the mother material, crossing both Heat Affected Zones (HAZ) and welding material.
Weld	Covers only the weld itself.
Left	Stops at the left Heat Affected Zone (HAZ).
Right	Stops at the right Heat Affected Zone (HAZ).

Note
Left, **Right** and **Weld** are subsets of **All**.
The test data entered for a zone is valid for all subsets. Selecting a subset only excludes one or more zones, the test data for the excluded zone(s) is preserved.

Position the pattern on the edge

1. Place the dashed red line on the edge of the welded object.

Hint
All test points of the welding test pattern have the same offset to this edge line.

2. Drag the end points of the edge line so that the edge line is right above the edge of the object.

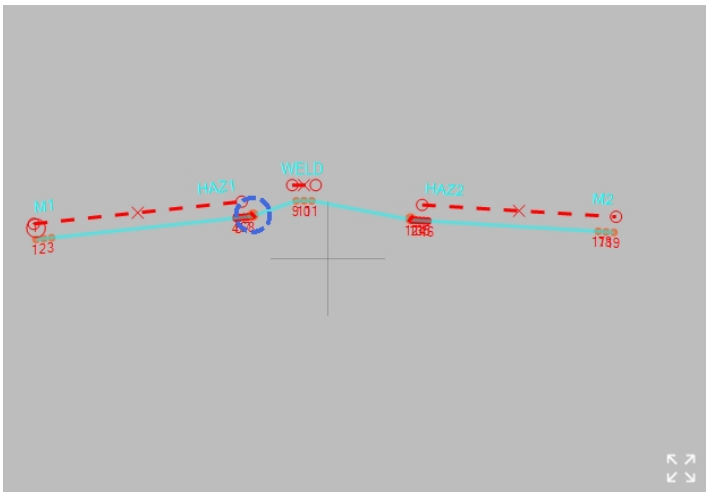
Number of points

To set the number of points in the test pattern and the distance between them:

1. Open the **Points configuration** menu.
2. Set the values in the **Zone** section.

Parameters	
M	Mother material
HAZ	Heat Affected Zone
W	Weld

Set the fusion line



A fusion point is highlighted as a dashed blue circle.

- Drag the fusion point onto the fusion line, keeping the solid red line parallel to the fusion line.

The distance between the fusion line and test points in the Heat Affected Zone must be less than 0.5 mm according to ISO 9015.

This fusion line offset is shown as a dashed red line, connecting the fusion point and the first test point in the heat affected zone.

Note
If there are 2 additional fusion points, then the three fusion points must have the same fusion line offset.

- Drag the additional points to the correct location, where the highlighted dashed circle is in contact with the fusion line.

Further settings

Starting position ► 127

Modify a pattern ► 130

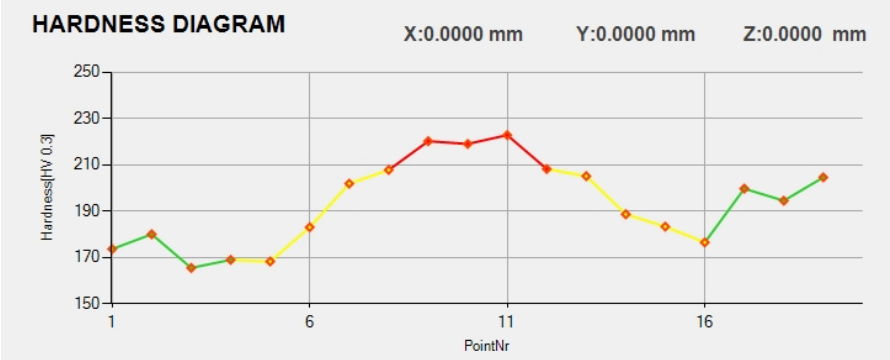
All patterns ► 131

Perform the test



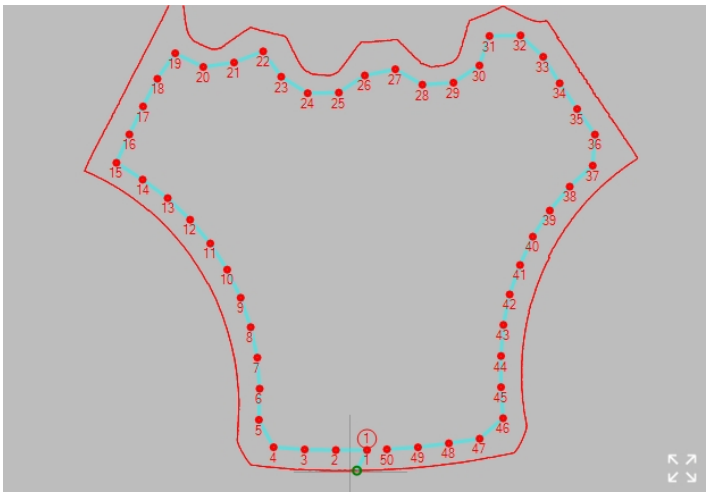
- Select **Start** to start the test.

The test results are shown in the **Diagram** area. See Diagram ► 94.



Green	Yellow	Red
Mother material	HAZ	Weld

26.10 Edge tests



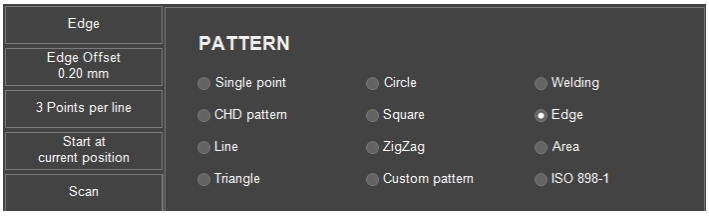
Use the **Edge** pattern to place equidistant test points along the edge of a sample.

Prepare for testing

1. Create a job. See Jobs ► 95.

Create the pattern

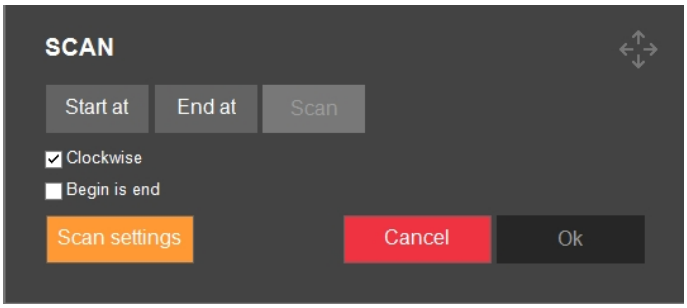
1. In the **Test tools** menu, select **Pattern** > **Edge**.



2. To adjust the distance to the edge for the pattern, select **Edge offset**.



3. To set the desired number of points, or the distance between the points, select **Points per line**.
4. To access the scanning dialog, select **Scan**.



Hint
Scanning functions best with low magnification objectives (2.5x, 5x, 10x).

5. To set the starting point for the scan, select **Start at**.
6. Click the edge of the specimen to define where the scan must start. To select the end point for the scan, select **End at**.
7. Click the edge of the specimen to define where the scan must end.
8. To scan the full circumference of the specimen, select **Begin is end**.
9. To start scanning the contour, select **Start**.
10. To accept the scan contour when the scan is finished, select **OK**.

    The scanned contour is shown in the **Pattern editor**.
11. If needed, adjust the **Edge offset** and **Points per line**.
12. To exit the pattern settings, select **Save** > **OK**.

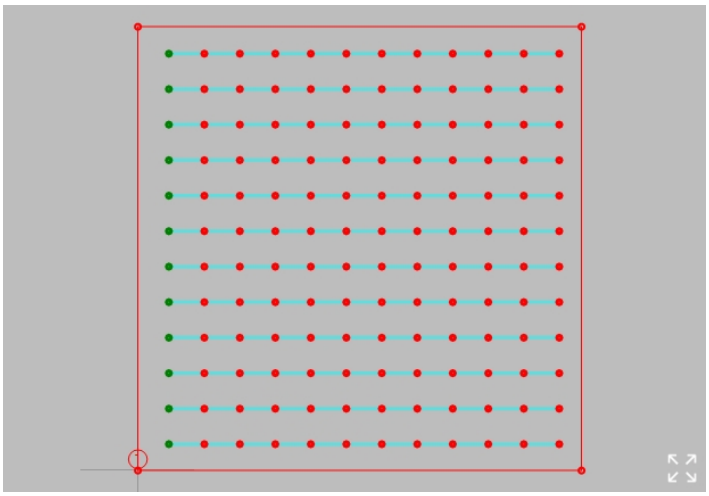
Perform the test



- Select **Start** to start the test.

The test results are shown in the **Diagram** area. See Diagram ► 94.

26.11 Area patterns



- Use this pattern if you need to cover an area of a specimen with a grid of test points.

The area pattern has a contour that is displayed as a number of red points connected by red lines. This grid is confined within the contour.

Prepare for testing

- Create a job. See Jobs ► 95.

Set the contour

Actions	
Add a new contour point	Hold down Ctrl and click on contour line.
Remove a contour point	Right-click a contour point and click **Yes**.
Move a contour point	Drag the contour point.
Move the whole pattern	Hold down Shift and drag the pattern.

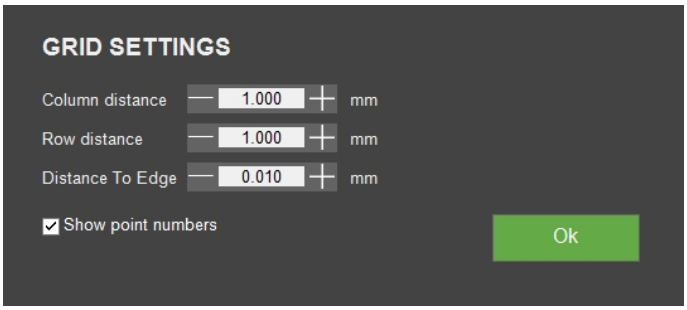
Hint
The contour rotates around the start point of the pattern.



The **Scanned contour** is only available if the whole edge of the sample has been scanned.

- Select this option to set the intersection of scanned and custom contour as the boundary for the test points.
- Modify the custom contour to cover the relevant area of the scanned contour.

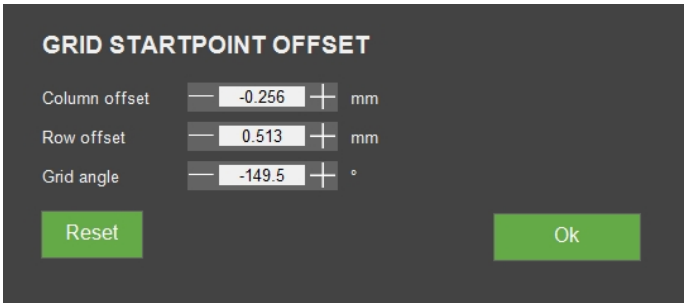
Set the grid



Note
The number of test points is unlimited. Too many test points will slow down the system.

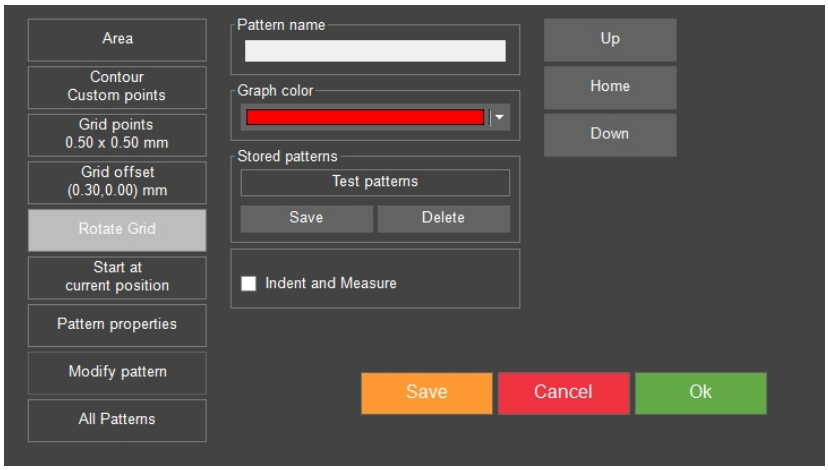
Usually the grid has to be aligned very accurately with a base line, for example an edge of the sample.

To adjust the orientation and offset of the grid:



- Use the **Grid startpoint offset** menu.

You can also:



1. Select **Rotate pattern** to change to **Rotate grid** mode.

   The button will start blinking.

2. Use the scrollbar to rotate the grid.

Further settings

Starting position ► 127

Modify a pattern ► 130

All patterns ► 131

Perform the test



- Select **Start** to start the test.

The test results are shown in the **Diagram** area. See Diagram ► 94.

26.12 ISO 898-1 patterns

This pattern is used to verify if the screw thread hardness of a specimen is in compliance with the requirements of ISO 898-1.

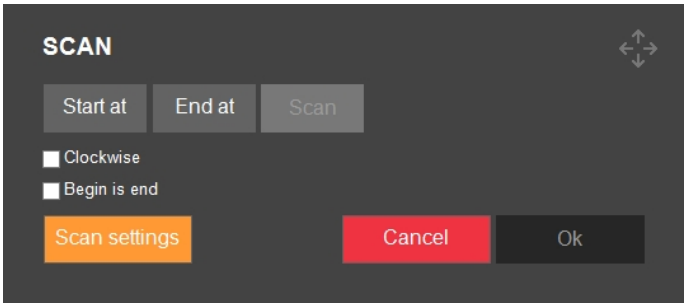
The carburization point is on the pitch line of the thread, adjacent to the thread on which determinations for decarburization and reference points are made.

The decarburization point is located at a certain distance from the reference point (the non-decarburized zone).



Hint
Refer to the ISO 898-1 standard for more information.

Scan the thread of the specimen



1. Select **Scan**.
2. Move the XY-stage to the location where you want to start scanning.
3. Select **Start at** and select a start position.
4. Do the same for the **End at** position or select **Begin is end** to scan the whole specimen.
5. Use **Clockwise** to choose the scan direction.
6. Select **Start**.

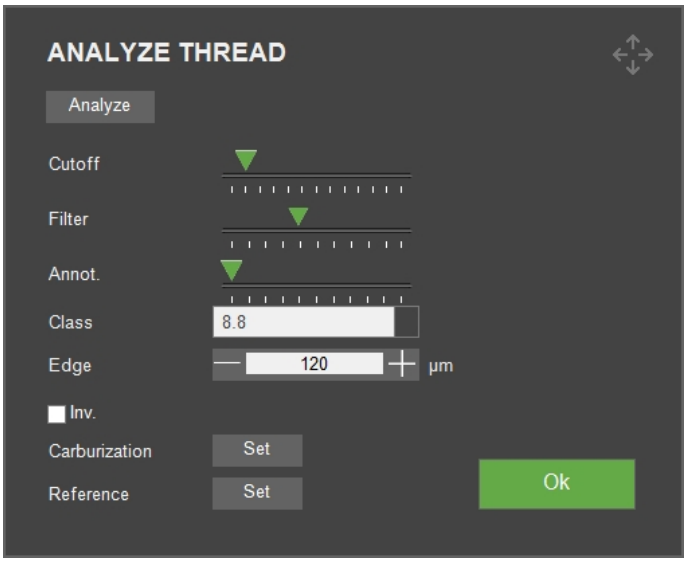
   The resulting scan is displayed in the pattern editor.

The color of the scanned contour changes from orange to red.

Hint
The **Start at** and **End at** positions are fixed during rotation, and do not invalidate the existing scan. **Start at** is the rotation pivot.

Note
For non-flat specimens it might be necessary to auto-focus during the edge scan.
For more scanning options, see Edge detection ► 36.

Analyze the thread



1. Set the material property **Class**, as defined in ISO 898-1.
2. Set the **Edge** value with the distance from the carburization point to the edge of the thread.

> **Note**
> The ISO 898-1 specifies an edge distance of 0.12 mm. This is the default value. The edge distance can be modified, but doing so voids compliance with ISO 898-1.

3. Select **Analyze** to start the analysis.

> **Hint**
> The test will pass if the hardness values of the carburization test point and decarburization test point are within a certain margin of the reference test point, according ISO 898-1.

> **Note**
> If the analysis fails:
> - Try to optimize the lighting level of the specimen and analyze it again.
> - Adjust the following parameters:
>   - **Annot.**:Review all steps of the algorithm.
>   - **Cutoff**: Adjust the detection level for a new thread.
>   - **Filter**: Adjust the determination level of the algorithm for main lines, sublines and nodes.

4. After the analysis, the reference point (hence the decarburization point) can be shifted to another thread with **Reference**. The carburization point can be shifted to another thread (tooth) with **Carburization**.
5. Select **OK** to accept the analysis and to include it in the test pattern.

Further settings

General pattern settings ► 125

All patterns ► 131

Perform the test



- Select **Start** to start the test.

The test results are shown in the **Diagram** area. See Diagram ► 94.

26.13 General pattern settings

Manage patterns

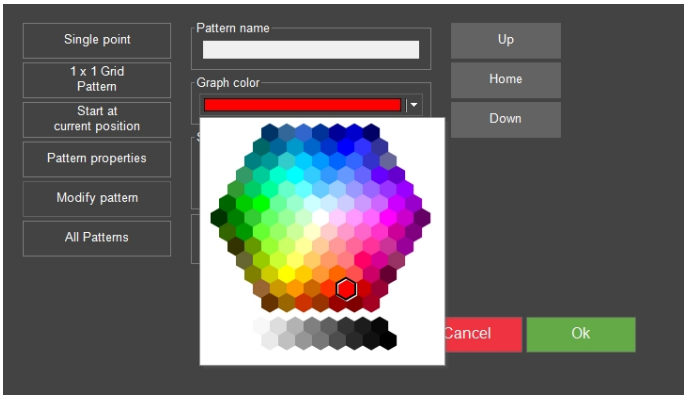


- To add another pattern, select **+**.
- To delete the selected description, select **-**.
- To create a copy of the selected pattern, select **C**.

Name a pattern

- Select the **Pattern name** field and enter the name of the pattern.

Choose a graph color

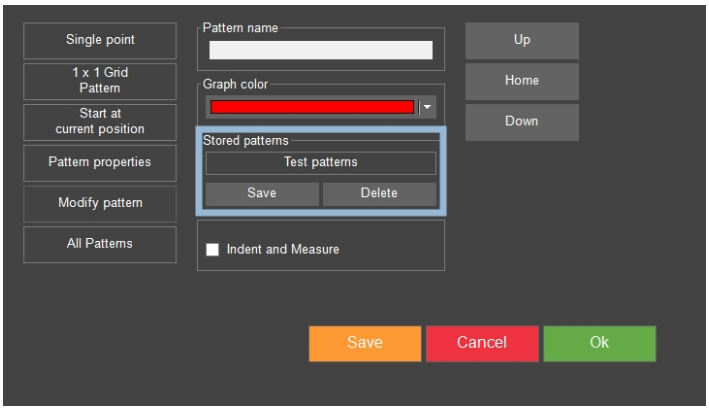


To set the color of the pattern in the hardness test:

1. Select **Graph color**.
2. Select a color.

Save a pattern

3. Highlight the pattern you want to save.

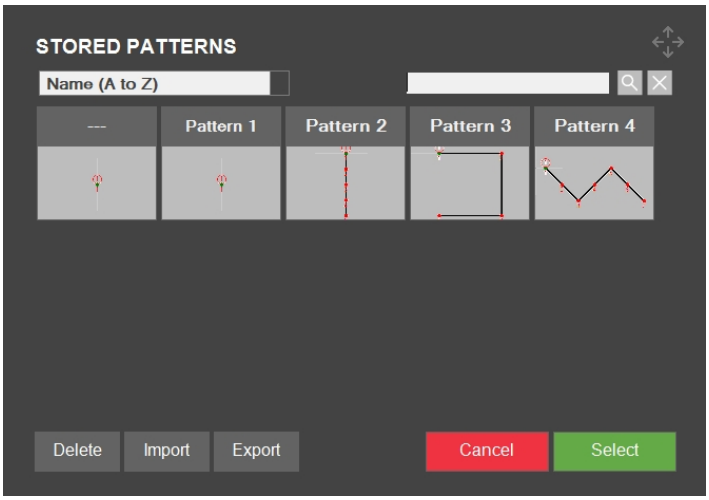


4. Select **Save** in the **Stored patterns** field.
5. Enter a name for the pattern.

Stored patterns

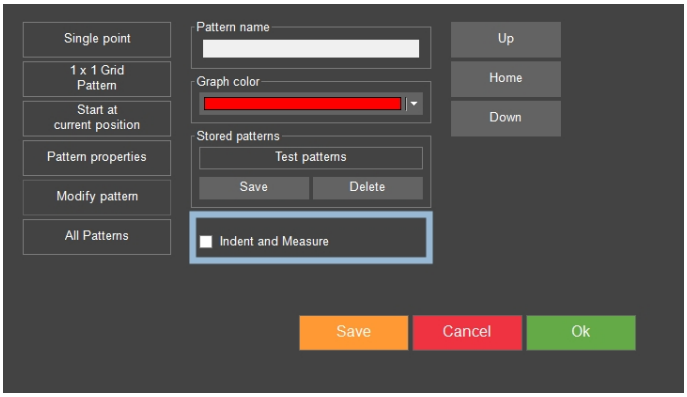
From the **Stored patterns** menu, you can load, delete, import, and export a pattern. To open the menu:

1. Select **Test patterns** in the **Stored patterns** field.



2. Select a pattern.

Indent and measure



- If the **Indent and Measure** check box is disabled, all indents are created, and subsequently measured.
- If the **Indent and Measure** check box is enabled, each indentation will be made and measured before proceeding to the next. This option slows down the process, since the machine switches between the objective and the indenter between each test point.

Rotate a pattern

You can rotate a pattern using the scroll bar on the left side of the **Pattern editor**.

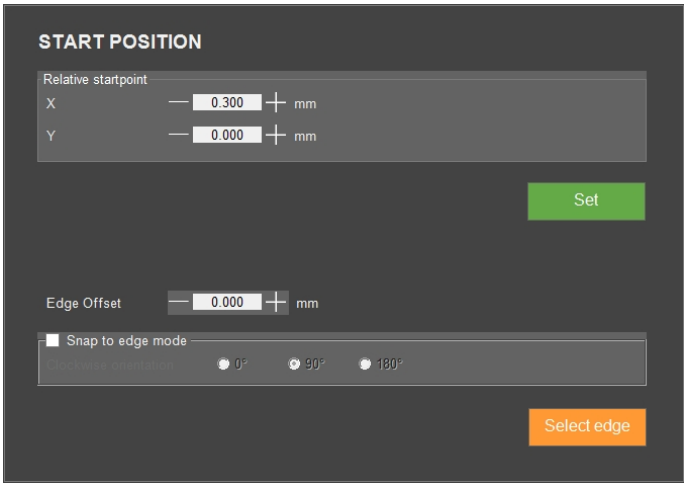
To obtain a specific rotation angle, enter the value directly in the field under the scroll bar.

26.13.1 Starting position

A pattern batch has a common start position, and each single pattern in the batch has a start position relative to the common start position.

Each test point in a single pattern has coordinates relative to the start position of the pattern.

To set the relative start position of the pattern:



1. In the **Pattern editor**, select **Start at current position**.
2. Set the values for **Relative startpoint**.

Hint
You can also to set the starting position by dragging it while holding down Shift.

Edge offset

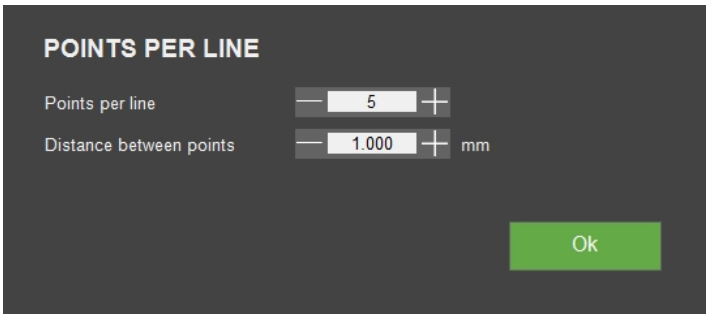
- Set the **Edge offset** value.

Snap to edge

- Select the **Snap to edge mode** box and choose the orientation relative to the edge.
- Select **Select edge**.
- Double click in the camera window near to the edge that is your desired starting point. Observe that the start point snaps to the border of your specimen and that the direction is aligned in the direction you selected.

26.13.2 Point settings

Use the **Points per line** option to set the number of points in a single line and the distance between the points.



Note
This menu is only available for predefined patterns.

26.13.3 Number of lines



Use the **Nr of lines** menu to set the number of lines in the pattern, and the distance between the lines.

26.13.4 Mirror settings

To change the mirror settings:

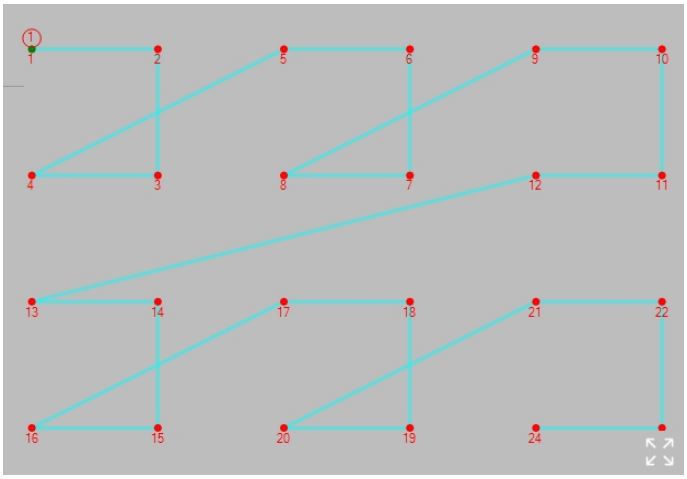
1. Select **Normal** to open the **Mirror** menu.



2. Choose an option:
   - **Mirrored Xaxis**: invert the X-axis of all test points.
   - **Mirrored Yaxis**: invert the Y-axis of all test points.
   - **Centre pattern**: move the center of gravity to the relative start position.

26.13.5 Grid settings

Use this function to group multiple specimens in a regular matrix:

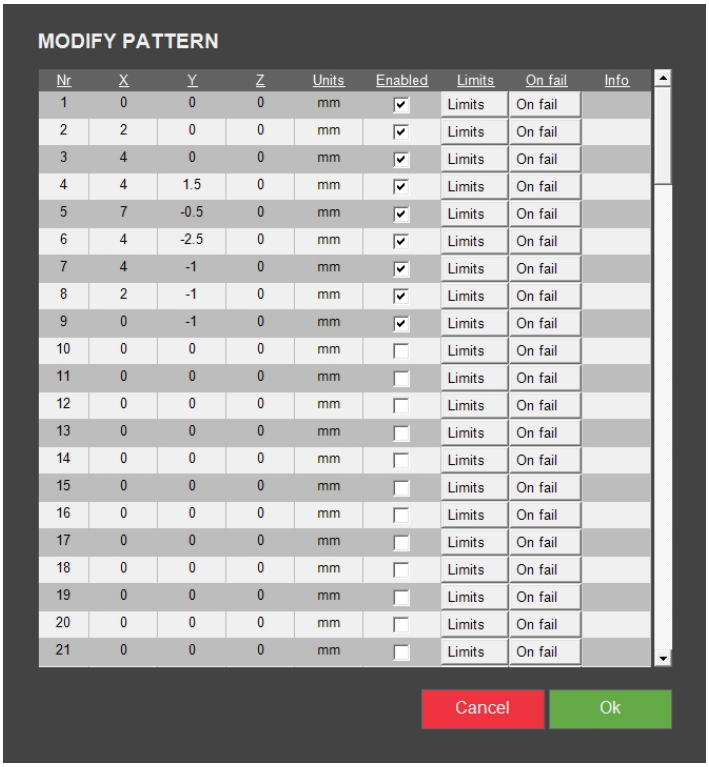


1. First set up the pattern for the first specimen in the assembly.
2. Select **Grid pattern**.



3. Choose your settings.

26.13.6 Modify a pattern



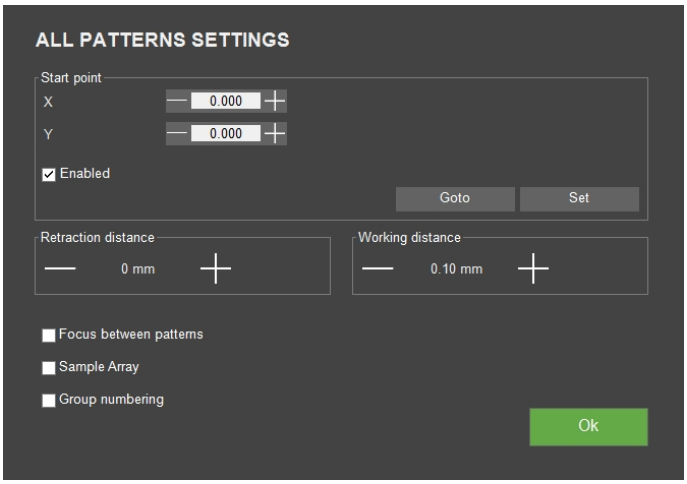
Use the **Modify pattern** to enter the coordinates manually:

1. Enter the coordinates for each individual test point.
2. Click the **Enabled** check box to either include or exclude each test point.

Limits

See Settings – test settings ► 67.

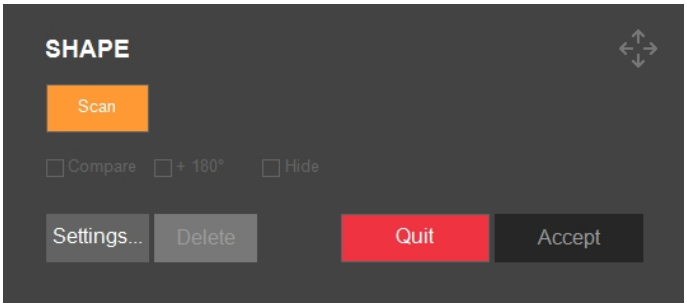
26.13.7 All patterns



1. Select **All patterns**.
2. To define the general properties and the shape of all patterns, select **Settings**.
3. Set the values for the following:

Parameters	
Start point	Set the start point of the pattern.
Retraction distance	See Test head retraction or Spindle retraction ► 29
Working distance	See Working distance ► 30.
Focus between patterns	Enable an initial (touch) autofocus between each pattern that is executed.
Sample array	Apply the pattern to an array of specimens and measure the mean hardness value.
Group numbering	Continue numbering the test points in the collection, instead of starting from 1 for individual patterns.

Shape



Parameters	
Compare	Preview the final result.
+ 180°	Rotate the final result.
Hide	Hide the shape display.

To define the shape of all patterns:

1. Select **Shape**.
2. Move the XY-stage to a position where part of the contour is visible.
3. Select **Scan**.

The scanned contour is displayed in orange.

If the scan fails:

1. Select **Quit**.
2. Make sure that the specimen is well lit.
3. Make sure that the specimen is light gray on a black background, on the objective camera view.
4. Scan the specimen.

Note
If there was already a shape for this pattern batch, this shape will be replaced by the scanned version and all patterns of the collection will be relocated to the new location.

Scan

See Edge detection ► 36.

26.14 Fracture toughness tests

A fracture toughness test is a manually executed test of brittle material. A fracture toughness test always consists of single measurements.

Kc measurement

A Kc measurement is a manually executed procedure.

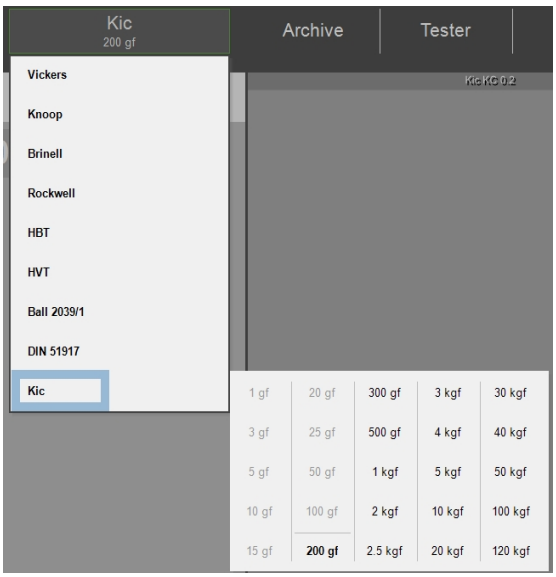
1. Select Kc scale.
2. Indent the brittle material.
3. Measure the (Vickers) indentation, and select **Accept**.
4. Position the cross-lines on the end of the cracks, and select **OK**.

Prepare for testing

- Create a job. See Jobs ► 95.

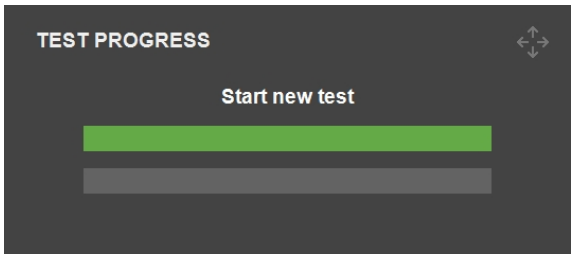
26.14.1 Perform the test

1. In the **Test method bar**, select **Kic**.

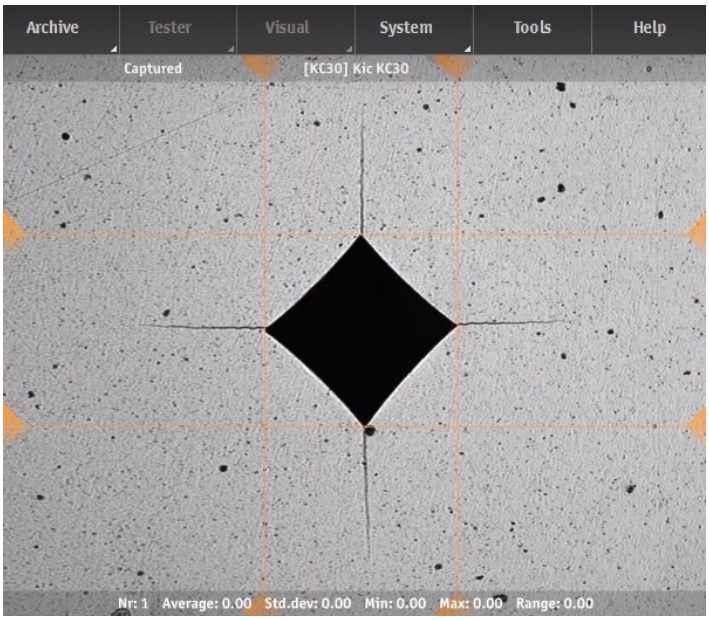


2. On the **Control panel**, select an objective with the turret controls, and focus on the surface of the specimen.
3. Select **Start** to start the test.

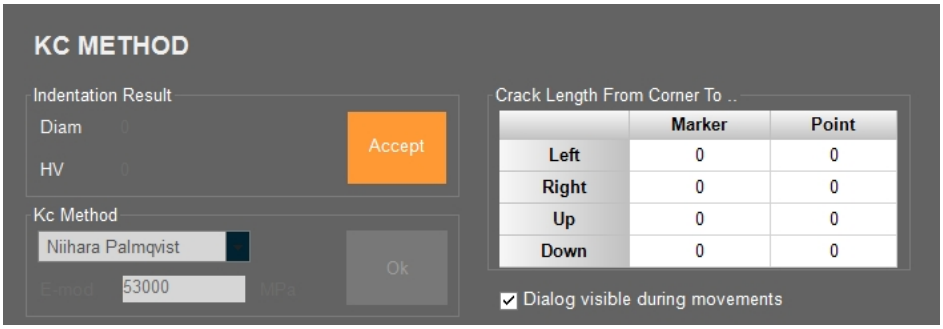




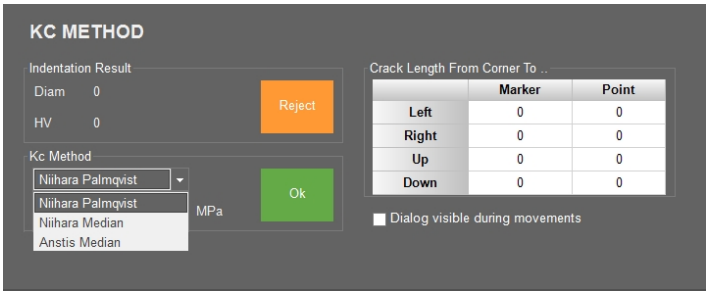
4. Make sure that there are visible cracks on all four corners of the indentation.



5. To accept the results, select **Accept**.

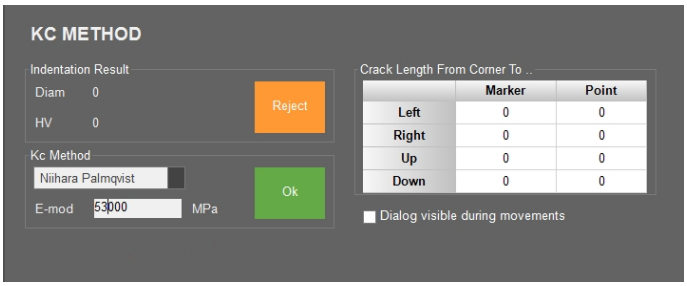


a. If the fracture follows the Palmqvist model, choose the **Niihara Palmqvist** method. Do not select this if the **Median** crack model is used.

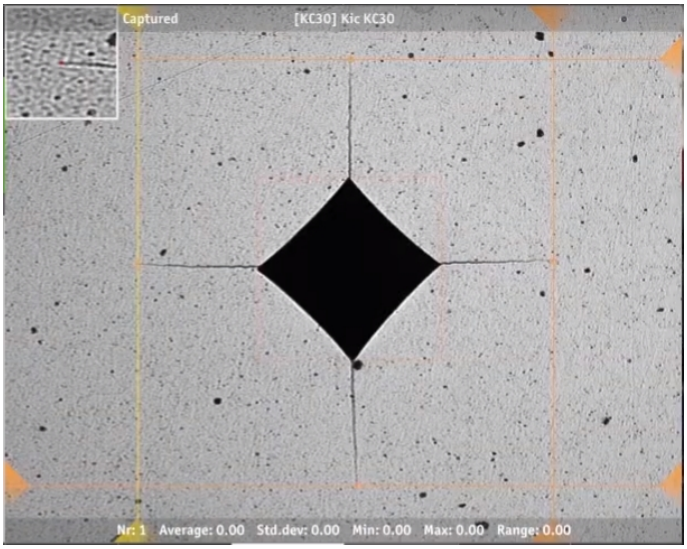


b. Enter the Young modulus **E-mod** of the material in MPa.

c. Select **OK** to start the crack length measurement.



6. Four markers appear in the Objective view.



7. Position the red dots of the cross-lines on the end points of the cracks. This is best done by dragging the dots with the mouse along the cracks while looking at the zoom window in the upper left corner of the screen. The results are refreshed when you release the left mouse button.
8. To generate the fracture toughness result (expressed in MPa/m²), select **OK**.

26.15 View the results

1. In the **Test method** area, select **Results**.
2. Click once on each result to see a captured image of each indent.
3. Hover with the cursor over each corner of the indent to make sure that all corners have been detected correctly.
4. If a corner has not been detected correctly, click on it and manually reposition the measuring line. You can use the magnified view in the upper left corner to precisely place the measuring line.
5. To save the results, click **Save**.
6. In the **Test method** area, see the results.
   - Click a result to see the captured image.
   - Double-click a results to see a live view of the selected measurement.

Hint
Use the left and right arrow keys on the keyboard to toggle from one indent to the next (live view only).

7. Save the test results: In the **Top menu bar**, select **Archive** > **Save**.

26.16 Report test results

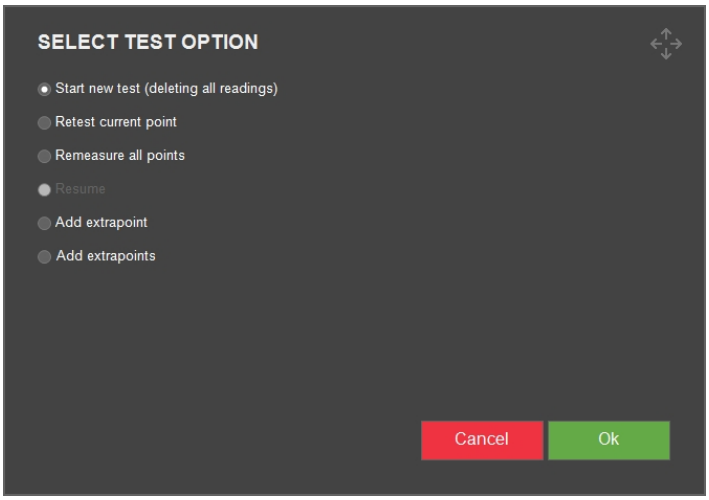
The test results can be included in a report, see Report ► 60.

In short:

1. To include snapshots in the report, select **Report** > **Snapshots**.
2. To print the report, select **Report** > **Print**.
3. To customize report templates, select **Report** > **Template Editor**.
4. To export measurement results into CSV-format, select **Report** > **Export**.

26.17 Reindenting a point in a pattern

1. Select the point in the results list and double-click it to move to the point.
2. Make sure that the specimen is in focus.
3. Move to the position where you wish to place the new indent.
4. To open the **Select test option** menu, select **Start**.



5. Select **Retest current point**.
6. To start the measurement, select **OK**.

26.18 Work with multiple specimens

If you work with multiple specimens, for instance if you are using a multiple-position specimen holder, Struers recommends that you create a job for each specimen.

Prepare for testing

1. Create a job for each specimen. See Jobs ► 95.
2. Enable the check boxes for the jobs in the order in which they should be executed.



Hint
In the **Top menu**, select **Visual** < **Autofocus**. Select an objective to use for autofocus between execution of the jobs.
If the specimens are not in the same focus plane, select a lower magnification objective to increase the autofocus search range.

27 DuraSoft-Met – metallurgy software

Description and function

Some machines in the Dura series come with the software module DuraSoft-Met.

The dimensions that DuraSoft-Met adds to hardness testing of products are:

Method	Norms	Description
Volume fraction	ISO 9042	Point counting method for statistically estimating the volume fraction
	ASTM E562	Standard test method for determining volume fraction by systematic manual point count
Coating thickness	DIN EN ISO 1463	Measurement of coating thickness
Grain size	DIN EN ISO 643	Micrographic determination of the apparent grain size
	ASTM E112	Standard test methods for determining average grain size

Benefits of DuraSoft-Met

- Automatic contouring
- Measure both hardness of substrate and thickness of layers, grain size or phases
- Wide range of measurable coatings
- The results are comparable with standard module microscope

Safety

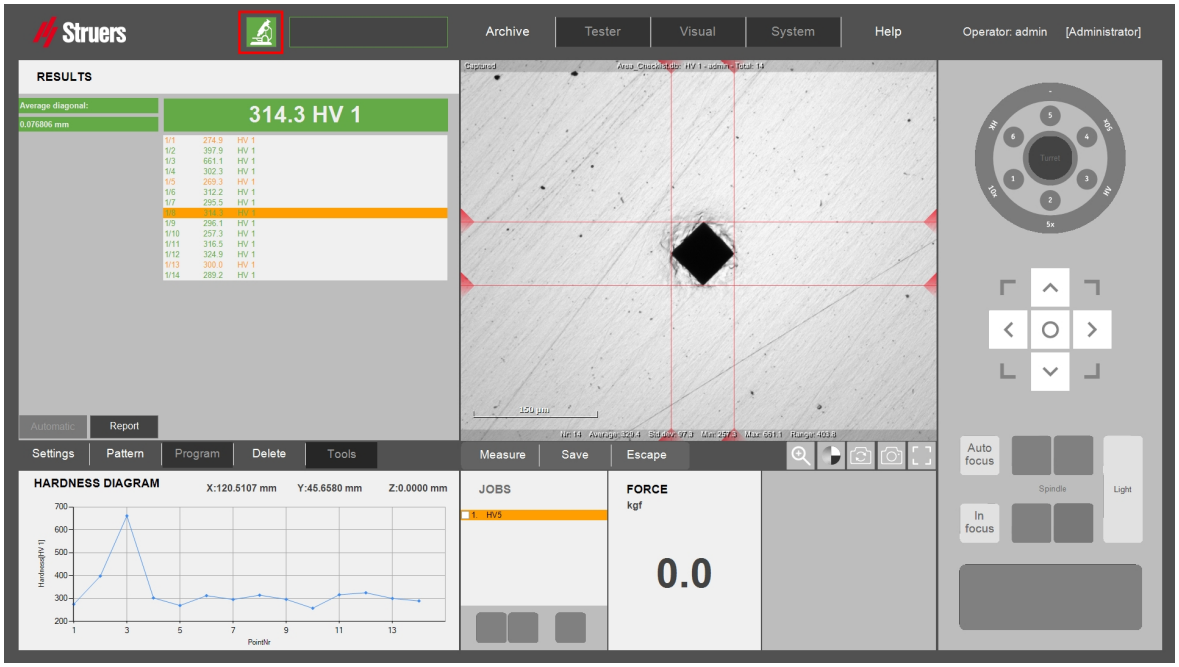
When you access the DuraSoft-Met software ...

- all controls to motorized parts (head, spindle, turret, XY stage) are disabled.
- you exit DuraSoft, and only the emergency control is still available.

27.1 Start and exit the software

Open DuraSoft-Met

1. Locate the DuraSoft-Met icon in the **Test method** area.



2. Select the DuraSoft-Met icon to open the application.



3. DuraSoft-Met opens and you are ready for testing.

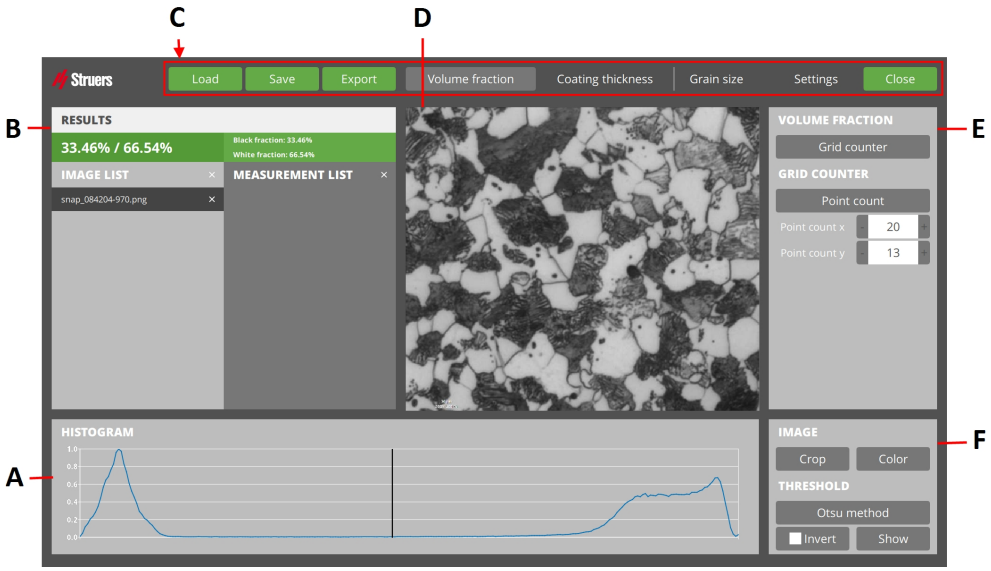
Exit DuraSoft-Met

- To return to DuraSoft, select **Close** in the upper right corner.



Note
All measurement of all images are exported automatically.

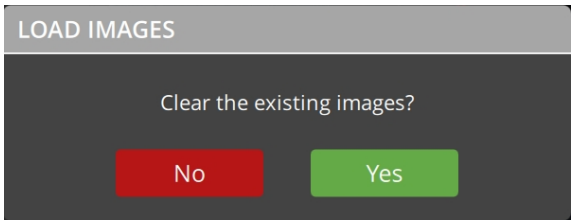
27.2 Display overview of DuraSoft-Met



A	**Chart**	**D**	**Main view**
B	**Test information**	**E**	**Method selection and settings**
C	**Top menu**	**F**	**Image**

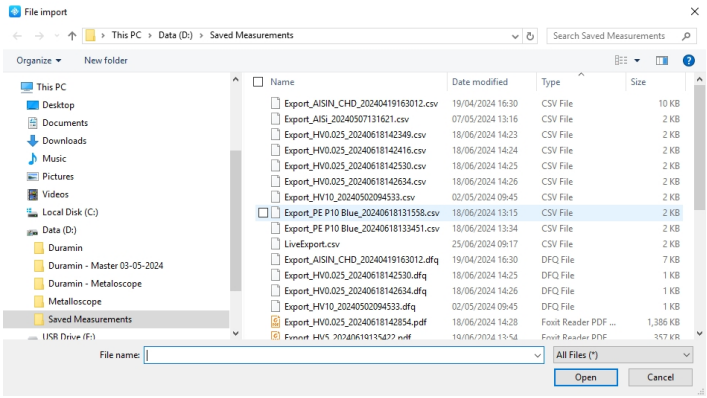
27.3 Load image

1. Press **Load** to select images.
2. If some images are already available, answer the message **Clear the existing images?** with **No** or **Yes**.

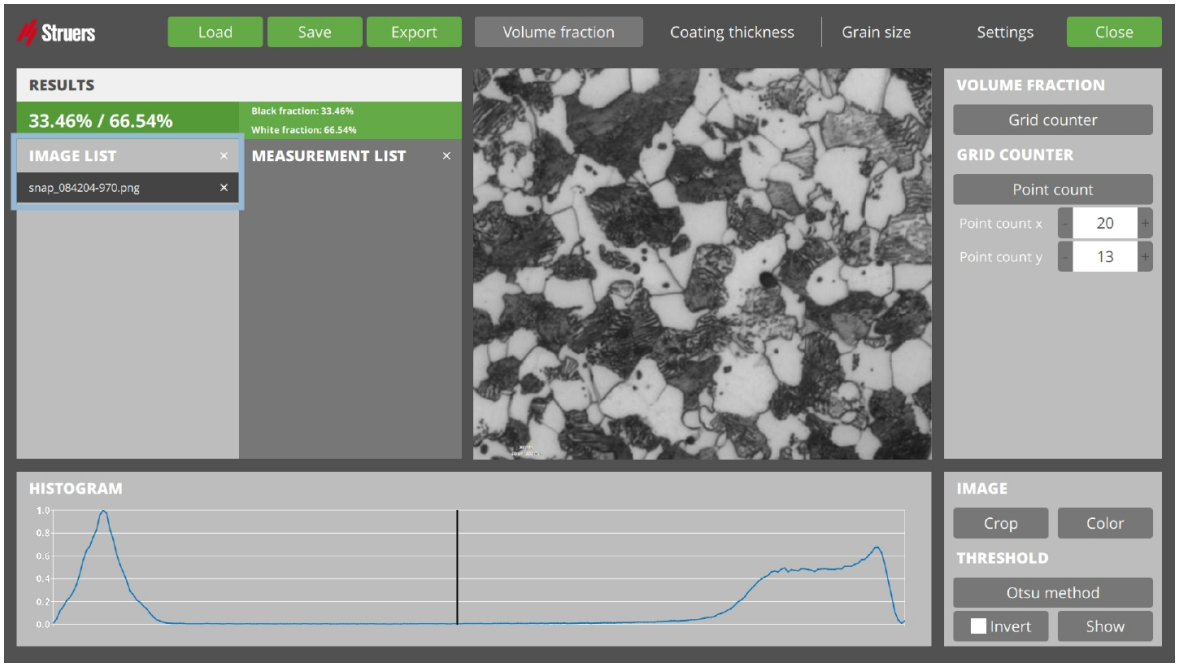


Note
If you clear the existing images, you also delete their measurements.

3. Next, a browser opens in the directory you last opened. You can change the directory if needed.



4. Select one or more files.
5. Select **Open**.
6. The selected image files are added to the **Image list**.



7. The last image in the list is selected and shown in the **Main view**.

Load images from a DuraSoft archive

1. In DuraSoft, select an archive via the **.tar** file.
2. Then load an image in DuraSoft-Met.

Load images and mesurements from a DuraSoft-Met archive

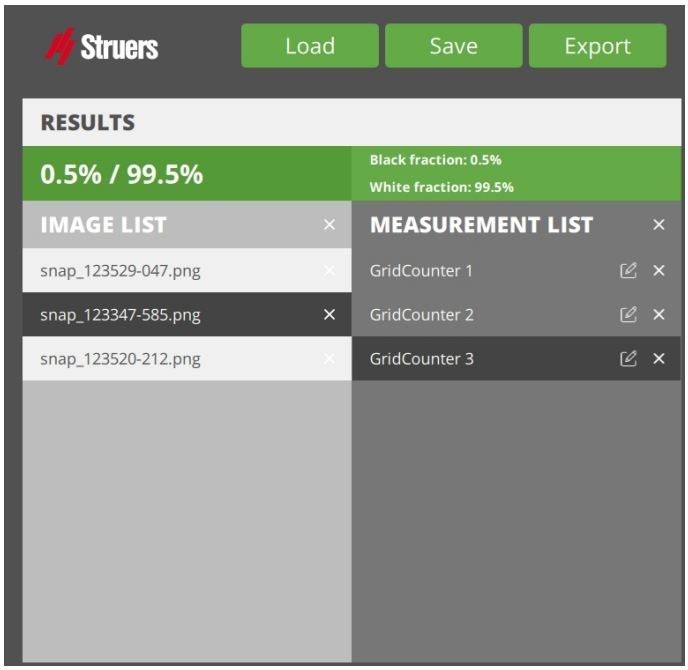
You can load exported images, including their measurements.

- To get all measurements and their images into the lists, select **Load**.

Hint
When a measurement name exists in the archive, you get errors.
1. **No data was imported**
2. **Measurement name is already being used**.

27.4 Save

- To add the calculated method values of the active image to **Measurement list**, select **Save**.



Hint
If no images are available or loaded, you cannot save any measurements, and you get the error **No images loaded!**.

27.5 Export

1. To save all measurements from all images in **Image list**, including their images, in one external archive file, select **Export**.

Hint
If **Measurement list** is empty, you get the error **No measurements saved**.

2. If there is at least one measurement in the list, browse to the desired export location.
3. Enter a name, with or without the extension “tar”, and press **Save**. The default file extension is “tar”.

Note
Images without measurements are not exported.

Note
When you start DuraSoft-Met from DuraSoft, an export is done automatically when you select **Close** in DuraSoft-Met.

Note
When you have exported a file, you can later load it back to DuraSoft-Met (with **Load**).

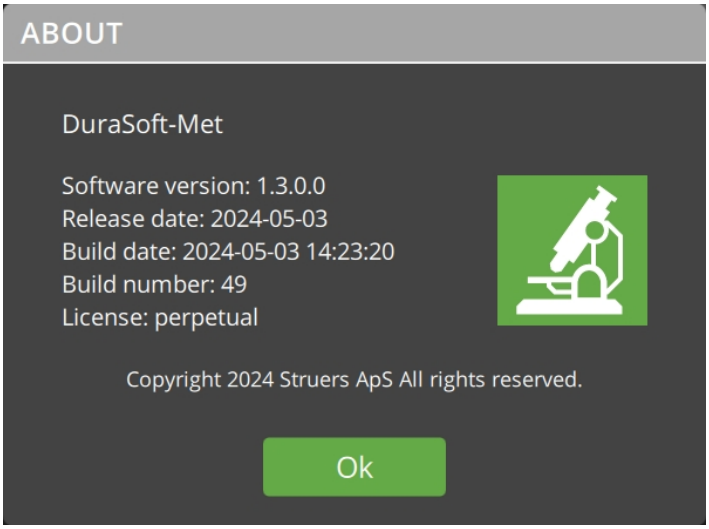
27.6 Settings

Settings unfolds to the following menu:

– **About**
– **Colors**
– **Decimals**
– **Pix per mm**

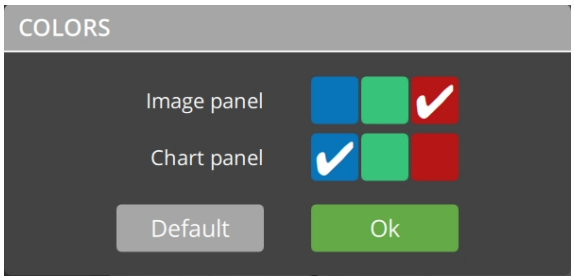
27.6.1 About

- Select **About** to see the information of the application version and license.



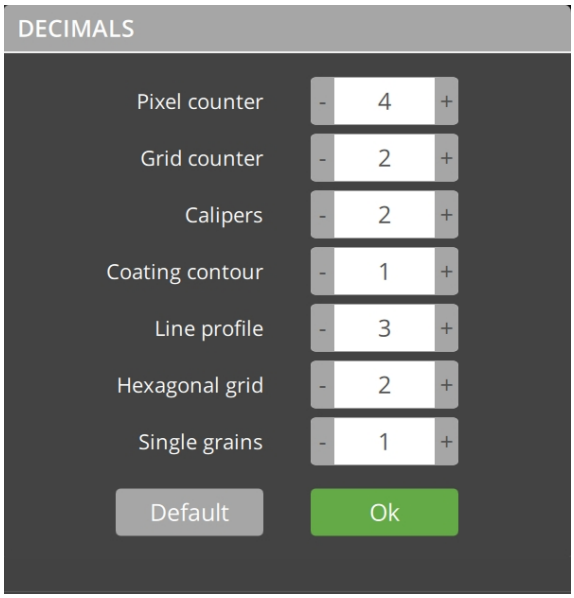
27.6.2 Colors

- Select **Colors** to:
  – set the colors of measurement overlays in the **Main view**. You do this in **Image panel**
  – set the color of the data line in **Chart panel**.



27.6.3 Decimals

- Select **Decimals** to set the amount of decimals when you save a measurement.



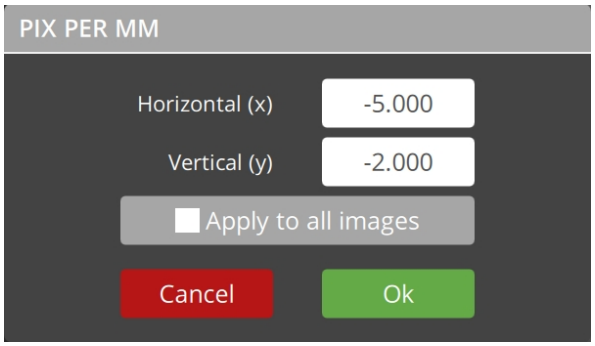
Note
When a measurement is already saved, you can only change the number of decimals by saving the measurement as another item in the measurement list.

27.6.4 Pix per mm

Note
When you transfer an image from DuraSoft, it already as a resolution.

1. Select **Pix per mm** to set or change the pixel per milimeter resolution of the active image in the **Main view**.

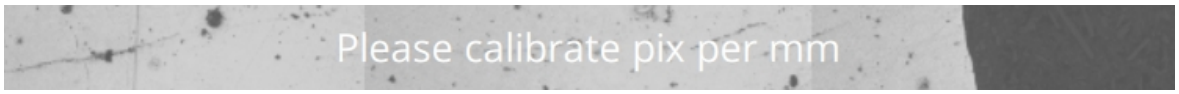
   A value of -1 indicates that no resolution is set.



2. Select **Apply to all images** to set the pixels per mm only for the currently listed images (but not including images that you load in the future).

If the chosen method needs pixel size data:

1. A text overlay with the text **Please calibrate pix per mm** appears in the **Main view**.



2. Fix the issue in 1 of 2 ways:
   – Click on the text message to open the dialog **Pix per mm** and fix the issue, or
   – Click on the text, or go to **Settings** and **Pix per mm**.

27.7 Close

- In the **Top menu**, select **Close** to return to DuraSoft.

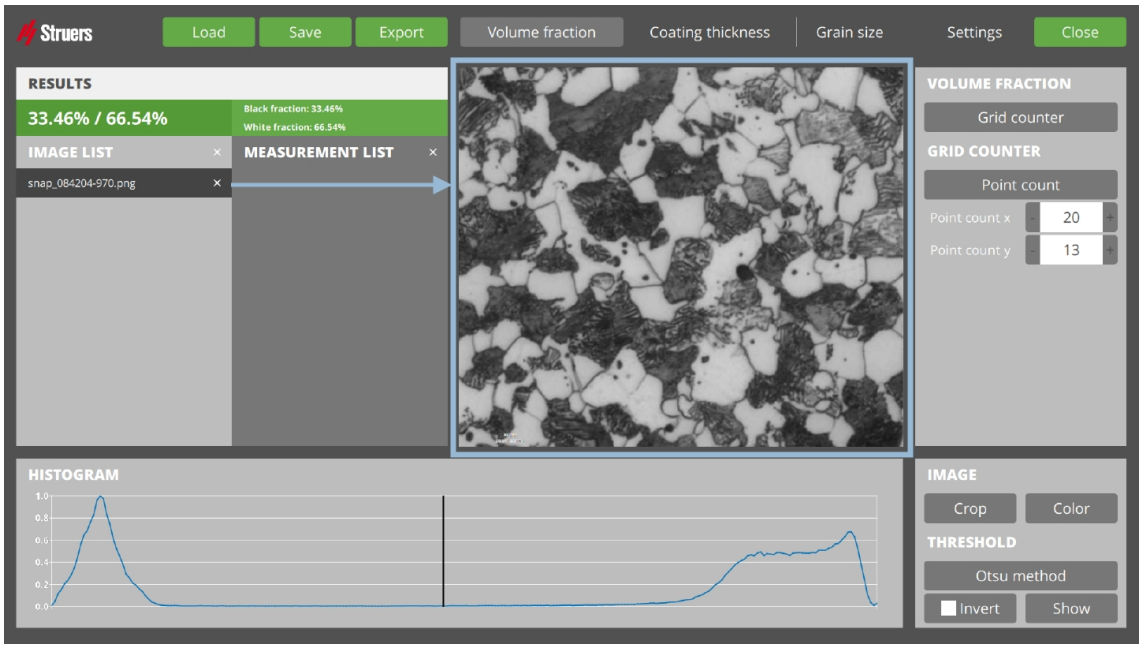
  All measurements are automatically exported to DuraSoft.



Note
If you started DuraSoft-Met standalone, this button is instead **Exit** and makes you return to Windows.

27.8 The Main view

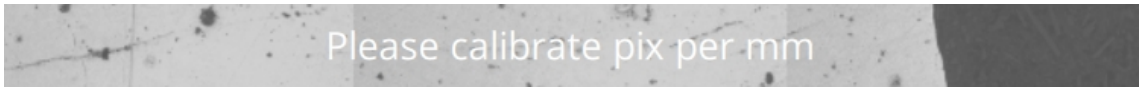
In the **Main view** you see the image you select in the **Image list**.



Overlay

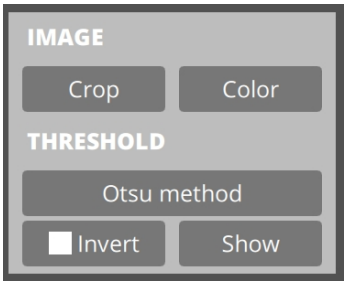
The image can have an overlay:

- Overlay lines/points depend on the measurement method you choose
- If the image has no resolution set, you will see the text **Please calibrate pix per mm**. See more about **Pix per mm** in Settings ► 142.



Adjustment in Image

You can adjust the image view in **Image** via **Crop**, **Color** or **Show**. See Image ► 159.



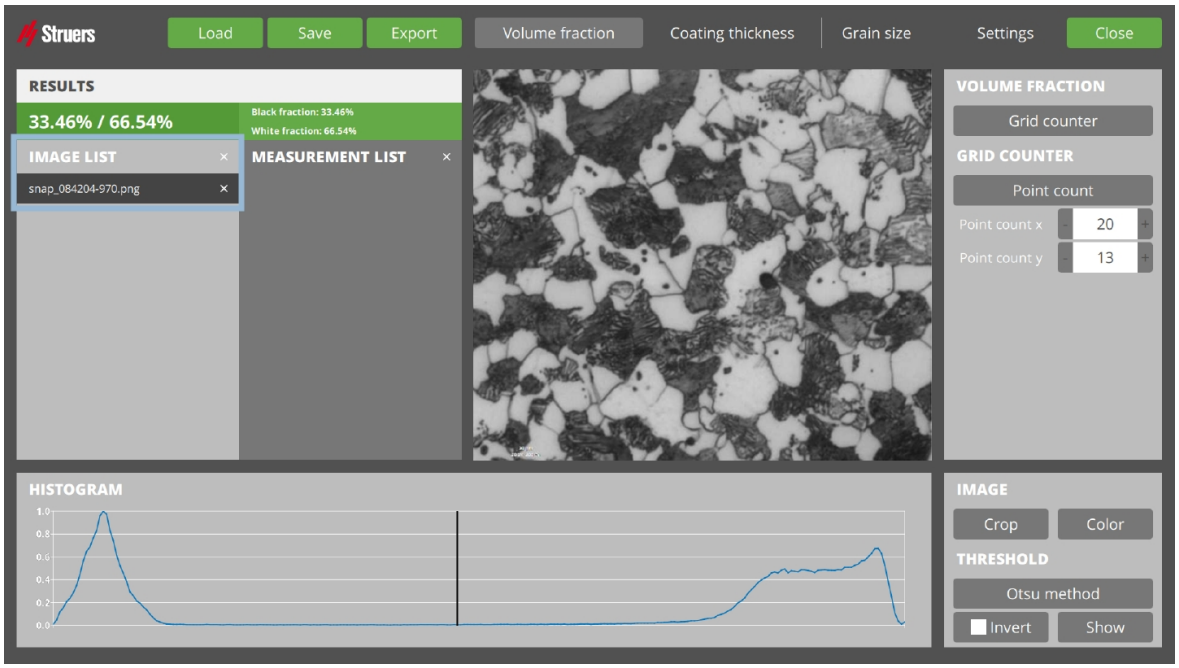
27.9 Test information

27.9.1 Results

In **Results** you see the actual measurements based on the active method and settings.

27.9.2 Image list

In **Image list** you see a list of all loaded images.

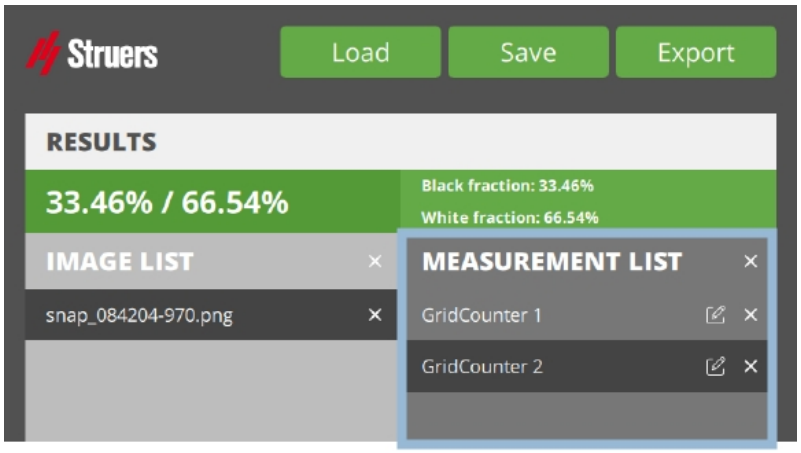


The entry that is selected is visible in the **Main view**.

- You can load images manually, or they are automatically imported from the list of captured images when DuraSoft-Met is started from DuraSoft.
- To delete one image from the list, select the cross-symbol next to the image name. When you do this, you also delete the measurements of the image.

27.9.3 Measurement list

In **Measurement list** you see all saved measurements of the image selected in the **Image list**.



When you select a measurement, you see the related view in the **Main view** and the test results in **Results**.

Note
If you change the method or a setting, the change is applied in real time in the **Main view** and in **Results**, but not saved automatically. This causes a difference between the selected (saved) measurement and the visible measurement.

Change the name of a measurement

The name of a measurement is used in a report or an export. You can customize this to avoid duplicate name issues.



1. Select the edit symbol.
2. A keyboard pops up.
3. Change the name and select the arrow icon **Enter**.

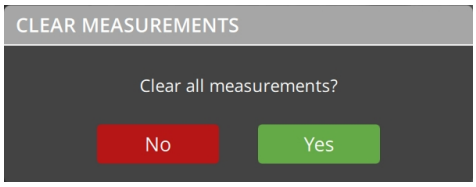
Delete a measurement

- To delete a measurement permanently, select the cross symbol next to the measurement name.

Delete all measurements



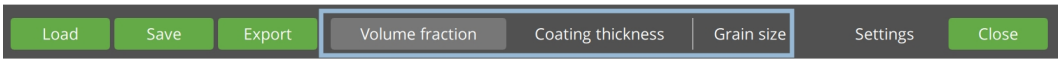
1. To delete all measurements of the active image permanently, select the cross symbol next to the headline **Measurement list** (see above).



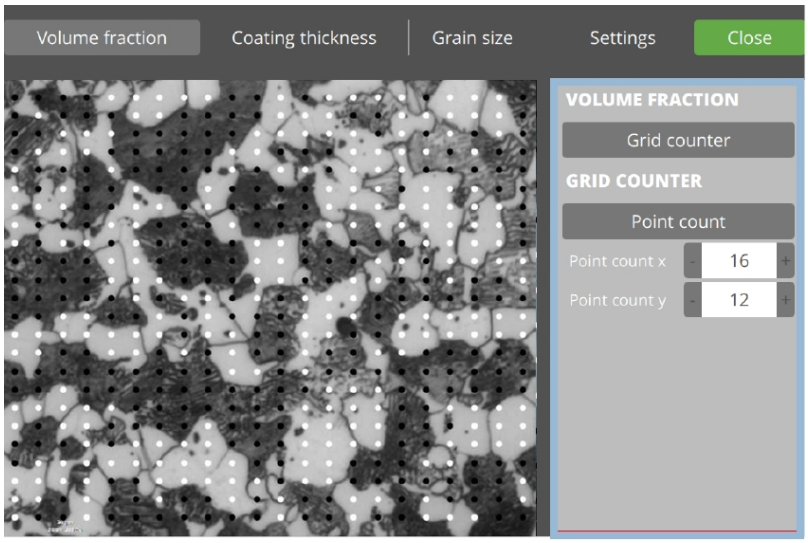
2. Confirm (**Yes**) or cancel (**No**) in the message **Clear measurements**.

27.10 Method selection and settings

1. In the **Top menu** from the **Methods group**, select the method you wish to use, i.e. **Volume fraction**, **Coating thickness** or **Grain size**.



2. You then do further selections for the methods in **Method selection and settings**.

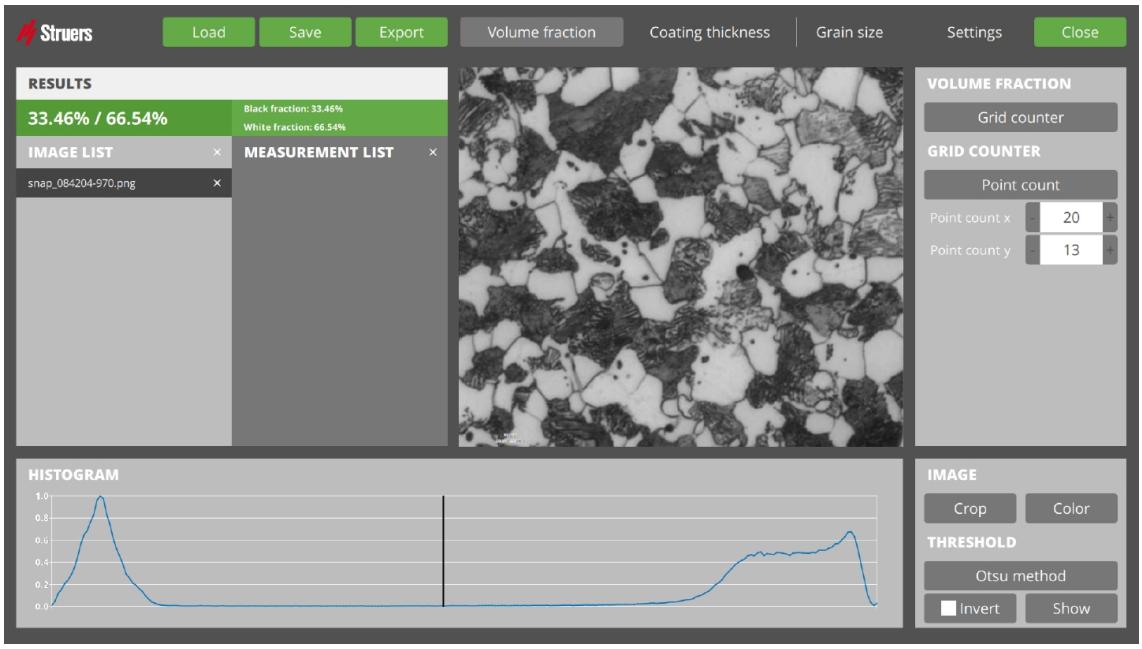


Each method has different method settings that are stored in the measurement once set.

27.10.1 Volume fraction

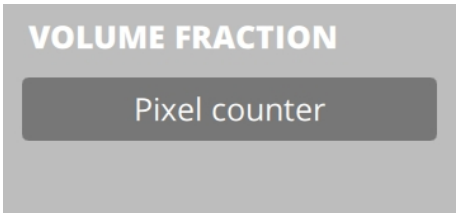
With this method, you can calculate the fraction of 2 phases in a specimen.

1. Select the image you wish to inspect from the **Image list**.



2. In the **Top menu**, select **Volume fraction**
3. In **Method selection and settings**, select either **Grid counter** or **Pixel counter**.

Pixel counter



This choice is for volume fraction calculation based on a histogram-guided image thresholding.

This offers 2 automatic thresholding algorithms (**Otsu method** and **Triangle method**) in addition to manual (and **Band Pass**) thresholding.

1. Select **Pixel counter**.
2. Select and hold **Show** to see the result of the count (**Black fraction** and **White fraction**) in the **Main view**.
3. In **Chart** you see the image information:
   – Horizontal axis: color intensity from dark to light
   – Vertical axis: (normalized) count

The vertical line(s): threshold(s) used for measurement.

4. In **Threshold**, set the point where black differs from white.
5. Invert the logic of the threshold in **Invert**.
6.

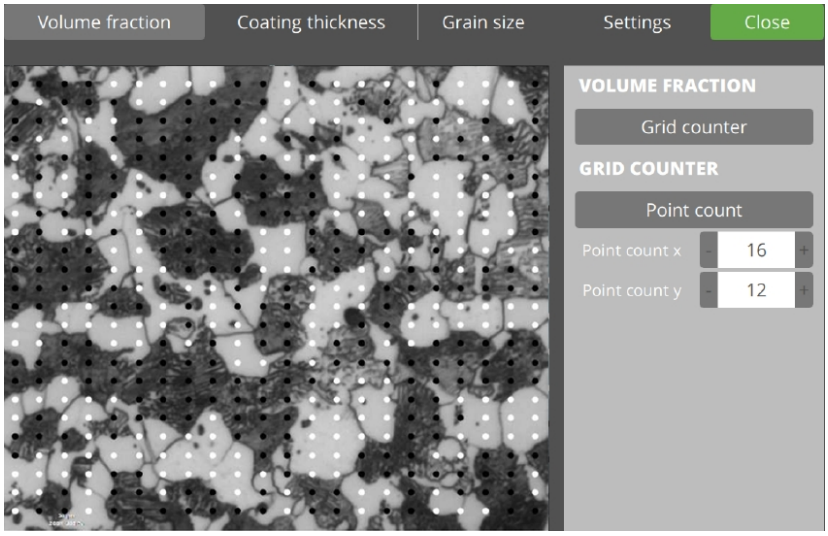
In **Results** you see the calculated value of the **Black fraction** and the **White fraction**. This is based on:

- your selected filters in **Color**
- your choice of **Threshold** type
- the placement of the threshold(s) in the **Chart**.

7. Save the measurement.

Grid counter

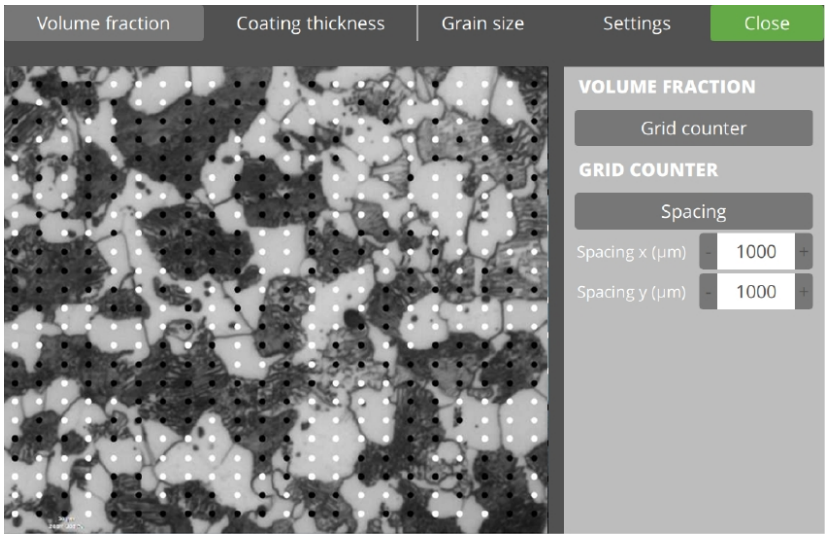
This choice is for volume fraction calculation using a superimposed grid.



Each grid point can be assigned to the black material or white material.

Initial values (black or white) are assigned automatically, but can be toggled manually by the user. Grid positions are calculated by defining the number of grid points or the grid spacing.

1. Select **Grid counter**.
2. Select **Point count** or **Spacing**.



3. For points placement based on distribution in X and Y, select **Point count**.
4. For points placements based on distance in µm, select **Spacing**.
5. Set the required amount of points in X and Y direction on the image.

> **Note**
> If you toggle between **Spacing** and **Point count**, this can change the X and Y values.

6.

In **Results** you see the calculated value of the **Black fraction** and the **White fraction**. This is based on:

- your selected filters in **Color**
- your choice of **Threshold** type
- the placement of the threshold(s) in the **Chart**.

7. Set the **Grid points**. Points are placed in the **main view** based on the method you choose and its set values.

   The color (black/white) of the points visualizes the automatic measurement of each point.

8. Save the image.

27.10.2 Coating thickness

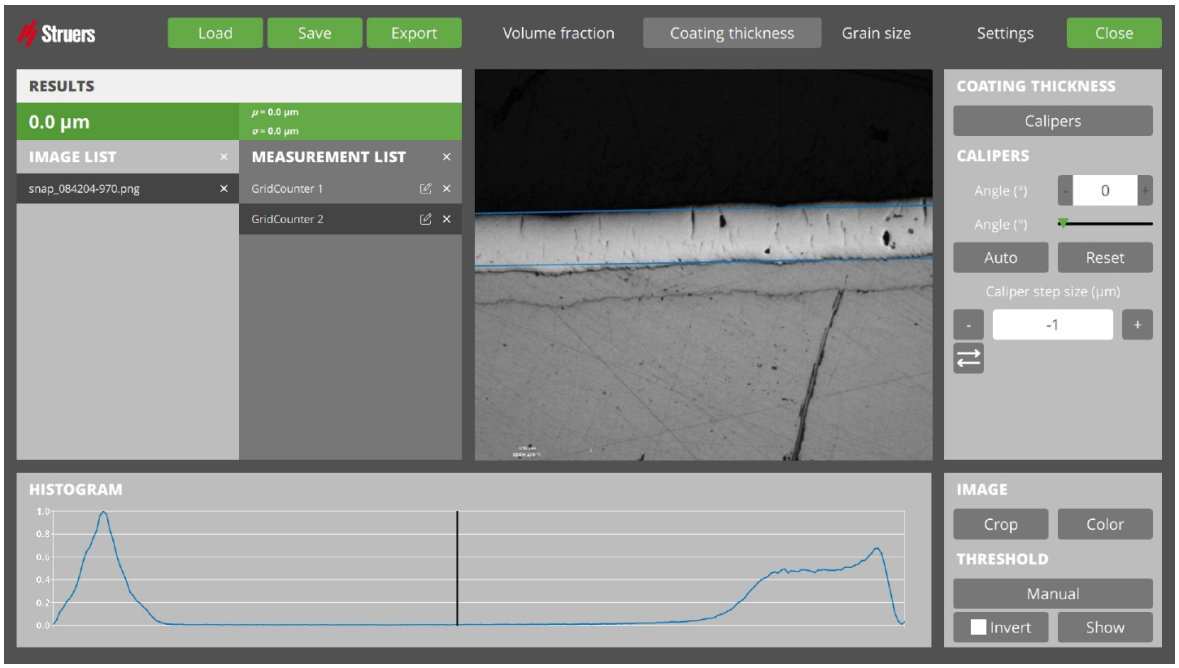
With this method, you can calculate the thickness of a coating layer. This can be a single thickness (first method; **Calipers**) or a mean thickness with standard deviation (second method; coating contour).

1. Select an image from **Image list**.
2. In the **Methods group**, select **Coating thickness**.
3. Then select either **Calipers** or **Coating contour**.

Calipers

With this method, the coating thickness is calculated using two parallel lines. The resulting coating thickness is the distance between these lines. Calipers can be rotated so horizontal (0°) and vertical (90°) coatings can be measured, as well as any angle in between.

Both automatic and manual modes are available.



Rotate with Move or Rotate

1. Select **Calipers**.
2. To rotate the lines, toggle to set **Move** to **Rotate**.

Move	Rotate
	

Rotate by dragging

1. Select the line.
2. Click and drag.

Rotation is done around the middle of the selected line.

Rotate by setting the angle

1. Select the line
2. Select either the **+** or the **–** button.
3. Adjust the slider.

Move the line in the view

1. Select the line.
2. Click and drag.

Move one line by step

1. Select the line.
2. Select either the **+** or the **–** button once to move the line 1 step.

Auto

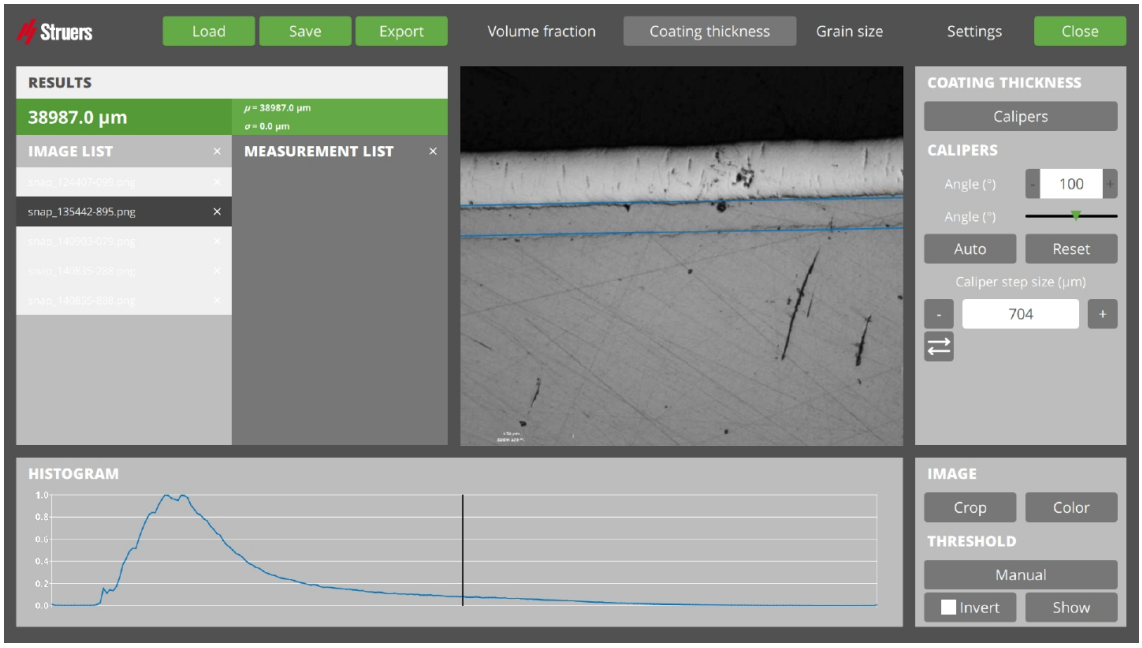
Engages the automeasurement function, where the software tries to find the coating based on the selected parameters.

Reset

Sets the caliper lines back to the default position.

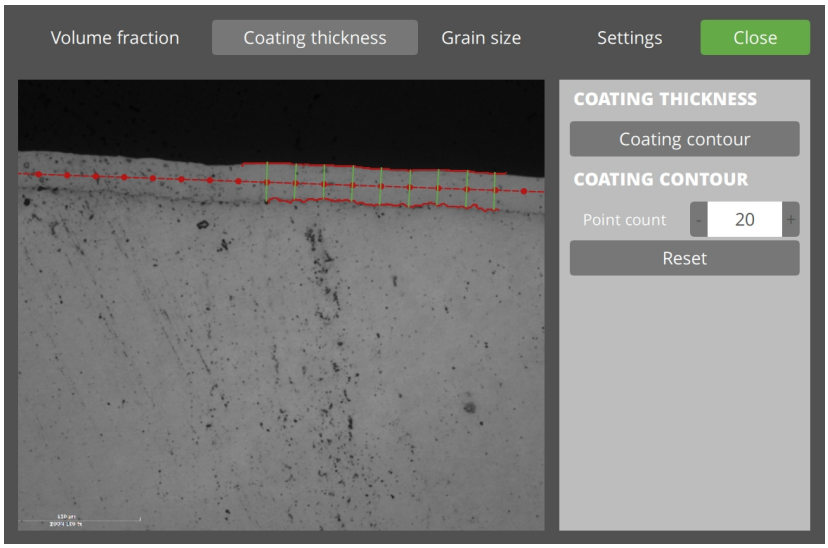
Results

In **Results** you see the calculated value of **Coating thickness** based on the placements of the calipers (lines).

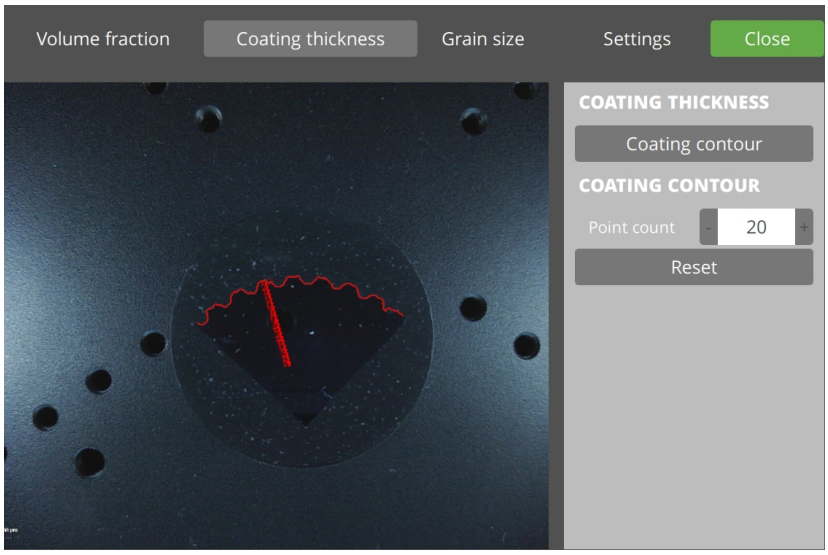


Coating contour

With this method, the coating thickness calculation is based on a number of measurement points. Mean thickness with standard deviation are calculated. Contour edges are drawn semi-automatically, and the number of measurement points can be selected by the user.



1. Select **Coating contour**.
2. In the **Main view**, draw the contour of one side:
   – Click and hold on the start location.
   – While you hold, move the mouse and automatically the line is drawn.



Note
Move the mouse backwards to correct the automatically drawn line.

3. In the **Main view**, draw the second line, similar to the first line.
   To remove both lines, select **Reset**.

Results

When the 2nd line is drawn, the coating thickness is calculated based on:

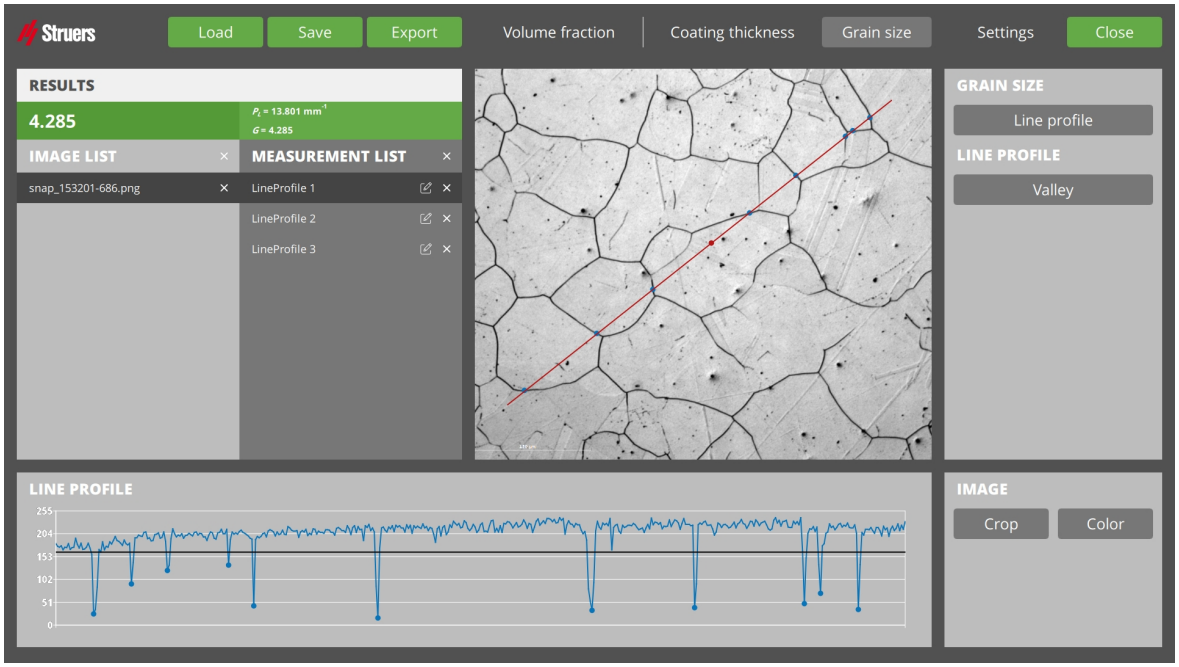
– the placements of the calipers (lines)

– the amount of point as set via **Point count**

In **Results** you now see the calculated value of the coating thickness.

27.10.3 Grain size

With this method, the grain size index is calculated using a 1-dimensional method (from the number of grain intercepts per mm) or a 2-dimensional method (from the number of grains per mm^2).



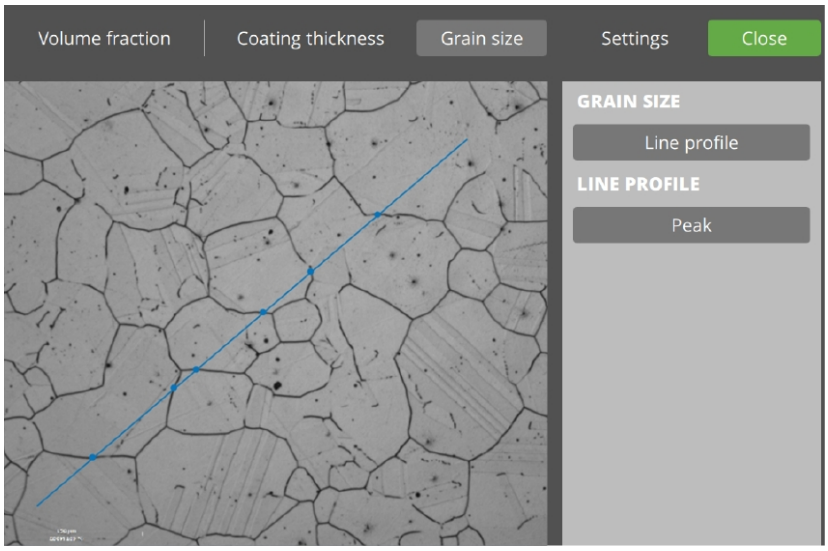
1. Select an image from **Image list**.
2. Select **Grain size** from the **Method group**.
3. Select 1 of 3 methods: **Line profile**, **Hexagonal grid**, or **Single grains**.

Line profile

With this method, the dimensional grain size index is calculated by counting the number of grain intercepts on a line.

You can position the test line anywhere in the image and the number of grain intercepts on the test line are counted automatically.

1. Select **Line profile**.



2. Reposition the line you now see in the **Main view** by moving its end nodes. Any found intersections are illustrated as dots on the line.
   – Click on the line to add a dot.
   – Click on a dot to remove it.

The Chart

In the Chart you see the image information:

– Horizontal axis: indicator for (normalized) location on the drawn line

– Vertical axis: (normalized) light intensity of the image across the line.

The horizontal line: used threshold for intersections.

Move threshold line downwards to indicate that a grain border has a lower light intensity

– Get less dots on line

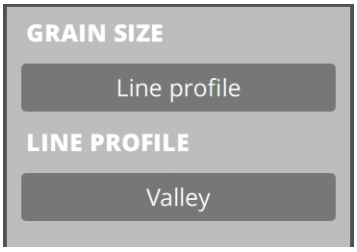
Move threshold line upwards to indicate that a grain border has a higher light intensity

– Get more dots on line

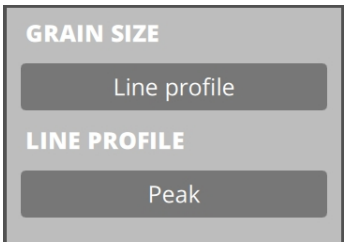
Line profile

Define what light intensity defines the grain separation: **Valley** or **Peak**.

Set the type **Line profile** to **Valley** when grain is surrounded by low light intensities.



Set line profile type to **Peak** when grain is surrounded by high light intensities.

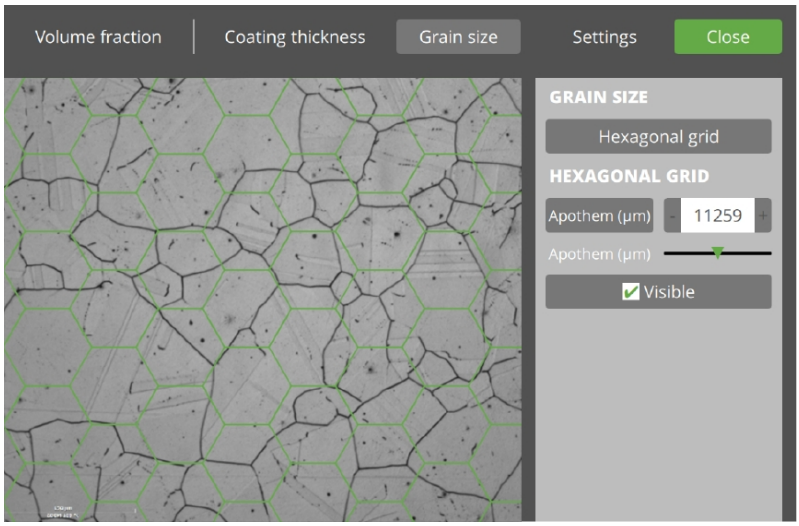


Results shows the calculated value of **Black fraction** and **White fraction**, also based on the placement of the threshold(s) in **Chart**.

- Save the measurement.

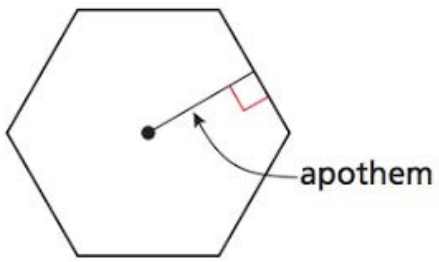
Hexagonal grid

2-dimensional grain size index calculation using a superimposed hexagonal grid.



You can adjust the size of the grid to visually match the grain size in the image.

1. Select the method **Hexagonal grid**. The **Main view** is now filled with a hexagonal grid.
2. Adjust the Apothem of the hexagons, so its size matches the size of the grains in the image.



- +/-

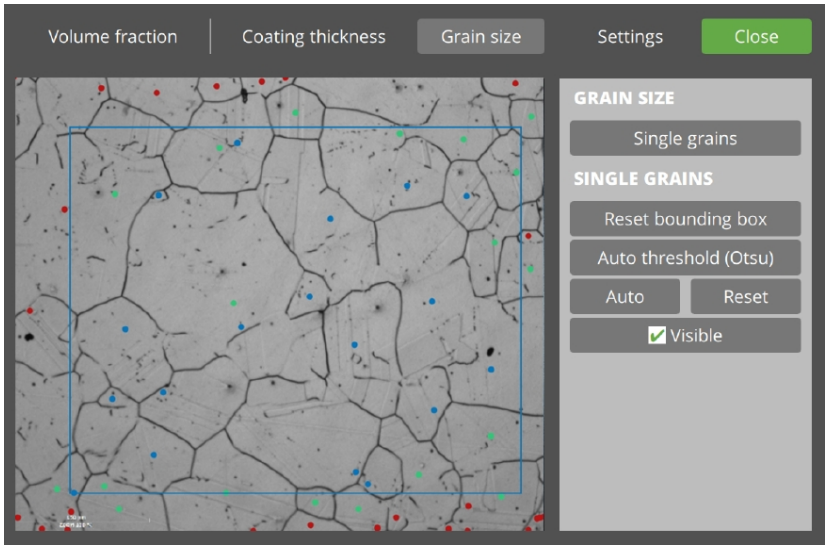
- Edit value

- Slider

In **Results** you see the calculated value of the grain size, based on the size of the hexagons.

3. Save the measurement.

Single grains



1. Select the method **Single grains** in **Method selection**.
2. In the **Main view** you now see a box. You can adjust the size by dragging its corners. If you regret, you can use **Reset bounding box**.
3. In the **Chart**, you see the **Histogram** of the entire image.

   – Horizontal axis: color intensity from dark to light

   – Vertical axis: (normalized) count

   Any vertical line(s) are used as thresholds for measurements.
4. **Threshold**

   – Auto threshold (Otsu)

   – **Show**
5. Count grains in the bounding box:

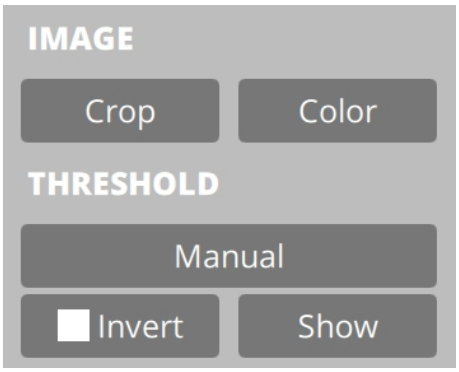
   – **Auto**to auto place dots in middle of grain

   – **Reset** to remove all dots

   – Add points
6. **Results** shows the calculated grain size per mm^2

   – m = 100 mm^{-2} => 100 grains per mm^2
7. Save the measurement.

27.11 Image



27.11.1 Image fit

With the first button in **Image**, you can choose from **Crop** and **Stretch** and **Pad**.

Crop: Shows the maximum of the image while keeping the horizontal/vertical ratio 1:1, by 'removal of borders'.

Stretch: Shows the entire image ignoring the horizontal/vertical ratio size of the image.

Pad: Shows the entire image while keeping the horizontal/vertical ratio 1:1, by 'shrinking'.

27.11.2 Image color filter

With the second button in **Image**, you can change the color of the image.

Color (default): No filtering.

Grayscale: Only show the light intensity.

Blue: Only show the blue component.

Green: Only show the green component.

Red): Only show the red component.

> **Note**
> When you change the color of the image, this may affect the measurement value.

27.11.3 Threshold algorithm

The number of available threshold algorithm differs per measurement method.

> **Note**
> When changing threshold algorithms, the current values of the threshold get lost. Consider to save a measurement before you change the algorithm.

Manual: User settable threshold.

Otsu method: Automatic image thresholding.

Triangle method: Automatic image thresholding.

Band Pass: User settable thresholds. All color intensities within the band is seen as the same fraction (White).

Canny edge: User settable thresholds.

Sobel x: Automatic image thresholding.

Sobel y: Automatic image thresholding.

Laplacian: Automatic image thresholding.

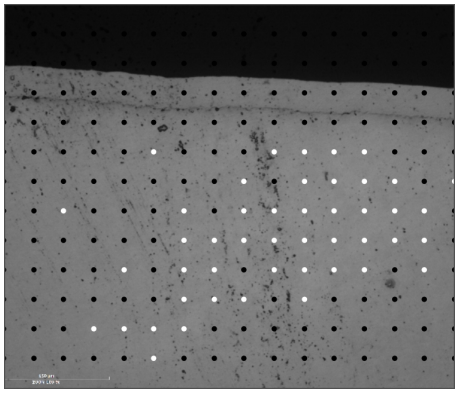
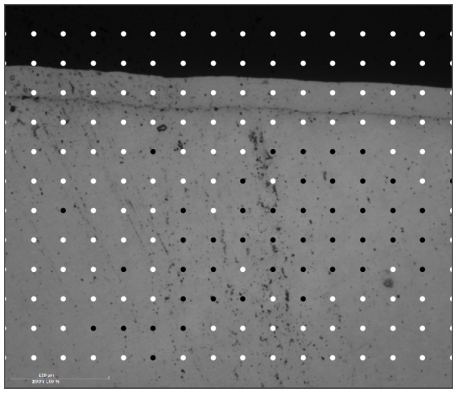
27.11.4 Invert

The **Main view** shows the active image, as selected in the **Image list**.

The image gets an overlay of the measurement results.

By default, when **Invert** is not active, pixels below the threshold are interpreted as **White fraction**, resulting in white points.

However, when **Invert** is set active, pixels above the threshold are interpreted as **White fraction**, resulting in white points.

Before Invert	After Invert
	

Note
A previous manually overruled point gets reset after toggling/using **Invert**.

27.11.5 Show

The **Main view** shows the active image, as selected in the **Image list**.

The image gets an overlay of the measurement results.

By default, pixels below the threshold are interpreted as **White fraction**.

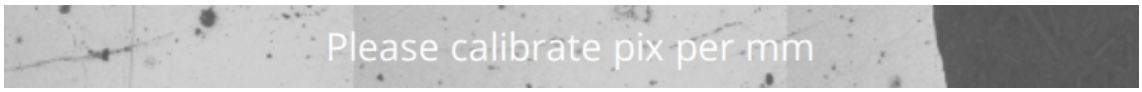
- To see what is below (white) and above (black) the threshold value, press and hold **Show**.

Note
Moving any threshold line in **Chart** also activates this mode.

27.12 Perform a measurement

The following example describes, from start to end, a basic metallography measurement based on default software settings.

1. Make a snapshot in DuraSoft.
2. In DuraSoft-Met, find the image via **Load**.
3. Select the image from **Image list**.
4. If the chosen method needs pixel size data, a text overlay with the text **Please calibrate pix per mm** appears in the **Main view**.



See Settings ► 142.

5. If the image already has an entry in **Measurement list**, ignore this for the moment.
6. Select the desired method in the **Method group**, i.e. **Volume fraction**, **Coating thickness** and **Grain size**.
7. Follow the detailed steps of the method.
8. Press **Save** to add this measurement to **Measurement list**.

27.13 Reporting

The metallographic measurement can be reported via DuraSoft (see Report ► 60).

28 Maintenance and service

28.1 Regular testing

Struers recommends that you use a certified test block to verify the performance of the machine on a regular basis.

Clearing the memory

Shut down the machine on a regular basis to clear the software memory.

28.2 Calibration

Struers recommends a yearly calibration to ensure the performance of the machine.

Calibration can be customized to specific needs and requirements. Contact Struers Service.

29 Troubleshooting

29.1 Troubleshooting – problems and actions

You can resolve most minor malfunctions by restarting the machine.

If you experience errors, see the table below for basic troubleshooting. If the error remains, contact Struers Service.

Problem	Action
The Overview camera is lagging/freezing.	If the settings for active image correction have been set to **High**, the camera cannot process the live video feed. 1. Select **Visuals** > **Contrast** while the Overview camera is active. 2. Select **Default**.
The Objective image flickers.	• Select **Visuals** > **Contrast**, and deselect **Automatic**.
Most or all buttons are grayed out when the software is started up.	The machine settings file is corrupted due to incorrect shutdown.
The message **Force too high** is shown when an indent is started.	• Perform an indenter length calibration.
The message **Object detected** is shown when an indent is being made	1. Make sure that the specimen is in focus before you start a measurement. 2. If the error remains, calibrate the indenter length.
The message **COM port x does not exist** is shown.	A digital micrometer connected to the machine has been moved to another USB port. 1. Move the connected device back to its original port. 2. Restart the software.
A method is missing in the software. Vickers, Knoop, Brinell, KIC, or HVT cannot be selected in the scale selection dialog.	• Make sure that the indenter for the method you are looking for is installed on the turret. • If you want to see the method without the indenter installed, select **System** > **Settings**. Make sure that the setting **Scales only with indenter** is disabled. If the error remains, the method has not been enabled for this machine.
The motorized XY stage stalls during reference search or movements during normal operation.	• Make sure that there is nothing obstructing or preventing the stage from moving (transport safety bracket, dirt, etc.)

Problem	Action
A **Timeout** message is shown. • **Trinamic timeout** • **Timeout Depthmeter Readout** • **LCA Timeout**	1. Restart the software. 2. The problem could be caused by the removal of a USB device, or by a faulty USB drive. Use a different USB port for the USB drive or use a different USB drive.
Comet tails or indenter scratches are visible.	1. Make sure that the specimen surface is plane. 2. Clean the indenter. 3. Rotate the indenter 180 degrees to see if the tail/scratch follows the indenter orientation. • If the tail/scratch follows the indenter orientation,replace the indenter with a new one. • If the tail/scratch does not follows the indenter orientation, contact Struers Service.
There is oil residue on the stage or specimen.	• Clean the specimen and the stage.
Autofocus cannot find the correct focus plane.	If **Autofocus** settings uses a combination of a high search range and a high search speed, the steps of the autofocus search may be too large to find the actual focus plane. • Lower the search range and the search speed for the specific objective: Select **Visual** > **Autofocus**.
The Vickers or Knoop indents are not symmetrical.	1. Make sure the specimen surface is plane. 2. Make an indent on a test block to verify the asymmetrical indent. • If the indent on the test block is symmetrical, check that the surface of the specimen is plane. • If the indent is asymetrical, contact Struers Service.
The measurement cursor changes from a green crosshair to a red dot.	• Use the mouse scroll wheel click function to toggle between the crosshairs and the red dot.
The user interface is shown in Landscape, not Portrait mode.	1. Make sure that the monitor is connected according to the marking on the rear of the hardness tester. 2. Restart the machine.

Problem	Action
The touch function on the monitor does not work.	1. Make sure that the USB cable between the monitor and the machine is connected correctly. 2. Press and hold the **Menu** and the **Enter** buttons on the side of the monitor to enable or disable the touch function.
Opening the connection to AUX or LCA failed.	1. Restart the software. 2. If the error remains, contact Struers Service.
There is no image on the objective camera.	• Make sure the objective light level is not set to 0.

29.2 Messages and errors

Errors must be corrected before operation can be continued.



- Press **OK** to acknowledge the error message.

  If the error remains, contact Struers Service.

Error message	Explanation	Action
Collision switch active	The turret has hit an object. The spindle is too far up, or the head is too far down.	Make sure that there is no obstacle to the turret movement. Make sure that the spindle is positioned correctly.
DuraSoft-Met was not installed (correctly)	Application could not be found.	Contact Struers Service.
Emergency switch pressed, release switch for further action	Correct the cause of the emergency stop. Release the emergency stop. See the specific Instruction Manual for your machine.	If the error remains or if the message occurs without activating the emergency stop, contact Struers Service.

Error message	Explanation	Action
Failed moving to home position	For machines with a load motor. During initialization, the home switch near the load motor has not been activated, and the motor has failed to move to its home position.	Make sure that there is no visible obstruction in the Z-axis. Restart the machine.
Failed moving to safe position	For machines with a motorized head. During initialization, the motorized head failed to retract approx. 1 cm from the current position.	Make sure that there is no visible obstruction in the motorized head.
Failed to find upper limit	For machines with a motorized head. For a special protocol (e.g. the crank shaft), the motorized head must be in the highest position.	If the error remains, contact Struers Service.
Failed to initialize turret	During initialization, the home switch in the turret was not found within the specified time.	Make sure that there is no visible obstruction in the turret.
Failed to initialize XY stage	For machines with a motorized XY stage. During initialization of the XY stage, the limits for the X and Y axes cannot be found.	Make sure there is no visible obstruction. Shut down the machine and reconnect the cable to the XY stage.
Failed to move spindle down	For machines with a motorized head and spindle. During initialization, the spindle failed to move lower .	Make sure that there is no visible obstruction in the motorized head.
Failed to open connection to Com[nr] : Comport name	Communication to the indicated port has failed. The port is present but cannot be opened by the operating system.	Restart the machine.
Force too high!	The measured force is not equal in both loadcells.	Make sure that there is no visible damage on the machine.

Error message	Explanation	Action
Humidity out of bounds Do you want to stop the test?	The condition prevents the hardness test from starting.	Select **No** to continue the test or **Yes** to stop it. If the humidity sensor triggers too easily, adjust the humidity threshold in **Settings**.
Indenter not present	A hardness method is selected which is not suitable for the selected indenter.	Select **System** > **Settings** > **Scales only with indenter**. Alternatively, replace the indenter.
Invalid license key		If you do not have the license key, contact Struers Service.
License expired		Contact Struers Service.
Loadcell not configured	Configuration of the loadcell or loadcells is incorrect.	Restart the machine.
Measurement name is already being used		Use another measurement name.
Missing connection for Com [nr] : Comport name	Communication to the indicated port has failed. The port is present but cannot be opened by the operating system.	Restart the machine.
Motor timeout reading position	Internal communication failure.	Restart the machine.
No data was imported		Import data.
No images loaded!	Chosen file format is not supported.	Use only supported file formats.
No measurements saved	Active image has no measurements.	Perform a measurement.
Object detected	The loadcell detects an unwanted force in the turret. The indenter touches the object on high speed.	Make sure that there is no visible obstruction in the turret. Increase the working distance
Running low on diskspace	The D: drive hard disk is running out of disk space.	Carry out file housekeeping and delete redundant files.
System not initialized	The user interface is released by the software before initialization has ended.	Contact Struers Service.

Error message	Explanation	Action
Temperature out of boundaries **Do you want to stop the test?**	The condition prevents the hardness test from starting.	Select **No** to continue the test or **Yes** to stop it. If the humidity sensor triggers too easily, adjust the humidity threshold in **Settings**.
This position cannot be changed	In this case, it is not possible to change the indenter or objective because this is protected by a higher log-in level.	
Timeout depthmeter readout	Internal communication failure between depthmeter and PC.	Restart the machine.
Unsupported scale	You have selected a hardness method scale that is out of range for the selected indenter.	Select **System** > **Settings** > **Scales only with indenter**. Alternatively, replace the indenter.
Unsupported tester	The dongle that is being used is not supported by the software.	Contact Struers Service.
Upper limit not reached	For machines with a motorized head. When the motorized head is in the highest position, but the upper limit has not been activated.	Contact Struers Service.
Vibration Detected	Test load is invalid because vibrations exceeded the threshold. This warning appears only for Vickers or Knoop scales with forces ≤ 200 gf.	Redo the test, or if the vibration sensor triggers too easily, adjust the humidity threshold in **Settings**.

29.3 Contact Struers Service

When you contact Struers Service, please provide the following information:

- Serial number of the machine
- Firmware versions (LCA/AUX)
- Software version
- Headline with a clear description of the issue
- Can the issue be reproduced? If this is the case, describe the steps in detail

- If the issue is related to measurements, include files that show the issue (both TAR and DB file)
- If the issue is related to the software, include the exception and debug file
- If possible, attach images and/or videos showing the problem
- Is a **TeamViewer** connection available? This allows Struers to carry out remote troubleshooting on your machine.

Finding the required information

1. From the **Top menu**, select **Tester** > **Info**.



2. Export the information to the desktop on **Export info**.
3. Send the information to Struers Service.
4. Save any measurement to an archive. Select **Archive** > **Save**.
5. Name the archive, and select the location where you wish to save it.
6. Copy the **.tar** and database files.
7. If needed, exception and debug files are located in the machine folder on the D: drive of the hardness tester. The file names are:
   - **exceptions.txt**
   - **debug.txt**

29.4 Software updates

Struers continuously improves the DuraSoft software. Contact your Struers representative for further information.

If you have a preventive maintenance agreement with Struers, the software is updated at every service call.

30 Manufacturer

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Responsibility of the manufacturer

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The manufacturer assumes no responsibility for errors in the text and/or illustrations in this manual. The information in this manual is subject to change without notice. The manual may mention accessories or parts not included in the supplied version of the equipment.

The manufacturer is to be considered responsible for effects on safety, reliability, and performance of the equipment only if the equipment is used, serviced, and maintained in accordance with the instructions for use.

Struers
Ensuring Certainty

en	For translations see
bg	За преводи вижте
cs	Překlady viz
da	Se oversættelser på
de	Übersetzungen finden Sie unter
el	Για μεταφράσεις, ανατρέξτε στη διεύθυνση
es	Para ver las traducciones consulte
et	Tõlked leiate aadressilt
fi	Katso käännökset osoitteesta
fr	Pour les traductions, voir
hr	Za prijevode idite na
hu	A fordítások itt érhetők el
it	Per le traduzioni consultare
ja	各種文書の翻訳版は次を参照:
lt	Vertimai patalpinti
lv	Tulkojumus skatīt
nl	Voor vertalingen zie
pl	Aby znaleźć tłumaczenia, sprawdź
pt	Consulte as traduções disponíveis em
ro	Pentru traduceri, consultați
se	För översättningar besök
sk	Preklady sú dostupné na stránke
sl	Za prevode si oglejte
zh	翻译见

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