

IMPRESSIONS™ 4

Advanced Hardness Tester Workflow Control

USER MANUAL



USER **MANUAL**

IMPRESSIONS™ 4

Advanced software applications

Thank you for buying this advanced INNOVATEST® hardness testing instrument.

The product meets the applicable DIN, ISO-EN, ASTM and JIS standards.

Products and/or product specifications can change due to new technologies and continuous development.

We reserve the right to change or modify specifications of products without prior notice.

INNOVATEST Europe BV assumes no responsibility or liability for any errors or omissions in the content of this instructions.

Please contact our sales office for up-to-date information.

INNOVATEST Europe BV

Borgharenweg 140
6222 AA Maastricht
The Netherlands
Phone: +31 43 3520060
Fax: +31 43 3631168
info@innovatest-europe.com

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Date of release:

June 2022

Document number:

RAD_X_UMIMP4 Version 1.0 (original instructions)

Read the "User Manual" thoroughly before usage, and properly operate the product.
In order to use the product safely, do not ignore visual cautions, warnings or safety symbols.

Please refer to the limited guarantee and responsibility issues in the INNOVATEST® guarantees conditions.

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1

INTRODUCTION

This manual contains essential information concerning the operating system of the hardness tester, IMPRESSIONS™ 4. A detailed description of the control functions will be given. This manual is part of the user manual of the machine. Before getting started, first read the dedicated user manual of the machine, this contains vital information concerning, safety, installation, operation, maintenance, transport and technical specifications of the machine.

1.1 GENERAL INSTRUCTIONS

WARNING

*Before using the machine, read the “Safety chapter” of the dedicated machine user manual, thoroughly.
In case of doubt, the manufacturer should always be consulted.*

The dedicated machine user manual contains important warnings to use the machine, safely, professionally and economically. By following this information, hazards can be avoided, repair costs and downtime can be reduced, and the reliability and service life of the machine can be increased.

This manual must always be accessible and available to the user. Always keep a copy of this manual with the machine! Before you work with the machine or carry out any maintenance or repairs, you must first read the relevant chapter of the user manual completely.

Text indicated as following: **“EXAMPLE”**, refers to a button or selector in the IMPRESSIONS™ software.

1.2 TARGET GROUPS

The **user / owner** is, as legal person, responsible for the intended use of the machine and for the training and deployment of the authorized persons. The user/owner keeps a record of qualifications and competences of these authorized persons.

Professional is a person who, based on their professional training, knowledge and experience, is able to assess the assigned tasks and is able to identify possible hazards. Furthermore, they are aware of the applicable standards and conventions. The competence level of persons and therefore the qualification assessment is done by the user/owner.

Educated / trained person is a person who has been trained in the assigned tasks and the possible hazards concerning improper use. Furthermore, this person is aware of the implemented protective devices and safety measures. The competence level of persons and therefore the qualification assessment is done by the user/owner.

Assembly, disassembly, maintenance and repair may only be carried out by **professionals**. Normal use can be carried out by **educated / trained persons**. The legally permissible minimum age is to be observed.

1.3 LIABILITY AND DISCLAIMER

All indications and instructions for operation, maintenance and repair are given with due regard to our current experience and insight. The original of this user manual was written in the English language and checked by INNOVATEST® in terms of content. This user manual has been compiled with the utmost care. Should you nevertheless detect imperfections and / or errors, we ask you to inform us in writing. Your suggestions are well appreciated and will help us to improve the manual in the future.

1.4 RE-ORDER

This manual will be supplied as an electronic copy. Also, a hard copy can be ordered, please note that there are costs associated with hard copies of this manual. A hard copy can be reordered at the address below:

INNOVATEST Europe BV
Borgharenweg 140
6222 AA Maastricht
The Netherlands
+31 43 3520060
www.innovatest-europe.com

1.5 COPYRIGHT

All rights reserved. No part of this manual may be reproduced, modified or utilized otherwise without prior written permission.

1.6 INTENDED USE

The intended use is the hardness testing of products. The machine is to be used in an industrial or laboratory setting. The machine is intended to be used by non-disabled trained full aged people. The machine may only be operated as described in this manual. The manufacturer is not liable 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 this manual.

Manufacturer responsibilities expire when:

- not or insufficiently complying with the information in this manual
- using spare parts or parts not approved by the manufacturer
- the machine is operated incorrectly
- removing, manipulating or not using safety features
- changing functions of the machine
- unauthorized modifications to the machine are applied
- maintenance is not carried out according to instructions
- the machine is used unintentional

1.7 IMPROPER USE

Dangers and hazards can occur due to unintentional or improper use of the machine. The limits stated in the documentation may not be exceeded under any circumstances.

1.8 LAYOUT OF THE USER MANUAL

This manual may only be used with INNOVATEST® equipment designed for IMPRESSIONS™. The complete user manual consists of:

- The dedicated machine user manual
- This IMPRESSIONS™ 4 manual
- The machine's unpack instruction (attached to the packaging)
- Declaration of Conformity

2

DESCRIPTION AND FUNCTION

3

SAFETY

IMPRESSIONS™ is an advanced user operating system. The software incorporates, manual and automatic hardness measurement for all common hardness scales, image detection, file storing, image storing, report printing, turret operation, manual and automatic focusing and many other advanced functions.

In combination with an XY-stage, the tester offers the option of running case depth hardness programs, pre-defined testing patterns and/or other specific and complex tasks defined by the user.

The software can convert hardness values to 5 different hardness (and tensile) scales simultaneously according to international standards (ISO/ASTM).

All data can be stored and exported into well-known formats as CSV and Q-DAS®. All data can be accessed over the (W)LAN and USB connections.



WARNING

Before using the machine, read the “Safety chapter” of the dedicated machine user manual thoroughly. In case of doubt, the manufacturer should always be consulted.

The dedicated machine user manual contains important warnings to use the machine, safely, professionally and economically. By following this information, hazards can be avoided, repair costs and downtime can be reduced, and the reliability and service life of the machine can be increased.

Definitions



WARNING:

Situation, operation or action that could potentially harm the professional or educated/trained person (operator) or lead to potentially dangerous situations for the professional or educated/trained person (operator).



CAUTION:

Situation, operation or action that could damage the machine.

NOTE:

Text with higher priority than plain text but not being a warning or caution.

3. SAFETY

3.1 SAFETY PROVISIONS

3.1.1 EMERGENCY MODE

Emergency is a situation of (potential) danger to a person or the machine.
In an emergency, one of the hardware emergency stop devices must be operated, causing the machine to stop immediately.

NOTE:
Information about the hardware emergency stop device, like its location/activation/reset, is described in the dedicated machine user manual.

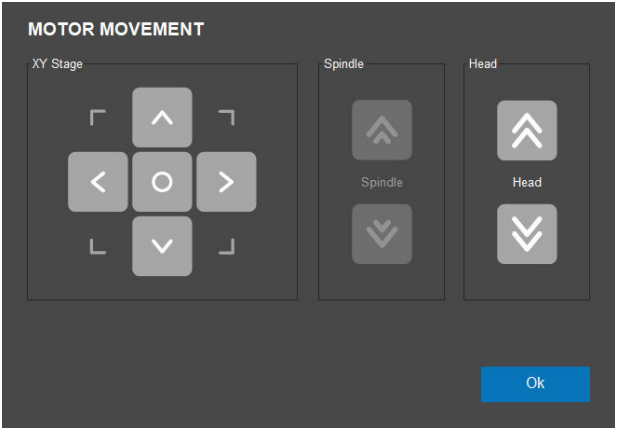
The software detects an activated emergency stop device, by presenting information and controls:



After releasing emergency switch, the software goes into an emergency mode where only manual controlled functionality is available.

Use available (software and hardware) controls to create a safe situation.

Depending on the hardware and motorized configuration of the tester, following controls are shown:



NOTE:
Information about the available hardware controls to create a safe situation, like moving spindle, is described in the dedicated machine user manual.

Press **"OK"** to leave emergency mode and return to WINDOWS.

CAUTION:
Only after creating a safe situation, it is allowed to restart the testing software.

4 INSTALLATION

We strongly recommend opting for installation and training of IMPRESSIONS™ by INNOVATEST® service personnel.

5

BASIC OPERATION

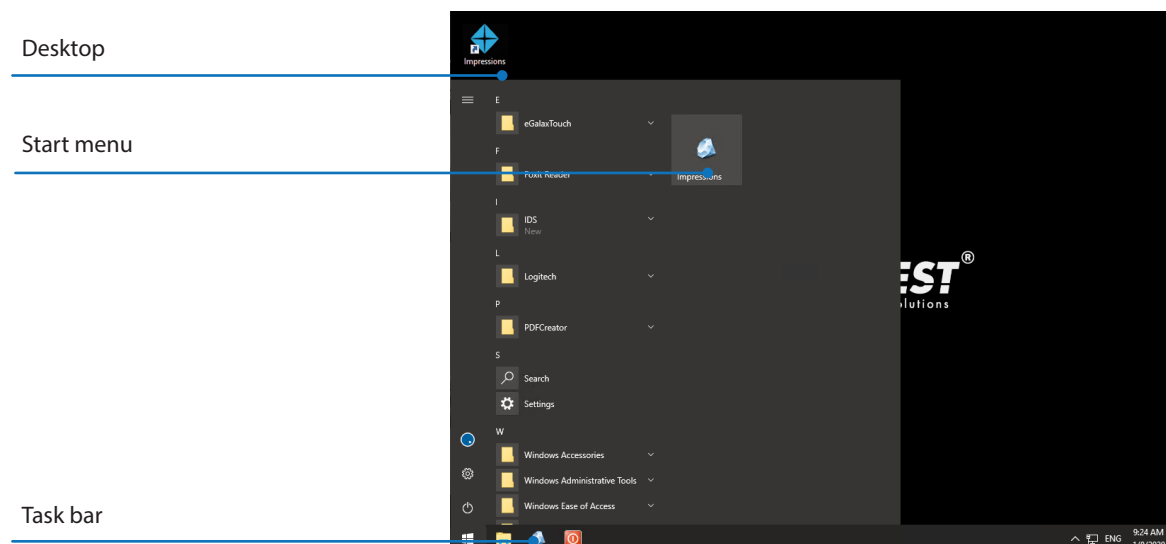
This section gives a detailed description of the user interface and basic functionality of IMPRESSIONS™.

NOTE:

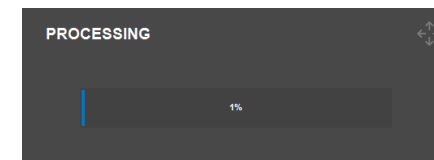
Some parts in this manual may relate to specific type of machines or optional software licenses and may differ or will be disabled by default.

5.1 START HARDNESS TESTING SOFTWARE IMPRESSIONS

1. If the software has been started with activated emergency switch, then see [Emergency mode](#).
2. If the hardness testing software was not started during tester power up, or after an emergency mode, then manually start hardness testing software by selecting any available shortcut on desktop, taskbar or start menu in WINDOWS:

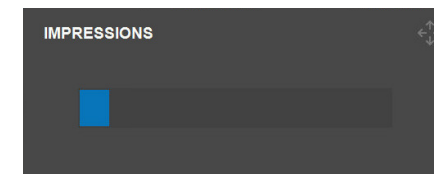


3. During startup several system functions and parameters will be checked

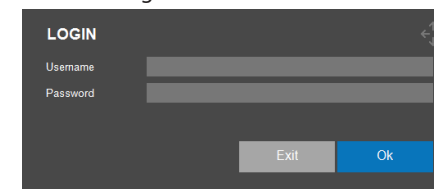


In case there are any [problems](#), a message will appear on the user interface

4. When there are no issues during initialization, the software will be started. The following progress bar will appear on your screen:



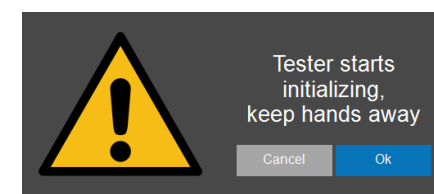
5. A correct start-up of the IMPRESSIONS™ system and the machine will show the login screen without any failure or error messages:



6. Fill in your [username and password](#) (the default username “admin” has no password). Press “**OK**” to continue, or press “**EXIT**” to [exit](#) IMPRESSIONS™.

5.1.1 INITIALIZING

1. Depending on the machine configuration, some tester components need to be initialized.
2. Some components need to move for initialization; possible (motorized) components are axes as in xy-stage, spindle and test head.
Before any automatic movements will be done by the machine, a message will be shown, to warn operator to keep hands away:

**NOTE:**

Only after pressing “**OK**”, machine components will move.

5.1.2 READY FOR TESTING

1. The machine is ready to testing when:
 - The [START/STOP button](#) shows a bright green “**START**”.
2. Depending on active processes, this can take a while.
 - Sometimes it helps to press “[ESCAPE](#)”.

5.2 PERFORMING A BASIC HARDNESS TEST

See dedicated machine user manual for instructions about steps to perform a hardness test.

5.3 EXIT HARDNESS TESTING SOFTWARE IMPRESSIONS

1. Select **"EXIT"** in the **"SYSTEM"** menu to exit the IMPRESSIONS™ software and return to Windows®.

WARNING:

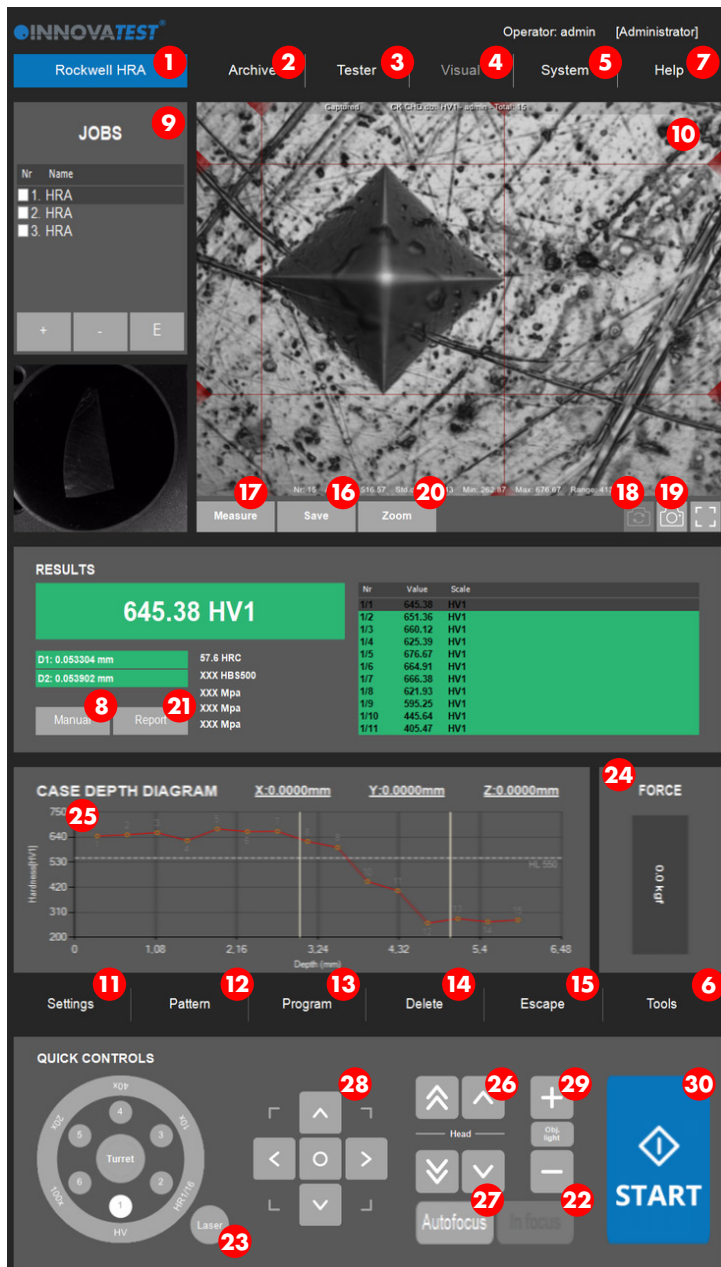
Do not turn off the machine in this state.

2. Shut down Windows®, in common way, or use shortcut on taskbar



5.4 OVERVIEW OF THE MAIN INTERFACE

1. **Scale selection.**
 2. **Archive:** Saving and recalling measurements.
 3. **Tester:** Tester specific settings.
 4. **Visual:** Visual settings of the tester.
 5. **System:** General system settings.
 6. **Tools:** distance/angle measurements.
 7. **Help:** Help and Service.
 8. **Automatic/Manual measurements.**
 9. **Results/Jobs area.**
 10. **Object or Overview camera view.**
 11. **Test setting:** Settings related to testing.
 12. **Test patterns:** Test pattern selection & editor.
 13. **Program:** Saving and recalling tester settings.
 14. **Delete:** Delete measurement(s) from the batch list.
 15. **Escape.**
 16. **Save:** Save a measurement to the batch list.
 17. **Measure:** Start optical measurement.
 18. **Overview:** Switch from objective to overview camera.
 19. **Snapshot:** Take a picture (snapshot) from live view or captured image.
 20. **Zoom.**
 21. **Report:** Reporting, exporting and snapshot management.
 22. **In Focus:** Manual in focus button.
 23. **Laser:** controls the positioning laser.
 24. **Test force indicator.**
 25. **Diagram:** visual representation of the results.
- Dashboard:**
26. **Indenter head control.**
 27. **Table/head (auto)focus controls.**
 28. **XY-table controls.**
 29. **Light control.**
 30. **Start/Stop.**



5.4.1 SCALE SELECTION

Press the **"SCALE SELECT"** button to select the required scale.
The selected scale is displayed in the button, e.g. **"VICKERS 2 KGF"**.

NOTE:

Be aware that changing the hardness scale, also the **test settings** will change and must be set for the selected scale.

Vickers 2 kgf	Archive	Tester	Visual
Vickers	1 gf 7 gf 25 gf 500 gf 5 kgf 50 kgf		
Knoop	2 gf 8 gf 50 gf 1 kgf 10 kgf 60 kgf		
Brinell	3 gf 9 gf 100 gf 2 kgf 20 kgf 100 kgf		
Rockwell	4 gf 10 gf 200 gf 2.5 kgf 25 kgf 120 kgf		
HBT	5 gf 15 gf 300 gf 3 kgf 30 kgf 150 kgf		
HVT	6 gf 20 gf 4 kgf 40 kgf		

5.4.1.1 SCALE KC (FRACTURE TOUGHNESS)

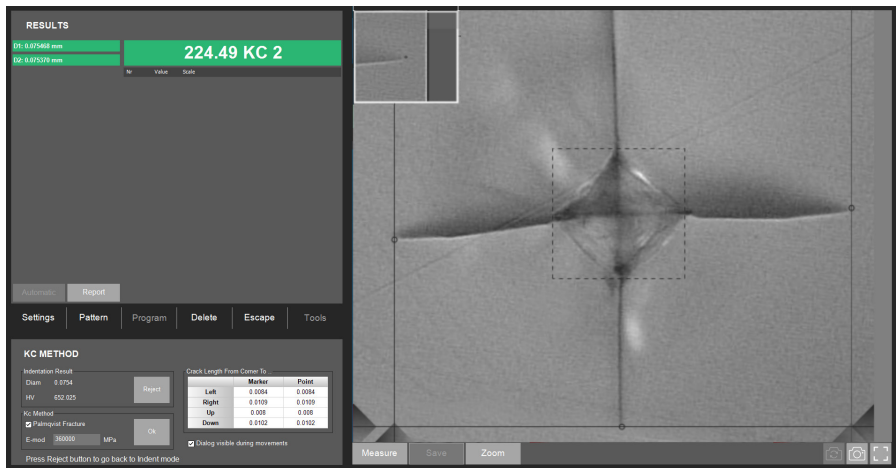
A Kc measurement is a manually executed procedure:

1. Select Kc scale
 2. Indent the brittle material
 3. Measure the (Vickers) indentation and press **"ACCEPT"**
 4. Position the cross lines on the end of the cracks and press **"OK"**
1. After selecting a Kc scale, the user interface of IMPRESSIONS shows the initial state of a Kic measurement.
 2. Fracture the brittle material with a Vickers indenter. The visible part of the fracture cracks starts at the corners of the indentation and in general stretches outwards for a certain distance. Average crack length is a measure for the fracture toughness of the material.

- Measure the Vickers indentation by pressing **"MEASURE"**. Note that an automatic measurement may produce incorrect results due to the cracking.
Correct if necessary and accept the measurement by pressing the **"ACCEPT"** button.
The ACCEPT button changes into REJECT; only press REJECT to remeasure the Vickers indentation.



- After pressing **"ACCEPT"**, the Vickers indentation is shown as a dashed square.
It is now possible to set the type of the fracture (**"PALMQVIST FRACTURE"**) and Young's modulus (**"E-MOD"**) of the material.
Note that the HVx result has been replaced by a KCx result, the fracture toughness value.
Position the red DOTs of the cross lines on the end points of the cracks as shown in the image. 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. Results are refreshed when the left mouse button is released.



NOTE:
Optional check **"DIALOG VISIBLE DURING MOVEMENTS"** to prevent popping up of the **CURSOR** controls.
Uncheck **"PALMQVIST FRACTURE"** if the fracture is also present beneath the indentation.

Press **"OK"** to recalculate the Kc-value.

Young's modulus must be a number > 0. Formulae are based on papers by Niihara.

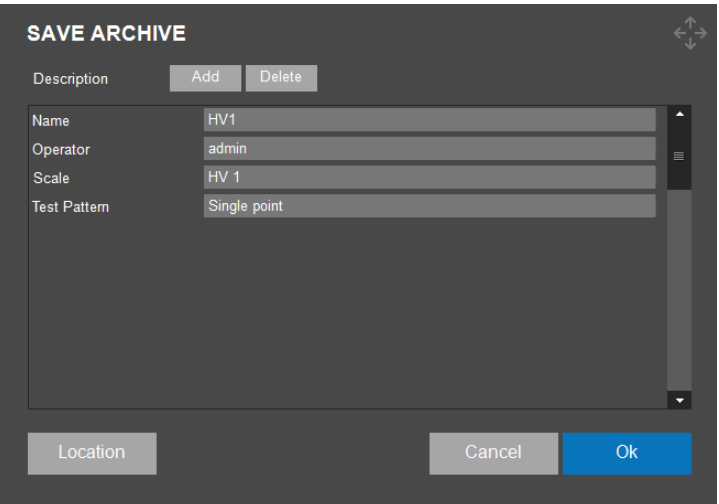
Press **"SAVE"** to store the measurement in the list.

5.4.2 ARCHIVE

In this area it is possible to save and recall measurements. [Snapshots](#) and [settings](#) are also saved into the archive.

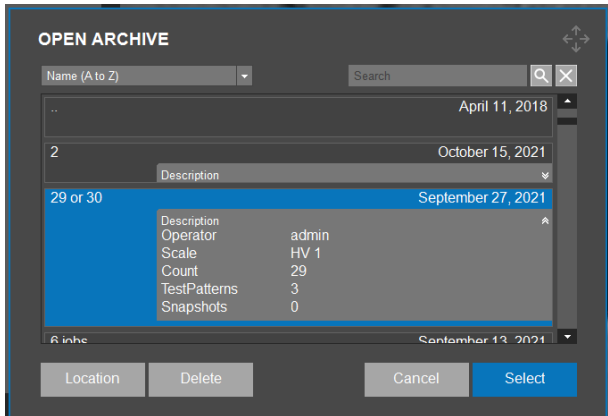
5.4.2.1 SAVING AN ARCHIVE

To save measurements select **"ARCHIVE"** -> **"SAVE"**.
Fill in a unique name for your archive and press **"OK"**.
For adding any extra description to your archive, press the **"ADD"** button. Pressing **"DELETE"** will delete this description.



5.4.2.2 OPENING AN ARCHIVE

Click **“ARCHIVE”** -> **“VIEW”**.
A list of all saved measurements will be displayed.



Selecting the double arrow “↔” will show additional information of an archive (Number of measurements, scale used, user, etc.). Click on the desired archive and press **“SELECT”**, to open the archive. The **“ARCHIVE”** button on the main screen will start blinking, indicating that an archive is active. This enables viewing, checking and corrections of the measurements. From this menu it is also possible to handle the data for [exporting or reporting](#).

From this menu it is also possible to:

- Open an Archive from another location (**“SELECT LOCATION”**)
- **“DELETE”** an archive

NOTE:
An opened archive can never be stored with the same name. This is to protect the initial data from that archive. Save the archive with another name.

Press **“ARCHIVE”** -> **“CLOSE”** to close an opened archive, the archive button will stop blinking.

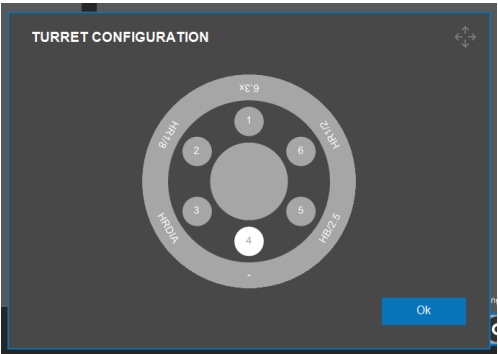
5.4.3 TESTER

This menu enables the general setup of the machine. The menu contains the turret setup, test head retraction, working distance, auto-save and the tester info.

Tester	
Turret configuration	“TURRET CONFIGURATION” : Settings to change the configuration of the turret.
Test head retraction	“TEST HEAD RETRACTION” : Sets the retract distance of the test head when changing a turret position.
Working distance	“WORKING DISANCE” : Sets the working distance of the spindle between indentations.
Auto save	“AUTO SAVE ON” : Saves individual measurements in a batch immediately after completion.
Info	“INFO” : Shows the information of the machine's hard- and software.

5.4.3.1 TURRET CONFIGURATION

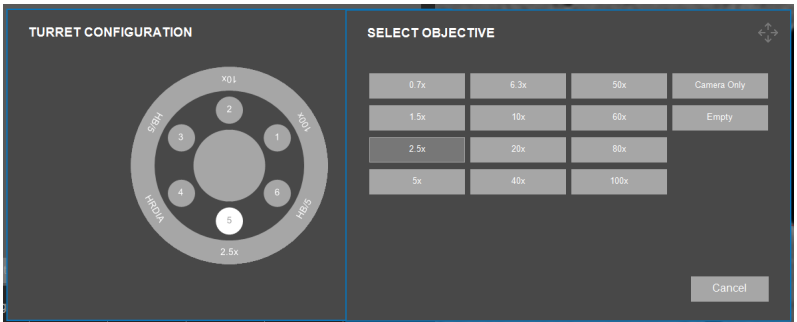
In the turret control the configuration of the turret can be changed. This is necessary after changing an indenter or objective.



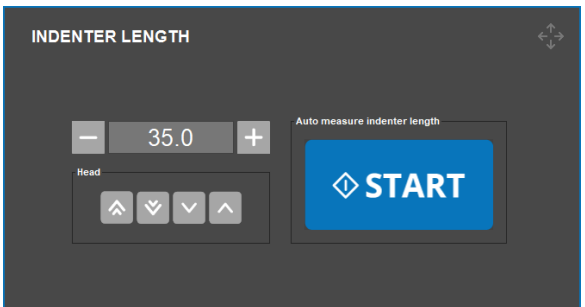
CAUTION:
Changing an indenter or objective must be done by a professional, an error in this configuration may severely damage your workpiece or the machine.

In some cases, it is not possible to change any indenter or objective, because this is protected by a higher log-in level showing the message: “This position cannot be changed”.

Changing an indenter
Before changing an indenter, it is important to bring the image into focus on a flat and clean test object. Best is to use the objective with the highest magnification. Select the indenter that needs to be changed, by clicking on that particular indenter. The turret positions the selected indenter to the front position. Replace the indenter as described in the dedicated machine manual.



Select the new indenter. The following window will appear:

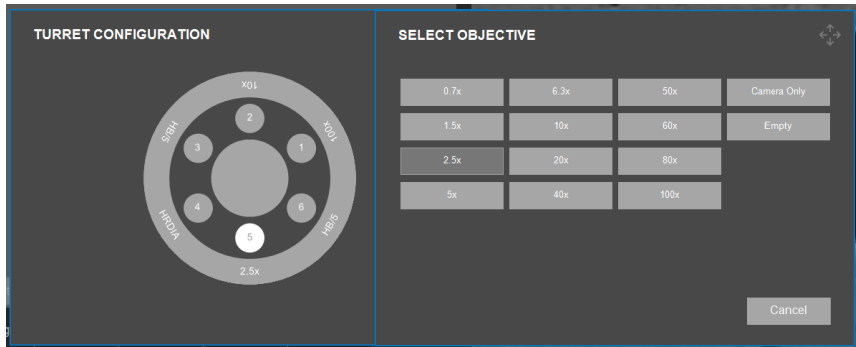


Now select the **“START”** button. The machine will lower the indenter slowly until it hits the object. This is to determine the length of the new indenter. Press **“OK”** to save the indenter length when the motion has stopped.

CAUTION:
Skipping this step may increase the measuring time or damage the system during the next measurement. Therefore, it is essential that this is done by a professional only.

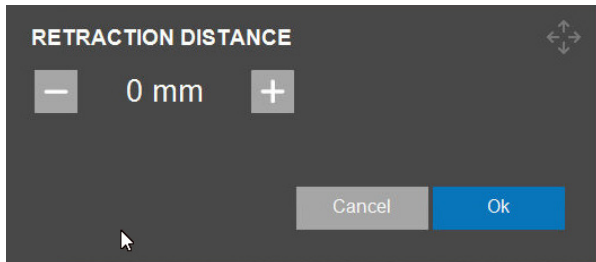
Changing an objective

Select the objective that needs to be changed by selecting that particular objective. The turret positions the selected objective to the front position. Replace the objective as described in the dedicated machine service manual.



5.3.3.2 SPINDLE RETRACTION

Test head retraction is a safety feature, mainly used for measuring nonparallel parts, irregular shaped parts or for measuring in holes.
The retraction distance can be set, meaning:
Before each movement (rotation) of the turret, the head will move this distance up to a position where the turret can rotate without hitting any object. For systems with a fixed turret, the table will move this distance down before any turret movement (rotation).

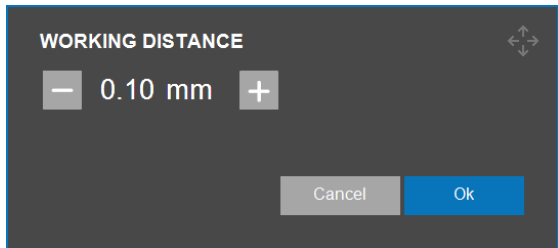


CAUTION:
Enter a correct retraction setting, a wrong setting can damage your part or the machine.

5.4.3.3 WORKING DISTANCE

This parameter is mainly used for testing on non-parallel or irregular shaped objects. After pressing **“START”**, the indenter will move down on high speed, at a certain distance the indenter will start moving down in low speed. The working distance is the distance the indenter will travel in low speed.

In normal operation, the indenter will never touch the object on high speed. If it does, the message “Object detected” will appear, meaning the indenter touched the object on high speed. Increase the working distance to avoid this.



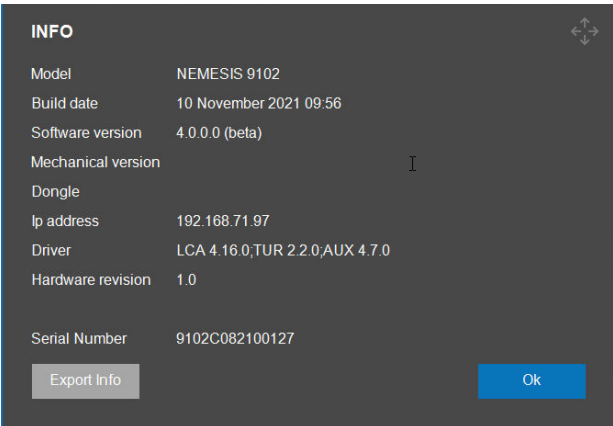
NOTE:
Increasing this value will also increase your test time. For safety reasons, the minimum working distance is set to 0,10 mm.

5.4.3.4 AUTOSAVE

When **“AUTO SAVE”** is enabled, individual measurements in a batch list will be saved, immediately after completion of the test, without confirmation. It is recommended to enable this during Rockwell testing.

5.4.3.5 INFO

This screen shows the information of the machine’s hard- and software.



5.4.4 VISUAL

All camera view settings of the machine are done here.



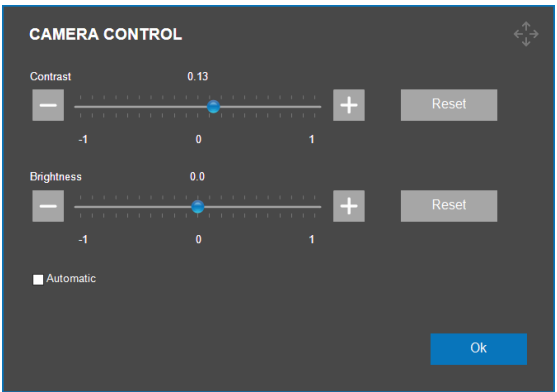
“CONTRAST”: Settings for the contrast level.
“AUTOFOCUS”: Settings for the auto focus option.
“RESOLUTION”: Selection for HALF (standard) or FULL resolution (slow) mode.
“BRIGHTNESS”: Selection for AUTO or MANUAL.
“EDGE DETECTION”: Settings for the edge detection.
“TURRET LIGHT”: Setting to switch the turret light ON or OFF.

5.4.4.1 CONTRAST

The contrast settings depend on the active live camera. Select the desired camera (objective or overview) before you start.

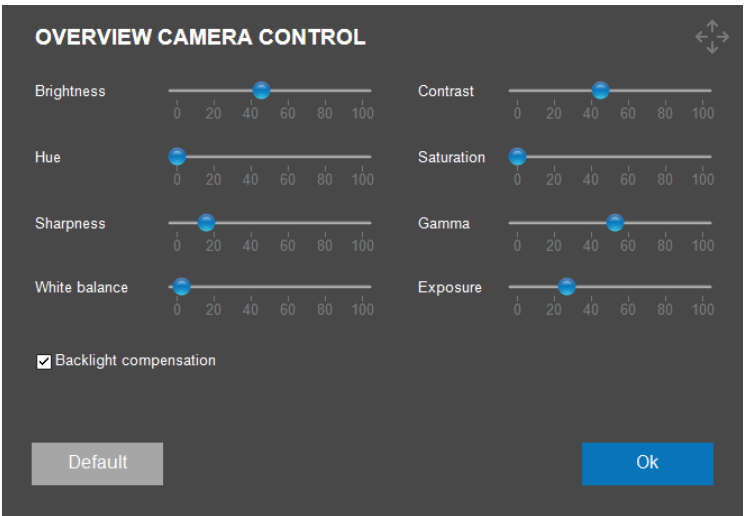
When the Objective camera is live

With these sliders it is possible to change the contrast and brightness of the objective camera. This is done “live” meaning that any change of these settings can be seen in the live image. Check **“AUTOMATIC”** if you want the system to determine the best contrast and brightness settings.

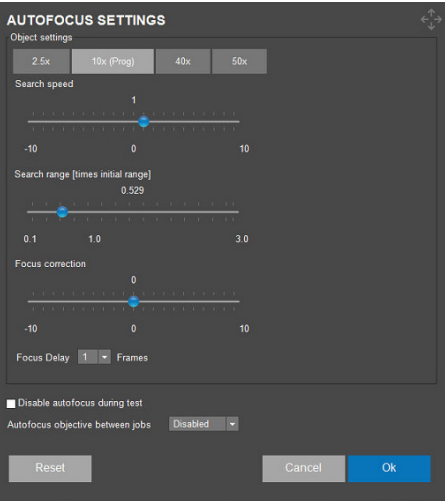


When the overview camera is live

With these sliders it is possible to change visual settings of the overview camera. This is done “live” meaning that any change of these settings can be seen in the live image. The button **“DEFAULT”** will set all parameters back to the default factory settings.



5.4.4.2 AUTOFOCUS



Each objective has its own autofocus settings. Select the correct objective to be modified. The active objective is always selected. The machine’s autofocus is done by moving the table up and down in steps over a certain range. For systems with a moving head, the focus is determined by moving the head up and down.

Search speed

The search speed is the size of each step that the table or head moves up and down to find the focus. Decreasing this value will make the focus much accurate and precise but increases the time to find the focus.

Search range

The search range restricts the maximum focus search area (Z-axis) of the table/head during autofocusing. Increasing this value will not increase the autofocus time. If the system finds the best autofocus before the end of the set range, it will stop searching.

Focus correction

After finding the focus, it is possible to force the table or head to move up or down a certain number of steps, this offset is set with this option. It is not recommendable to set this parameter. If a focus correction is needed, decrease the search range instead.

5.4.4.3 RESOLUTION

In this menu either **“HALF”** (standard) or **“FULL RESOLUTION”** (slow) mode can be selected.

5.4.4.4 BRIGHTNESS

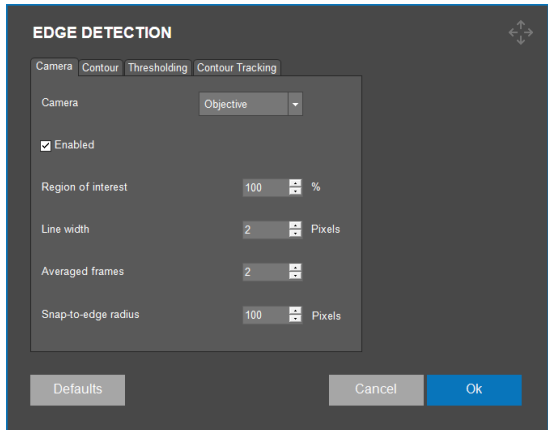
In this menu the light level can be set to **“AUTO”** after the auto focus and before measurement. Setting this brightness to **“AUTO”** can affect the value of the hardness reading. A better alternative is to have good homogenous finish of the test surface and adjust the light by hand with the **“OBJECT LIGHT”** buttons of the dashboard.

5.4.4.5 EDGE DETECTION SETTINGS

IMPRESSIONS™ has a sophisticated algorithm for edge detection and scanning. The effectiveness of edge detection is determined by several factors. Most relevant are lighting and good surface finish of test samples. The detection method is based on a robust global thresholding algorithm. This algorithm works best if the test sample appears light grey against a black background. The 2.5x or the 5x objective are the best objectives to use for edge detection/scanning.

Changing the edge detecting parameters is recommended for users who are familiar with computer vision parameters. It is always possible to return to factory settings by pressing the **“DEFAULTS”** button.

Camera



This tab enables the configuration of the camera for edge detection. Select **"CAMERA"** in the first tab to view and modify setup of OBJECTIVE or OVERVIEW camera. The settings of the other tabs apply to the camera selected here.

Check **"ENABLED"** to enable edge detection for this camera. The overview camera is disabled by default because it is hardly used for edge detection/scanning.

Make the **"REGION OF INTEREST"** smaller to limit edge detection to the, less deformed, inner part of the image.

"LINE WIDTH" is the width in pixels of the detected edge.

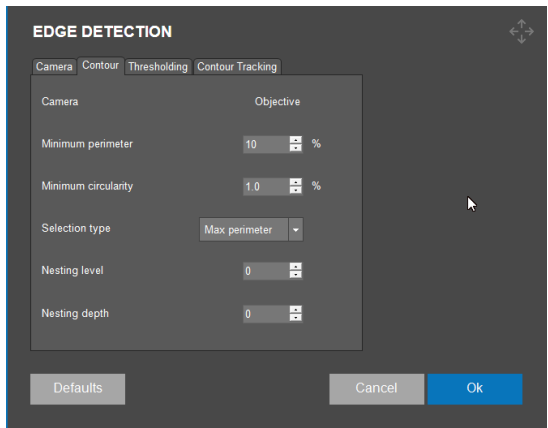
Reduce noise by **"AVERAGING"** subsequent camera frames.

"SNAP-TO-EDGE RADIUS" is used in snap to edge mode. If the mouse cursor is within range of this radius, then an anchor appears on the screen, showing the snap location. See **"RELATIVE START POINT"** of a test pattern.

Press **"DEFAULTS"** to restore factory values of the settings of this tab.

Press **"OK"** to accept changes or **"CANCEL"** to abort.

Contour



This tab enables the configuration of the contour selection for edge detection.

"CAMERA" is the camera selected in the previous tab.

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 test sample are in general regarded as a contour). Therefore, it is essential to ignore irrelevant contours in the image.

Two selection criteria are always applied:

"MINIMUM PERIMETER" for the size and **"MINIMUM CIRCULARITY"** for the shape. The minimum perimeter is expressed as a percentage of the image circumference and minimum circularity as percentage of a perfectly round circle (100%).

Select the **"SELECTION TYPE"** for the contours:

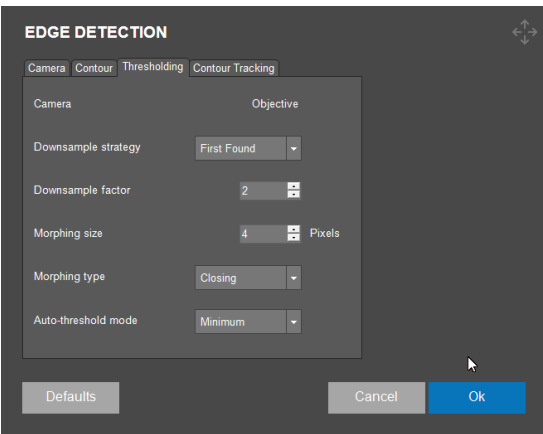
- **"NONE"**: selects all contours fulfilling the minimum criteria.
- **"MAXPERIMETER"**: (default) selects the contour having maximum perimeter.
- **"MAXAREA"**: selects the contour the with largest area.
- **"Type MINDISTANCE"**: is for internal use only.

Contours can be enclosed by other contours. Enclosed contours have a higher LEVEL. An external contour has level 0 (= default **"NESTING LEVEL"**). A **"NESTING DEPTH"** equal to 0 (= default) selects contours having the same level. Summarized, all contours are selected that satisfy:

NESTING LEVEL < LEVEL < NESTING LEVEL + NESTING DEPTH

Thresholding

The tab **"THRESHOLDING"** displays the setup of the edge detection algorithm based on global thresholding. Global thresholding assumes that the test sample is light grey against a dark background or vice versa. Adjust the light source such that this is the case.



If lighting is optimal then an uneven surface finish of the test sample might cause problems. Choose the right **"DOWNSAMPLE STRATEGY"** to compensate for a bad surface finish:

- Strategy **"NONE"** means that the specified **"DOWNSAMPLE FACTOR"** is applied to the image. This is the fastest method, but it could fail.
- Strategy **"FIRSTFOUND"** continues down sampling until a contour has been found that satisfies the criteria.
- Strategy **"MATCHING SHAPE"** is like **"FIRSTFOUND"** but does one more down sampling and demands that the contour looks like the previous one.

Surface finish might be so bad that additional morphing of the down sampled image is necessary.

"MORPHING TYPE" **"CLOSING"** closes dark scratches on a light test sample.

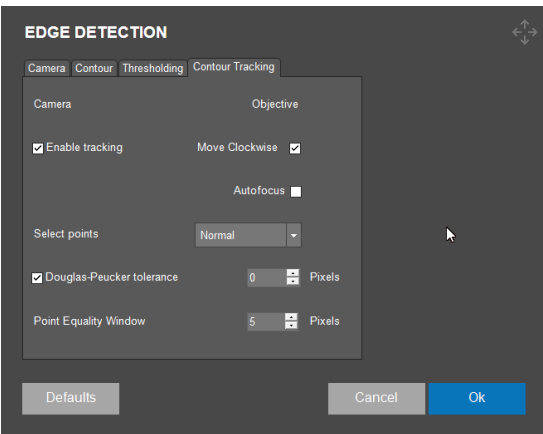
"MORPHING TYPE" **"OPENING"** does the opposite. Adjust the **"MORPHING SIZE"** to get good results.

NOTE: A large **"MORPHING SIZE"** deforms the edge. This is not desired in SNAP TO EDGE mode.

If lighting is such that the image has a bimodal histogram then **"AUTO-THRESHOLD MODE"** should be set to **"MINIMUM"** or **"BIMODAL"**. Default for the objective camera is **"MINIMUM"**. Modes **"ISO DATA"** and **"OTSU"** might give good results for the overview camera.

Contour tracking

The tab **"CONTOUR TRACKING"** displays the setup for tracking contours of test samples.



"CAMERA" is the camera that is selected in **"CAMERA"** tab.

Contour tracking is executed as follows:

The XY-stage is moved to the start point or the next location. Then the spindle is adjusted if **"AUTOFOCUS"** is enabled. An image is taken at this location and scanned for an edge. On success the result is stored as part of the contour an the XY-stag moves to the location where this part of the contour ends. **"TRACKING"** stops when the last scan is close enough to the very first scanned edge.

Check **"ENABLE TRACKING"** to make contour tracking possible in either **"CLOCKWISE"** or counterclockwise mode.

Increase the **"POINT EQUALITY WINDOW"** if tracking fails to stop at the start location.

At the end of tracking all parts of the contour are assembled. If **"DOUGLAS PEUCKER TOLERANCE"** is disabled, then all pixels are converted to points of the contour, provided **"SELECT POINTS"** mode is set to **"NORMAL"**.

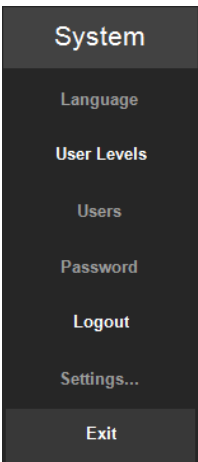
Mode **"EXIT POINTS"** stores only the last pixel of each part. The number of contour points can be huge if **"DOUGLAS PEUCKER TOLERANCE"** is disabled. The Douglas Picker algorithm straightens contours by checking the distance of a pixel to the line connecting the neighbor pixels. Pixels with a distance less or equal than the tolerance will be removed. Disable **"AUTOFOCUS"** if surface elevation of the test sample contour is within focus depth of the objective camera. Do not use auto-focus for overview camera. Auto-focus is very time consuming.

5.4.4.6 TURRET LIGHT

If the machine is equipped with an extra Rockwell light, it can be switched **“ON”** and **“OFF”**.

5.4.5 SYSTEM

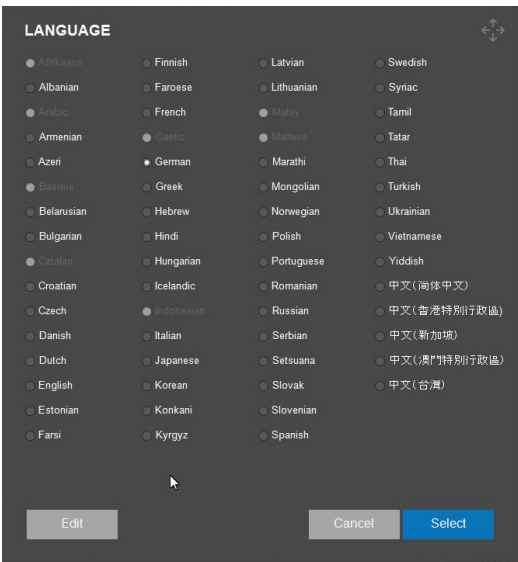
This menu allows to set, change or delete users, usernames, user rights and passwords. The menu allows you to logout from the IMPRESSIONS™ software as a user or to exit from the IMPRESSIONS™ software and return to the Windows® desktop.



“LANGUAGE” is to set the language.
“USER LEVELS” is to view or edit user levels.
“USERS” is to view or edit users.
“PASSWORD” is to change your password.
“LOGOUT” the login menu appears. Enter name and password or press **“EXIT”** to exit IMPRESSIONS™.
“SETTINGS...” to change the software configuration of IMPRESSIONS™.
“EXIT” to exit from the IMPRESSIONS™ software and return to Windows®.

5.4.5.1 LANGUAGE SETTINGS

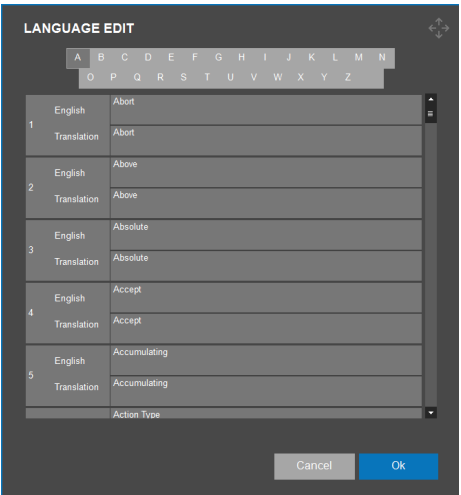
The language of Impressions can be changed and even edited. This language system is independent of the language of the operating system.



Changing to a different language

Select the desired language and press **“SELECT”** to accept or **“CANCEL”** to exit. After selecting another language, IMPRESSIONS has to be restarted.

Edit a language



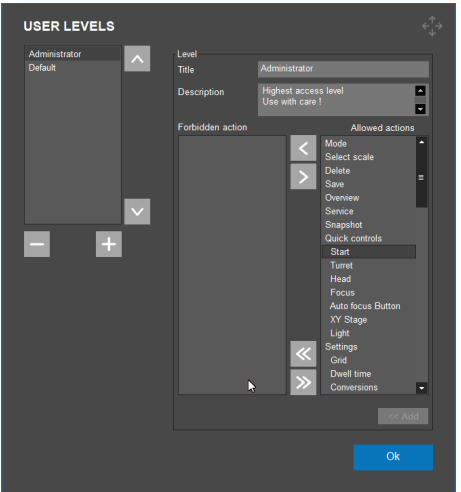
Although all common world languages are available, it is still possible to edit the translation of a language. Select the desired language to edit and press **“EDIT”**. The following window will appear.

All words within the software are presented in alphabetical order. Click in the translation area and fill in the correct translation of the word in the selected language. Press **“OK”** to save or **“CANCEL”** to exit.

5.4.5.2 USER LEVELS

Users are linked to a certain user level. A user level can be created or modified with the **“USER LEVELS”** menu. For every user level, actions can be allowed or forbidden. This will disable or enable corresponding functions.

Certain user actions are grouped under a parent user action. If such a parent action is disabled, then all underlaying actions will be disabled too. If a underlaying action of a parent action is enabled, its parent action will also be enabled, since this is mandatory to access the underlaying action.



To **“ADD”** a new user level, select the **“+”** (plus) button below the list of available user levels. Then fill in the name of the user level and an optional (but recommended) description. Now, select the actions you want to enable for this level and move them to the allowed list with the allow action button **“>”**. To forbid an action use the forbid action button **“<”**. By default all actions are forbidden.

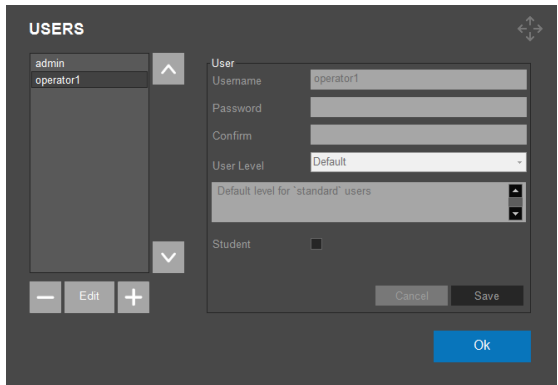
With the Allow all **“>>”** and forbid all **“<<”** buttons all items can be moved from the forbidden list to the allowed list and vice versa.

When all settings have been done, click the **“<< ADD”** button to store the new user level.

To **remove** a user level, use the **“-”** (minus) button; a user level can only be removed if it is not in use!

User levels can be modified by selecting a level from the list of available user levels and change the allowed/forbidden actions as described above.

5.4.5.3 USERS



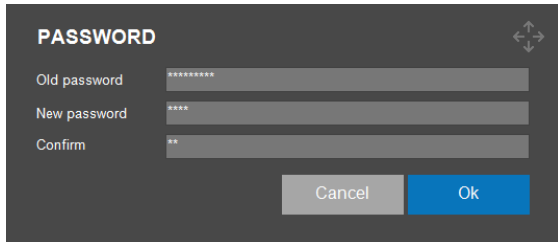
To add a new user, click the “+” (plus) button, fill in the desired username and password and link this user to a user level. Press “OK” to store this new user.

To edit an existing user, select a user from the available users and click “EDIT”. Make the desired changes and click “OK”.

To delete a user, select a user from the list, press the “-” (minus) button and click “OK”. The service and admin user cannot be changed or deleted.

5.4.5.4 PASSWORD

In this dialogue the active (logged-in) user can change his/her password.

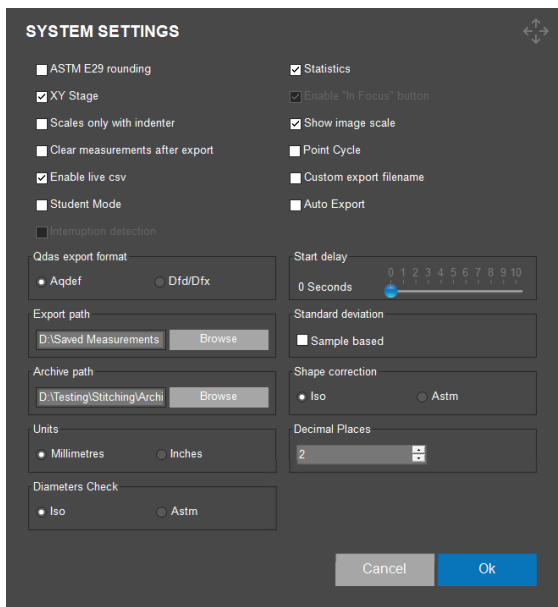


5.4.5.5 LOGOUT

The active user will be logged out and the login window will appear.

5.4.5.6 SETTINGS

In the settings menu general system settings can be configured.



ASTM E29 Rounding

By default, the hardness value is presented with two decimal places. Turning this parameter “ON” will change this to one decimal place. The rounding of the value is done according to the ASTM E29. (“ON” = 1 decimal place).

XY-Stage

To turn off the motorized XY-stage uncheck this box. (Selected = XY-stage “ON”).

Scales only with indenter

If an indenter is not installed in the system, the scale is not selectable in the scale selection. (“ON” = scale is not selectable if indenter is not present).

Clear measurements after export

If the values will be exported, the batch list will be cleared. (“ON” = the batch list is cleared after export).

Downscale before measure

Detecting an indent automatically on the highest camera resolution is slower than on lower resolution. To make the indent detection quicker, turn this setting ON. (“ON” = detect indent on lower resolution).

Q-DAS export format

Sets the Q-DAS export format to “AQDEF” or “DFD/DFX”.

Student Mode

With student mode selected, the hardness value is not presented. Only the length of the diagonals will be visible. The hardness value needs to be calculated by “heart”. Mainly used for educational purposes (“ON” = Student mode).

Statistics

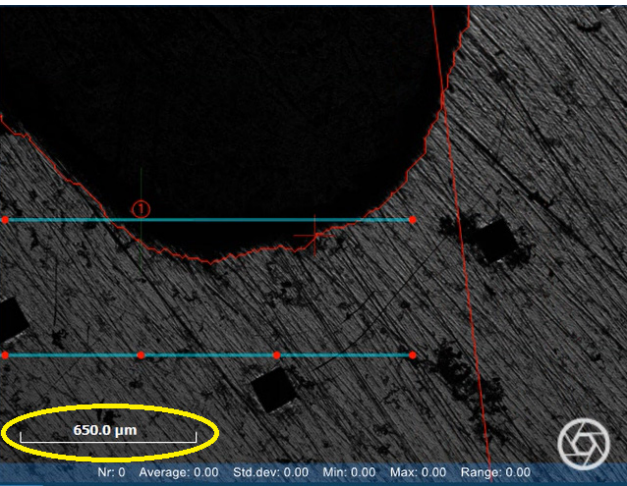
Turns on the statistics line in the live view of the camera. This doesn't affect the statistic's calculation in the report.

Enable “In Focus” button

This setting will enable the “In Focus” button. This gives the operator the possibility to determine the focus ($Z = 0$) by hand without using the autofocus which can take more time than manual focusing. (“ON” = in focus button is enabled).

Show image scale

Turns on the image scale in the live view of the objective camera. (“ON” = Scale is ON).



Point cycle

This will turn on the point cycle feature (“ON” = Point cycle ON). When enabled: if a test pattern is active, it is possible to double click on a point of the pattern to move to the position of that point. Use the arrow keys left and right on the keyboard to cycle trough all points in the test.

Custom export filename

The filename of the exported data is a fixed format. Turning this setting on will give the user the chance to give each export file another name. ("ON" = Export filename is not fixed).

Export and Archive path

Setting to change the location of the export or archive file. This can also be a network location.

Units

Change measuring units from Inches to mm. If changed to Inches, the diagonals of the indents will still be in mm.

Shape correction

ISO and ASTM have a different shape correction table (Convex, concave and spherical correction). This setting allows you to select which correction is used.

Diameter check

The diameter check for Vickers is not the same for ISO and ASTM. This setting allows you to select which diameter check is used.

"ISO" Diagonal check:

The difference between the lengths of the diagonals should not be greater than 5 %. If the difference is greater, this shall be stated 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 four corners of the indentation are not in sharp focus, the test surface may not be perpendicular to the indenter axis.

Standard deviation

It is possible to select two different methods of calculating the standard deviation. Sample or non-sample based variance.

"SAMPLE BASED" 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 calculated by taking 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.

"SAMPLE BASED" selected:

Identical to sample based not selected but dividing the sum of the squares by the number of values in the set minus 1.

Start delay

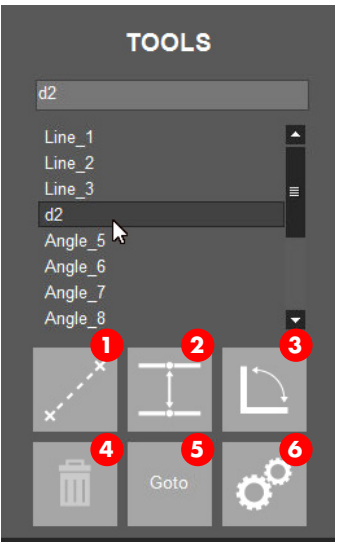
Start delay is used to delay the start action, if the start button is pressed accidentally. Setting this value to X seconds means; to start the test, press and hold the start button for at least X seconds. This feature is mainly used when working with a footswitch.

5.4.5.7 EXIT

This will close IMPRESSIONS™ and return to Windows®.

5.4.6 TOOLS

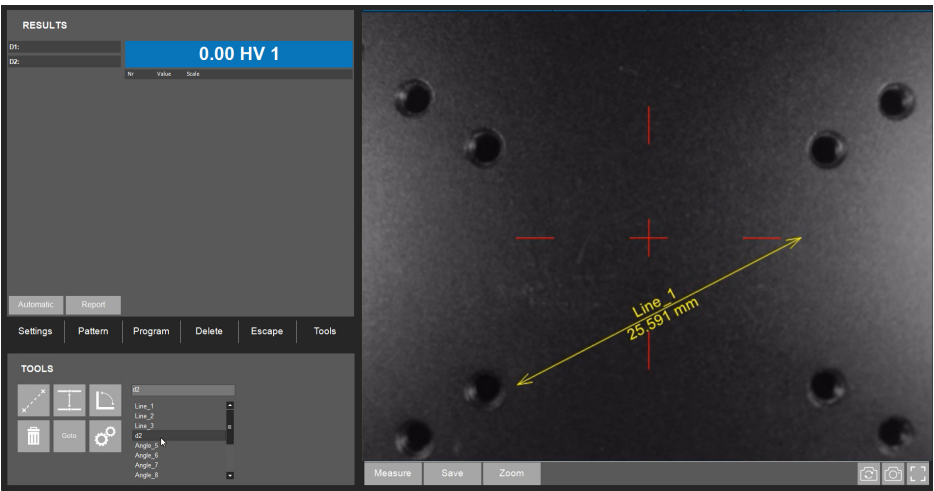
In live objective and overview camera view several measurements are available.



1. Distance measurement
2. Line to line measurement
3. Angle measurement
4. Delete selected measurement
5. Jumps to selected measurement in the view panel
6. Opens the tools settings

Entry field: Possibility to change the name of selected measurement

5.4.6.1 PERFORMING A DISTANCE/ANGLE MEASUREMENT



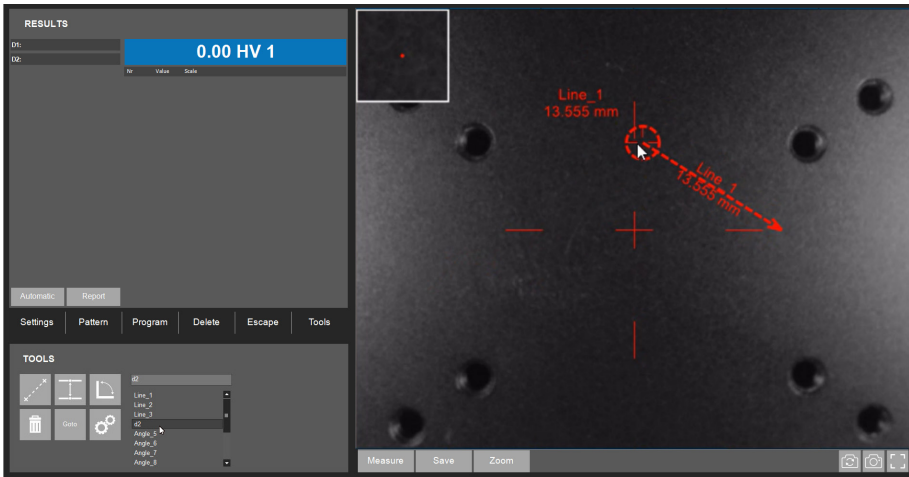
- Select a measurement.

Place cursor on the end of the line, the line end will be highlighted with a red dotted circle.

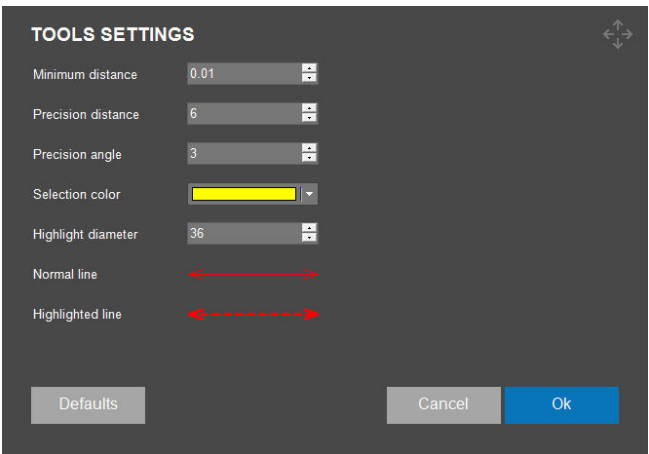
- Hold the cursor* and drag the line end to the desired position.

* when using a mouse, select the line end by selecting and holding it with the left mouse button.

The distance/angle, covered by or between the arrow(s), will be shown.



5.4.6.2 MEASUREMENTS SETTINGS



“MINIMUM DISTANCE”: The smallest distance which will be measured.

“PRECISION DISTANCE”: Number of decimals behind the comma for a distance measurement.

“PRECISION ANGLE”: Number of decimals behind the comma for a distance measurement.

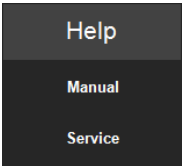
“SELECTION COLOR”: The color setting for the selected measurement.

“HIGHLIGHT DIAMETER”: The diameter size of the selected measurement point.

“NORMAL LINE”: The settings to configure the appearance of the normal line.

“HIGHLIGHTED LINE”: The settings to configure the appearance of the normal line.

5.4.7 HELP

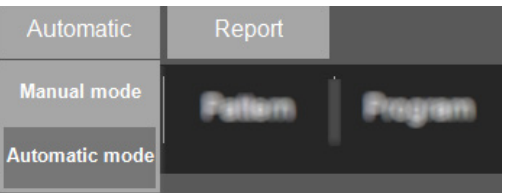


“MANUAL”: Opens the IMPRESSIONS™ user manual.

“SERVICE”: Opens the service menu.

5.4.8 AUTOMATIC/MANUAL MEASUREMENTS

NOTE:
Auto/manual setting does not affect Rockwell testing.



5.4.8.1 AUTOMATIC

After an indentation has been made, the diameter measurement of the indentation will be done automatically.

1. Make a hardness indentation according to the entered requirements.
2. After the indentation has been made, the turret will position to the original pre-indentation set objective, for image viewing.
3. After a second, 4 crosslines will appear in the captured **objective** view.
4. The **crosslines** will then automatically position on the edges of the indentation.
5. After processing, the hardness value appears on the screen.

5.4.8.2 MANUAL

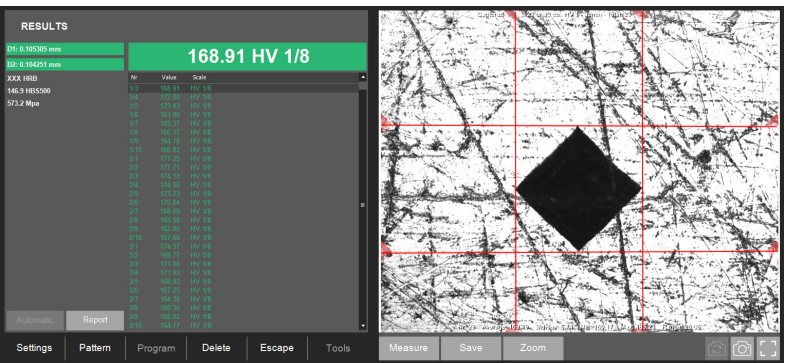
After an indentation has been made, the diameter measurement of the indentation has to be done manually.

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 press **“MEASURE”**.
5. After a second, 4 crosslines will appear on screen.
6. The **crosslines** must be positioned on the edges of the indentation, manually.
7. After processing the 4 crosslines, the hardness value appears on the screen.

5.4.9 RESULTS/JOBS

The **“RESULTS”** tab shows the results of the last measurement, all other measurements are shown in the batch list. This tab enables viewing and modifying individual measurements.

The **“JOBS”** tab opens the Job list. In the Job list multiple Jobs can be added. The Job list is mandatory when handling multiple samples or multiple hardness scales. A job contains all settings needed to perform the measurements. On the **“JOBS”** tab, Jobs can be selected, edited, created and deleted. When the **“START”** button is pressed in automatic mode then all measurements of the active job are executed. At exit, the current jobs are stored on disk and loaded at next start up. After next start-up the first job in the list will be active. This job can be used, a job from the list can be selected or a new job can be made.



5.4.9.1 RESULTS

D1: Diameter 1 of indentation.
 D2: Diameter 2 of indentation.
 154.32 HV1/2s: Hardness value.
 135.3 HBS500: Converted value.
 523.8 Mpa: Converted value.
 Batch list of measurement results.



TIP: One mouse click on D1/D2 shows the average diameter.

When selecting a result from the batch list (it will turn light blue), the measurement can be modified by selecting a crossline in the objective camera view and moving it to a new position. Whenever the length of a diagonal results in an incorrect ratio according the used standard, the diameter box will turn RED.

When the modification is done, the measurement can be saved with **"SAVE"** or discarded with **"ESCAPE"**.

5.4.9.2 JOBS

In the Job list the active Job is marked blue. Also, the active Job is indicated in the upper part of the objective camera view. Also, the active Job is indicated in the upper part of the objective

It is also possible to select multiple jobs, by selecting them. Selected Jobs are marked with a checkmark.

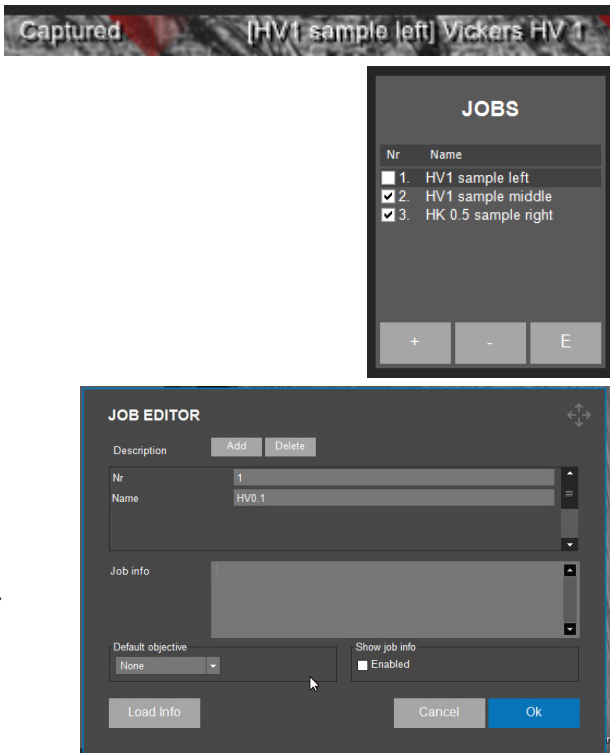
"+": To add a job.

"-": To delete selected jobs.

"E": To edit a job.

In the Job editor several Job settings can be modified.

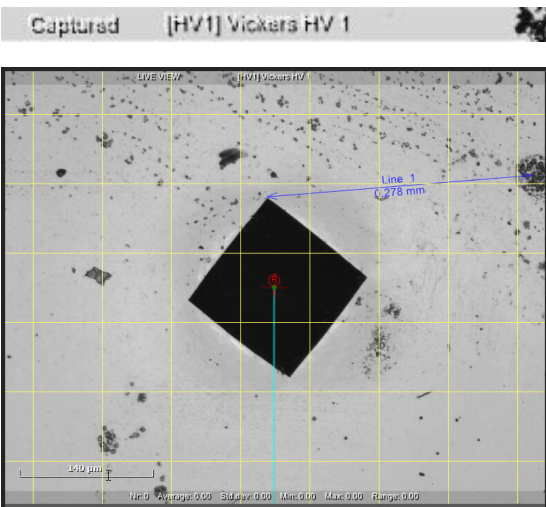
- **"DEFAULT OBJECTIVE"**.
- Add/remove a **"DESCRIPTION"** with **"+"** or **"-"**.
- Job **"NR"** in the Job list.
- **"NAME"** in the Job list.
- **"SHOW JOB INFO"** If ON, then all descriptions will be shown to the user before the measurement sequence of the job is started.
- Press **"LOAD INFO"** to fill field **"JOB INFO"** with contents of a text file.



5.4.10 OBJECTIVE/OVERVIEW CAMERA VIEW

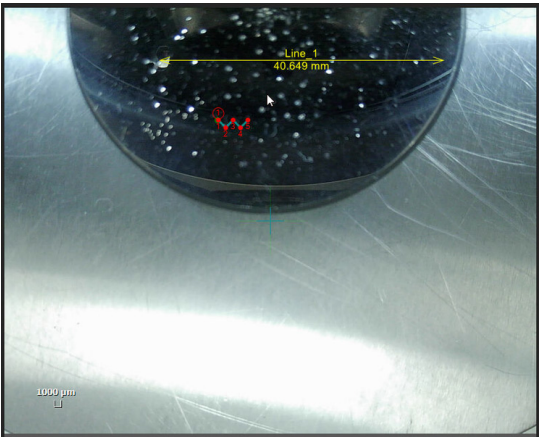
When the workpiece is brought into focus the overview camera can be selected, by selecting the **"OVERVIEW"** Button.

5.4.10.1 OBJECTIVE CAMERA VIEW



In the objective view, the workpiece will be visible through the selected objective (with magnification). The objective camera view can be selected for both live view and captured images. In the upper part of the objective camera view, the view and the selected hardness scale are visible.

5.4.10.2 OVERVIEW CAMERA

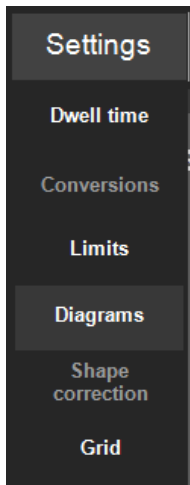


In the overview view, the workpiece will be visible through the overview camera.

This view will show, in most cases the whole workpiece or a large part of it. This view is convenient to find the correct position to perform the tests.

Movement of the camera can be done by dragging the crosshair to the desired position (a red arrow will indicate the movement) or by double clicking the desired position.

5.4.11 TEST SETTINGS



All specific test settings are configured here. These settings can be stored in a Job or in a program.

“DWELL TIME”: Dwell time settings for preload, main load and recovery.

“CONVERSIONS”: To select one or more conversions of the results into another standard/scale.

“LIMITS”: To indicate an upper and lower limit for test results.

“DIAGRAMS”: To set the diagram type for the results.

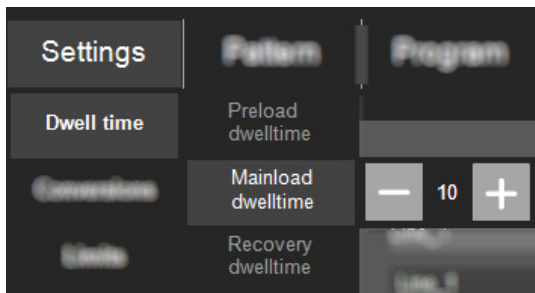
“SHAPE CORRECTION”: To set a correction for concave, convex or sphere-shaped materials.

“GRID”: To enable a grid in the camera view.

NOTE:
Be aware that changing the hardness scale, also the test settings will change and must be set for the selected scale.

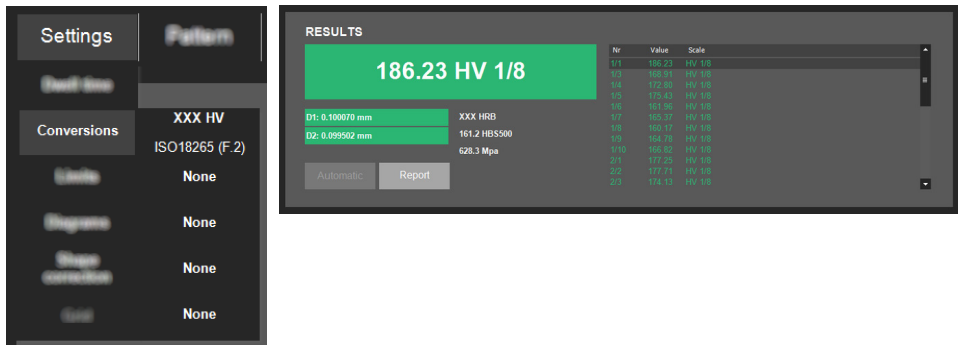
5.4.11.1 DWELL TIME

All dwell time settings can be configured in this menu (in seconds). **“PRELOAD”**, **“MAINLOAD”** and **“RECOVERY”** dwell times are enabled for all depth scales and only **“MAINLOAD”** dwell time for other scales. The minimum set time is 1 second and the maximum is 999 seconds in steps of 1 second. Select **“+”** or **“-”** to in or decrease the dwell time value.



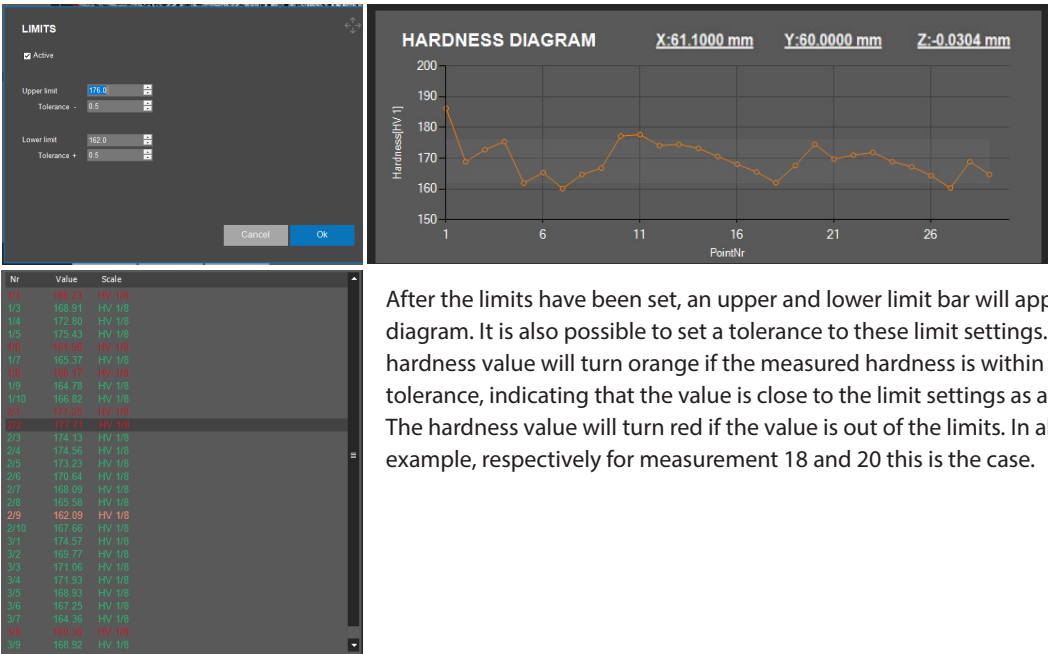
5.4.11.2 CONVERSIONS

In this menu several conversions to different standards/scales can be selected. In the results list the conversions will be shown beneath the actual measurement result.



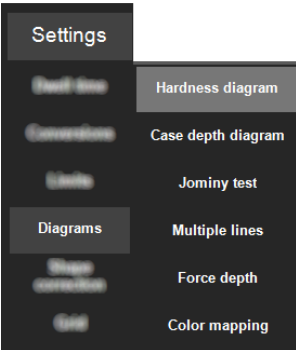
5.4.11.3 LIMITS

This menu gives access to the **“UPPER”** and **“LOWER”** limits settings. Check **“ACTIVE”** to activate the limit settings. Press **“OK”** to save the setting. The last measured values and the values in the batch list will turn red if the value is outside of these limits.



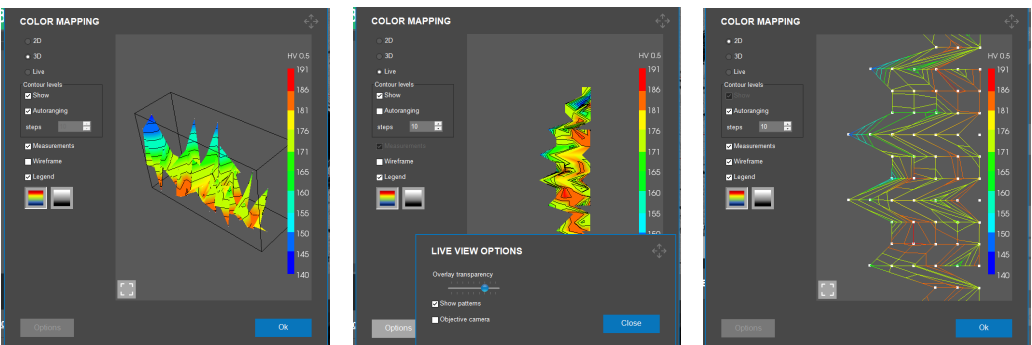
After the limits have been set, an upper and lower limit bar will appear in the diagram. It is also possible to set a tolerance to these limit settings. The hardness value will turn orange if the measured hardness is within this tolerance, indicating that the value is close to the limit settings as a pre-warning. The hardness value will turn red if the value is out of the limits. In above shown example, respectively for measurement 18 and 20 this is the case.

5.4.11.4 DIAGRAMS

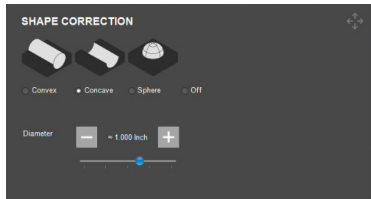


Hardness values can be displayed in several ways. The **“HARDNESS DIAGRAM”** simply shows the hardness values for all subsequent test points. The **“CASE DEPTH DIAGRAM”** shows the hardness values as a function of depth. The depth value is the distance to the edge of the object under test. If a test has been executed according to ISO-642 then the **“JOMINY TEST”** diagram is appropriate.

Advanced diagram settings
Select the **“MULTIPLE LINES”** For the visualisation of multiple patterns in one graph. **“FORCE DEPTH”** will display, in 2 separate lines, the course of test force on the indenter and depth of the indentation (for Rockwell). **“COLOR MAPPING”** will display 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.

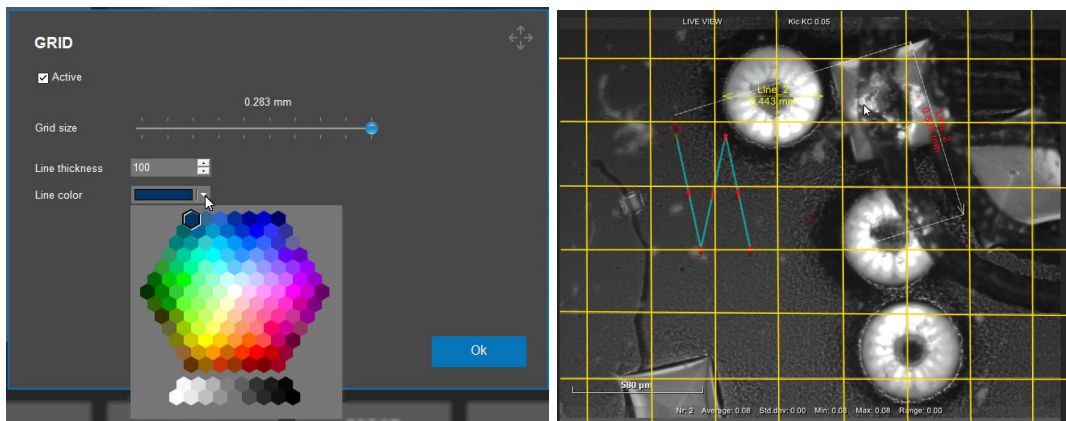


5.4.11.5 SHAPE CORRECTION



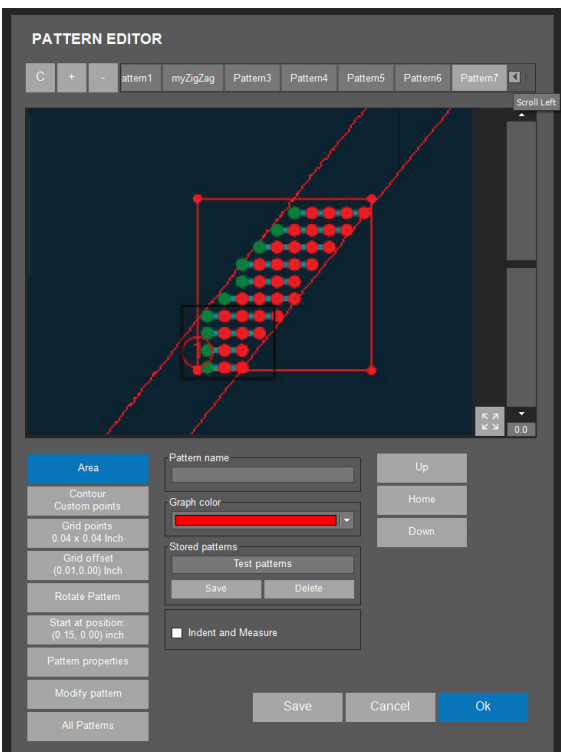
When the material under test has a **“CONVEX”**, **“CONCAVE”** or **“SPHERE”** shaped form, the radius in mm can be entered. This radius will be taken into account when determining the hardness value. Select **“OK”** to save the setting.

5.4.11.6 GRID



In the **“GRID”** menu it is possible to display a grid in the objective camera view. Size, thickness and color of the grid lines can be set. Set the desired properties of the grid and check **“ACTIVE”** before pressing **“OK”**.

5.4.12 TEST PATTERN



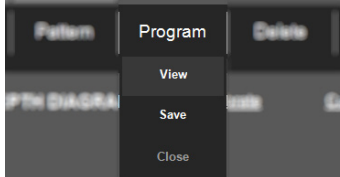
“TEST PATTERN” opens the test pattern menu.

Pressing **“SINGLE POINT”** disables the active test pattern. After pressing the **“START”** button the tester does a single indentation at the current location.

Pressing **“TEST PATTERN”** opens the test pattern editor. The pattern editor makes it possible to add/remove patterns to a pattern collection.

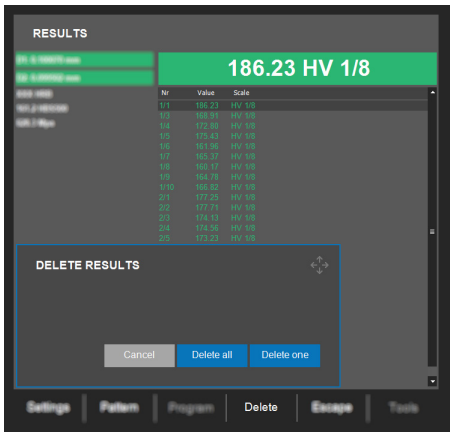
See [chapter 6](#) for more information on test patterns and the test pattern editor.

5.4.13 PROGRAM



In the **“PROGRAM”** menu, settings of custom programs can be stored. This is convenient for frequently returning tests and will reduce the setup time for the tester. Press **“VIEW”** to select an existing custom program. Press **“SAVE”** to store the current setup of the tester in a custom program.

5.4.14 DELETE



After a measurement has been made, it will be listed in the batch list of measurements. **“DELETE”** enables the removal of individual measurements or all measurements from the batch list. To delete a selected individual reading from the batch list. Select individual measurements (light blue bar) and press **“DELETE ONE”**. To delete all measurements in the batch list, select **“DELETE ALL”**. Select **“CANCEL”** to leave the menu without deleting a measurement.

5.4.15 ESCAPE



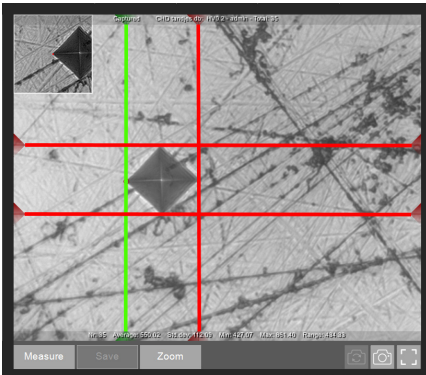
“ESCAPE” will return to the main screen, after or during a measurement.

5.4.16 SAVE



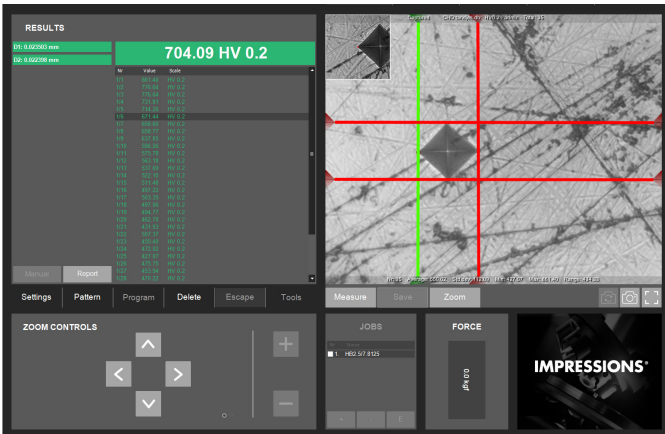
After a measurement has been made, the result can be saved to the batch list or the active Job. If an indentation has been remeasured, press **“SAVE”** to replace the results.

5.4.17 MEASURE



“MEASURE” turns ON optical measurement mode indicated by four cross lines. If the option automatic measurement has been purchased, the cross lines are placed at the correct positions, automatically. If the measurement has to be done manually or if the automatic result is not satisfying, the cross lines can be placed manually. This image shows an example of a Vickers indentation. The buttons **“ESCAPE”** and **“SAVE”** are available during and after a measurement. Press **“ESCAPE”** to stop measuring or **“SAVE”** to save the measurement to the batch list of results or active job.

5.4.17.1 EXAMPLE OF MODIFYING A MEASUREMENT



This image shows an example of a Vickers indentation where 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.

The incorrect placed cross line can be selected, the color will change from red to purple.

A cursor control with four arrows will be available on the dashboard.

A cross line contains a marker in the form of a little red dot, that can be seen in the magnification in the upper left corner of the camera view. This red dot can be positioned on the corner of the Vickers indentation with the four arrows on the dashboard, the mouse wheel or dragging it with the mouse.

5.4.18 OVERVIEW

“OVERVIEW” toggles between objective camera and overview camera. It involves a movement of the XY-stage, if available. Also see [chapter 5.2.10 Objective/Overview camera view](#).



⚠ WARNING: Possible automatic movements of the motorized XY-stage and/or test head.

NOTE: On Dual screen configuration, Overview camera view is always shown on 2nd screen.

5.4.19 SNAPSHOT

Snapshot takes a picture from a live or a captured image. The snapshots can be included in the [report](#). The snapshots are also available in the snapshots folder of the impressions installation directory, for instance: C:\Impressions\Data\Snapshots\



5.4.20 ZOOM



Press **“ZOOM”** to enter the zoom mode.

A slider allows to magnify the camera view, **“+”** enlarges the image and **“-”** reduces the image.

Also, several predefined zoom levels (1x to 5x) can be selected. The arrows enable scrolling through the image when the image is enlarged. Press **“ESCAPE”** to exit zoom mode, the last selected zoom level will stay active in the current image, as long as it is active.

5.4.21 REPORT



“REPORT” opens the menu to configure, print or export a report. A report can contain statistics, diagrams, tester settings, measured values, snapshots, etc.

“SNAPSHOTS”: to select the snapshots to be included in the report.

“PRINT”: Opens a print preview of the report. In the preview the report can be printed, exported (.PDF and .XLSX) and edited (company info).

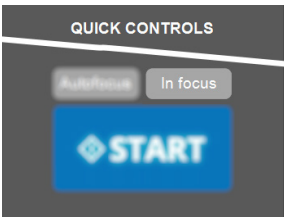
“TEMPLATE EDITOR”: Opens the template editor. In the editor the report template can be modified (layout, content etc.) and saved.

“EXPORT” exports the measurements in CSV and/or Q-DAS format and location as set in the **“SYSTEM SETTINGS”**, see [chapter 5.4.5.6](#).

5.4.22 IN FOCUS

Each time the Z-axis is moved manually, the camera view is out of focus. The **"IN FOCUS"** button starts blinking and the **"START"** button is disabled. Focus on the workpiece by:

- Adjusting the position of the Z-axis until the workpiece is in focus.
Then press **"IN FOCUS"**.
 - Or use the autofocus function, **"IN FOCUS"** stops blinking automatically.
- For correct operation of the tester it is essential that the camera is always in focus.

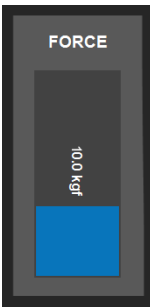


5.4.23 LASER

"LASER" activates the positioning laser (if present). The laser indicates the center of the camera view.



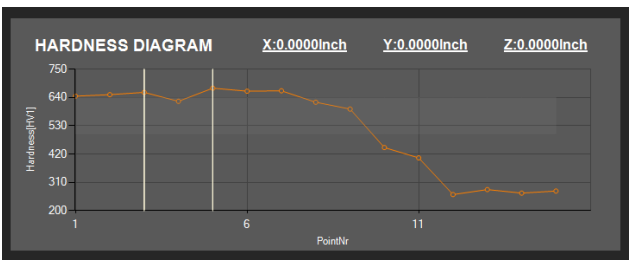
5.4.24 TEST FORCE INDICATOR



When the indenter is active, this indicator 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.

5.4.25 DIAGRAM

The diagram shows the graphical representation of the measured hardness values. Refer to [chapter 5.4.11.4](#) for more information on the different types of diagrams.

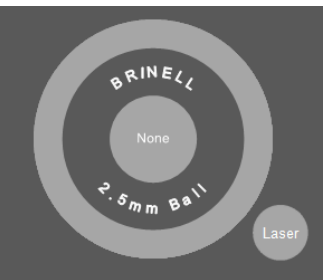


5.4.25.1 ABSOLUTE XY COORDINATES

In the upper part of the diagram the actual X Y Z coordinates of the table are shown. Click on the X or Y value on the screen. A text box will appear to fill in the new absolute position of the table. Click **"OK"** and the table will move to that new position.



5.4.26 INDENTER HEAD CONTROL



Contents of the test head:

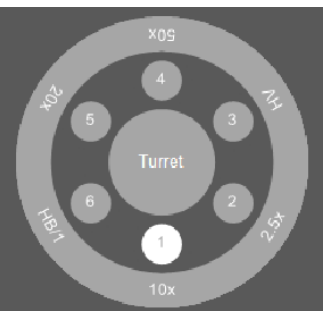
Test head with 1 location.
1 indenter (BRINELL 2.5MM BALL)
An external indent measure camera installed (BIOS 1)

Available actions in interface:

No controls;
shown indenter is the needed indenter based on chosen hardness scale.

NOTE:

Software assumes that the indicated indenter is installed, else incorrect hardness values will be calculated.



Contents of the test head:

Test head with multiple location.

Example shows active element in test head is the objective (10x) on position 1.

Available actions in interface:

Clicking in the center ("Turret") will rotate the turret to the next position.

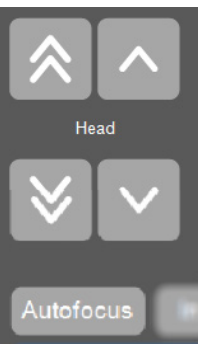
Clicking on an objective or indenter, will move the turret to that position.

Define contents of the Turret In the turret configuration.

CAUTION

Always make sure that the turret is free to rotate.

5.4.27 TABLE/HEAD AND AUTOFOCUS



These buttons control the Z-axis.

With the left button **"HEAD"**, the Z-axis moves up and down in high speed (rough focusing).

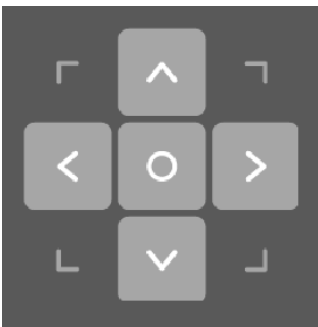
With the other button the Z-axis moves slowly up and down (fine focus). Fine focusing can also be done with the mouse wheel.

The Z-axis can also be controlled with the hardware buttons and Joystick on the front of the machine (If available) and the scroll wheel of the mouse.

The **"AUTOFOCUS"** button will start the autofocus cycle with the selected objective.

Tip: To find focus manually, always start with the lowest magnification

5.4.28 VIRTUAL JOYSTICK



This virtual Joystick controls the motorized XY-table. Click and hold the direction you want to move the table. Press and hold the center button to move the table to its home position. If the tester is equipped with a physical Joystick, the table can also be moved with that joystick.

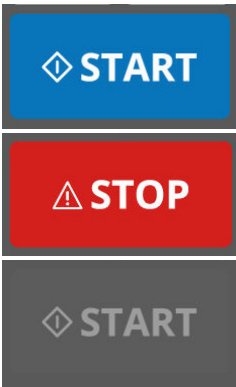
NOTE:
Center homing button is disabled in **emergency mode**.

5.4.29 LIGHT CONTROL



The light of all objectives and cameras can be controlled with these buttons. Clicking in the center will change the control of the light source. (Objective light, Overview light and Ring light).

5.4.30 START/STOP



The **"START/STOP"** button can have following status:

- **"START"** Blue: The machine is ready for test. All conditions to start are ok.
- **"STOP"** Red: The machine is busy. If the start button is red, the button can be selected to stop the activity of the machine.
- **"START"** Disabled: The tester is not ready to start (check focus, settings etc.).

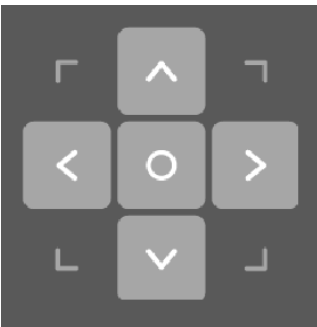
5.5 OPERATING THE AUTOMATIC XY-TABLE

In IMPRESSIONS™ there are several methods to operate the automatic XY-table. The automatic XY-table can be operated by using:

- The onscreen virtual joystick.
- Absolute movement.
- Double click onscreen.
- Click and drag onscreen.

All options will be described hereinafter.

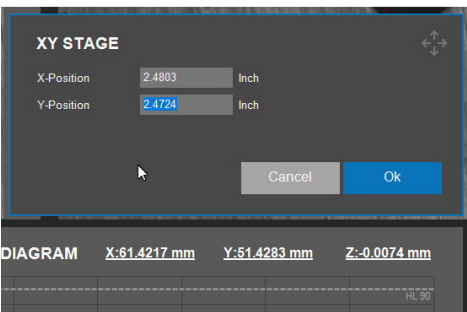
5.5.1 JOYSTICK



The motorized XY-table can be controlled with this **virtual Joystick**. If the tester is equipped with a physical Joystick, the table can also be moved with that joystick.

5.5.2 ABSOLUTE MOVEMENT

Click on the X or Y coordinate in the **diagram**.

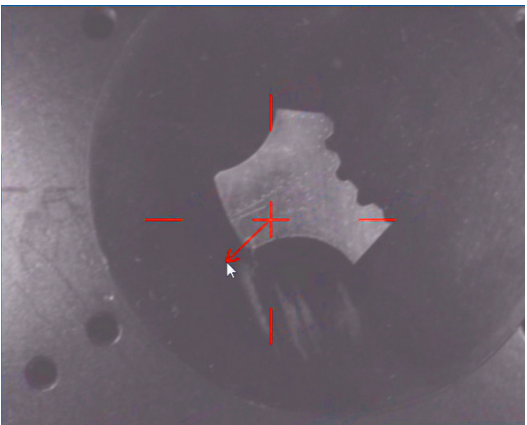


5.5.3 DOUBLE CLICK TO MOVE

Double click in the live view on the desired position, the XY-stage will move to that position.

5.5.4 CLICK AND DRAG

Click and drag with the mouse over the live view, the XY-stage will follow the direction of the cursor. The longer the arrow, the faster the table will go.



6

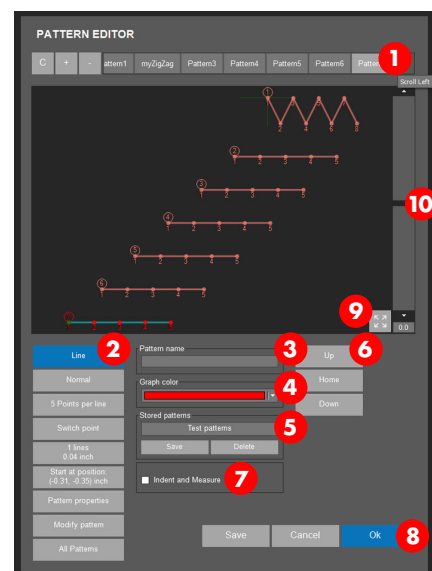
THE TEST PATTERN EDITOR

Selecting “**TEST PATTERN**” opens the test pattern editor. The pattern editor makes it possible to add/remove patterns to a pattern collection. A selection of predefined customizable test patterns are available, alternatively custom patterns can be made. For each pattern there is a dedicated set of settings. This chapter gives an overview of the pattern editor and a description of the available settings per pattern type.

NOTES:

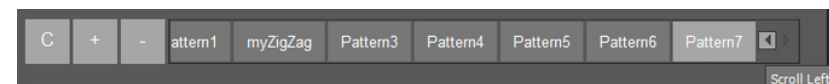
A pattern collection cannot be empty: it contains at least a Single Point test pattern. On Dual screen testers, the test pattern editor is always open.

6.1 OVERVIEW OF THE TEST PATTERN EDITOR



1. **Tab strip:** add/remove patterns.
2. **Pattern selection and settings.**
3. **Pattern name.**
4. **Graph color:** color of the pattern in the hardness diagram.
5. **Stored patterns:** save/retrieve patterns.
6. **Z-axis control.**
7. **Indent and measure.**
8. **Save/Cancel/OK.**
9. **Fit pattern(s) in view.**
10. **Rotation angle scroll bar.**

6.1.1 TAB STRIP



“**C**”: Copy the highlighted pattern to the pattern collection.

“**+**”: Add a new pattern to the pattern collection.

“**-**”: Remove the highlighted pattern from the pattern collection.

“**PATTERN7**”: the tab of the selected pattern is light. Other patterns of the pattern collection will be dark.

6.1.2 PATTERN SELECTION AND SETTINGS

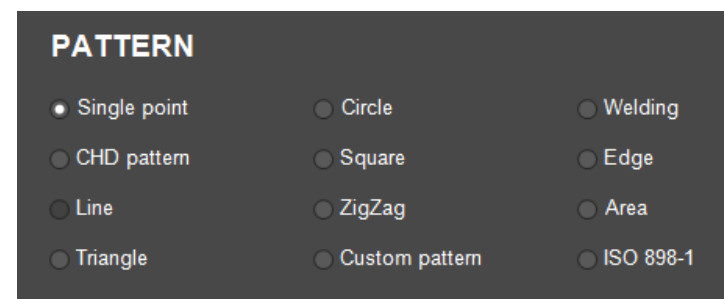
In this menu the type of pattern can be selected. For each pattern there is a dedicated set of settings. These settings will be described in detail as of [chapter 6.2](#).

Available test patterns are: Single point, CHD pattern, Line, Triangle, Circle, Square, ZigZag, Custom points, Welding, Edge, Area and ISO 898-1.

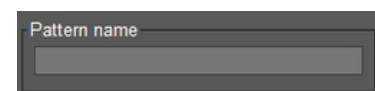
NOTE: The rotation angle is not reset.

NOTE: Some of the pattern types have to be purchased.

NOTE: Each pattern type has its own set of buttons.



6.1.3 PATTERN NAME



Set the name of the pattern on the tab in the pattern editor and in the hardness diagram.

6.1.4 GRAPH COLOR

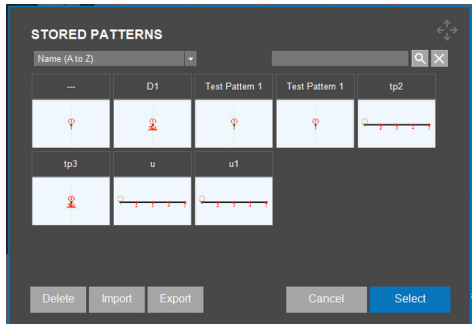


Set the color of the pattern in the hardness diagram.

6.1.5 STORED PATTERNS



Pattern collections can be stored and retrieved to and from disk. The reuse of pattern collections can reduce the workload significantly!
Select **"SAVE"** to store/overwrite the active pattern collection on disk.
Select **"DELETE"** to delete the retrieved pattern collection from disk. Confirm the removal by pressing **"OK"**.
Press button **"TEST PATTERNS"** to pop up a dialog box with thumbnails of stored pattern collections.



Select a pattern collection from the thumbnail list and press **"SELECT"**.
Select **"CANCEL"** to abort or **"DELETE"** to remove the selected collection(s) permanently.
It is also possible to **"EXPORT"** and **"IMPORT"** pattern collections.

***NOTE:** The active pattern collection is always present as first item in the list.*

The name of the selected pattern collection is shown on the **"TEST PATTERNS"** button.

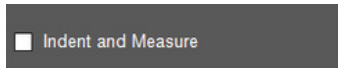
6.1.6 Z-AXIS CONTROL



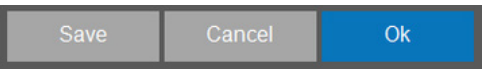
The pattern editor hides the dashboard with access to controls of the Z-axis. Buttons **"UP"**, **"HOME"** and **"DOWN"** enable moving the spindle from within the pattern editor. **"HOME"** restores the spindle position at the time the pattern editor was opened.

6.1.7 INDENT AND MEASURE

If this option is checked, the pattern also performs a measurement after indenting.



6.1.8 SAVE/CANCEL/OK



"SAVE" stores the pattern collection under edit in the active job. The camera view is immediately updated.
"CANCEL" discards all changes made since the last save and close of the editor.
"OK" to stop editing. A prompt to confirm the changes will appear. Press **"YES"** to overwrite the pattern collection of the active job.

6.1.9 FIT PATTERN(S) IN THE VIEW

This button resizes the display in such way that all patterns in the collection are visible.



6.1.10 ROTATION ANGLE SCROLL BAR



The orientation of the active pattern is set by the scrollbar. Make the pattern active by clicking on it in the camera view or selecting the tab in the pattern editor. Rotate the active pattern by dragging the slider. Clicking one of the arrows changes the rotation angle with 0.1° increments. Coarse stepping is possible by clicking above or below the slider. Double click the displayed angle to reset the rotation angle or fill in a value.

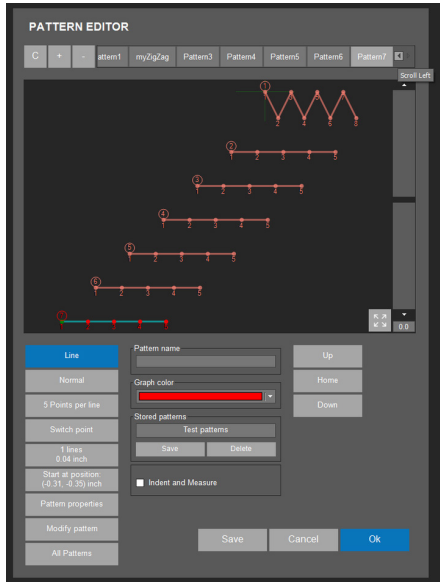
The rotation pivot is always the first test point of the pattern except for patterns in **"CENTER"** mode, in which case the center position of the pattern will be the pivot. Following patterns behave differently:

- CHD pattern.
- Patterns that use single edge or frame mode like **"WELDING TEST"** and **"LINE"** pattern.
- EDGE pattern.
- AREA pattern.

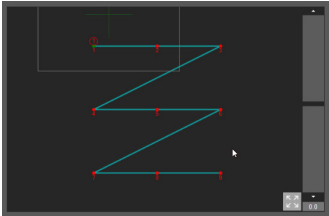
In which case the pivot will be the first point of the edge line or frame.

6.2 TEST PATTERN, SINGLE POINT

The Single Point pattern consists of a single test point.

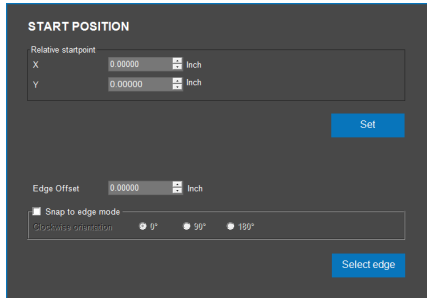


6.2.1 GRID SETTING



This function enables grouping multiple samples in a regular matrix. First set-up the pattern for the first sample in the assembly. Then select the **“GRID”** button to set the number of **“ROWS”** and the **“ROW DISTANCE”** and do the same for the **“COLUMNS”**. The example shows a 3x4 grid for a single point pattern.

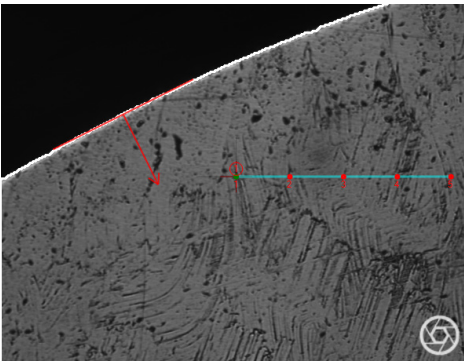
6.2.2 START AT CURRENT POSITION, POSITIONING A PATTERN



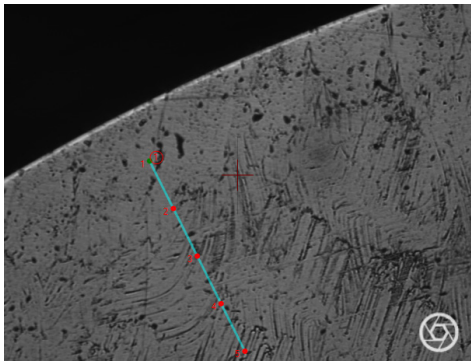
A pattern collection has a global start position, see **“ALL PATTERNS”**, **“GENERAL PROPERTIES”**. A single pattern in the collection has a start position relative to this global start position. Each test point in a single pattern has coordinates relative to the pattern start position. The relative pattern start position can be set in this menu. Alternatively, it is possible to change the start position by holding down the SHIFT key, left-clicking the pattern and drag it to another location.

“SNAP TO EDGE MODE” is very convenient if the pattern should have an offset to the edge of a test sample. In this case you can select a point at the edge. The resulting pattern starts at this position with a certain **“EDGE OFFSET”** and **“CLOCKWISE ORIENTATION”**. Check the checkbox to enable automatic edge detection (option edge detection has been purchased). After setting all options press **“SELECT EDGE”** and left click on the desired edge location. The pattern is now moved to this location. If the checkbox is unchecked, then the orientation of the pattern has to be set with a second left-click, a red anchor is displayed during the selection process. See following example: Clockwise orientation= 90° and edge offset=0.3mm.

Edge selection



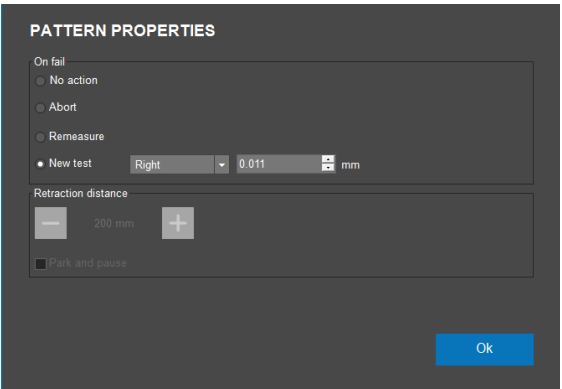
Result



6.2.3 GENERAL PROPERTIES

In this menu, the action to perform when the hardness of the test point is not within limits, can be set. **“NO ACTION”**: Just mark the point as outside limits. **“REMEASURE”**: Moves the XY-stage slightly out of center to create another camera angle and remeasures. If the point was outside the limits because the image was not optimal, this remeasurement might be acceptable. **“NEW TEST”**: If the remeasurement fails, a new test on a different location on the specimen, can be set. This new test will be stored as if it was the original location.

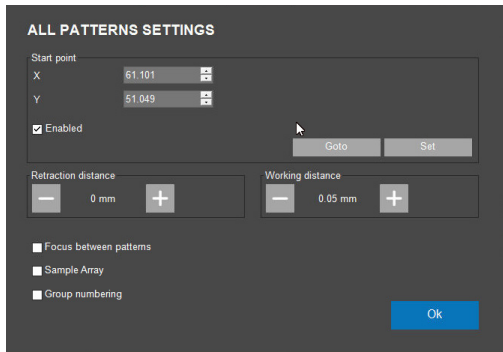
NOTE: If all actions fail, the remeasured points will be marked as outside of limits.



6.2.4 ALL PATTERNS

In this menu, settings that will affect all patterns of the pattern collection, can be set. There is a **“GENERAL PROPERTIES”** and a **“SHAPE”** submenu.

6.2.4.1 GENERAL PROPERTIES



Settings related to the global start position of the pattern collection:

- X and Y coordinate.
- Selecting **“GOTO”** moves the XY-stage to the global start position.
- Selecting **“SET”** makes the global start position equal to the current position of the XY-stage.
- Uncheck **“ENABLED”** to disable the global start position. Indentation then starts at the relative start position from the current position.

Change the global start position with the mouse: while holding down the SHIFT key left click a pattern and drag it to another location.

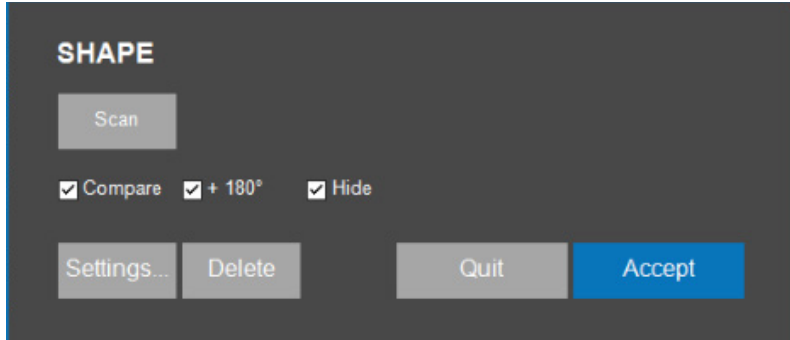
Change the **“RETRACTION DISTANCE”** for all patterns in the collection with the up and down arrows. This distance is the height, above the test sample, the indenter retracts to after indenting.

Change the **“WORKING DISTANCE”** for all patterns in the collection with the up and down arrows. This distance is the height, above the test sample, where the indentation procedure commences.

Check **“GROUP NUMBERING”** to continue numbering the test points in the collection instead of starting from 1 for individual patterns.

Check **“SAMPLE ARRAY”** to apply the pattern to an array of samples and measuring the mean hardness value. This is a very specific option, used in very specific applications. Contact your sales representative for more information.

6.2.4.2 SHAPE, CONTOUR SCAN



This button is enabled if the option **“AUTOMATIC CONTOUR SCANNING”** has been purchased.

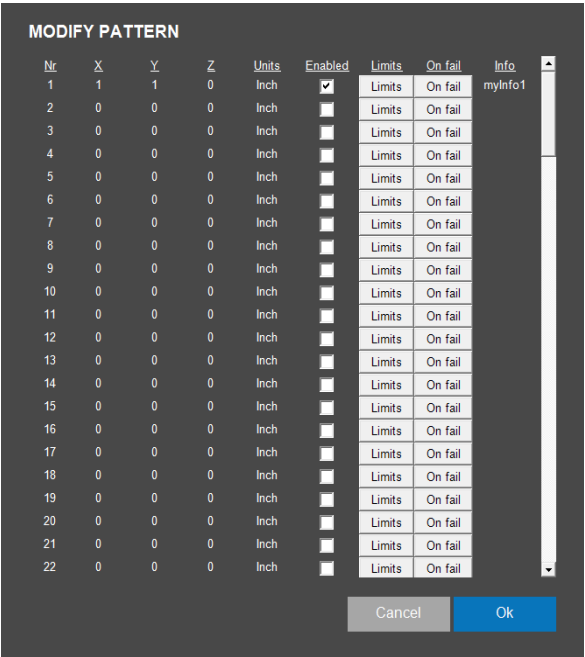
Select **“SHAPE”** to create or delete the shape of the pattern collection. This shape is the contour of the test sample for which this collection of patterns has been created. Shapes are used for recognition of test samples. They are persistent, just like the patterns in the collection. Pressing **“DELETE”** will remove it permanently. **“HIDE”** toggles the display of shapes. It is always possible to (re-)scan the contour of a sample. Move the XY-stage to a position where part of the contour is visible. Press **“START”** to scan the contour. On success, the scanned contour is displayed in orange. If the scan fails, then poor lighting is probably the cause.

Select **“QUIT”** to abort the scan and close the dialog. Make sure that the test sample is (light) grey on a black background, on the objective camera view.

Scan setup can be changed by pressing **“SETTINGS”** similar as in EDGE DETECTION.

When **“COMPARE”** is enabled, the final result can be previewed. Check **“+ 180°”**, to rotate the existing shape over this angle. Press **“ACCEPT”** to accept the result and close the dialog. If there was already a shape for this pattern collection, this will be replaced by the scanned version and all patterns of the collection will be relocated to the new location.

6.2.5 MODIFY CUSTOM PATTERN



For all pattern types it is possible to view the properties of individual test points by selecting **“MODIFY CUSTOM PATTERN”**. Press **“CANCEL”** to stop viewing. Selecting **“OK”** converts the active pattern into a custom pattern! Only then changes to individual test points are saved.

NOTE: The conversion to a custom pattern is irreversible.

6.3 TEST PATTERN, CHD (CASE HARDNESS DEPTH)

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

6.3.1 CHD TYPE

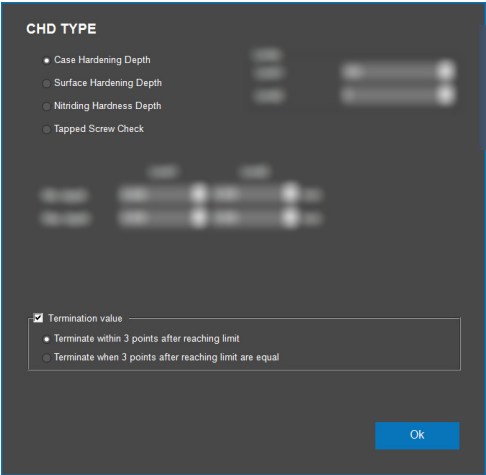


Diagram method **“CHD”** is according to ISO-2639. Enter a (hardness) **“LIMIT”**. This limit is shown in the CHD diagram.

Diagram method **“SHD”** is according to DIN-10328. Enter the hardness values for **“HV-MIN”** and **“HV-MAX”**. This limit is shown in the CHD diagram.

Diagram method **“NHD”** is according to DIN-50190. Is intended for testing depth profiles of nitrated surfaces. Enter a (hardness) **“LIMIT”**. This limit is shown in the CHD diagram.

Enable **“TERMINATION VALUE”** when the hardness values have to be terminated in the CHD diagram, after reaching the limit. **“MIN AND MAX DEPTH”** sets limits for the depth. These limits are shown in the CHD diagram.

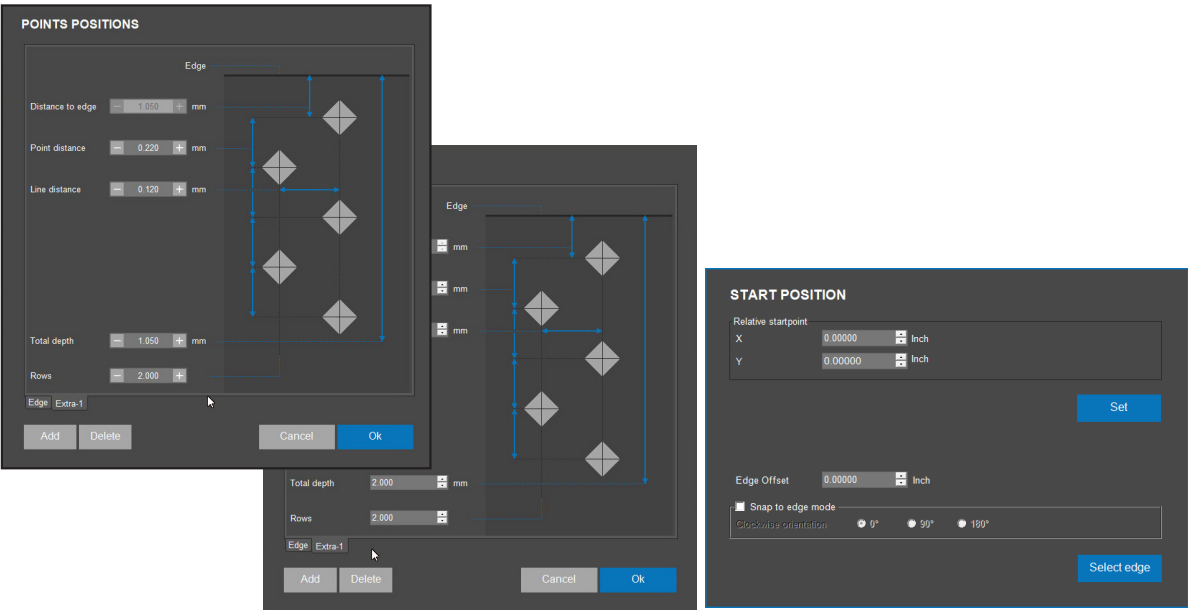
6.3.2 POINTS POSITIONS

The **"POINT POSITIONS"** menu specifies the sequence of test points starting at a certain distance from the surface. One or more sections in the depth profile can be defined. Each section specifies a vertical **"POINT DISTANCE"**, horizontal **"LINE DISTANCE"** parallel to edge and a **"TOTAL DEPTH"**. The first section is called the edge section and specifies the actual **"DISTANCE TO EDGE"**. The **"TOTAL DEPTH"** of the last section determines the depth (or span) of the pattern. Press **"+"** to add a section at the end and **"-"** to delete it.

See following example:

The image is the result of the settings of:

- 2 sections in the **"POINT POSITIONS"** menu. The **"EDGE"** section starts at a distance of 0.150mm from the edge and has a depth (span) of 0.550 mm. The **"EXTRA-1"** section has a depth of 1.250-0.550=0.7mm.
- At the start point, which has been set with the **"START POSITION"** menu, the start point snaps to the edge and will be 90° rotated.



For the positioning of the pattern and other settings: **"START AT CURRENT POSITION"**, **"GENERAL PROPERTIES"**, **"ALL PATTERNS"** and **"MODIFY CUSTOM PATTERN"**, see [chapter 6.2 Test pattern, Single point](#).

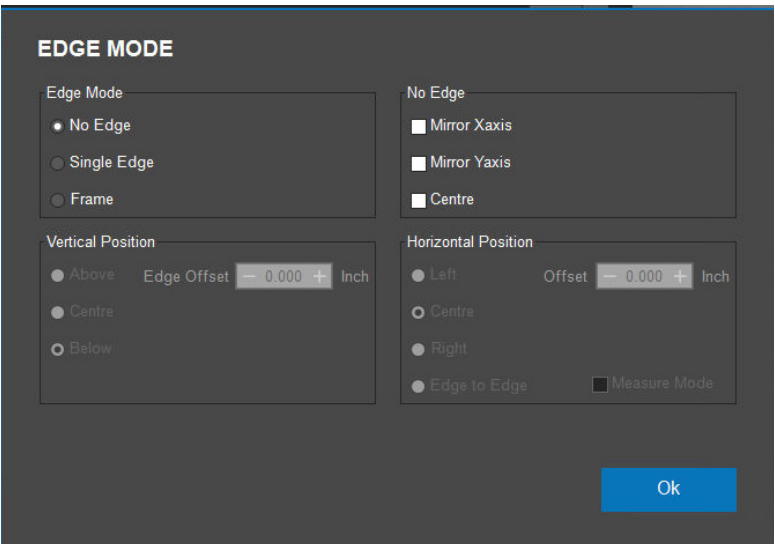
6.4 TEST PATTERN, LINE

The generic line pattern can be used in following (edge) modes: **"NO EDGE"**, **"SINGLE EDGE"** or **"FRAME"**. Main parameters are the **"NUMBER OF LINES"**, **"LINE DISTANCE"**, **"NUMBER OF POINTS"** and **"POINT DISTANCE"**.

The modes and parameters will be explained in following examples.

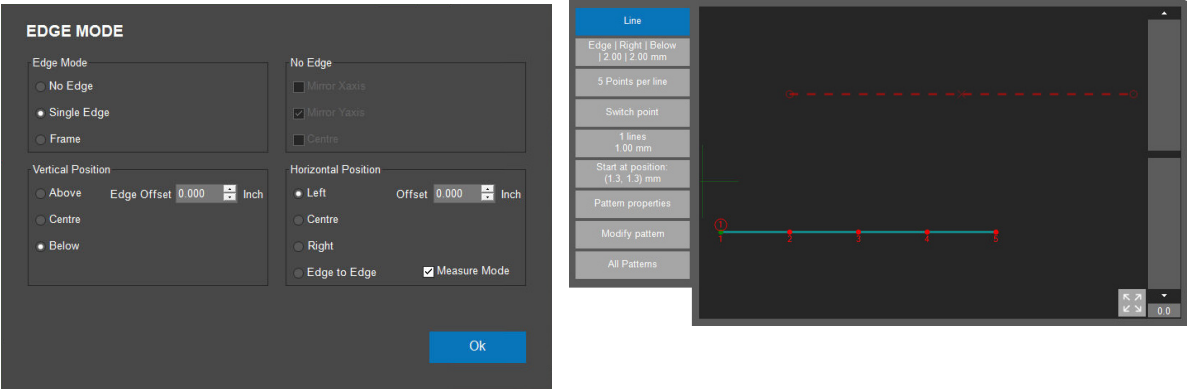
6.4.1 NO EDGE MODE

Select **"NORMAL"** to open the edge mode menu. Select **"NO EDGE"** and select **"OK"**. By default, a line pattern consisting of 5 test points will be placed. Furthermore, there is the option to mirror or center the line pattern.



6.4.2 SINGLE EDGE MODE

Use **"SINGLE EDGE"** if the pattern must have a certain offset from the edge of the sample. Select **"NORMAL"** to open the edge mode menu. Select **"SINGLE EDGE"** and select **"OK"**. In following example, the line is placed 2mm below the edge reference line and is shifted 2mm from the right side.

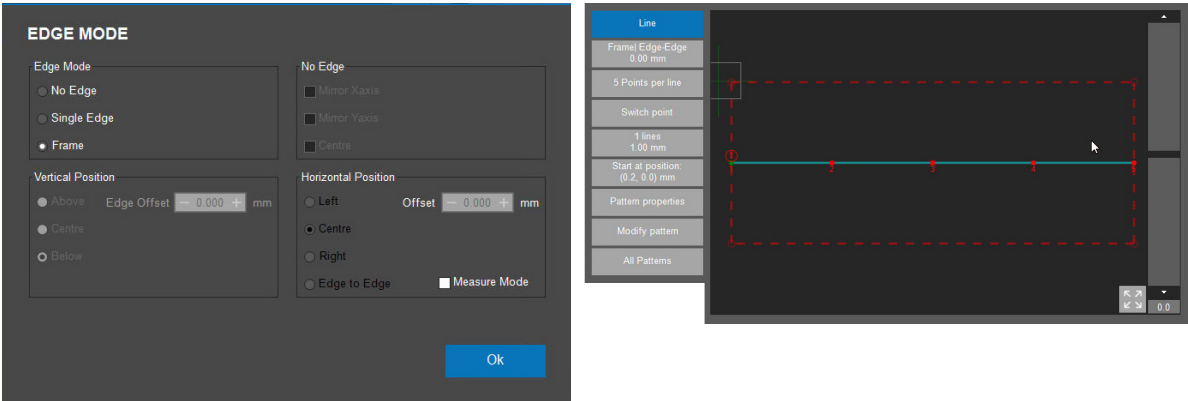


To position the edge, move the mouse cursor to the start or end point of the edge reference line (red circle), left click and drag the edge into position.

NOTE: That when using **"EDGE TO EDGE"** as horizontal position, the **"POINT DISTANCE"** changes if the edge reference line is stretched → **"SWITCH POINT"** is inactive.

6.4.3 FRAME MODE

Use **“FRAME”** if the line(s) of the pattern have to be distributed evenly between two edges of the sample. Select **“NORMAL”** to open the edge mode menu. Select **“FRAME”** and select **“OK”**. In following example, the line is placed across the frame, reaching from edge to edge, hence for horizontal position **“EDGE TO EDGE”** is selected.

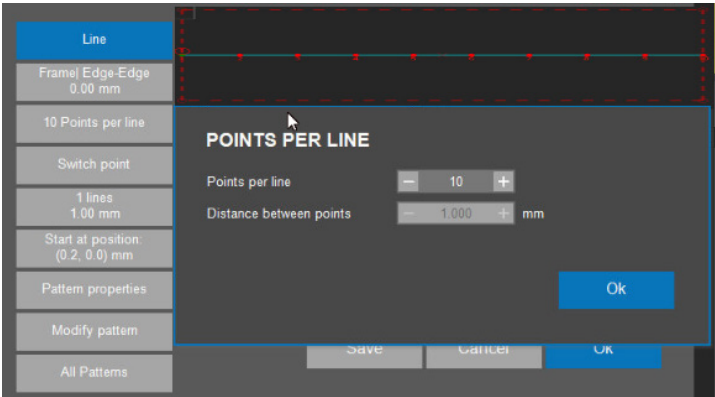


To modify the frame, move the mouse cursor to one of the corners (red circle), left click and drag the frame into position. The line will move and scale with the frame.

NOTE: That when using **“EDGE TO EDGE”** as horizontal position, the **“POINT DISTANCE”** changes if the frame is stretched → **“SWITCH POINT”** is inactive.

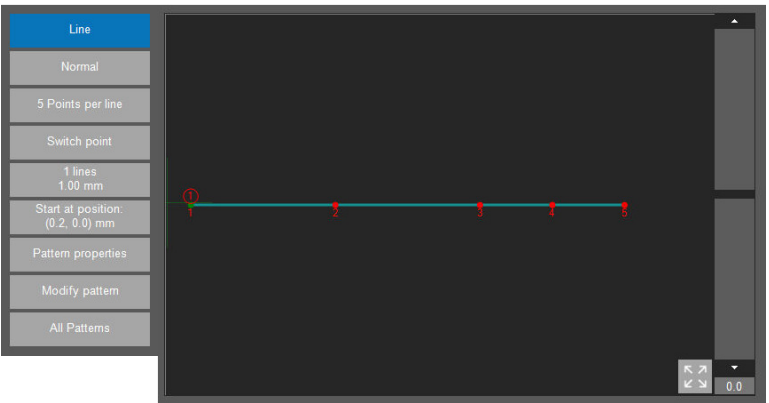
6.4.4 POINTS PER LINE AND POINTS DISTANCE

This menu is only present for predefined patterns. Select this option to set the number of points in a single line and the distance between the points. Following example shows 10 points per line with a distance of 1 mm.

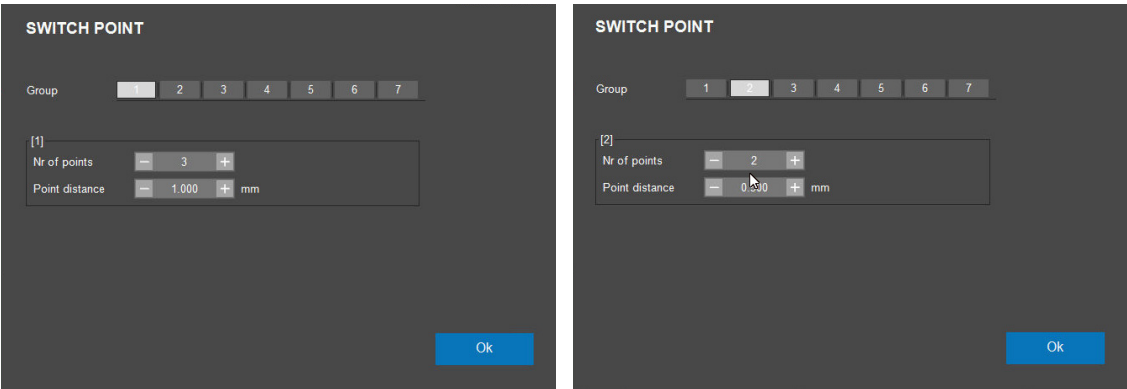


6.4.5 SWITCH POINT

It is possible to use up to 10 different point distances within a single pattern. Select the **“SWITCH POINT”** menu and enter the **“NUMBER OF POINTS”** and **“POINT DISTANCE”** for each section. A section becomes inactive if the number of points is zero. Following example shows a line pattern with two sections. The point distance changes from 0.5 mm to 1 mm after 2 points.

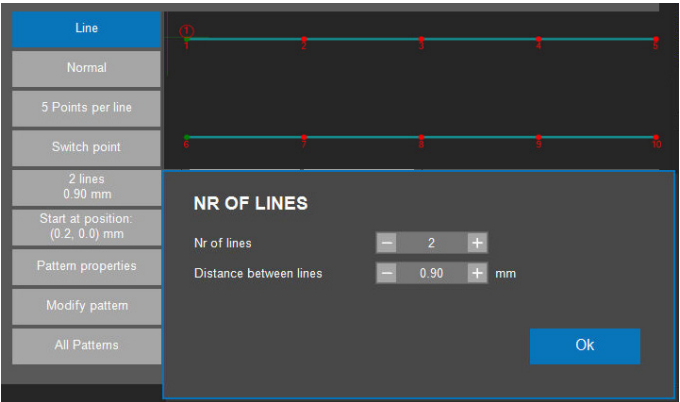


NOTE: The **“POINTS PER LINE”** will be changed to the first section if following sections have no points.



6.4.6 NUMBER OF LINES

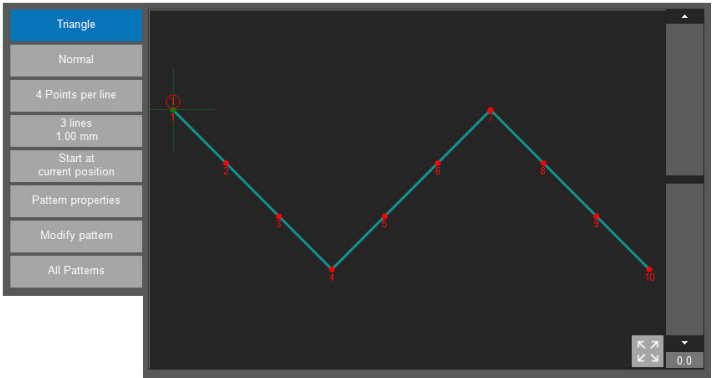
This menu is to set the number of lines in the pattern and the distance between the lines. Following example shows 2 lines with a distance of 0.5mm between them.



For the positioning of the pattern and other settings: **“START AT CURRENT POSITION”**, **“GENERAL PROPERTIES”**, **“ALL PATTERNS”** and **“MODIFY CUSTOM PATTERN”**, [see chapter 6.2 Test pattern, Single point.](#)

6.5 TEST PATTERN, TRIANGLE

The path of the equidistant test points is shaped like a **"TRIANGLE"**. 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"** (x) between first and last point and the vertical **"POINT DISTANCE"** (y) between them. Do not confuse **"POINT DISTANCE"** with the actual point distance! The actual point distance is equal to $(x^2 + y^2) / (n - 1)$ where n = **"POINTS PER LINE"**.



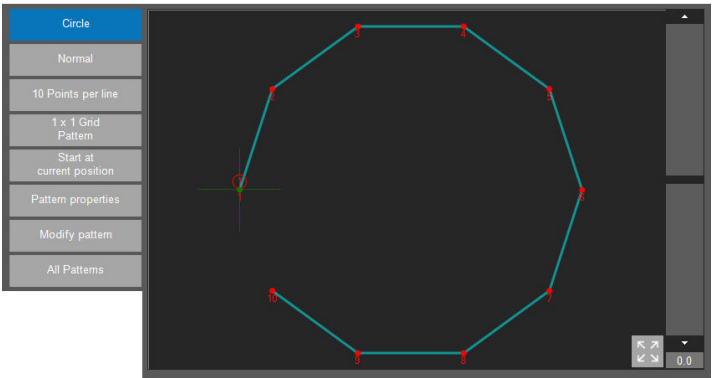
Select **"NORMAL"** to open the mirror menu. For the **"EDGE"** modes [see chapter 6.4 Test pattern, Line](#).
 Select **"MIRROR XAXIS"** to invert the X-coordinate of all test points: $(X, Y) \rightarrow (-X, Y)$.
 Select **"MIRROR YAXIS"** to invert the Y-coordinate of all test points: $(X, Y) \rightarrow (X, -Y)$.
 Select **"CENTER PATTERN"** to move the center of gravity to the relative start position.

For **"POINTS PER LINE"** and **"NUMBER OF LINES"**, [see chapter 6.4 Test pattern, Line](#).

For the positioning of the pattern and other settings: **"START AT CURRENT POSITION"**, **"GENERAL PROPERTIES"**, **"ALL PATTERNS"** and **"MODIFY CUSTOM PATTERN"**, [see chapter 6.2 Test pattern, Single point](#).

6.6 TEST PATTERN, CIRCLE

The **"CIRCLE"** pattern arranges 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.
 Circle diameter is equal to: $d / \sin(180^\circ / n)$.



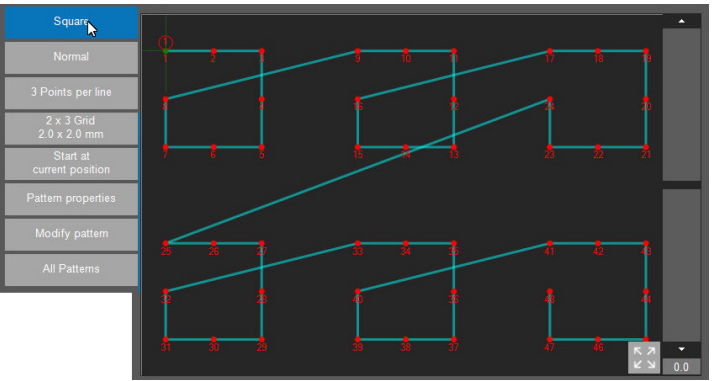
For **"MIRROR"** options, see [chapter 6.5 Test patterns, Triangle](#).

For **"POINTS PER LINE"**, see [chapter 6.4 Test pattern, Line](#).

For the positioning of the pattern and other settings: **"GRID"**, **"START AT CURRENT POSITION"**, **"GENERAL PROPERTIES"**, **"ALL PATTERNS"** and **"MODIFY CUSTOM PATTERN"**, see [chapter 6.2 Test pattern, Single point](#).

6.7 TEST PATTERN, SQUARE

There are just two parameters to set-up a **"SQUARE"** pattern: the number of points on each side and the point distance. If multiple samples have to be clamped together in a regular matrix layout, then the grid feature can be used. Start with configuring the pattern for the first sample in the assembly. Then press button **"GRID"** to set the number of **"ROWS"** and the **"ROW DISTANCE"** and do the same for **"COLUMNS"**. The pattern is extended to "rows x columns" test points. The example shows a 2x3 grid of a square pattern consisting of 3 points per line.



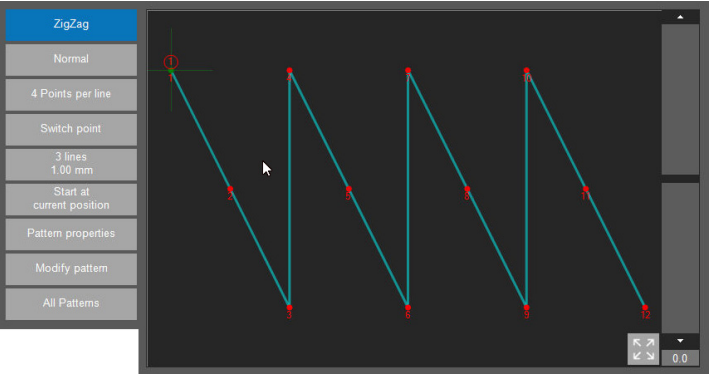
For **"MIRROR"** options, see [chapter 6.5 Test pattern, Triangle](#).

For **"POINTS PER LINE"**, see [chapter 6.4 Test pattern, Line](#).

For the positioning of the pattern and other settings: **"GRID"**, **"START AT CURRENT POSITION"**, **"GENERAL PROPERTIES"**, **"ALL PATTERNS"** and **"MODIFY CUSTOM PATTERN"**, see [chapter 6.2 Test pattern, Single point](#).

6.8 TEST PATTERN, ZIGZAG

The **"ZIGZAG"** pattern arranges test points in parallel but shifted (horizontal) lines. The example shows a pattern of 3 lines with a **"LINE DISTANCE"** of 1 mm, 4 **"NUMBER OF POINTS"** per line at a **"POINT DISTANCE"** of 1 mm.
 The name of the pattern refers to the path that the tester will travel.



For **"MIRROR"** options, see [chapter 6.5 Test pattern, Triangle](#).

For **"POINTS PER LINE"** and **"SWITCH POINT"**, see [chapter 6.4 Test pattern, Line](#).

For the positioning of the pattern and other settings: **"START AT CURRENT POSITION"**, **"GENERAL PROPERTIES"**, **"ALL PATTERNS"** and **"MODIFY CUSTOM PATTERN"**, see [chapter 6.2 Test pattern, Single point](#).

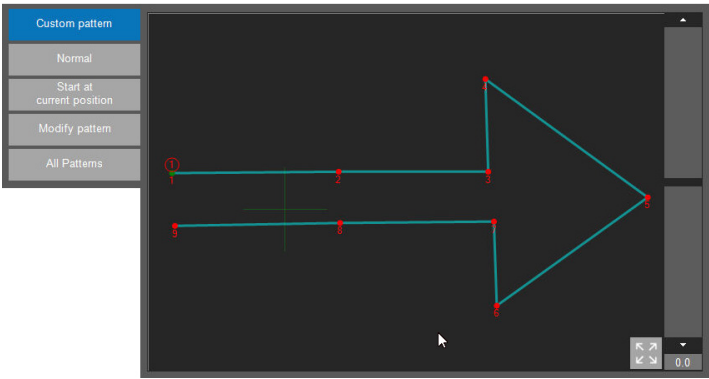
6.9 TEST PATTERN, CUSTOM POINTS

The “CUSTOM” pattern is not a template pattern like “LINE, TRIANGLE” etc. The test points have to be placed, one by one at custom locations. A newly created “CUSTOM” pattern starts with a single test point at the current position. Holding down the CTRL key turns on INSERT mode. The cursor changes into a “+” sign.

- Add a new test point by clicking on the target location.
- Insert a new test point between two existing test points by clicking on the target line piece. The test points are renumbered.

Relocate a test point by selecting it with the left mouse button and drag it to another location. Relocate the whole pattern by holding down the SHIFT key.

Remove a test point by right clicking it and press “YES” to acknowledge.



For “MIRROR” options, [see chapter 6.5 Test pattern, Triangle](#).

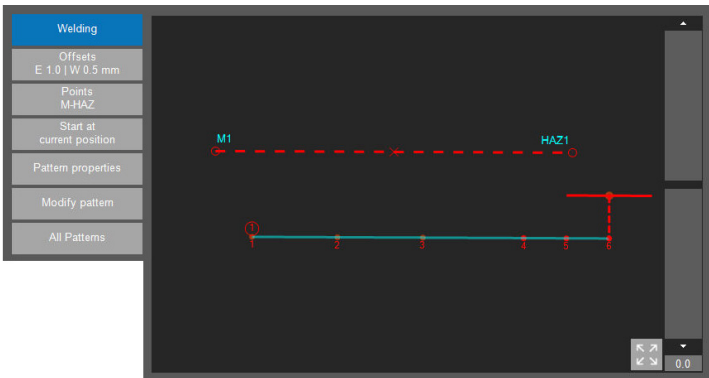
For the positioning of the pattern and other settings: “START AT CURRENT POSITION”, “ALL PATTERNS” and “MODIFY CUSTOM PATTERN”, see [chapter 6.2 Test pattern, Single point](#).

6.10 TEST PATTERN, WELDING

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

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

The example shows a single sided welding test pattern, positioned on the fusion line of a fillet weld.



The welding test pattern has many parameters.

The recommended way of working is:

1. Define the offsets in the “OFFSETS” menu.
2. Define the “TYPE” in the “POINTS” dialog.
3. Position the pattern on the edge of the sample.
4. Define the number of points for each welding zone in the “POINTS” dialog.
5. Position the pattern on the fusion line.

These steps will be explained hereinafter.

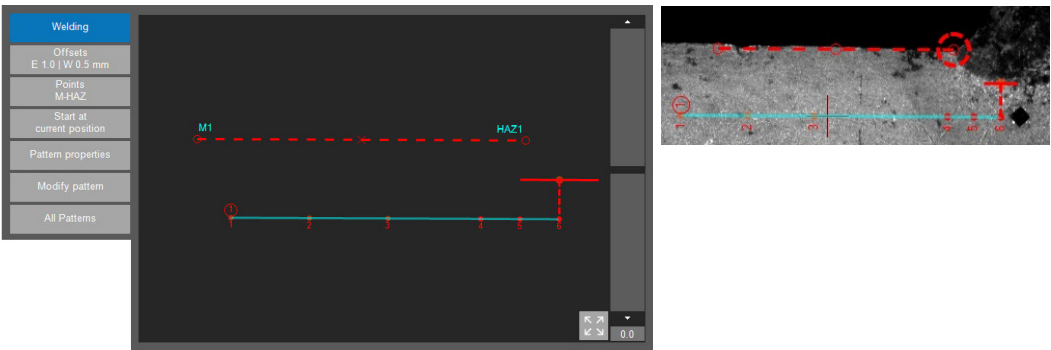
1. Offset.

Edge and fusion line offsets are set in the “OFFSETS” dialog.

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.

In above mentioned example, following offsets were used.



2. Type.

Next step is to choose the “TYPE” of the pattern in the “POINTS” dialog.

Type “ALL” is used for welds along a straight edge. In this case the pattern stretches from the mother material on one side to the other side, crossing both Heat Affected Zones and welding material.

Type “LEFT” stops at the left Heat Affected Zone, “RIGHT” at the right one and type “WELD” covers only the weld itself.

NOTE: “LEFT”, “RIGHT” and “WELD” are actually subsets of “ALL”. 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.

3. Positioning the pattern on the edge.

Place the dashed red line on the edge of the welded object. All test points of the welding test pattern have the same offset to this edge line. Drag the end points of the edge line to locations such that the edge line is on top of the edge of the object. In the example in the beginning of this chapter, one end point is placed close to the start of the fusion line.

4. Number of points.

Next is to set the number of points in the test pattern and the distance between them. This is done per zone in the “POINTS” dialog: unaffected mother material (M), welding material (W) and heat affected zone (HAZ). Zone order of the welding test pattern is always: “M-HAZ-W-HAZ-M”. Type “LEFT” has order M-HAZ, type “WELD” just W and “RIGHT” order HAZ-M.

Test points of the W-zone are centered between the end points of the edge reference line.

Test points of the M-zone are connected to the last point of the HAZ. However, an additional distance can be set to move them further away into the M zone. The location of the first point of the HAZ is set by the fusion point. Two additional fusion line test points can be created next to the first HAZ point.

In the example in the beginning of this chapter, following points have been configured.

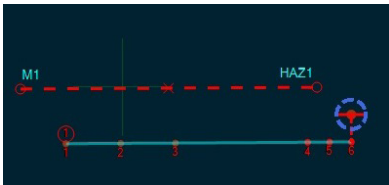
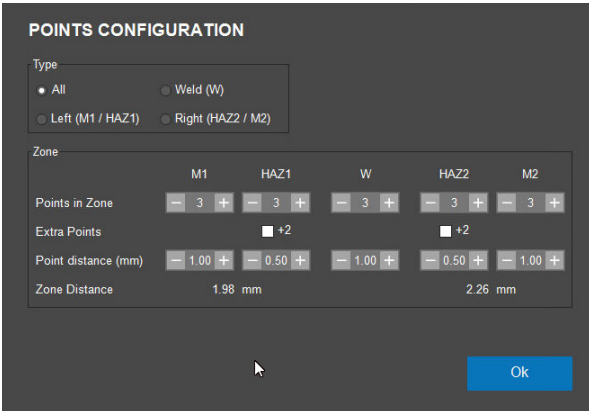


5. Positioning on the fusion line.

Last step is to position the fusion point(s) of the test pattern. A fusion point is highlighted as a dashed blue circle and selected by left clicking it.

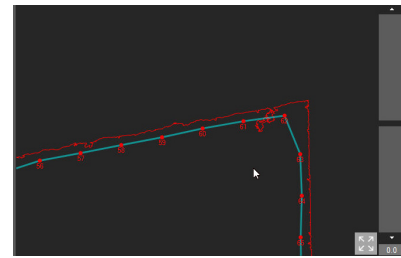
Drag the fusion point onto the fusion line keeping the solid red line parallel to the fusion line as shown in the example in the beginning of this chapter. The distance between the fusion line and test points in the Heat Affected Zone should be less than 0.5 mm according to ISO 9015. This fusion line offset is shown as a dashed red line connecting the fusion point and the first test point in the heat affected zone. If there are 2 additional fusion points then, all three of them should have the same fusion line offset! Drag the additional points to the correct location (highlighted dashed circle touches fusion line).

For the positioning of the pattern and other settings: “START AT CURRENT POSITION”, “GENERAL PROPERTIES”, “ALL PATTERNS” and “MODIFY CUSTOM PATTERN”, see [chapter 6.2 Test pattern, Single point](#).



6.11 TEST PATTERN, EDGE

Apply this pattern to position equidistant test points along the edge of a sample. Is only available if option “AUTOMATIC EDGE DETECTION” has been purchased. Following example shows an edge pattern consisting of 8 points per line, with an edge distance of 0.2mm.



Select “EDGE OFFSET” to set the “DISTANCE TO EDGE” of the pattern. The “DISTANCE BETWEEN POINTS” is set by selecting “POINTS PER LINE”.

Next step is to scan the edge of the sample. Press “SCAN” to pop up the edge scan menu. Move the XY-stage to the location where the scan should start. Press “START AT” and left click the desired start position. Do the same for the “END AT” position or check “BEGIN IS END” to scan the whole sample. Choose the scan direction with “CLOCKWISE” and then press “START”. The resulting scan is displayed in the pattern editor, see above mentioned example. Press “OK” to accept it or “CANCEL”. The color of the scanned contour changes from orange into red. “EDGE OFFSET” and “POINT DISTANCE” can be changed without the need for a rescan.

The same applies for “START AT” and “END AT” points, provided they are located on the previously scanned part of the sample. The edge pattern, including scanned contour, can be rotated and moved to another location, like other test patterns.

NOTE: “START AT” and “END AT” positions are fixed during rotation, thereby NOT invalidating the existing scan. “START AT” is the rotation pivot.

The scanned contour is saved together with the test points. If the same sample is relocated on the XY-stage, then it is possible to ‘match’ the stored pattern manually with the exiting contour.

NOTE: For non-flat samples it might be necessary to auto-focus during the edge scan. This and other scan option are available in the “SETTINGS” menu, see [chapter 5.4.4.5 Edge Detection settings](#).

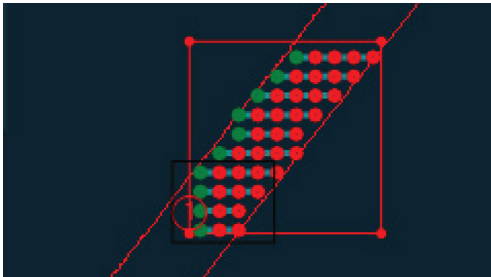
NOTE: If the “EDGE OFFSET” is too small and/or the scanned edge is too long, then Impressions™ can run out of resources. In that case there will be no pattern. Make the edge offset larger and/or reduce the existing scanned edge by selecting a new “END AT” position closer to the “START AT” position.

For the positioning of the pattern and other settings: “START AT CURRENT POSITION”, “GENERAL PROPERTIES”, “ALL PATTERNS” and “MODIFY CUSTOM PATTERN”, see [chapter 6.2 Test pattern, Single point](#).

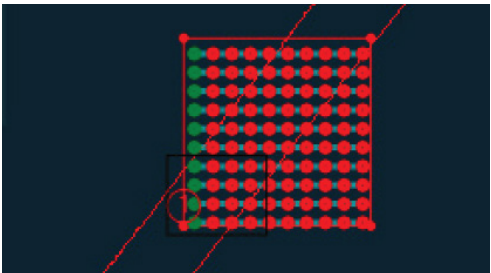
6.12 TEST PATTERN, AREA

Apply this pattern if an area of a sample has to be covered with a grid of test points. This grid is confined to a boundary called the contour. Recommended way of working is to define the contour first and then the grid properties. Following example shows an “AREA” pattern inside a scanned contour, consisting of a grid of test points of 0.5mmx0.5mm, without an offset to the edge.

The area pattern has a contour that is displayed as a number of red solid points connected by red solid lines. Contour points can be left clicked and dragged to another location. A new contour point is created by holding down the CTRL-key and left-clicking a connecting line. An existing contour point is deleted by doing the same for the point. Drag the whole contour by holding down the Shift-key and left clicking it somewhere. The contour rotates around the start point of the pattern.



If the whole edge of the sample has been scanned, then the area pattern can operate in mode **“SCANNED CONTOUR”**. Select this mode in the **“CONTOUR CUSTOM POINTS”** menu. The intersection of scanned and custom contour is now the boundary for the test points. Modify the custom contour to cover the relevant area of the scanned contour.



Next step is to set grid properties. The point distance of the grid is set in the **“GRID POINTS”** menu. Horizontal point distance by **“COLUMN DISTANCE”**, vertical distance by **“ROW DISTANCE”** and distance to the boundary by **“DISTANCE TO EDGE”**. Press **“OK”** to accept. **“SHOW POINT NUMBERS”** is unchecked by default.

NOTE: The number of test points is unlimited! Be alert when using small point distances. Too many test points will slow down the system.

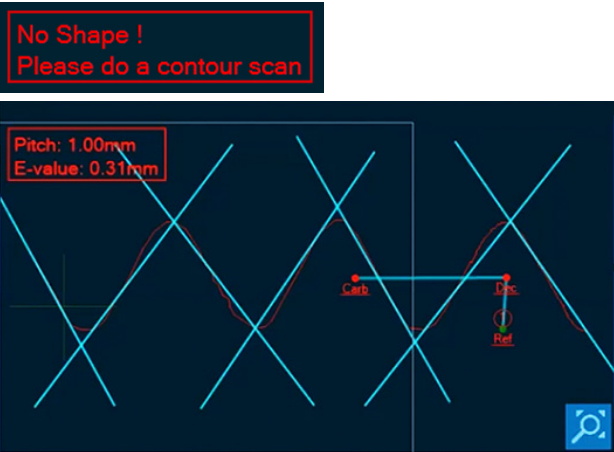
Usually the grid has to be aligned very accurate with a base line, for example an edge of the sample.



Orientation and offset of the grid can be (re-)set by dialog **“GRID OFFSET”**. This can also be achieved interactively. Left click one of the grid points and drag the grid to a new location. Press button **“ROTATE PATTERN”** to set **“ROTATE GRID”** mode. The button will start blinking. Change the grid angle with the rotation slider. For the positioning of the pattern and other settings: **“START AT CURRENT POSITION”**, **“GENERAL PROPERTIES”**, **“ALL PATTERNS”** and **“MODIFY CUSTOM PATTERN”**, see [chapter 6.2 Test pattern, Single point.](#)

6.13 TEST PATTERN, ISO 898-1, SCREW (DE)CARBURIZATION

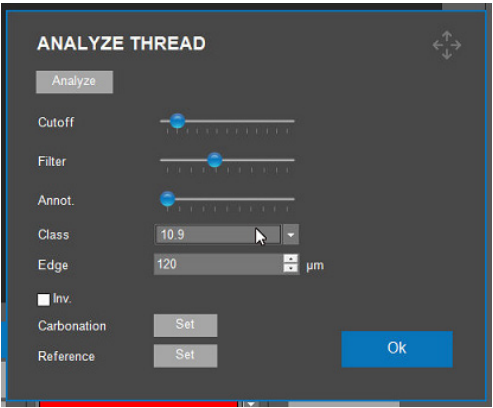
This pattern is used to verify if the screw thread hardness of a specimen is in compliance with the requirements of the ISO 898-1. Following example shows an ISO 898-1 test pattern. The carburization point is on the pitch line of the thread adjacent to the thread on which determinations for decarburization and reference points are made. The decarburization point is located from a certain distance from the reference point (the non-decarburized zone). Refer to the ISO 898-1 standard for more information.



First step is to scan the thread of the sample. Press **“SCAN”** to pop up the edge scan menu. Move the XY-stage to the location where the scan should start. Press **“START AT”** and left click the desired start position. Do the same for the **“END AT”** position or check **“BEGIN IS END”** to scan the whole sample. Choose the scan direction with **“CLOCKWISE”** and then press **“START”**. The resulting scan is displayed in the pattern editor, see above mentioned example. Press **“OK”** to accept it or **“CANCEL”**. The color of the scanned contour changes from orange into red.

NOTE: **“START AT”** and **“END AT”** positions are fixed during rotation, thereby NOT invalidating the existing scan. **“START AT”** is the rotation pivot.

NOTE: For non-flat samples it might be necessary to auto-focus during the edge scan. This and other scan option are available in the **“SETTINGS”** menu, see [chapter 5.4.4.5 Edge Detection settings.](#)

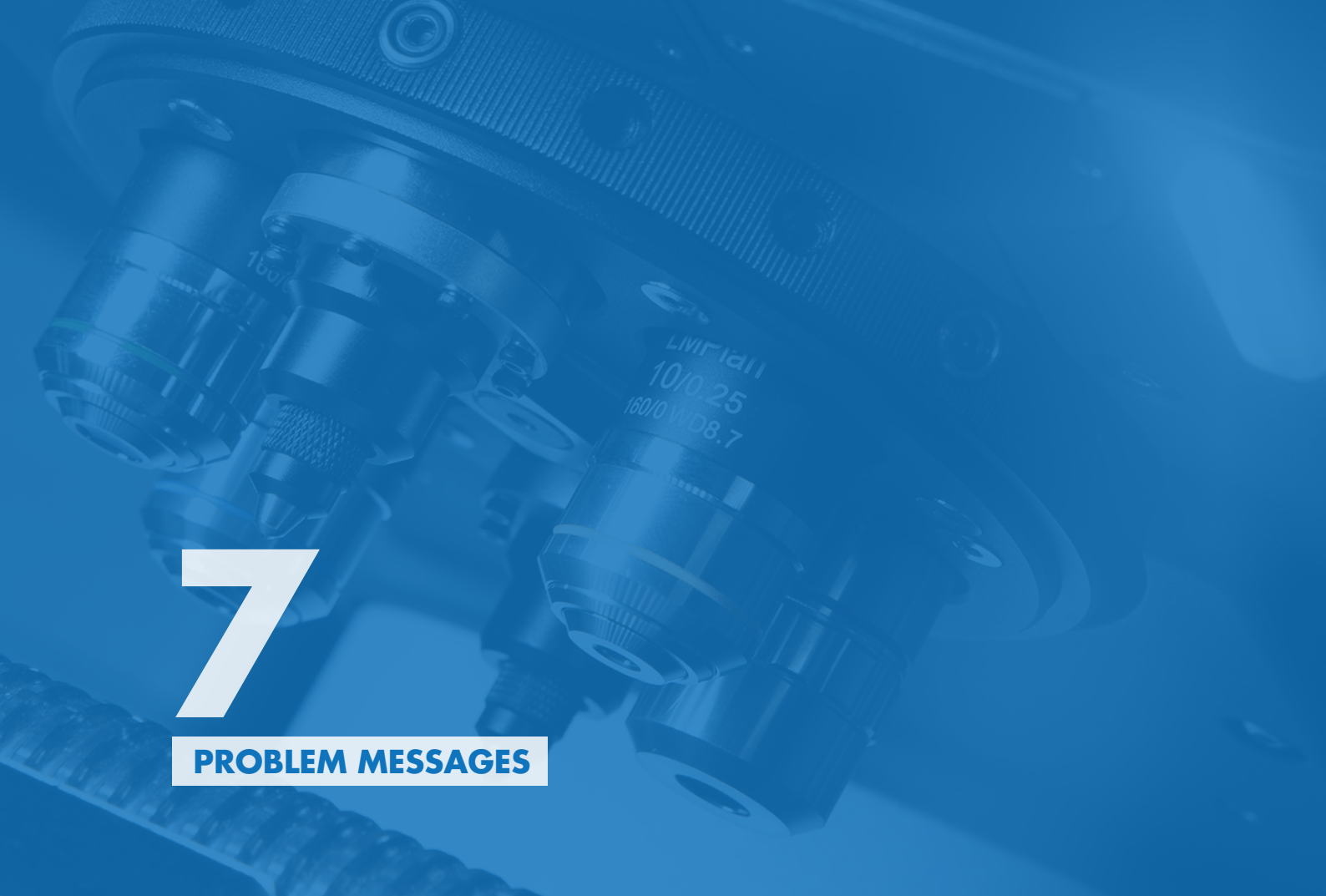
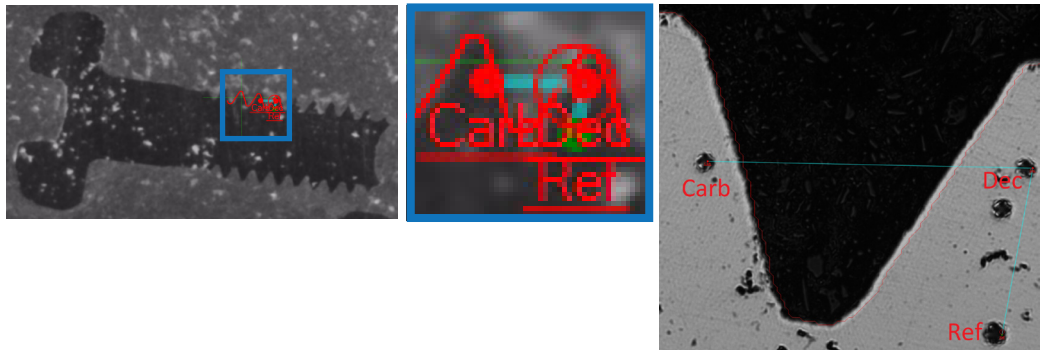


Next step is to analyze the thread and, select “**ANALYZE THREAD**”. The thread analysis involves a sophisticated algorithm, in this menu all parameters for the thread analysis algorithm can be set. Follow these steps:

- 1. Select the material property “**CLASS**”, as defined by the ISO 898-1.
 - 2. Select the “**EDGE**” distance of the carburization point to the edge of the thread.
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.
- NOTE:** The ISO 898-1 specifies an edge distance of 0.12mm, this is the default value in this ISO 898-1 test pattern. The value can be modified, but this is not recommended, hence compliance to ISO 898-1 could be voided.*
- 3. Select “**ANALYZE**” to start the analysis.
 - 4. If the analysis was successful, continue with step 8.
 - 5. If the analysis was unsuccessful, there will be a message after the analysis.
 - 6. First try to optimize the lighting level of the specimen and “**ANALYZE**” again.
 - 7. If the analysis fails again, move the “**ANNOT.**” scroll bar up to review all steps of the algorithm. When a step fails, following parameters can be modified to enhance the sensitivity of the algorithm:
- “**CUTOFF**”: With this scroll bar, the detection level for a new line (thread) can be increased/ decreased.
 - “**FILTER**”: With this scroll bar, the determination level for main lines, sub lines and nodes for the algorithm can be increased/decreased.
- 8. After the analysis the reference point (hence the decarburization point) can be shifted to another thread (tooth) with “**REF.**”. The carburization point can be shifted to another thread (tooth) with “**CARB.**”.
 - 9. Select “**OK**” to accept the analysis and to include it in the test pattern.

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

For the other settings: “**GENERAL PROPERTIES**”, “**ALL PATTERNS**” see [chapter 6.2 Test pattern, Single point](#).



⚠ WARNING
If the personnel detect problems or dangers, the user/owner or his authorized representative must be informed immediately. The user/owner or his authorized representative informs the manufacturer.

The machine’s software has a central control. In this control several problems can be detected and registered. A message is displayed on the user interface when a problem occurs. Based on these messages, problems can easily be found and solved. However, not all problems are detected by the control system. These are more complex malfunctions or malfunctions that occur rarely.

Following table shows the possible messages during a problem and their possible solutions.

Message	Description
 Collision switch active	Turret is hitting an object. Spindle too far up, or head too far down. If above is not the case, contact your service representative.
 Emergency switch pressed, release switch for further action	See for an instruction to release the emergency switch: dedicated tester user manual: chapter Emergency stop
 Emergency switch pressed, application will exit now	If above does not solve the problem or if the message occurs without activating the emergency switch, contact your service representative.

Message	Description
 Failed moving to home position	Machine with load motor. During initialization the home switch near the load motor is not activated, failing to move to home position. If a reboot does not solve the problem, contact your service representative.
 Failed moving to safe position	Machine with motorized head. During initialization the head failed to retract approx. 1 cm from the current position. If there is no visible obstruction in the head, contact your service representative.
 Failed to find upper limit	Machine with motorized head. For a special protocol (e.g. crankshaft), the head has to be in the highest position. Failing this will result in the message. Contact your service representative
 Failed to initialize turret	During initialization the home switch in the turret is not found within a certain time. If there is no visible obstruction in the turret, contact your service representative.
 Failed to initialize xy-stage	Machine with motorized XY-table. During initialization of the XY-table, the limits for the X and Y-axis cannot be found. If reconnecting the cable to the XY-table does not solve the problem, contact your service representative.
 Failed to move spindle down	Machine with motorized head and spindle. During initialization the spindle failed to lower approx. 1 cm from the current position. If there is no visible obstruction in the head, contact your service representative.
 Failed to open connection to Com[nr] : Comport name	Communication failure to the indicated port. The port is present but cannot be opened by the operating system. If a reboot does not solve the problem, contact your service representative.

Message	Description
 Force too high!	If the measured force is not equal in both loadcells. If there is no visible damage, contact your service representative
 Indenter not present	If a hardness scale is selected which is not suitable for the selected indenter. To avoid above mentioned, activate the "SCALES ONLY WITH INDENTER" option in the "SYSTEM" "SETTINGS" menu. Alternatively, the indenter could be changed. If above does not solve the problem, contact your service representative.
 Loadcell not configured	Configuration of the loadcell(s) is incorrect. If a reboot does not solve the problem, contact your service representative.
 Missing connection for Com[nr] : Comport name	Communication failure to the indicated port. The port is not present and therefore cannot be opened by the operating system. If a reboot does not solve the problem, contact your service representative.
 Motor timeout reading position	Machine without euroboard. Internal communication failure. If a reboot does not solve the problem, contact your service representative.
 Object detected	The loadcell detects an unwanted force in the turret. If there is no visible obstruction in the turret, contact your service representative.
 Running low on diskpace!	The impressions hard disk is running out of diskpace. If cleaning the archive does not solve the problem, contact your service representative.

Message	Description
 System not initialized!	The user interface is released by the software before the initialization has ended. Contact your service representative.
 Timeout depthmeter readout	Internal communication failure between electronics and PC. If a reboot does not solve the problem, contact your service representative.
 Unsupported scale	If a hardness scale value is selected which is not in range of the value of the selected indenter. To avoid above mentioned, activate the “SCALES ONLY WITH INDENTER” option in the “SYSTEM”“SETTINGS” menu. Alternatively, the indenter could be changed. If above does not solve the problem, contact your service representative.
 Unsupported tester	The dongle that is being used is not usable with the installed impressions software. Contact your service representative.
 Upper limit not reached	Machine with motorized head. When the head is in the highest position, but this is not detected. Contact your service representative.

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Distributor :

CORPORATE HEAD OFFICE

INNOVATEST Europe BV

Manufacturing, Distribution & Service

Borgharenweg 140

6222 AA MAASTRICHT

The Netherlands

Phone: +31 43 3520060

Fax: +31 43 3631168

info@innovatest-europe.com

www.innovatest-europe.com

INNOVATEST Deutschland GmbH Sales & Service

Phone: +49 245 670 59 500

info@innovatest-deutschland.com

www.innovatest-deutschland.com

INNOVATEST France SARL Sales & Service

Phone: +33 1848 88038

info@innovatest-france.com

www.innovatest-france.com

INNOVATEST USA Company Sales & Service

Phone: +1 267 317 4300

info@innovatest-usa.com

www.innovatest-usa.com

INNOVATEST Japan Co., Ltd. Sales & Service

Phone: +81 3 3527 3092

info@innovatest-japan.com

www.innovatest-japan.com

INNOVATEST UK Ltd. Sales & Service

Phone: +44 (0)121 824 4775

info@innovatest-uk.com

www.innovatest-uk.com

INNOVATEST Polska sp. z o.o. Sales & Service

Phone: +48 697 099 826

info@innovatest-polska.pl

www.innovatest-polska.pl

INNOVATEST Shanghai Co., Ltd. Sales & Service

Phone: +86 21 60906200

info@innovatest-shanghai.com

www.innovatest-shanghai.com

INNOVATEST South East Asia Sales & Service

Phone: +65 6451 1123

info@innovatest-singapore.com

www.innovatest-singapore.com