

**Bedienungsanleitung**  
**Instruction manual**  
**Istruzioni per l'uso**  
**Instructions d'emploi**  
**Instrucciones para el uso**

**EMCO·TEST**



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## Instruction manual

Translation of the original instructions.

# DuraScan 10, 20

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# 1 Introduction

## 1.1 Preface

Our hardness testing machines represent state-of-the-art technology and comply with current norms and standards. Both the hardware and software in our machines can be upgraded on an ongoing basis. As a result, you can ensure that the technology in your machine is always up-to-date.

The machines are equipped with a measuring system and electronic power control. They are also distinguished by their ergonomic design and user-friendly software, which complies with DIN standards.

Take time to read this instruction manual closely. You will be amazed by the many application options available.

## 1.2 Safety instructions

<b>Safety regulations</b>	<p>Familiarity with the applicable safety regulations is a prerequisite for safe, error-free operation of this machine.</p> <p>Refer to the instructions in this manual, and, in particular, to the safety instructions, when operating the machine. It is also essential that you observe all rules and regulations for accident prevention that apply in the location where the machine is operated.</p> <p>The design of this machine and its equipment is state-of-the-art and complies with recognized safety regulations. Nevertheless, risk of injury or death to the user or third parties may arise in certain cases, and the machine or other property may be damaged. Icons are used to highlight these risks in the relevant chapters.</p>
<b>Operating instructions</b>	<p>Read all of the operating instructions before starting the machine.</p>
<b>Moving the machine</b>	<p>To avoid personal injury while moving the machine, never try to move it unassisted.</p>
<b>Transportation safety devices</b>	<p>Remove all transportation safety devices before starting the machine.</p> <p>Please bear in mind that the machine must not be used in explosive environments.</p>
<b>Fire and explosion protection</b>	<ul style="list-style-type: none"><li>▪ Position the machine on a secure and stable working surface.</li><li>▪ Ensure that its working height is in accordance with ergonomic principles and will not result in unnecessary physical strain.</li><li>▪ Ensure that there is sufficient space available to access the machine and that an adequate emergency route is kept clear in case of unforeseen incidents.</li><li>▪ Ensure that the work station has adequate lighting.</li><li>▪ The hardness tester must be protected against shocks and vibrations which could influence the test result</li></ul>
<b>Positioning</b>	
<b>Workwear and protective equipment</b>	<p>Ensure that workwear is close-fitting and cannot become entangled in the machine's moving parts. Make sure you use your personal protective equipment.</p>
<b>Electrical power supply</b>	<p>The machine should only be connected to a grounded electrical outlet.</p>
<b>Work time</b>	<p>Do not work with the machine for too long or when you are unable to concentrate properly.</p>
<b>Protection from splashing</b>	<p>The machine must not come into contact with water. Protect the machine from splashing.</p>
<b>Startup</b>	

Before each startup, ensure that the machine is in a flawless condition and that none of the safety features have been removed and are all functional. Any damaged cables must be replaced immediately by authorized personnel.

<b>Operation by authorized personnel</b>	Ensure that the machine is only operated by authorized and properly trained persons. Ensure that the machine cannot be started or operated by unauthorized persons.
<b>Single-person machine</b>	Ensure that the machine is only operated by one person at all times.
<b>Unauthorized changes</b>	Do not make any unauthorized changes to the machine's safety features. Bridging of control features and any interference with the electrical/electronic components of the machine are not permitted and will nullify the warranty in all cases.
<b>EMERGENCY-OFF</b>	In case of emergency, shut down the machine immediately with the EMERGENCY-OFF button.
<b>Securing workpieces</b>	<p>Before testing, check that the testing tools are securely clamped.</p> <p>Do NOT attempt to touch the internal parts of the machine while it is operating.</p> <p>Use appropriate fixings to secure any workpieces that do not stay in place without support.</p> <p>Never hold workpieces in place by hand!</p> <p>Wear protective gloves when handling heavy or sharp workpieces or removing chips.</p>
<b>Resetting the machine</b>	Use the main switch to turn the machine off before resetting.
<b>Supervision</b>	Never leave the machine unsupervised while it is operating. Always switch the machine off before leaving the work station.
<b>Work station</b>	Keep your work station clean and tidy. A cluttered work station increases the risk of injury.
<b>Maintenance</b>	<p>Use the main switch to turn the machine off. Remove the power plug to disconnect the machine from the power supply before you carry out any maintenance or readjustments. Any work on the machine's electrical parts unit should only be carried out by skilled electricians or service technicians.</p> <p>Make sure you comply with the inspection and maintenance intervals specified (see standard EN ISO 6507).</p>
<b>Claims</b>	Contact your supplier in the event of collision or damage. Always specify the unit number and software version of your machine in cases of complaint or damage or when making inquiries or ordering replacement parts.

### 1.3 Manufacturer's notes

<b>Intended use</b>	<p>The machine is intended to be used to test the hardness of metals according to the following methods:</p> <ul style="list-style-type: none"><li>▪ Vickers      EN ISO 6507, ASTM E384</li><li>▪ Knoop        EN ISO 4545, ASTM E384</li></ul> <p>Workpieces must not exceed the following dimensions and weights:</p> <ul style="list-style-type: none"><li>▪ Maximum height from support surface: 260 mm</li><li>▪ Maximum depth from test point: 150 mm</li><li>▪ Weight: 10 kg</li></ul> <p>Workpieces must either be sufficiently stable or secured with appropriate fixings. Workpieces should only be positioned/removed by hand.</p>
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Testing of other materials is not permitted or, in exceptional cases, may only proceed following consultation with your supplier. Do not, under any circumstances, use materials which are toxic or harmful to health. To use this machine as intended, it is also essential that you comply with the specified operating and maintenance instructions. Do not expose the machine to extreme, short-term fluctuations in temperature, as otherwise a stable autofocus function cannot be guaranteed.

The machine is designed for an ambient temperature of 23 C

The machine must be installed in a clean location. It is particularly important that this location is free of metal chips, dust, smoke and other contaminants. If the ambient air in the installation location is contaminated, the machine must be operated within a closed test cell.

The machine may only be operated by persons who have been properly trained in the operation, maintenance and repair of the machine and are aware of the risks involved. All accident prevention and safety instructions for operating the machine must be observed. The manufacturer accepts no liability in cases where the machine is used for purposes other than those for which it is intended. In these cases, liability is transferred to the user.

#### **Ambient temperature**

The machine is adjusted for the ambient temperature specified in the technical data. Avoid major fluctuations in temperature at the installation area, or no stable Autofocus function can be guaranteed.

#### **Unauthorized uses of the machine**

The machine must not be used to test workpieces with low mechanical stability, which may become distorted or may break when clamped. Workpieces that are stable but do not have the required structural integrity may only be clamped if they are secured using appropriate fixings. The machine should not be used for workpieces which are toxic or harmful to health.


#### **EC conformity**



The CE mark and the EC conformity declaration certify that the machine and this manual comply with the stipulations of the directives that apply to the product.

#### **Disposal**



The WEEE symbol  on your unit indicates that it is a WEEE-relevant machine containing electrical/electronic components and must not be disposed of as general waste. For more information about recycling this product, contact your relevant local authority.

#### **Warranty conditions for new machines**

The warranty period for new machines is 24 months from the date of delivery by the manufacturer with unlimited operating hours.

If a defect is detected, inform your sales partner or nearest service center of the manufacturer immediately, providing a detailed description of the defect in written form, over the phone or in person.

Defects that are properly reported and are covered by the manufacturer's warranty will be corrected free of charge either by repair or replacement delivery. If requested, defective parts are to be returned to the manufacturer at the customer's expense and risk.

The manufacturer's warranty does not apply to defects that are caused by one or more of the following:



- failure to fully comply with the operating instructions, safety and licensing regulations or other instructions relating to the delivery, installation, startup or use of the machine
- incorrect assembly or startup of the machine
- unauthorized, unapproved interference with or modifications to the machine by the customer or a third party
- improper or inappropriate use of the machine for purposes other than those for which it is intended
- normal wear and tear
- negligent or incorrect handling
- chemical, electrochemical or electrical exposure
- an insufficient or incorrect power supply
- force majeure

The cost of services not covered by warranty are to be borne by the customer.

## 1.4 Icons and typographic conventions

### Icons

The following icons and typographic conventions are used in this instruction manual:



#### **Danger**

indicates a risk of personal injury or death



#### **Caution**

indicates a risk of functional damage to your machine



indicates that particular attention is required



indicates additional information and tips

### Typographic conventions

<b>Bold</b>	indicates menu options and button labels
<i>Italics</i>	indicate names, software programs or figure titles
Monospace	indicates system output
"Inverted commas"	indicate chapter titles and terms of particular importance
➤	indicates a necessary work step

## 1.5 Technical data

### Technical data

	DuraScan 10	DuraScan 20
XY table / cross slide	Ø 90 mm	135 x 135 mm
Traverse path	--	25 x 25 mm

	DuraScan 10	DuraScan 20
Turret	Manual (optionally motorized)	Manual (optionally motorized)
Max. workpiece weight	50 kg	50 kg
Dimensions (WxHxD)	505 x 670 x 420 mm	505 x 670 x 420 mm
Footprint (WxD)	650 x 500 mm	800 x 650 mm
Touch screen [inches]	8,4"	8,4"
Weight of basic unit	68 kg	68 kg
Base plate	Aluminum	Aluminum
Positioning accuracy	--	0.01 mm

#### Ambient conditions

Room temperature (as per ISO/ASTM) [°C]	23 (±5)°C
Rel. humidity (non-condensing) [%]	40 – 70 %

Please take note of the information about the ambient temperature in chapter "Manufacturer's notes", page 5.



#### General technical data

Test loads	0.098 – 98 N (0.01 – 10 kg)
Test area height	260 mm
Resolution of test unit: Z-axis	5 nm
Feed speed of test unit	0.03 nm/s to 2mm/s
Ports	2 x USB 2.0, 1 x RS232, 1 x Ethernet (RJ45), VGA port
Measuring camera	CMOS, 1.3 mpix, USB 2.0

#### Electrical power supply

The machine adjusts automatically to the voltage variant.

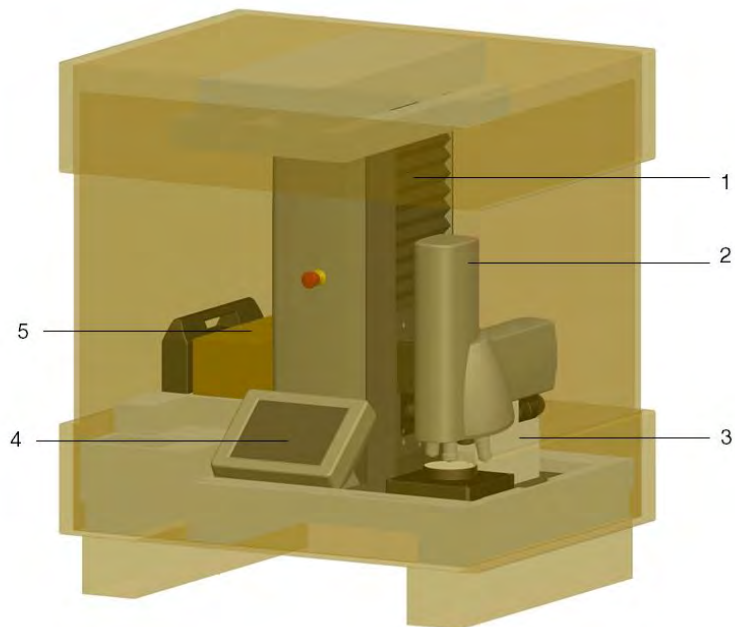
Power supply (V)	110/230 V~1/N/PE, 50-60 Hz
Max. voltage fluctuations	+10 %/-10 %
Max. power consumption	120 W
Main fuse rating (110 / 230 V)	T6,3 A
Protection category EN 60529	IP20

## 2 Initial startup

### 2.1 Unpacking the machine

#### Unpacking the machine

- Remove the plastic and paper packaging.



- 1 Machine stand
- 2 Test unit
- 3 Transportation safety device
- 4 Control unit
- 5 Accessory case

The serial number can be found on the rear of the tester.



### 2.2 Inspecting the delivery

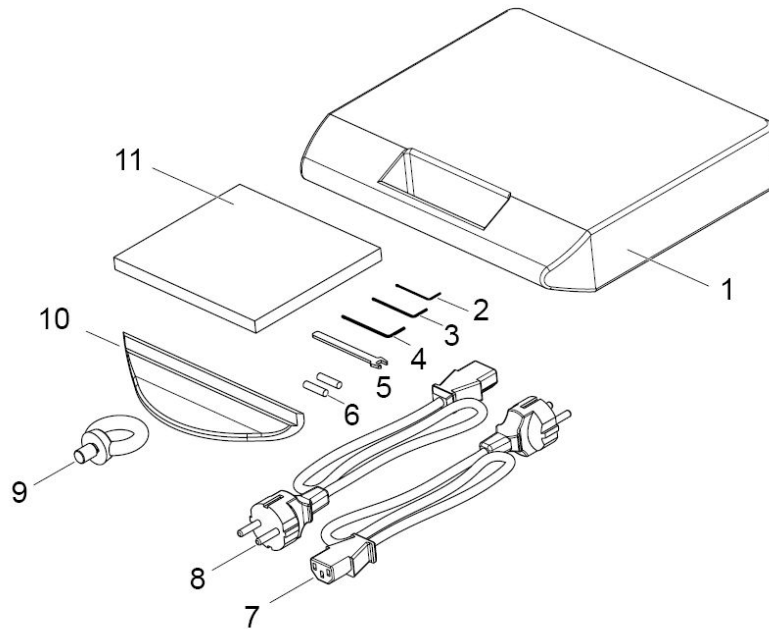
#### Inspecting the delivery

- Inspect the machine for any damage that may have occurred during transportation and check that the delivery is complete.
- If you detect any defects, contact your supplier or insurance provider immediately.
- Please specify the machine's serial number when making a complaint. You will find this serial number on the rating plate at the rear of the machine.



- 1 Machine stand
- 2 Test unit
- 3 Turret with indenter and lenses  
(indenter and lenses not yet fitted on delivery.)
- 4 Test anvil
- 5 Control unit
- 6 EMERGENCY-OFF button

### Accessories



- |    |   |
|----|---|
| 1  | Accessories case  |
| 2  | Allen wrench 0,9 mm   |
| 3  | Allen wrench 1,3 mm   |
| 4  | Allen wrench 1,5 mm   |
| 5  | Flat wrench   |
| 6  | Two spare fuses (T6, 3A)  |
| 7  | Cable 3-pole EU   |
| 8  | Cable 3-pole US   |
| 9  | Ring bolt   |
| 10 | Cover   |
| 11 | CD-ROM 01 with machine data and documentation and conformity test<br>CD-ROM 02 with machine-specific data and certificate |

#### Accessories required

- Indenter
- Objective Lenses
- Micrometer spindles



Indenters and lenses are not included in the machine shipment and must be ordered separately. If you ordered lenses or indenters at the same time, they will be included in the delivery and must be mounted.

#### Optional accessories

- Calibrated test blocks
- Additional indenter
- Standard USB printer
- Sample holders



To order additional accessories and replacement parts, contact your supplier. Only approved products have been tested for use with this machine.

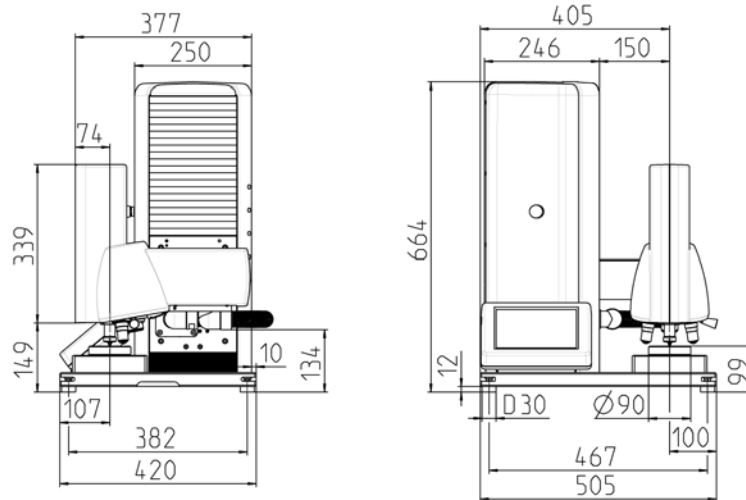
## 2.3 Weight and dimensions

### DuraScan 10

#### Weight and dimensions

without pallet: approx. 68 kg

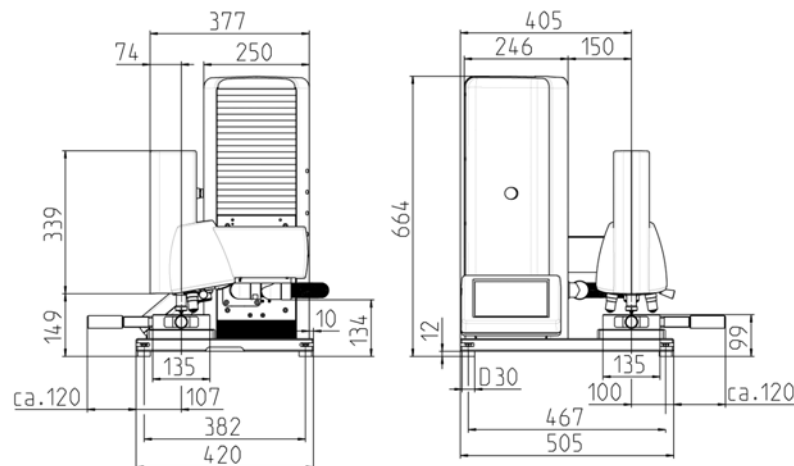
with pallet: approx. 78 kg



### DuraScan 20

without pallet: approx. 68 kg

with pallet: approx. 78 kg

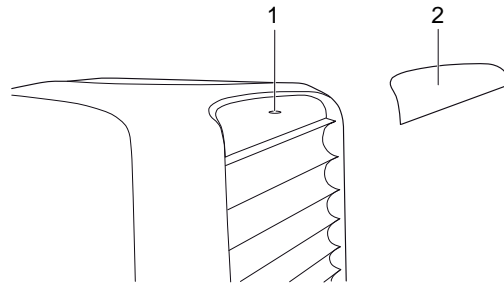


## 2.4 Transporting the machine

- Use a forklift or hand lift truck to transport the machine to its installation location, on a pallet if wished.
- Screw the ring bolt supplied into the machine and place on the prepared worktable using a crane.

### Attaching the cover

- Remove the ring bolt.



- Secure the cover (2) over the hole for the ring bolt (1).  
The cover is supplied with a Velcro fastener.

## 2.5 Installing the machine

### Installing the machine

The bench on which the machine is installed must meet the following requirements:

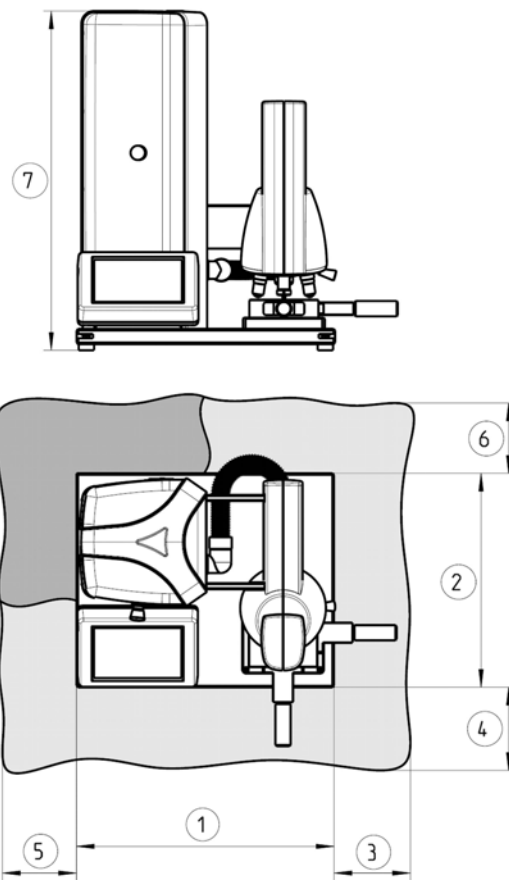
- The bench must be level and have a height of approx. 700 mm.
- It must be capable of supporting at least 220 kg.
- The bench must be solid and resistant to oscillation.

The machine must be professionally installed.

During installation, allow sufficient space for operating the machine and for carrying out possible maintenance work.



Please take note of the information about the ambient temperature in chapter "Manufacturer's notes", page 5.



Machine base	Operation	Maintenance	Height
1 / 2	3 / 4	5 / 6	7
505 / 420 mm	100 / 100 mm	150 / 150 mm	670 mm

The machine's ergonomic design is intended to optimize operation.

- During installation, ensure that the work station has adequate lighting.
- Avoid direct glare (dazzling light sources within the operator's line of vision) and reflected glare (reflections and light reflexes) on the touch screen.
- Also avoid very strong, direct light from external sources in the test area. This may cause distortion and reflections, so leading to erroneous test results.

## 2.6 Starting up the machine

### Overview

To start up the tester, it is not only necessary to fit the standard accessories, but also calibrate and adjust the individual lenses and indenter. Here the ecos Workflow offers assistance with the menu item Settings.

The following table shows an overview of the operations necessary:

Operation	Chapter
Switching the power on	Initial startup
Switching the machine on for the first time	Initial startup
Removing transportation safety device(s)	Initial startup
Selecting ecos Workflow language	Initial startup
Installing indenter in adapter	Fitting standard accessories

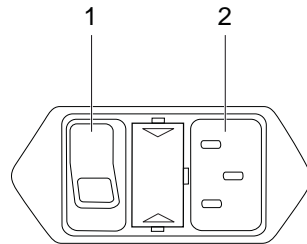


Adjusting indenter  
Screwing lenses into turret  
Mounting micrometer spindles

Fitting standard accessories  
Fitting standard accessories  
Fitting standard accessories

Other settings which can then only be made in the ecos Workflow software are to be found in the chapter "Configuration and Calibration", page 74.

### Switching the power on



*Connections on the rear of the machine*

- 1 Main ON/OFF switch with pilot light
  - 2 Mains connection
- If necessary: Turn the main switch to the OFF position (1).
  - Plug the power cable into the mains connection (2).
  - Plug the opposite end of the power cable into a grounded electrical outlet with a protective conductor contact.



*Connections on the left of the machine*

- 1 Ethernet port (RJ45)
  - 2 Keyboard connection
  - 3 USB ports (e.g. USB mouse, USB stick)
  - 4 RS232 port
  - 5 VGA port
- Insert an Ethernet cable in the Ethernet interface (RJ45) if you wish to address the machine via a network.



**Switching the machine  
on for the first time**

Contact the network administrator to set the network functions of Windows XP Embedded accordingly.

The test unit is secured by a transport lock (block of foam).

- Remove the transportation safety device.
- Turn the main switch to the ON position.
- If necessary: To release the EMERGENCY-OFF button on the machine turn it in a clockwise direction.
- Switch the machine on using the Standby button on the left of the touch screen.

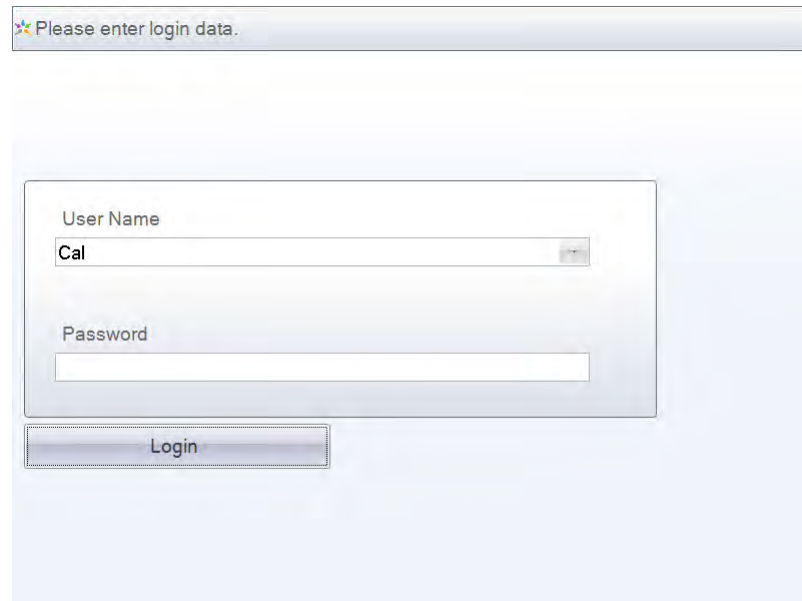
The green pilot light in the Standby button lights up.

The operating system will start. The ecos Workflow starts automatically.

You will see the following screen after a few moments:



The software starts the initialization process and opens the login screen. On delivery the machine is set to English.



- Accept the preconfigured user name "Cal" and select Login without entering a password.



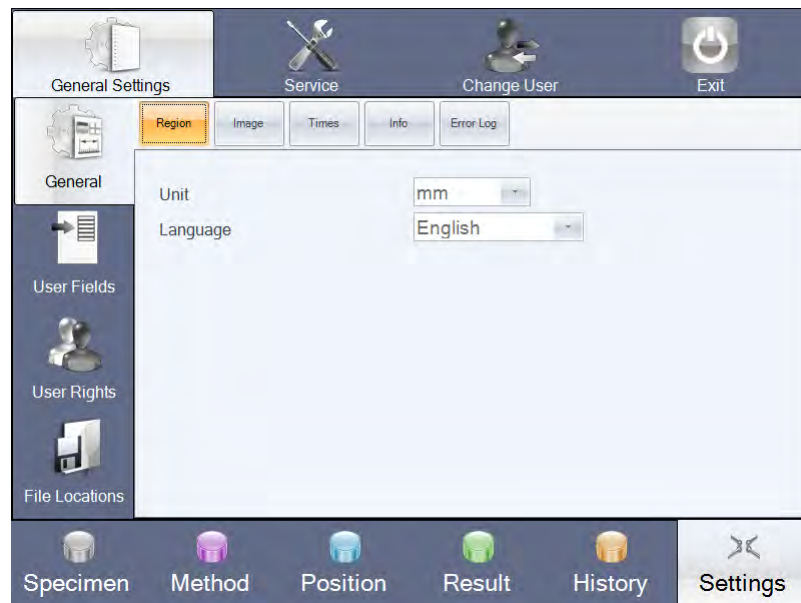
If you are unable to log in without a password, contact your administrator or Service team to ask for your login data.

The ecos Workflow opens with the first screen.



### Selecting language

- In the Workflow bar (bottom of screen) select Settings.
- Under General – Region in the field Select Language select the language of your choice.



The screen is immediately displayed in the language selected.

You can now fit the standard accessories.

## 2.6.1 Mounting the accessories required

### 2.6.1.1 Indenter and lenses

#### Manual turret

Three positions are available with the manual turret: Position 1 is for the indenter (Vickers or Knoop). Positions 2 and 6 are used for the lenses.

#### Motorized turret

Six positions are available with the motorized turret: max. two indenters and four lenses or one indenter and five lenses. Position 1 is for the indenter (Vickers or Knoop). Positions 2 to 6 are available to fit an optional second indenter and the lenses.

#### Installing indenter in adapter



- Remove the transport lock of the indenter with an Allan wrench.



- Insert the indenter into the adapter.

When doing so, the flat wrench must be parallel with the bench.

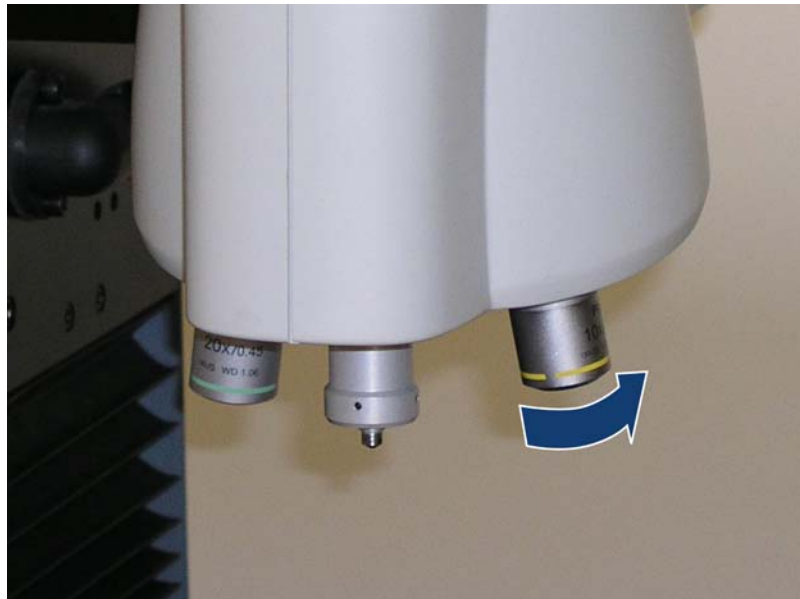


- Hold the indenter in position (2) with the flat wrench until you have secured the indenter with the socket head wrench (1).

### Fitting the lens



In order to swivel lenses as quickly as possible, it is recommended fitting the lenses you use most often on the right and left of the indenter (positions 2 and 6). The position numbers are marked on the turret.



- Set the lens in the right position on the turret and secure.
- Repeat the process for other lenses as necessary.

The procedure for adjusting lenses can be found in chapter Adjusting lenses (Assistant - Objective Lenses)" page 88.

#### *Calibration*



The machine has already been calibrated and adjusted by the manufacturer or stockist. After transportation and fitting the indenter / lenses, new settings however have to be made with the so-called "configuration assistant". Calibration should only be carried out by trained technicians. Further information can be found under "Configuration and Calibration", page 74.

#### *2.6.1.2 Micrometer spindles*

##### **Mounting micrometer spindles**

Only the DuraScan 20 is equipped with a cross slide and the required micrometer spindles.

The micrometer spindles are not mounted on the cross slide on delivery.



- Insert the micrometer spindle in the opening in the cross slide. When doing so, make sure that the scale faces upwards and is plainly visible.



- Secure the micrometer spindle by tightening the screw with a socket head wrench.



### 3 Design and Functions

#### 3.1 Design of machine

##### Design of machine



- 1 Machine stand
- 2 Test unit
- 3 Turret with indenter and lenses
- 4 Test anvil (here: DuraScan 10 with XY table)
- 5 Control unit
- 6 EMERGENCY-OFF button

The essential components of the hardness tester are the machine stand, the test unit plus turret including the indenter/lenses, and the test anvil. The control unit is used to control operation of the tester.

If wished, you can also connect a screen, keyboard and mouse.

The machine stand is made of cast aluminum. The stand contains all of the machine's electrical and electronic components, as well as all drive mechanisms.

The test unit is powered by a DC motor. It can move at max. 2 mm/s and is capable of measuring workpieces with a maximum height of 260 mm.

The DuraScan 10 and DuraScan 20 are normally equipped with a manual 3-fold turret, although a motorized 6-fold turret is optionally available.

The test anvil can be designed as an XY table (DuraScan 10) or a cross slide (DuraScan 20).

##### Table of lenses

With the optical Vickers and Knoop test methods lenses are required to see the indent. The following rule applies: The lower the test force, the greater the optical magnification. The following table shows the allocation of the 5 lenses.



Test load range [kg]

	0,01	0,025	0,2	0,5	1	3	5	10
10 x								
20 x								
40 x								
60 x								
100 x								

Table of lenses

### 3.2 Control unit

A control unit with touch screen allows you to control and configure the machine. The software is menu-based and offers a range of options for test methods and conversion as well as exporting data and reporting.

#### Controls

The control unit has the following controls:



- 1 Touch screen
- 2 Touch pen
- 3 Standby button with green pilot light

You can operate the touch screen by selecting the buttons with your finger or with a suitable touch pen.

#### Caution

Never use sharp tools or conventional pens or pencils to enter data on the touch screen as they may damage it.

The touch pen (2) can be easily removed from the control unit.

An EMERGENCY-OFF button is located on the front of the machine as a safety device. If you press this button, the current operation is cancelled and the machine is switched off.

The test unit stops moving and the touch screen light dims.

To release the EMERGENCY-OFF button, turn it in a clockwise direction.



#### Safety feature



**Danger**

In case of emergency, shut down the machine immediately with the EMERGENCY-OFF button. Do not make any unauthorized changes to the machine's safety features.

## 4 Basic Operation

### 4.1 Switching the machine on and off

#### Switching the machine on



- Switch the machine on using the Standby button on the left of the touch screen.

The green pilot light in the Standby button lights up.

If the machine does not switch on:

- If necessary: Release the EMERGENCY-OFF button by turning it in a clockwise direction.
- Check that the main switch is turned on.

The ecos Workflow starts with the login screen, see „User login“, page 94.

- Enter your login data.

The ecos Workflow opens the screen Specimen.



#### Switching the machine off

- Switch the machine off with the Standby button.

The green pilot light in the Standby button switches off.

The test unit stops moving and the touch screen light dims.

### 4.2 Touch screen

The control unit display is a so-called touch screen. You can operate the touch screen by selecting the buttons with your finger or with a suitable touch pen. Your finger or the touch pen assumes the role of a "mouse" as used with a standard computer.

#### Caution

Never use sharp tools or conventional pens or pencils to enter data on the touch screen as they may damage it.



## 4.3 Turret

Depending on the type, operation of the turret with the indenter and lenses is either manual or motorized (optional).


### Manual operation

If you are prompted in the ecos Workflow to swivel in the indenter, then proceed as follows:

- Grasp the hand lever with one hand.
- Turn the turret so that the indenter is above the workpiece and catches in place.



When swivelling in the indenter, pay attention to the catch point of the indenter.

- Use  to confirm when the indenter has caught in the right position.


Use the same procedure when swiveling in lenses.

If you wish to swivel in a lens without being prompted, then proceed as follows:

- Select the menu item Turret.



The tool which has been swiveled in is marked with a red arrow.

- Select the 10x lens for example.
- Comply with the prompt and swivel in the 10x lens until it catches in place as described above under "Manual operation".
- Confirm with .

The ecos Workflow automatically returns to the Image screen.

Use the same procedure when swiveling in the indenter.

### Motorized operation

With a motorized turret the electronic control system is responsible for moving the turret. Wait until the turret has moved the indenter or lens over the workpiece.

You can then continue with operation in the ecos Workflow.

If you wish to swivel in a lens without being prompted, then proceed as follows:

- Select the menu item Turret.



The tool which has been swiveled in is marked with a red arrow.

- Select the lens you require.

The lens is swiveled in automatically.

The ecos Workflow automatically returns to the Image screen.

Use the same procedure when swivelling in the indenter.

## 4.4 Graphical interface

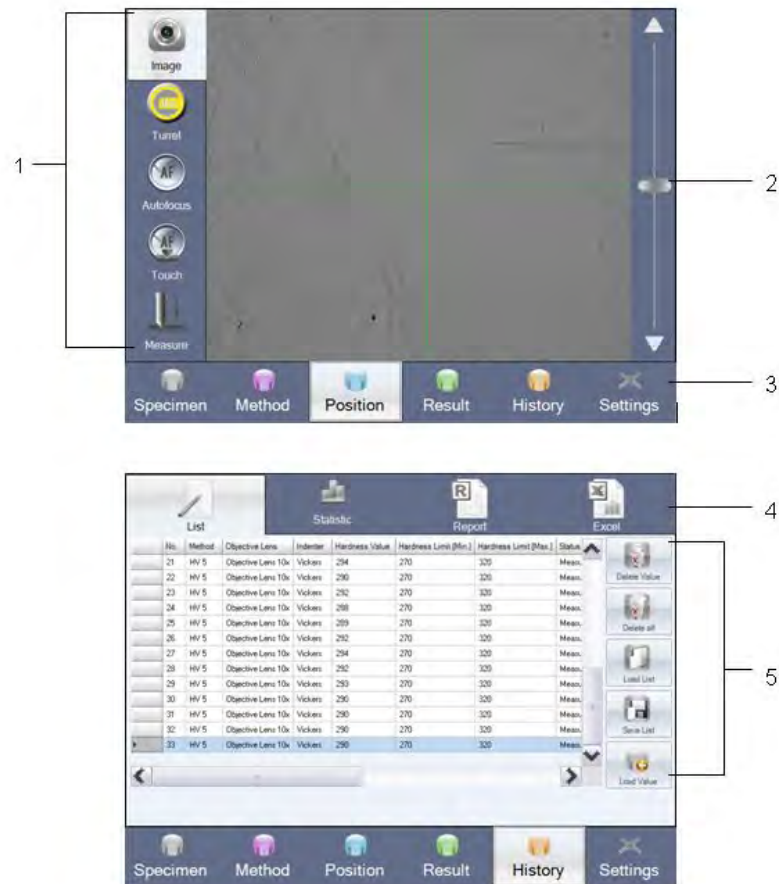
### Basic elements



The ecos Workflow includes a graphical interface which is easy to use.

The number of basic elements depends on the configuration level of the machine and the software modules released.

The following figure shows the basic elements of the graphical interface.



- 1 Menu items
- 2 Slider for moving test unit
- 3 Workflow bar
- 4 Menu bar
- 5 Submenus

### Progress bar

The progress bar indicates how long it will take for the triggered action to be completed and how much time has already elapsed since it was triggered.



### Slider



The slider at the right-hand edge can be used to move the test unit up and down. This allows you to:

- focus the image
- raise or lower the indenter.

With the bar in the middle the test unit is moved continuously up or down.

The two arrows at the top and bottom end of the slider move the test unit up or down in steps.

## 4.5 Buttons

### General



The specified function is deactivated



The specified function is activated



Printing of various data



Displaying various information



Saving various data



Deleting various data



Creating a file location



Cancelling of a procedure



Confirming a procedure

### Specimen



single  
measurement

Select test type Single Measurement


















Series  
measurement



















Only with DuraScan 20 or as an optional software module for DuraScan 10!  
Select test type Series Measurement








Method



	CHD	Only with DuraScan 20 or as an optional software module for DuraScan 10! Measures the case hardness depth (CHD)
	Nht	Only with DuraScan 20 or as an optional software module for DuraScan 10! Measures the nitride hardening depth
	Rht	Only with DuraScan 20 or as an optional software module for DuraScan 10! Measures the surface hardness
	Load sample	Enables you to load a saved sample
	Read QR-code	Enables you to read a QR-code
	Method and Objective Lens	Defines indenter, lens and test method
	<i>Indenter</i>	Makes the indenters installed available for selection
	<i>Lenses</i>	Makes the lenses installed available for selection
	<i>Method</i>	Makes the possible test methods available for selection
		Opens additional lines
	Create Sample	Enables the creation of a sample for hardness testings
	Create QR-Code	Enables the creation of a QR-Code for hardness testings
	Conversion	Makes the existing conversion tables available for selection
	Limits	Permits the entry of limits
	Sample Correction	Permits the entry of sample correction data with round workpieces












<b>Position</b> 		Test Point Pattern	Only with series measurement on DuraScan 20! Defines the test point pattern for series measurement
		Image	Shows the current view in the magnification selected
		Turret	Shows the tool currently active (either indenter or lens)
		AF Camera	Automatically creates an optimum image without the user's involvement See "Autofocus function (AF Camera)", page 33
		AF Indentation	For automatically locating and identifying the surface of a specimen See "AF Indentation function", page 33
<b>Result</b> 		Measure	Starts measurement
		Value	Shows the hardness value and the test method applied
		Auto	Automatically remeasures a test point
<b>History</b> 		Manual	Permits manual remeasurement of a test point
		List	Opens the result list
		Statistics	Opens statistics for the values measured. These values can be displayed in text form or as a histogram or trend line.
		<i>Values</i>	Shows a statistical analysis in table form
		<i>Trend line</i>	Shows a sequence of measurements as a trend line
		<i>Histogram</i>	Shows a statistical analysis as a histogram
		Report	Opens the Report screen

	Excel	Exports the measured data as a csv file
	Export	Exports the measured date in the currently set format (only with option export editor)
	Delete Value	Deletes a value from the result list
	Delete all	Deletes all values from the result list
	Load List	Loads an existing result list
	Save List	Saves the current result list in a file
	Load Value	Loads the image and value for a measurement from the result list to the current memory. The value can be seen under Result and can, for example, be re-measured.

## Settings



	General Settings	Opens the screen for general settings
	<i>General</i>	Opens the screen General
	<i>User fields</i>	Opens the screen User fields
	Times	Displaying of set dwell times of the test forces
	Setting the export	Opens the screen for setting the individual export data (only with option export editor)
	<i>User Rights</i>	Opens the screen User Rights
	<i>File Locations</i>	Opens the screen File Locations
	Service	Is only for the service team and requires at least the user rights "User"
	Change User	Opens the login screen



Exit

Ends the ecosWorkflow

## 4.6 Virtual keyboard

### Alphanumeric keyboard

The virtual keyboard opens automatically when you select a field which requires an alphanumeric input.



You can enter or edit text with the alphanumeric keyboard. You must finish inputting by pressing Enter.



Moves the virtual keyboard on the screen



Deletes the old value or with a current input, the character to the left



Completes inputting



Cancels inputting (Escape)



Switches between lower and upper-case

## 4.7 Autofocus function (AF Camera)

The AF Camera function automatically creates an optimum image without the user's involvement:

- Image is focused
- Brightness is optimized.

Select the AF Camera function where possible to ensure values that are objectively comparable.



The perception of focus by the human eye varies widely, so possibly resulting in different test evaluations depending on the user.

## 4.8 AF Indentation function

The AF Indentation function is used for automatically locating and identifying the surface of a specimen.

The indenter is automatically moved to the workpiece, where it leaves a little indentation with a test load of approx. 10 g and a diagonal of 10 - 15  $\mu$ . The indenter is then raised slightly.

The lens with the lowest magnification is swiveled in and automatically adjusted for an optimum image.

The optimum working height is then approx. 0.3 mm above the workpiece.

## 5 Examples of ecos Workflow

The following examples will teach you how to use the ecos Workflow.

The ecos Workflow reliably guides you through the hardness test procedure in five steps.

- The first example describes single measurement with the DuraScan 10.
- The second example deals with CHD measurement (series measurement) with the DuraScan 20.

### 5.1 Single measurement

#### Example

In this example single measurement is carried out using the HV5 test method.

- Machine: DuraScan 10 with manual 3-fold turret
- Test anvil: XY table
- Test type: Single measurement
- Test method: HV5
- Indenter: Vickers
- Lens: 10x


#### Login

After switching on, the ecos Workflow starts with the login screen, see "User login", page 94.

- Enter your login data.

You can ask the administrator for your login data!

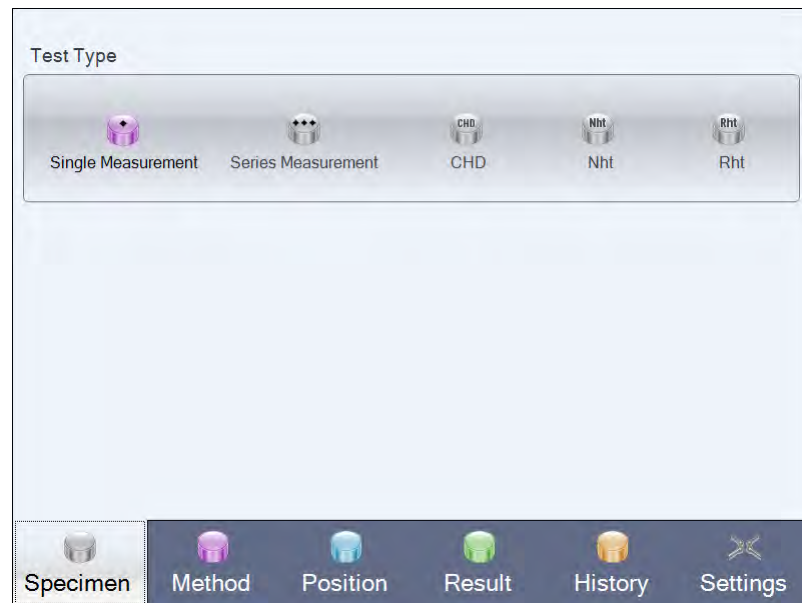


- Comply with the prompt and swivel in the indenter.
- Confirm with .

The ecos Workflow opens the Specimen screen.

#### 5.1.1 Specifying test type

Specify the test type in the Specimen screen.

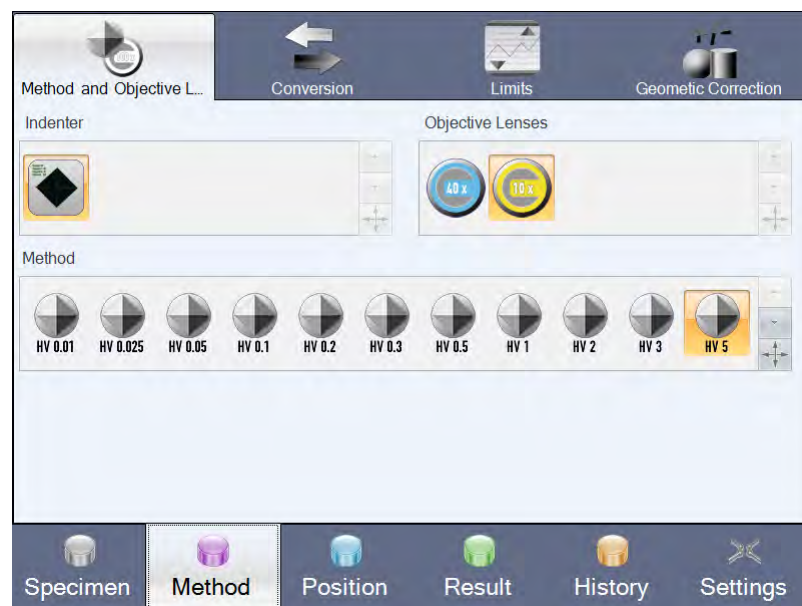


- Select the test type Single Measurement.
- In the Workflow bar select Method to open the Method screen.

### 5.1.2 Specifying test method and lens

In the Method screen select the lens and specify the test method.

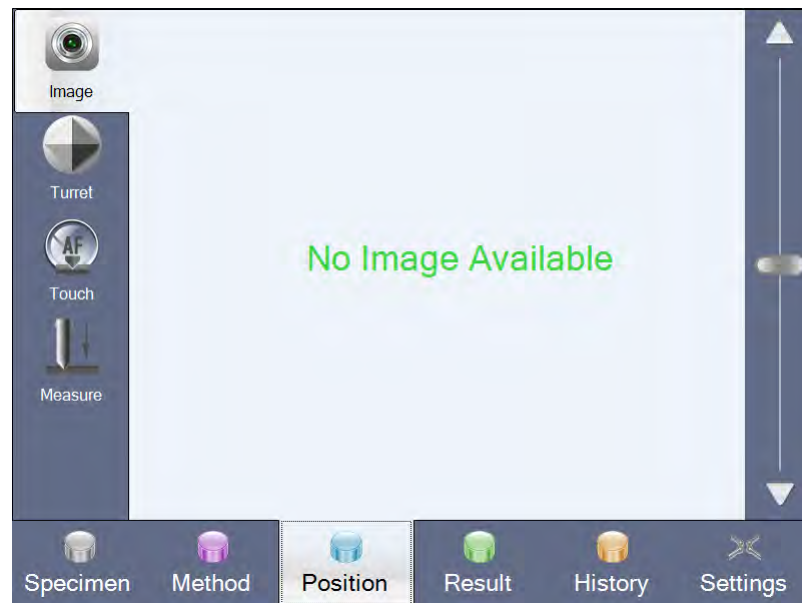
If a second indenter is installed, it can also be selected here.



- Select the 10x lens in Objective Lenses.
- Select the test method HV5 in Method.
- In the Workflow bar select Position to open the Position screen.


### 5.1.3 Specifying position

In the Position screen position the indenter in relation to the workpiece and specify the test point.



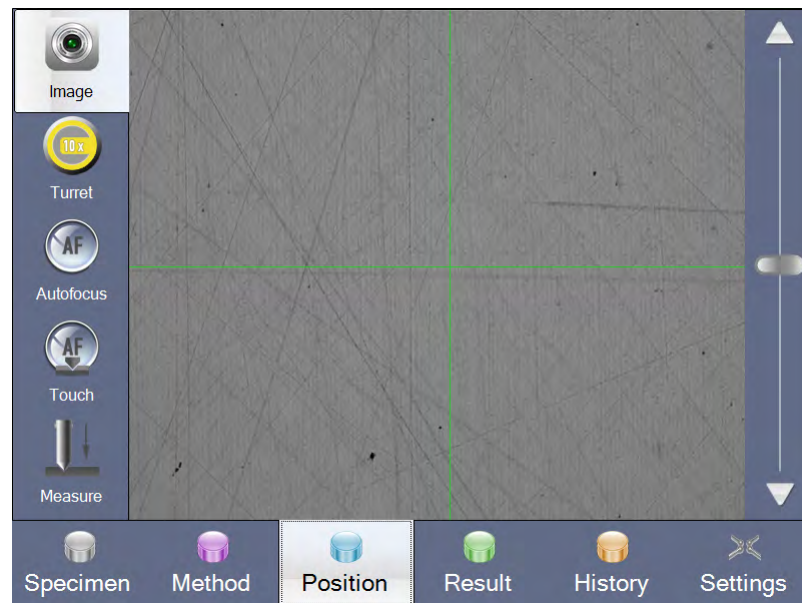
- Select the menu item Turret.




- Select the 10x lens.
- Comply with the prompt and swivel in the 10x lens until it catches in place.
- Confirm with .

The ecos Workflow automatically returns to the Image screen.

- Place the workpiece under the lens on the test anvil.





- Move the workpiece to a position without any indentation.
- If necessary, focus the image using the slider on the right of the screen.  
Or:
- Select the menu item AF Indentation. Focusing and adjustment of the indenter to the optimum working height is carried out here automatically.
- Comply with the prompt and swivel in the indenter until it catches in place.
- Confirm with .

The AF Indentation function is used to move the indenter automatically to the workpiece, where it leaves a little indentation with a test load of approx. 10 g and a diagonal of 10 - 15  $\mu$ .



In certain cases the indent left by the AF Indentation function is not desirable. In this case you must lower the indenter manually using the slider until it is close to the workpiece.

- Comply with the prompt and swivel in the 10x lens until it catches in place.
- Confirm with .
- Move the workpiece to the position at which measurement is to take place.
- Select the menu item Measure. Then comply with the prompt and swivel in the indenter until it catches in place.
- Confirm with .




### **Danger**

Keep your hands away from the area around the moving test unit.

After measurement has started, several messages are displayed on the touch screen.

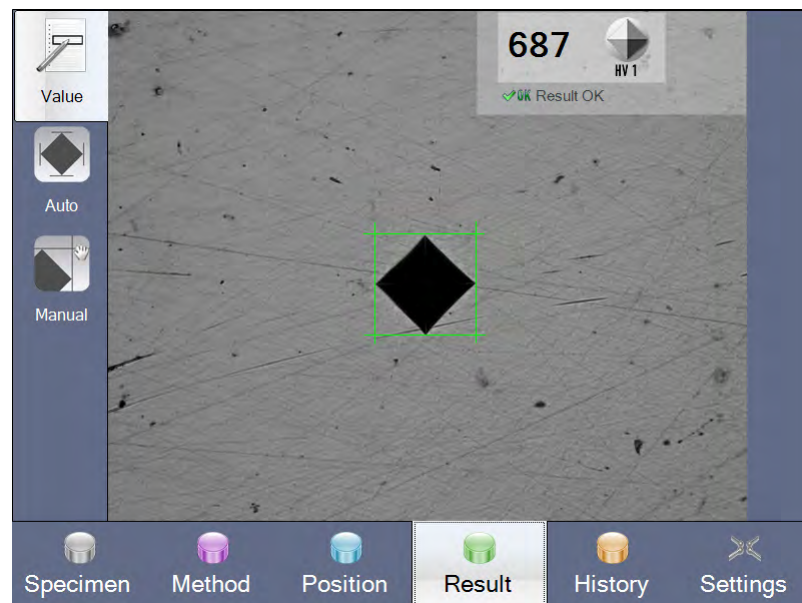


- Once measurement has finished, comply with the prompt and swivel in the 10x lens until it catches in place.
- Confirm with .

The Result screen is displayed automatically.

#### 5.1.4 Viewing result

The result is displayed in the Result screen and is available for further processing.



The indent is automatically set to optimum brightness, focused, subjected to optical analysis and displayed by the ecos Workflow.

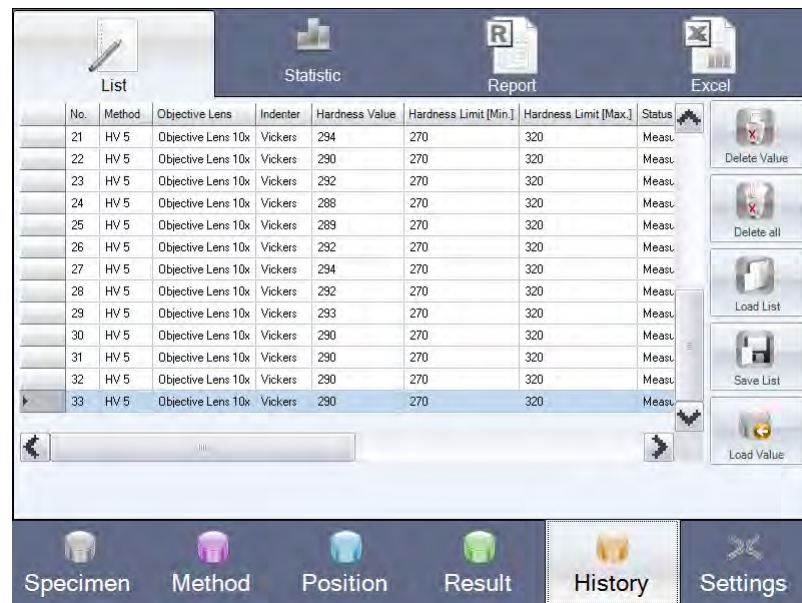
The measurement result is displayed in the top right of the touch screen, where it can be read off.

All values measured are saved in a list.

- In the Workflow bar select History to open the History screen.

#### 5.1.5 Viewing entry in History

All results are permanently stored in the History screen with a clear structure.



The screenshot shows the 'List' tab of the DuraScan software. It features a table with columns: No., Method, Objective Lens, Indenter, Hardness Value, Hardness Limit [Min.], Hardness Limit [Max.], and Status. The table contains 13 rows of data. To the right of the table are buttons for 'Delete Value', 'Delete all', 'Load List', 'Save List', and 'Load Value'. At the bottom of the interface are tabs for 'Specimen', 'Method', 'Position', 'Result', 'History', and 'Settings'.

No.	Method	Objective Lens	Indenter	Hardness Value	Hardness Limit [Min.]	Hardness Limit [Max.]	Status
21	HV 5	Objective Lens 10x	Vickers	294	270	320	Measu
22	HV 5	Objective Lens 10x	Vickers	290	270	320	Measu
23	HV 5	Objective Lens 10x	Vickers	292	270	320	Measu
24	HV 5	Objective Lens 10x	Vickers	288	270	320	Measu
25	HV 5	Objective Lens 10x	Vickers	289	270	320	Measu
26	HV 5	Objective Lens 10x	Vickers	292	270	320	Measu
27	HV 5	Objective Lens 10x	Vickers	294	270	320	Measu
28	HV 5	Objective Lens 10x	Vickers	292	270	320	Measu
29	HV 5	Objective Lens 10x	Vickers	293	270	320	Measu
30	HV 5	Objective Lens 10x	Vickers	290	270	320	Measu
31	HV 5	Objective Lens 10x	Vickers	290	270	320	Measu
32	HV 5	Objective Lens 10x	Vickers	290	270	320	Measu
33	HV 5	Objective Lens 10x	Vickers	290	270	320	Measu

Further processing of the values generated (e.g. remeasurement) is described in chapter "Advanced Settings and Functions", page 48.

Evaluation and editing of your values is described in chapter "Documentation and evaluation", page 63.

## 5.2 CHD measurement (series measurement)

### Example

In this example CHD measurement is carried out using the HV1 test method.

- Machine: DuraScan 20 with optional motorized 6-fold turret
- Test anvil: Cross slide with micrometer spindles
- Test type: CHD measurement
- Test method: HV1
- Indenter: Vickers
- Lens: 20x

### Login

After switching on, the ecos Workflow starts with the login screen, see "User login", page 94.

➤ Enter your login data.

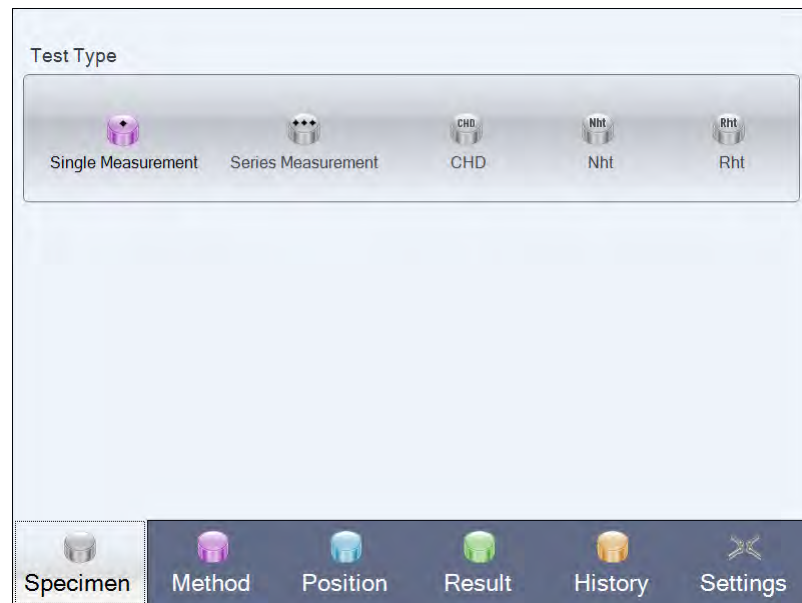
You can ask the administrator for your login data!



The ecos Workflow opens the Specimen screen. The indenter is swiveled in.

### 5.2.1 Specifying test type

Specify the test type in the Specimen screen.

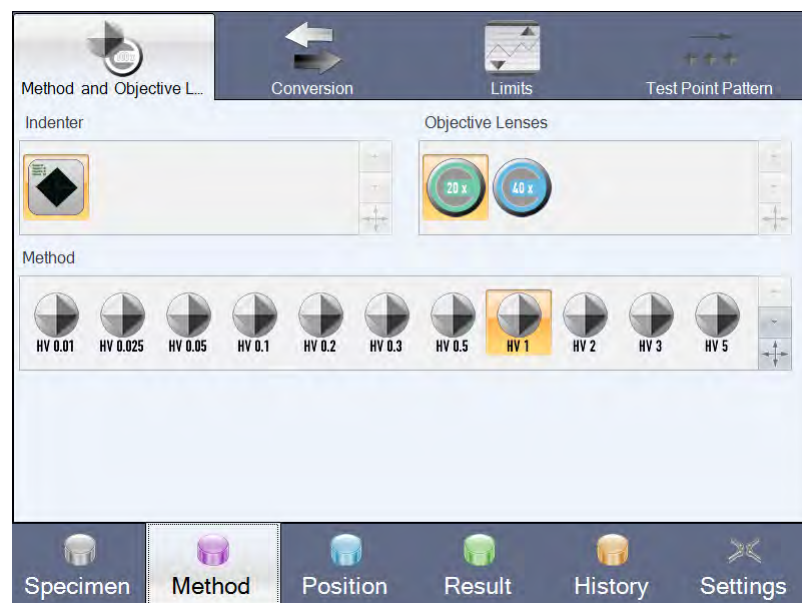


- Select the test type CHD.
- In the Workflow bar select Method to open the Method screen.

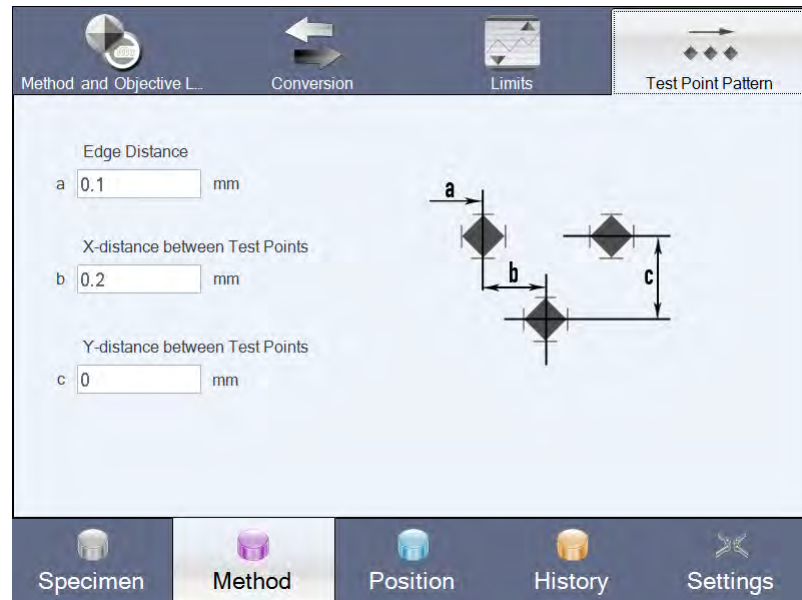
### 5.2.2 Specifying test method and lens

In the Method screen select the lens, specify the test method and define the test point pattern. See "Test Point Pattern", page 56, section "Test point pattern".

If a second indenter is installed, it can also be selected here.



- Select the 20x lens in Objective Lenses.
- Select the test method HV1 in Method.
- Select the Test Point Pattern menu to specify the pattern you wish to test.

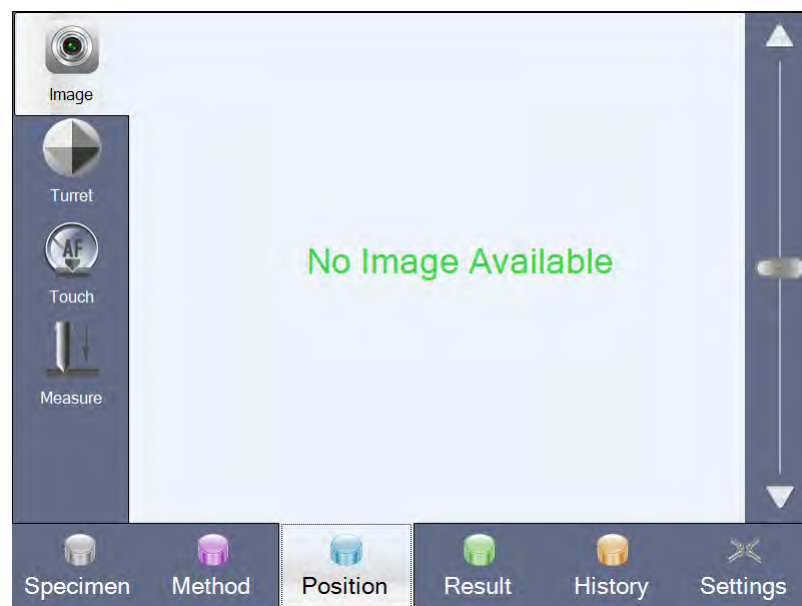


- Enter the required values for the parameters a, b and c. In this example:  $a=0.1$ ,  $b=0.2$ ,  $c=0$ .
- In the Workflow bar select Position to open the Position screen.

### 5.2.3 Specifying position

#### Positioning indenter

In the Position screen position the indenter in relation to the workpiece and specify the start point for the measurement series.



- Select the menu item Turret.

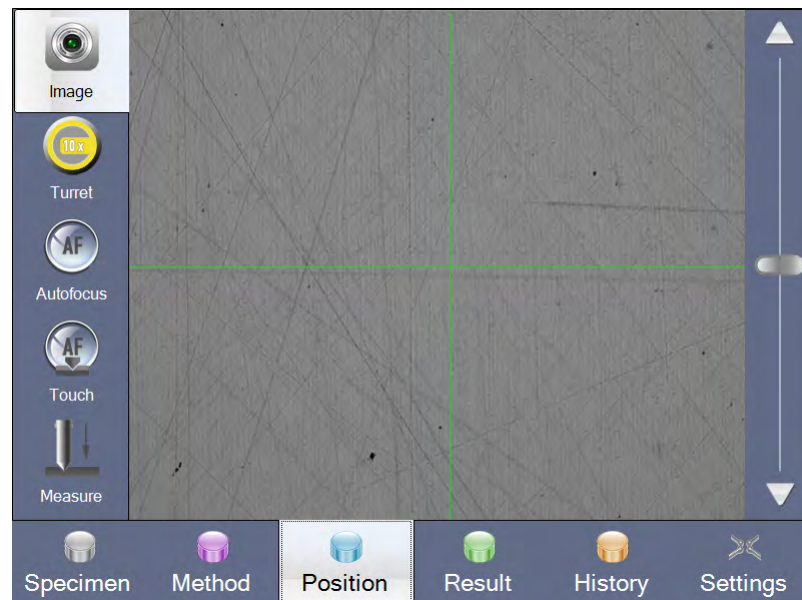


- Select the 20x lens.

The lens is swiveled in automatically.

The ecos Workflow automatically returns to the Image screen.

- Place the workpiece under the lens on the test anvil.



- If necessary, focus the image using the slider on the right of the screen.  
Or:
- Select the menu item AF Indentation. Focusing and adjustment of the indenter to the optimum working height is carried out here automatically.

The AF Indentation function is used to move the indenter automatically to the workpiece, where it leaves a little indentation with a test load of approx. 10 g and a diagonal of 10 - 15  $\mu$ .

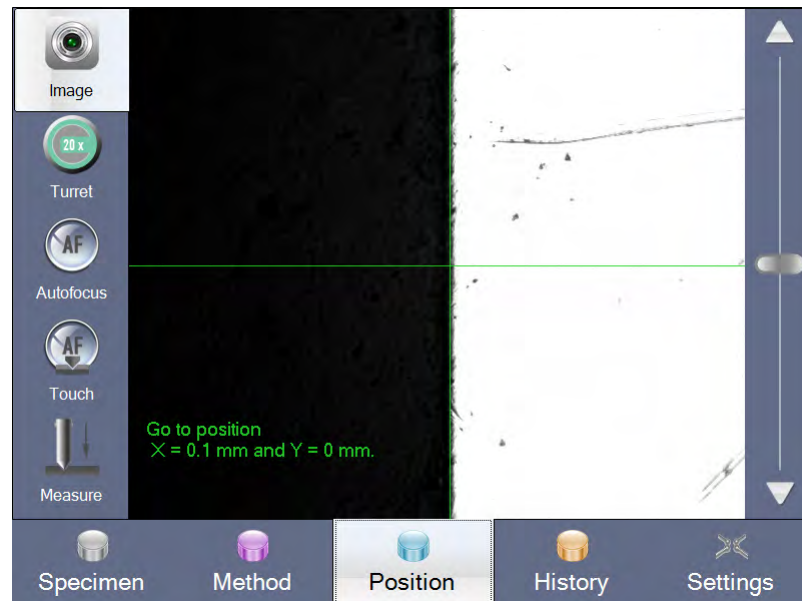




## Specifying the start point

In certain cases the indent left by the AF Indentation function is not desirable. In this case you must lower the indenter manually using the slider until it is close to the workpiece.

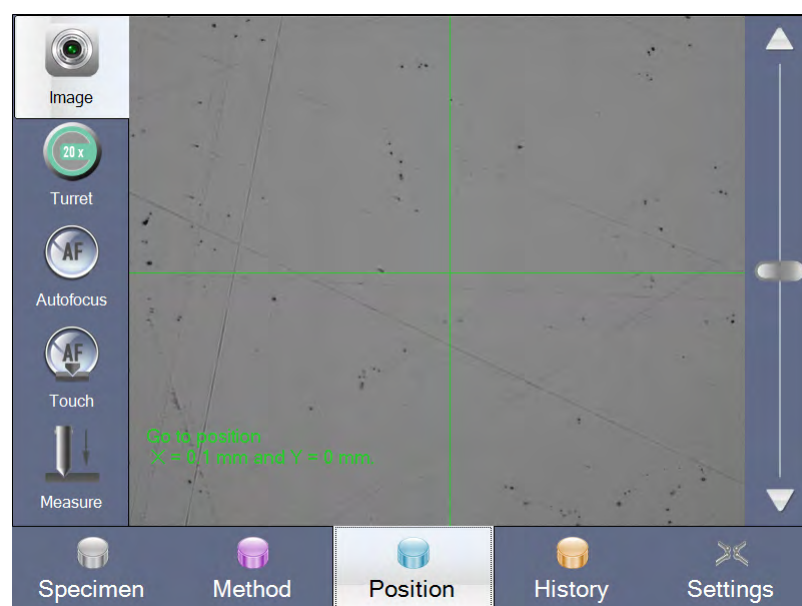
- Wait until the image is optimized.



- Set both micrometer spindles (analogue or optionally also digital) to "0".
- Position the workpiece so that its vertical edge lines up with the crossline as far as possible.

The test direction is always from left to right.

## Recording values



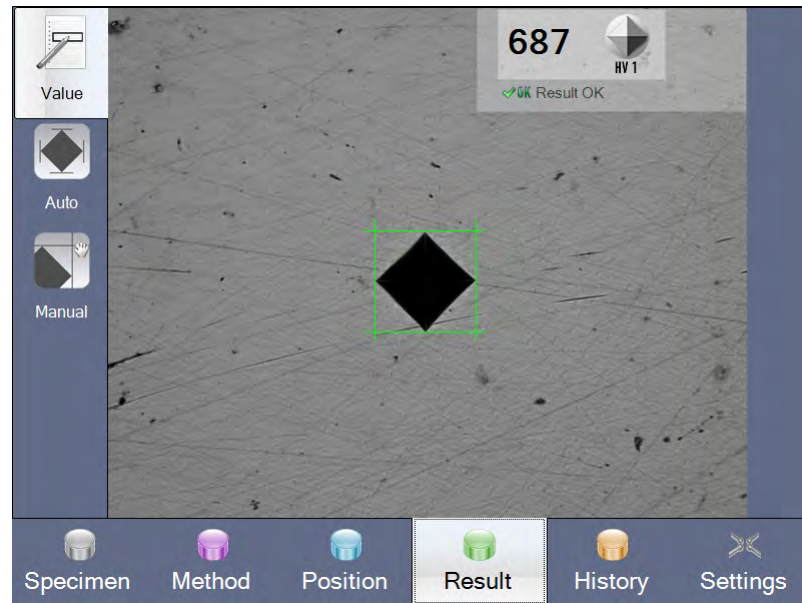
- Comply with the prompt and move the workpiece with the micrometer spindles to the values specified in the X- and in Y-axis.
- Select the menu item Measure.



### Danger

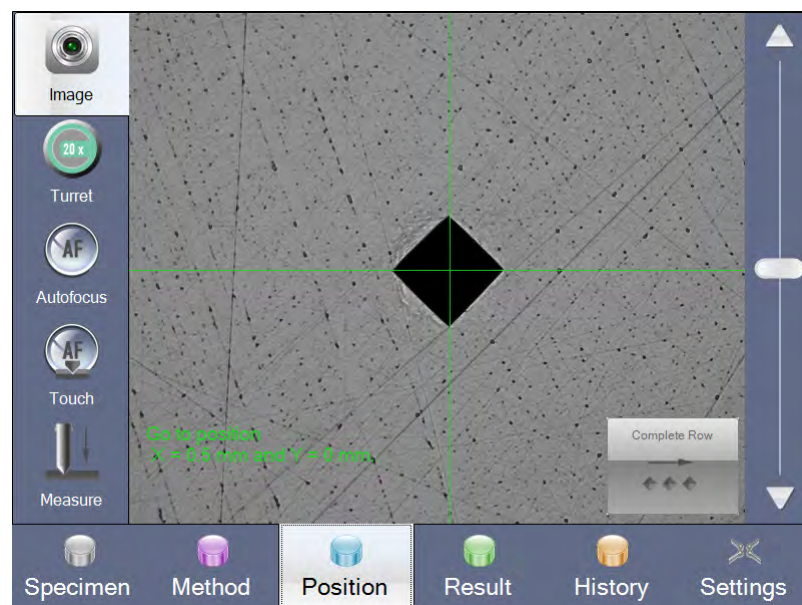
Keep your hands away from the area around the moving test unit.

After measurement has started, several messages are displayed on the touch screen.  
The Result screen is displayed automatically.



The measurement value and an image of the indent are displayed in the Result.

- In the Workflow bar select Position to return to the Position screen.



When you have carried out at least two measurements, you can perform another measurement or end the series.

- If necessary: Perform another measurement as described above.

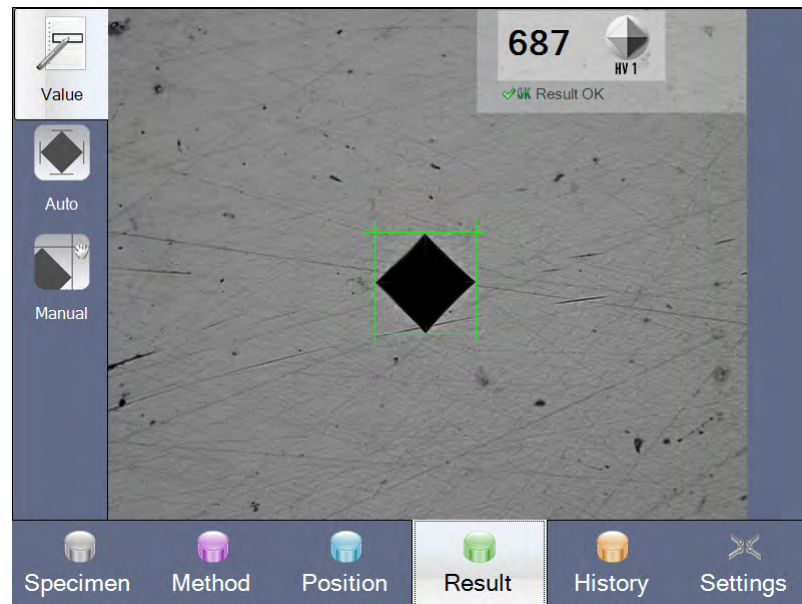
### Completing series

- Select the Complete Series function to end the series.

The History screen is displayed automatically.

### 5.2.4 Viewing result

The result is displayed in the Result screen and is available for further processing.



The indent is automatically set to optimum brightness, focused, subjected to optical analysis and displayed by the ecos Workflow.

The measurement result is displayed in the top right of the touch screen, where it can be read off.

All measurement series are saved in a list.

- In the Workflow bar select History to open the History screen.

### 5.2.5 Viewing entry in History

All results are permanently stored in the History screen with a clear structure. The series measurements are displayed. You can read off the values measured for each series and are informed about the status of the series (Series complete or Series not complete).

Series not complete is displayed:

- with program abort
- when the CHD value is not attained.

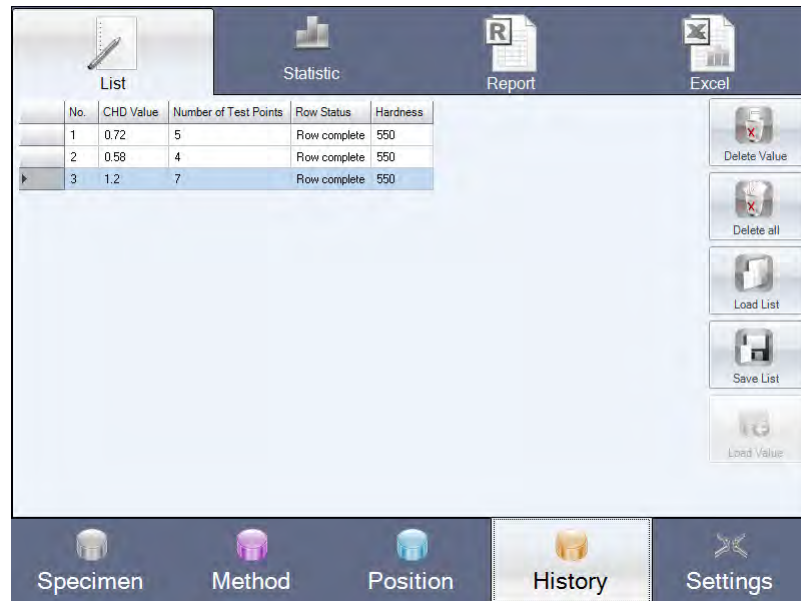
#### Caution

It is not possible to finish measuring the series later on!



Double-clicking on the measurement series will display the associated result list.





Further processing of the values generated (e.g. remeasurement) is described in chapter "Advanced Settings and Functions", page 48.

Evaluation and editing of your values is described in chapter "Documentation and evaluation", page 63.

## 6 Advanced Settings and Functions

### 6.1 Advanced settings with measurements

#### 6.1.1 Specimen screen



The screen Specimen opens automatically after login.





You can choose between single measurement and series measurement depending on the configuration level of the machine and the available software modules. With series measurement several options are available: CHD, Nht and Rht.

- CHD** The CHD case hardness depth is defined by determining the effective depth of the carburized and case-hardened layer. With the HV1 test method the typical CHD limit is 550 HV.
- Nht** The Nht nitride hardening depth is defined by determining the effective hardness depth after nitriding. The typical Nht limit corresponds to the current core hardness of +50 HV with test method HV0.5.
- Rht** The Rht surface hardness depth is defined by determining the effective hardness depth after flame or induction hardening. The typical Rht limit is 80% of the surface hardness of test method HV1.
- Load** Here you can load and use the previously saved settings for the sample hardness testing.

- Press the load sample button



- Select the required sample from the list.
- If necessary, select the  button in order to display the deposited settings of the sample.
- Press the  button in order to use the sample for the hardness testing

After the sample has been loaded the ecos Workflow directly changes to Position.

**Read QR-code** Here you can read a QR-code in order to use the settings for the hardness testing it contains. Note, an additional hand-held scanner is necessary. It is not included in the shipment!

- Press the read QR-code button



- Now scan the desired QR-code with a hand-held scanner (not included in the shipment).

After the QR-code has been scanned the ecos Workflow directly changes to Position.

## 6.1.2 Method screen



In the screen Method you can determine the settings for your metering.

Depending on your settings, you can adjust further settings in the following menus:

- In the menu Method and Objective Lens
- In the menu Conversion
- In the menu Limits
- In the menu Sample Correction,
- In the menu Test Point Pattern

### 6.1.2.1 Method and Objective Lens



In the screen Method and Objective Lens select the test type, the lens, the (test) method, and the zoom level.





Example view for method > method and lens with standard zoom

Measurement Type	By default a test type can be selected. With the optional turret additional indenters can be installed and configured and therefore several test types may be available.
Objective Lenses	By default, one lens can be selected. With the optional turret additional lenses can be installed and configured and may therefore be available.
Method	Here you can choose between the test methods listed.
Zoom level	By default, you can choose between two zoom levels. When the optional zoom lens is installed, the additional zoom levels are displayed here. With depth difference methods the lenses and the zoom level are deactivated.
Create	All settings for the hardness testing that were made under

sample "Specimen", "Method" and "User fields" can be saved here as a sample.

- Press the create sample button






- Enter the desired name for the sample.
- If necessary, select the  button in order to display the deposited settings of the sample.
- Press the  button to save the sample. The sample is filed under the set file location for templates Specifying file locations (File Locations)", page 83.


After the saving process the ecos Workflow changes back to Method.

Create QR- All settings for the hardness testing that were made under  
code "Specimen", "Method" and "User fields" can be created as QR-code  
here.



- Press the create QR code button



- If necessary, select the  button in order to display the deposited settings of the QR- code.
- Select the  button to print out the QR- code directly.
- Select the  button to save the QR- code.

When you press , the following screen opens:



- Select the  button to select the desired directory.
- Enter the desired name for the QR-code into the name field.
- Select the  button to save the sample.

After the saving process the ecos Workflow changes back to Method.

### 6.1.2.2 Conversion





When dealing with different hardness test methods, it is often necessary to convert the hardness value measured with one method to that of another method. For this reason empirical values have been established based on numerous comparative measurements, conversion tables drawn up and standardized in the relevant norm. Different tables apply to different materials. The appropriate norm should be consulted for conversion according to the standards.

For example, the conversion tables also state the tensile strength of steel in N/mm<sup>2</sup>.

When you select the Conversion the following screen will open:



With the  or  buttons you can activate or deactivate the conversion.



- Use the  button to activate Conversion so you can select a conversion table.



The following conversion tables are available for selection:

- DIN EN 50150
- ASTM E140
- DIN EN ISO 18265

Conversion Table lists the test methods offered by the machine as well as its norm-based conversion options.

➤ After selecting a conversion table, choose the test method and test unit.



If you have selected the conversion tables ASTM or DIN EN ISO 18265, you can choose between several materials.

➤ Leave Conversion by directly calling Position up.

### 6.1.2.3 Limits




If you have selected Limits the following screen will open:

With the  or  buttons you can activate or deactivate the entering of limit values.





- Select the  button to enter limits.
- Enter the limits for the test method.

If a result is within the set limits, OK is displayed when the measurement is taken. If a result is outside the set limits, the display reads Result too High or Result too Low.

With evaluation of the results in the History screen, the limits are displayed as a trend line in red. Further information can be found in the chapter "Documentation and evaluation", page 63.

Statistical analysis can only be performed with activated limits.

The limits are specified in the same unit of hardness as for the test method selected, e.g. HV for the Vickers test method.



- Leave limits by directly calling Position up.

#### 6.1.2.4 Sample Correction,




If you have selected Sample Correction, the following screen will open:



With the  or  buttons you can activate or deactivate the entering of limit values.



Here you can enter a correction for a sample type based on the test method. A sample correction is required in order to produce correct measurements in the case of round (cylindrical, spherical) samples.

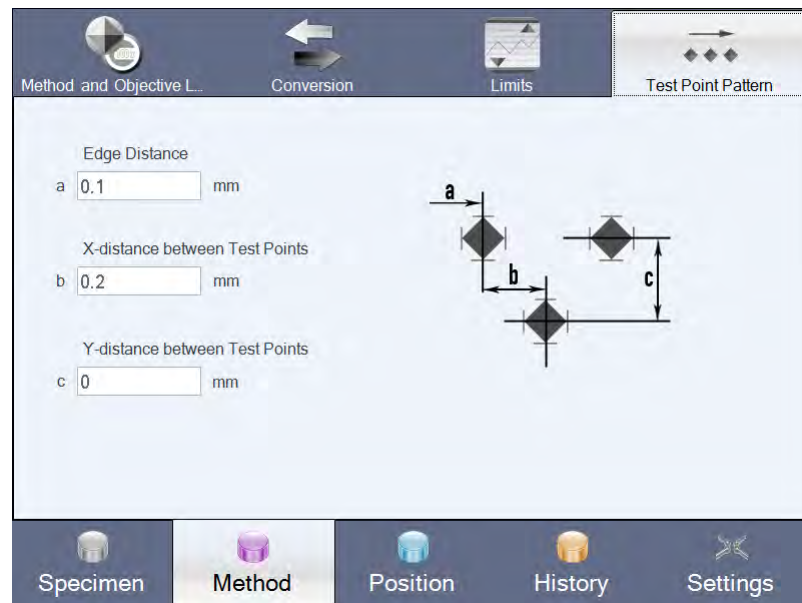
- Use the  button to activate Sample Correction so you can specify the sample correction.
- Select the form (spherical or cylindrical).
- Specify whether the curvature is concave (inwards) or convex (outwards).
- Specify the angle at which the measurement series is positioned on the workpiece.
- Measure the diameter of the workpiece and enter it in the Diameter field.
- Leave sample correction by directly calling Position up.

#### 6.1.2.5 Test Point Pattern



If you are performing series measurement, you will see the Test Point Pattern menu in the menu bar on the top right.

If you select Test Point Pattern, the following screen will open:



Here you can specify the distances between the individual test points as well as the distance to the edge from which the first of several test points is to be set.

- Switch to the Method screen and select the Test Point Pattern menu.
- Enter the required value in the Edge Distance field.
- Enter the required values in the fields X-distance between Test Points and Y-distance between Test Points.



If you are performing series measurement with a linear arrangement for all test points (only X-axis), you should not enter a value for Y-distance between Test Points. If you require an offset in the X- and the Y-axis, you must enter values in both fields.

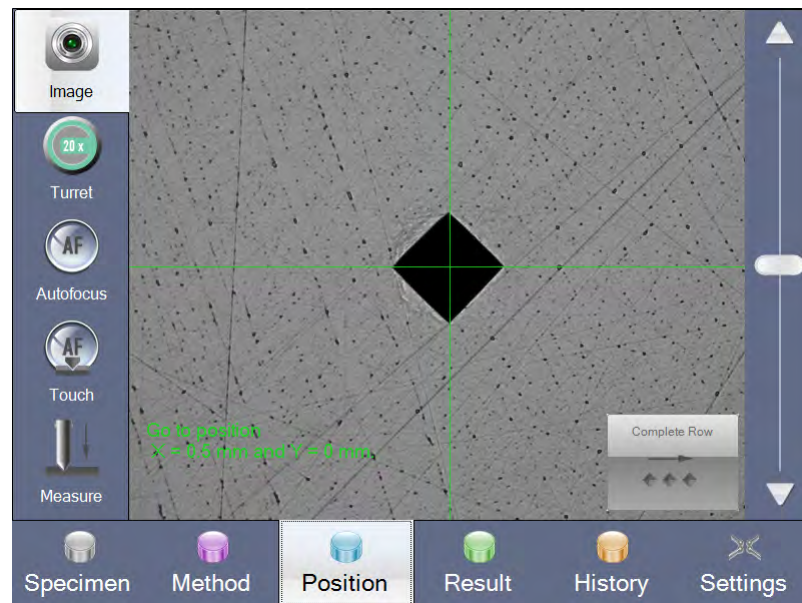
Once you have entered all values and switched to the Position screen, a message will immediately appear, prompting you to move the specimen.

- Switch to the Position screen.
- Set both micrometer spindles to "0".
- Place the workpiece under the lens on the test anvil.
- If necessary, focus the image using the slider on the right of the screen.
- Position the workpiece so that its vertical edge lines up with the crossline.
- Perform at least two measurements, complying with the instructions shown on the screen.
- After each measurement select Position again to carry out the next measurement.

Once you have carried out all measurements, you must complete the measurement series.

After the very first measurement the Position screen will display the Complete Series button on the bottom right.

- Complete Series should however not be selected until you have performed at least two measurements.



This completes the measurement series, and you can then view and analyze the values as required.



In the result list shown in the History screen incomplete series are shown in the column Series Status as Measurement series not complete.



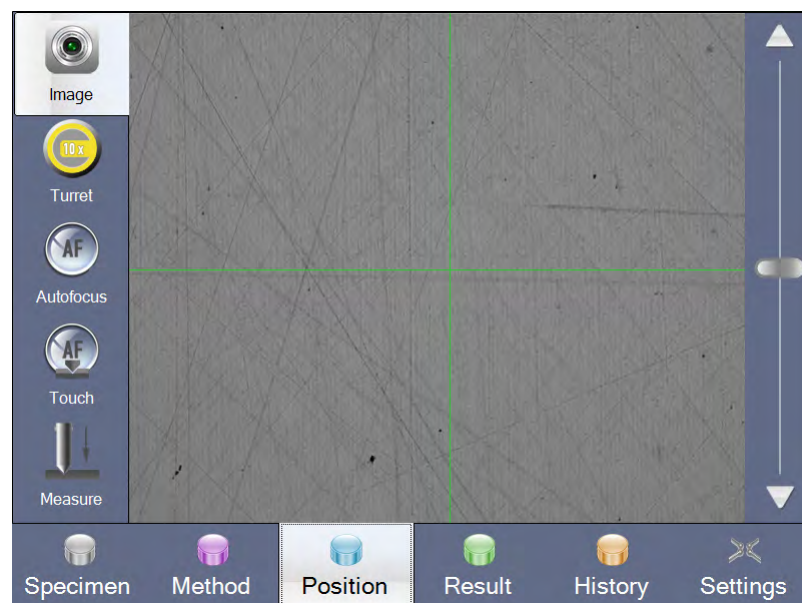
### Caution

It is not possible to finish measuring the series later on!

## 6.1.3 Position screen



If you select Position, the following screen appears:



You can perform measurement here as well as optical analysis and viewing.

Image

Shows an image of the workpiece.

Turret	If you select this menu item, you can either select a lens or the indenter (depending on equipment) and then bring it into position in response to a prompt on the screen. After measurement you will either be prompted to swivel in the lens, or the turret will automatically move to the right position.
AF Camera	This function automatically focuses the image of the indent without the user's involvement. If it is not sharp enough and refocusing is required, use the slider on the right of the screen to refocus.
AF Indentation	<p>The AF Indentation function is used for automatically locating and identifying the surface of a specimen.</p> <p>The indenter is automatically moved to the workpiece, where it leaves a little indentation with a test load of approx. 10 g and a diagonal of 10 - 15 <math>\mu</math>. The indenter is then raised slightly.</p> <p>The lens with the lowest magnification is swiveled in and automatically adjusted for an optimum image.</p> <p>The optimum working height is then approx. 0.3 mm above the workpiece.</p> <p>In certain cases the indent left by the AF Indentation function is not desirable. In this case you must advance the indenter manually using the slider until it is close to the workpiece.</p>
Measure	Measurement is carried out. The value measured is shown in the Result screen.

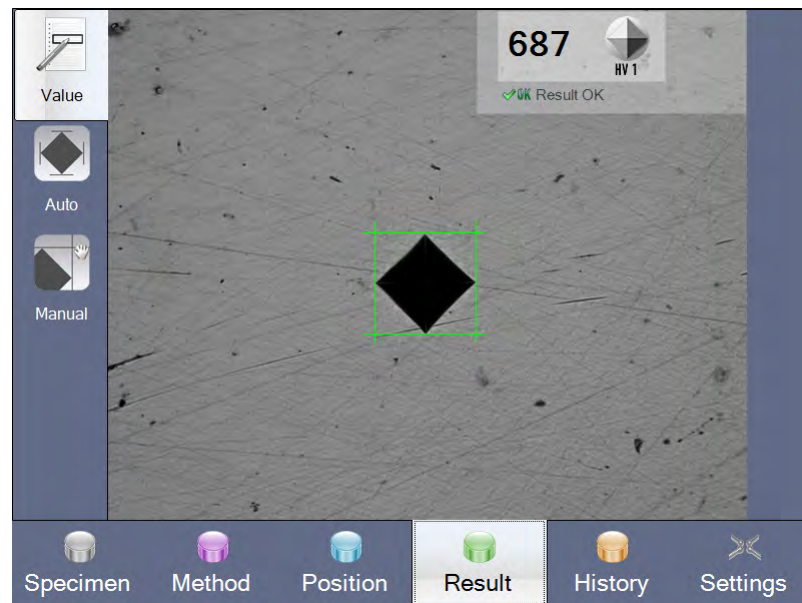
**Danger**

Keep your hands away from the area around the moving test unit.

If automatic image processing is enabled, you can swivel in the lens after measurement, or this will take place automatically and the indent measured. On the top right you will see the hardness value with the test method.

If automatic image processing is disabled, the machine will automatically offer the Manual Remeasurement function.

Automatic image processing can be enabled or disabled under General Settings – Image, see "Settings", page 75.



If the hardness value measured seems incorrect (e.g. cavities at indent tip), you can either have it remeasured automatically or remeasure it manually.


Before applying one of the two methods, make a (mental) note of the value, as remeasurement results in a new value, which will be then displayed and also saved as appropriate.



#### 6.1.3.1 Automatic remeasurement



- Select Auto and center the indent under the crossline.

- Confirm with .

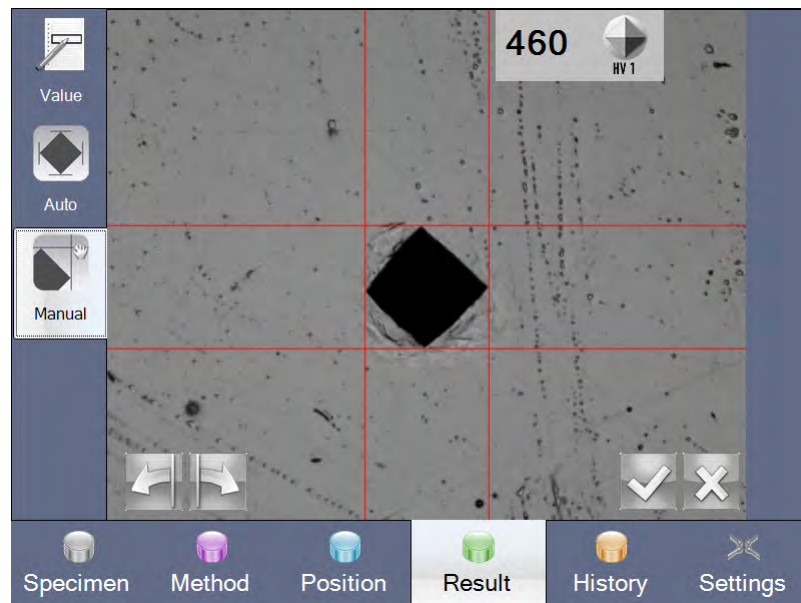
The value will be automatically remeasured and the new value shown on the top right.

#### 6.1.3.2 Manual remeasurement



If you select Manual, the following screen appears:

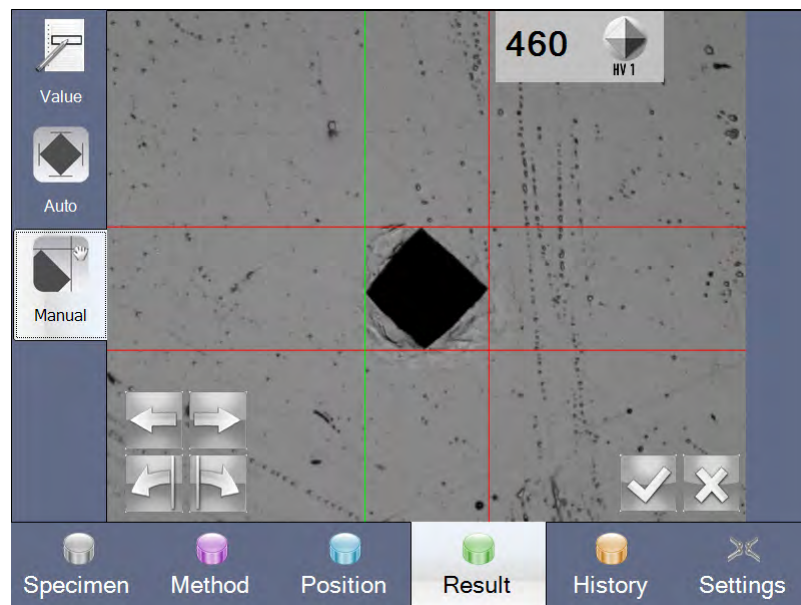


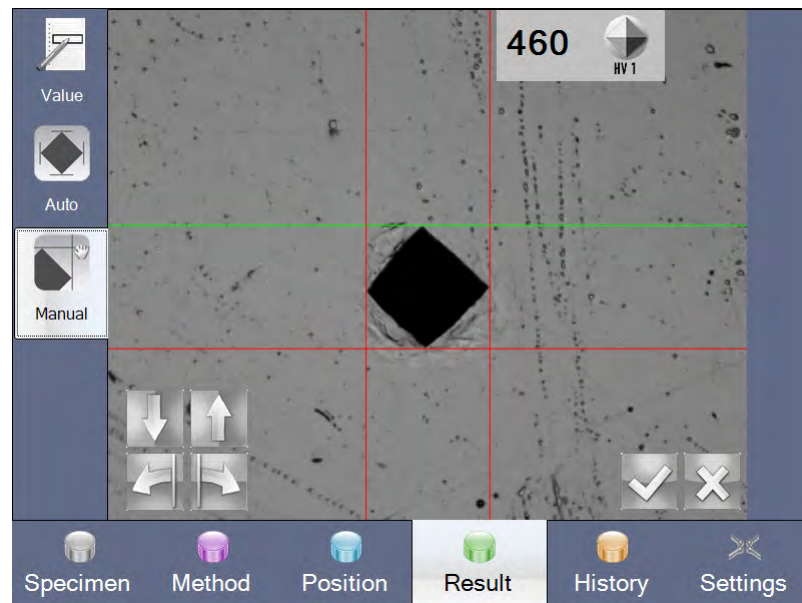


The measured value is shown on the top right.

The two curved arrows on the bottom left can be used to move all lines at once to attain the optimum measuring position.


Depending on which green line you have selected, you will see two vertical arrows to move the line up or down or two horizontal arrows to move it to the right or left.



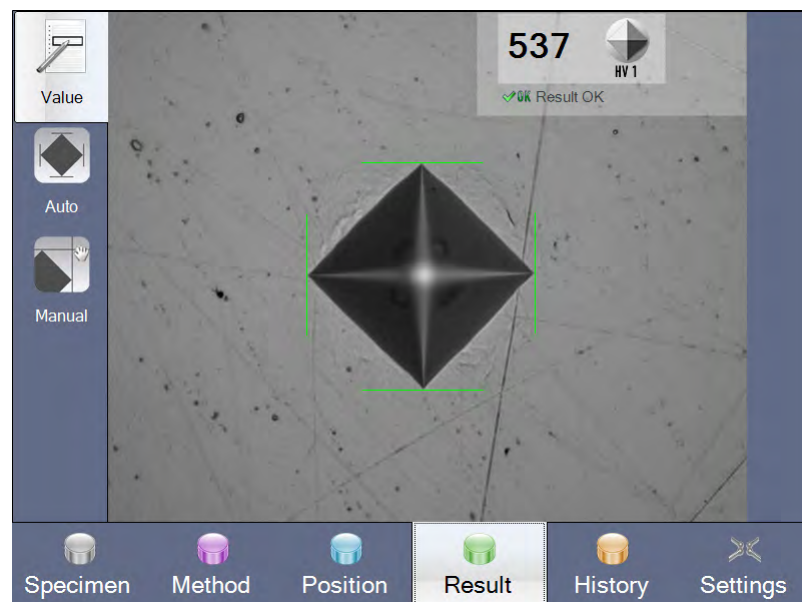



Depending on which green line you have selected, you will see two vertical arrows to move the line up or down or two horizontal arrows to move it to the right or left.

➤ When the four corners of the indentation are exactly between the green lines,

confirm the result of remeasurement with .

The remeasured value is displayed and saved.



You can cancel remeasurement with .

The List in the History screen shows whether the value was remeasured (Remeasured) or not (Measured). Further information can be found in the chapter "Documentation and evaluation", page 63.



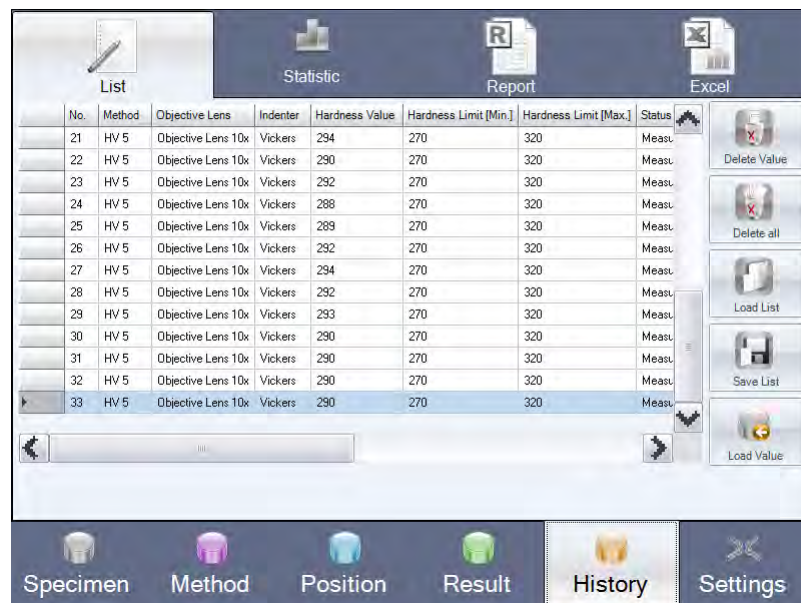
## 6.2 Documentation and evaluation

### 6.2.1 List of measurements



- Select History in the Workflow bar.

The List screen with buttons on the right-hand side is displayed.




You can use the scroll bars on the right and at the bottom of the screen to view the contents of the current list. Measurements are numbered consecutively. The following information is saved in the list as documentation for every measurement performed: method, lens, indenter and hardness value measured. The set hardness limits are displayed.

Status indicates whether the result is the first value measured or whether remeasurement was carried out. The Diagonal is the mean calculated from the first and second diagonal. It is indicated whether conversion was selected and which conversion method.

Classification shows a brief evaluation of the measurement, whether the value was "OK" or too high/low and whether conversion was successful.

#### 6.2.1.1 Delete Value



You can use the  button to delete a value from the result list. You can, for example, delete a value that was measured using a different test method. This ensures that statistical analysis is performed correctly.

- Select a value to highlight it.

- Select the  button.

The following hint appears on the touch screen:

Do you want to Delete Value?


- Select Yes to delete the value.




After you delete a value, all subsequent values are re-numbered.

### 6.2.1.2 Deleting the result list



You can use the  button to delete the entire result list.

- Select the  button.

The following hint appears on the touch screen:


Do you want to Delete all Values ??

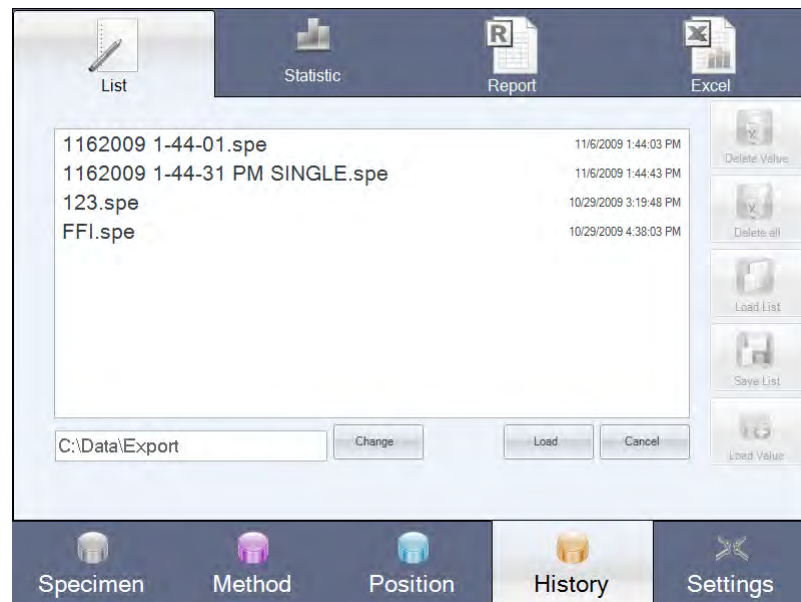
- Select Yes to delete the entire result list.

### 6.2.1.3 Loading result list



Your results, images, Excel files and export lists are stored in standard directories. With the appropriate user rights you can specify the file locations (see "Specifying file locations (File Locations)" page 83). The standard directory for measured results is C:\Data\Export. The list is saved in XML format with the file extension .spe.

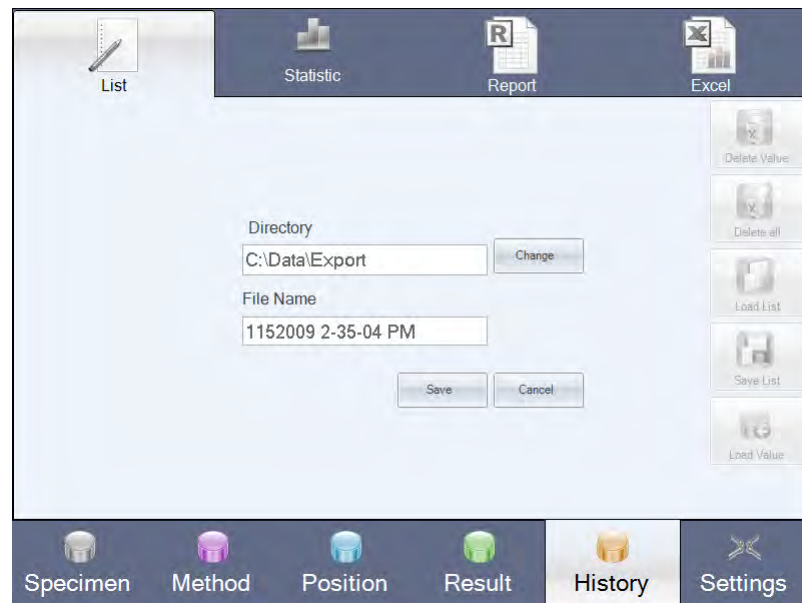
- Select the  button.
- Select the list you require.



### 6.2.1.4 Saving result list



You can save the current list under any name in any directory.



The Directory field can be used to specify the location where the file is to be saved. The default directory can be changed.

The File Name field can be used to specify a file name for the result list export. The file name you specify here is automatically used to save the list but can be changed at any point.

#### 6.2.1.5 Loading value



The Load Value button can be used to load the image for a measured result you have selected. If no image is available, the following message will appear: No image available for chosen Test Point.

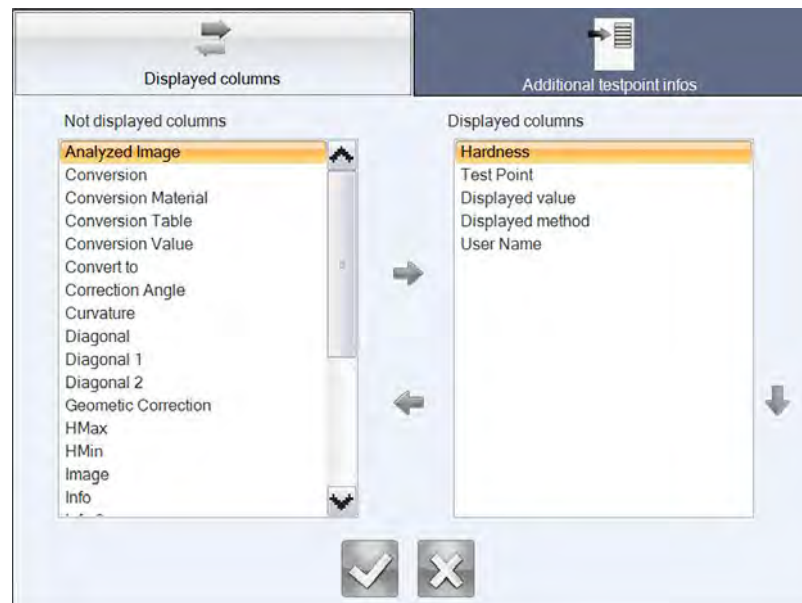
You can then remeasure the value loaded, see chapter "Automatic remeasurement", page 60.


#### 6.2.1.6 Adjust result list

By default, all kinds of data of a hardness testing is displayed in the result list. In order to show only specific data in a certain order, it is possible to individually adjust the result list.

- Double click on one of the names of the columns in the result list (e.g. hardness value).

The following screen opens:

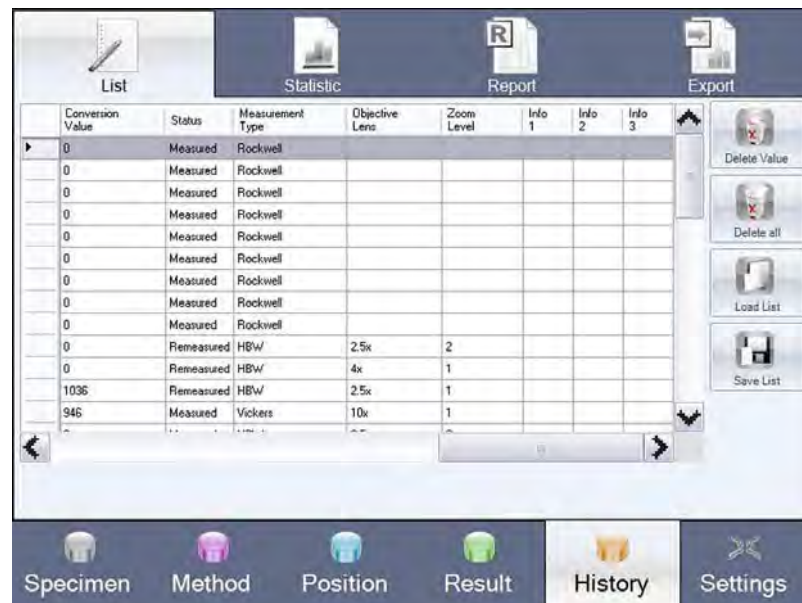


- Under Displayed columns set the data that should be contained in the result list.
- In order to consider values for the result list they must be selected previously. In order to do so, the fields displayed in the list Not displayed columns must be marked and by means of the arrow key moved to the list on the right hand side Displayed columns . If the values should not be considered, they can be moved back by means of the arrow key – left.
- If required, the values in the list Displayed columns can be arranged by means of the up and down arrow keys.
- For confirmation of the settings press .

#### 6.2.1.7 Additional information for hardness testings

The result list has 3 additional information fields for each hardness testing. These can be filled with customer specific data (e.g. batch no., etc.) prior to every measurement or subsequently in the result list. Moreover, it is possible to adjust the names of the columns of the information fields.

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- Double click on one of the names of the columns in the result list (e.g. hardness value).
- Change to the Additional test point information button

The following screen opens:

Displayed columns      Additional testpoint infos

☐ Enter additional infos before each measurement


Please enter desired names for additional testpoint infos

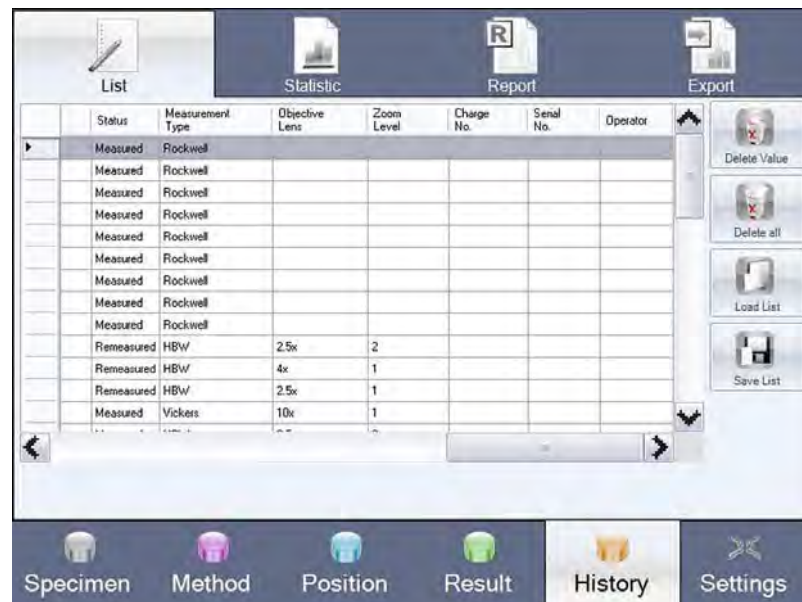
Additional info 1 name

Additional info 2 name

Additional info 3 name

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- If required, enter the desired column name for each additional information.
- Should you wish to use the additional information for your measurement, activate the respective additional information by means of the respective "Apply" button.
- If required, activate the "Enter additional information prior to each measurement" button. If this button is activated, additional information can be entered prior to each hardness testing. After pressing the Start Measurement button a screen for filling in the additional data appears for every activated additional information. This data is automatically applied to the result list after the hardness testing.
- If you only wish to fill the additional information into the result list, deactivate the "Enter additional information prior to each measurement" button.
- For confirmation of the settings press 



- In order to fill the additional fields of the result list with data, double click on the respective additional field.

The following screen opens:



- After you filled in the fields and pressed "next" the entered data is automatically applied to the result list.

	Status	Measurement Type	Objective Lens	Zoom Level	Charge No.	Serial No.	Operator
▶	Measured	Rockwell			123	43	NNN
	Measured	Rockwell					
	Measured	Rockwell					
	Measured	Rockwell					
	Measured	Rockwell					
	Measured	Rockwell					
	Measured	Rockwell					
	Measured	Rockwell					
	Measured	Rockwell					
	Remeasured	HBW	2.5x	2			
	Remeasured	HBW	4x	1			
	Remeasured	HBW	2.5x	1			
	Measured	Vickers	10x	1			

Delete Value

Delete all

Load List

Save List

Specimen

Method

Position

Result

History

Settings

#### 6.2.2.1 Trend line



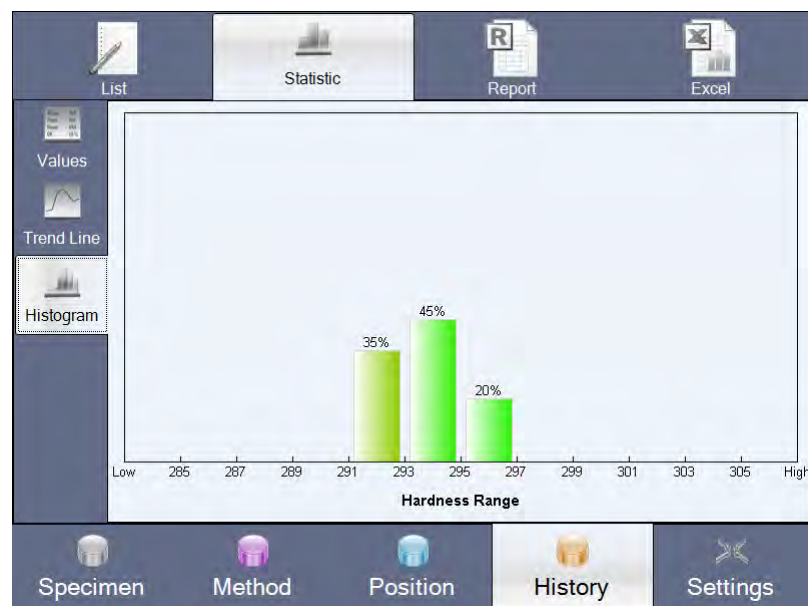
If you wish to map certain measured values, these values must be incorporated in a new list before `selectingStatistic`.



#### 6.2.2.2 Histogram



You can also display the values as a histogram by selecting the Histogram button. The values will be displayed as follows:



The distribution of the values in percent over the hardness range is shown as a histogram.

#### 6.2.2.3 Statistics for values



Under Values you can perform statistical analysis of the values selected.





To ensure a correct statistical analysis, note the following points:

- Delete the result list after saving it.
- Make the following settings: test methods, test parameters, hardness limits.

Statistical analysis can only be carried out if you have specified hardness limits.



These settings must not be changed during the statistical analysis. If they are changed, you must delete the relevant value from the result list before the analysis, see "Delete Value", page 63).

The results then undergo a statistical analysis.

Number	Total number of measurements taken
Number OK	The number of values that lie between the Hardness Minimum and Hardness Maximum limits
Number too Soft	The number of values that lie below the Hardness Minimum limit
Number too Hard	The number of values that lie above the Hardness Maximum limit
Minimum	The lowest value recorded
Maximum	The highest value recorded
Range	The difference between the minimum and maximum values
Mean	The arithmetical mean of all values
Stand. Dev.	Standard deviation
Cp	Process conductivity $Cp = (\text{Hardness Max} - \text{Hardness Min}) / 6 \times \text{Standard Deviation}$
Cpk	Process conductivity index $Cpk = (\text{Mean} - \text{Hardness Min}) / 3 \times \text{Standard Deviation}$ $Cpk = (\text{Hardness Max} - \text{Mean}) / 3 \times \text{Standard Deviation}$

The lower of the two Cpk values is used for the statistical analysis.

### 6.2.3 Printing report



The report contains ten user fields, which you can define in accordance with your requirements. Further information about definition of the user fields can be found in the chapter "Defining user fields (User Fields)", page 80.

You can select a sample under Pattern.

The sample selected should correspond to your test method, e. g. CHD.



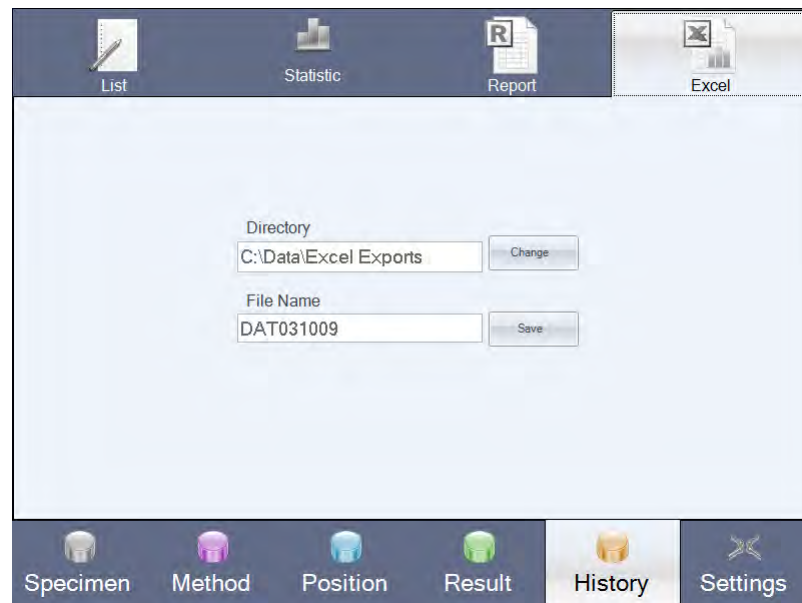
You can only print the report if a USB printer is connected and installed.

- Select Print to print the report.

### 6.2.4 Exporting to Excel



You can save the result list as an Excel file.



The Directory field can be used to specify the location where the file is to be saved. The default directory can be changed.

The File Name field can be used to specify a file name for the result list export. The file name you specify here is automatically used in the result list export but can be changed at any point.

The output format for the data export is an Excel-compatible file (csv). csv format is a format for text files, which can be processed in Excel, for example. The file extension csv is short for "comma separated values".

### 6.2.5 Export (optional)



By default, only one manual export to Excel in a .csv format is possible.

However, if the option export editor is available "Export Editor", page 100, the result list can be saved in different file formats with user-defined data. Possible file formats are csv/txt/xls/xlsx.

## 6.3 Configuration and Calibration

Different options are available for configuration and calibration of the machine. The various selections available can be found in the Workflow bar under Settings.



As special skills are required for certain settings, they will only be displayed if the logged-in user has the appropriate rights. Further information about user rights can be found under "User administration (rights)" page 81.

The General Settings menu includes functions that are mainly used for administration of the machine. The Service menu includes all functions you require to calibrate the machine. With Change User you can open the login screen to log in (possibly with other user rights). Exit can be used to close the ecos Workflow program and switch to the operating system (Windows XP Embedded).

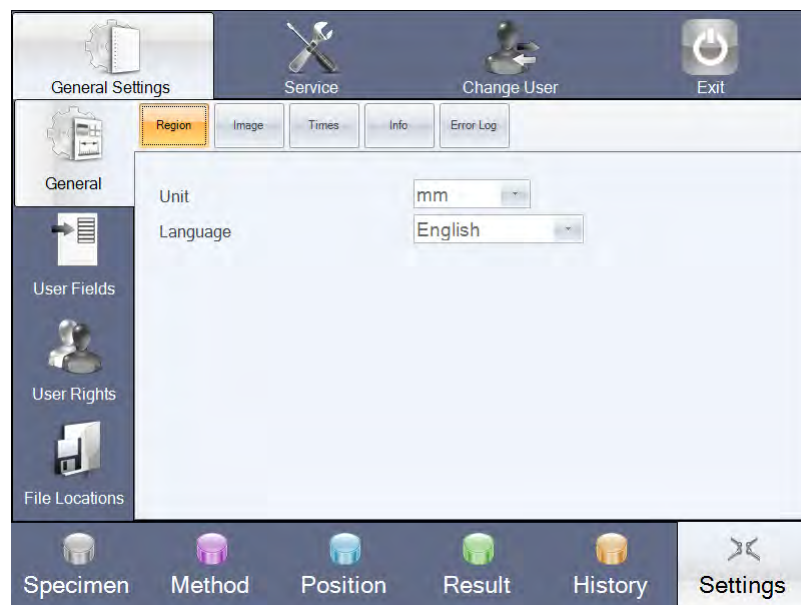
### 6.3.1 General Settings

- Select Settings in the Workflow bar.

The General Settings screen opens. The menu item General with the first tab Region is active.



To make selections in the menu item General you must at least have the user rights "User".



Example of view with user rights "Cal"

#### 6.3.1.1 Regional settings (General - Region)

##### Selecting unit of measure

On delivery of the machine the unit of measure is set to mm.

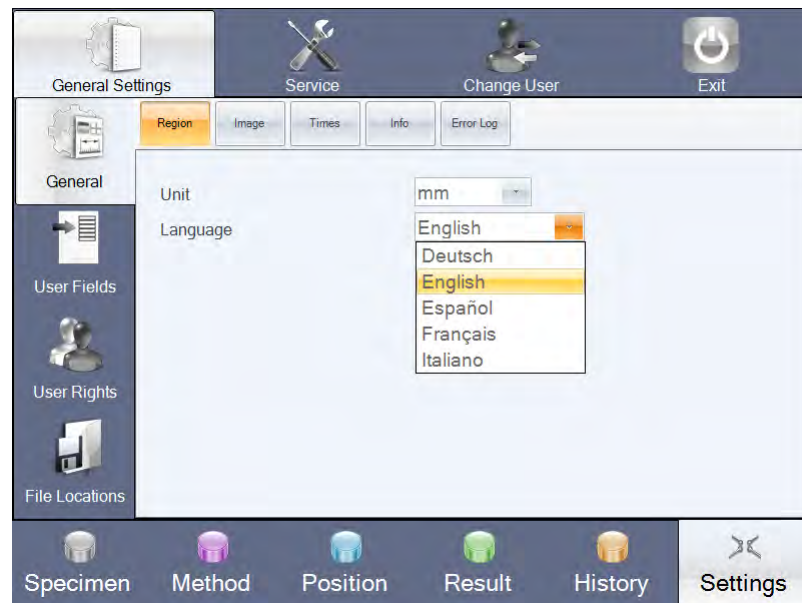
- Under General – Region select the required unit of measure (mm or inch) in the Unit field .

All measurements of length – e.g. coordinates with series measurement – will appear in the unit of measure selected.

**Selecting language**

On delivery the machine is set to English.

- Select the required language in the Language field under General – Region.



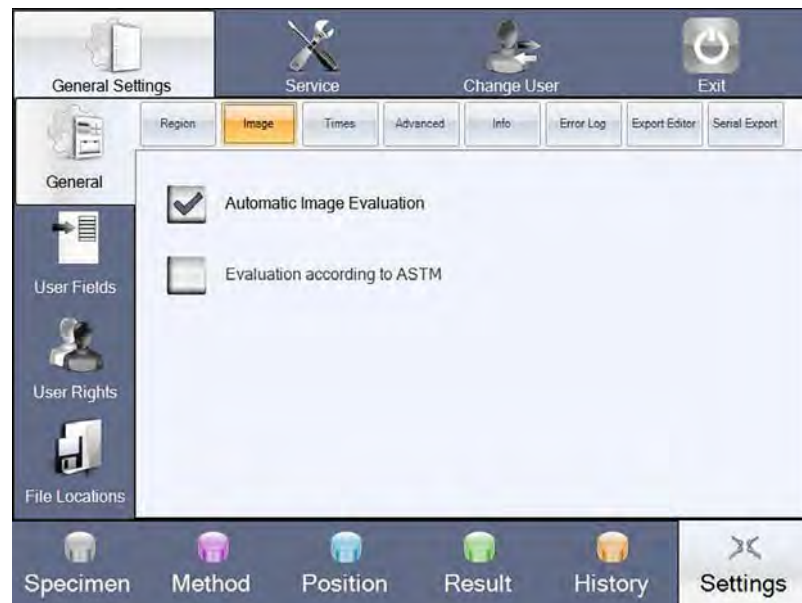
The screen is immediately displayed in the language selected.

**6.3.1.2 Settings***Automatic image processing (General – Image)*

Automatic image processing is enabled as standard. With automatic image processing measurement is followed by automatic measurement of the indent using the digitized image of the indentation and display of the result. Manual remeasurement is however possible at any time. You can disable the automatic image processing for special applications (e. g. for work pieces with a very rough surface).



*Analysis according to ASTM*

By default, the image processing according to EN ISO standard is performed for Vickers and Knoop measurements. In order to perform the image processing according to ASTM standard, it can be enabled here.



➤ Select General – image



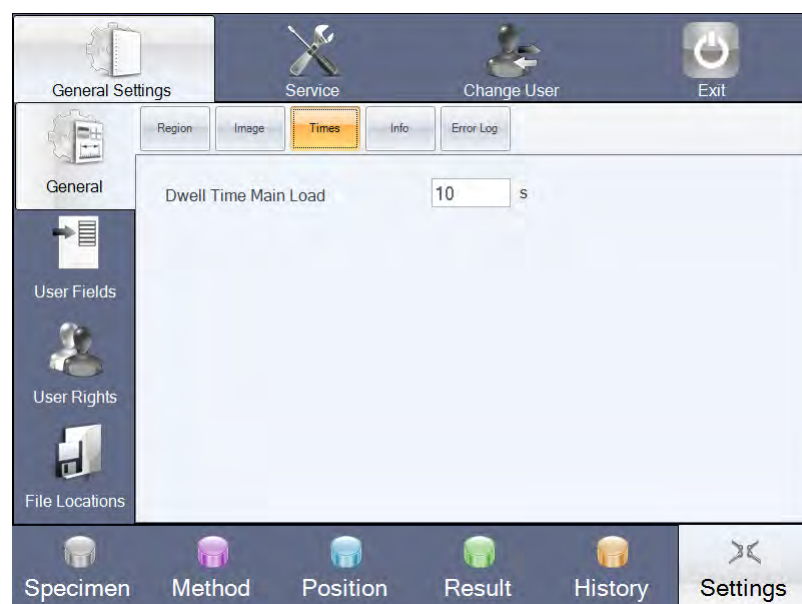
With the  or  buttons you can activate or deactivate the parameter *Automatic image processing*.

If automatic image processing is disabled, you have to measure the indent manually (see chapter "Manual remeasurement" page 60).

### 6.3.1.3 Setting dwell time (General - Times)

Setting the dwell time allows you to specify the length of time during which the test force is to be applied. The value selected here is a "global" parameter for all test methods.

Please take note of the relevant norms when adjusting the dwell time.






- Under General – Times select the dwell time for the test force (in seconds).

#### 6.3.1.4 Advanced settings (General – Advanced)

You can set additional parameters here.


*Automatic change to "Position" after measurement in*

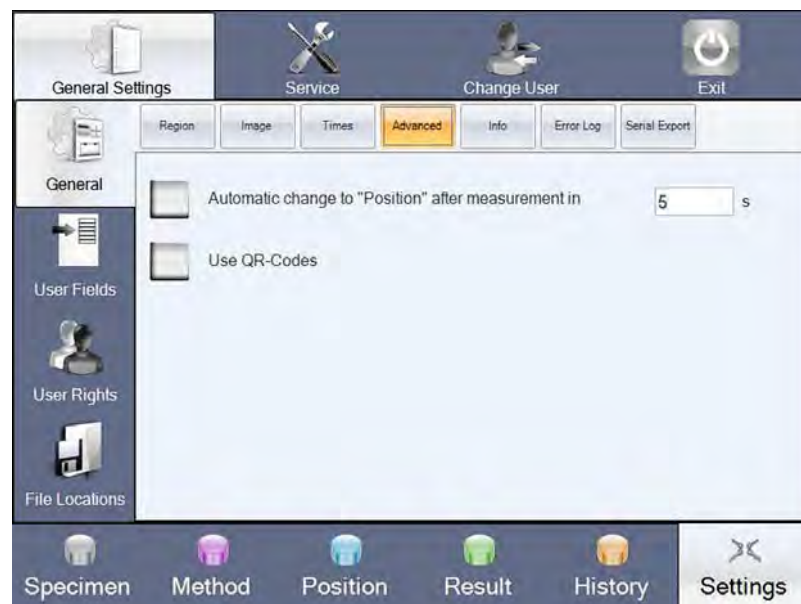
If you select this parameter, the Position screen is displayed again automatically following a measurement once the period of time set here has elapsed.

- Select the  button to activate this parameter.
- Enter the required time in seconds.

*Use-QR codes*

If this parameter is enabled, it is possible to create QR-codes in the "Method" screen or to read them by means of a hand-held scanner in the "Specimen" screen.

- Select the  button to activate this parameter.

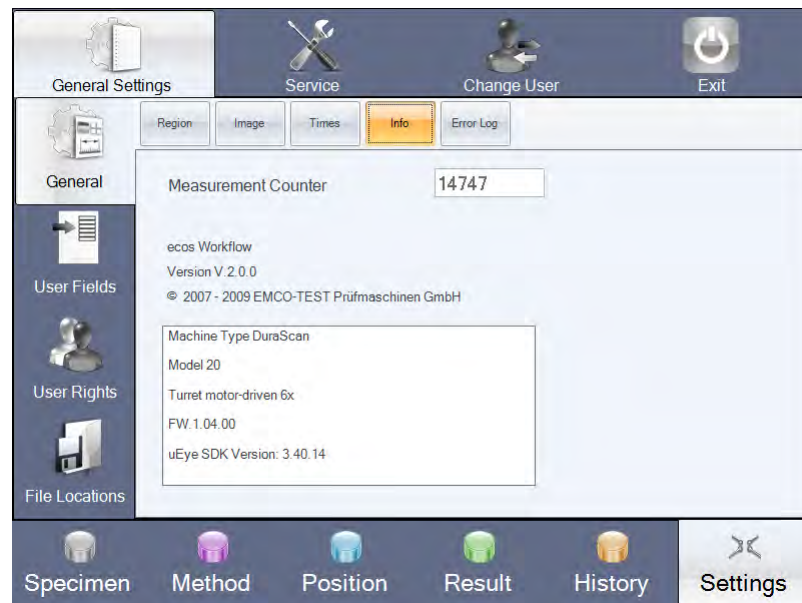


#### 6.3.1.5 Displaying information (General - Info)

This screen is only displayed for your information. The measurement counter automatically counts the number of measurements performed on the machine. Here you can also find information about the machine equipment and program versions possibly of interest to the Service team.

- Select General – Info to display this information.

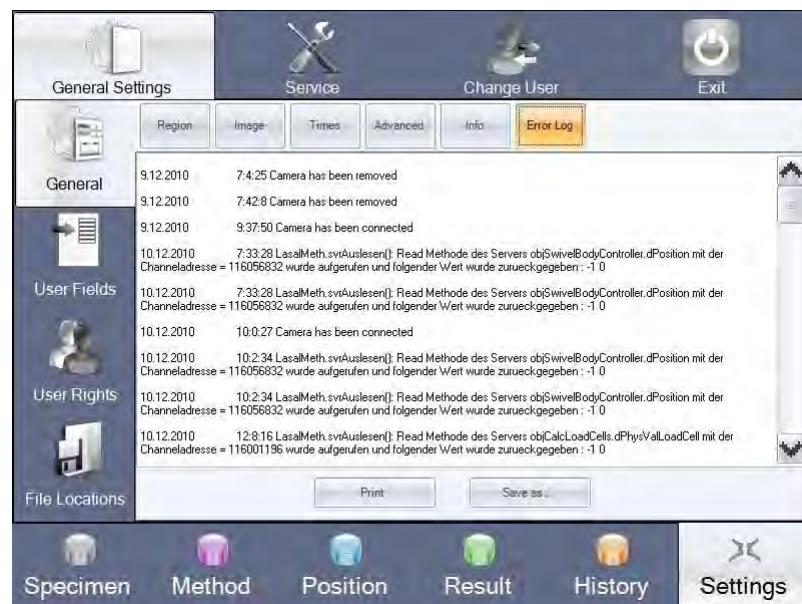
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## 6.3.1.6 Viewing and printing error list (General - Error List)

The error list contains hints for the Service team should problems occur when performing measurement on your machine. You can view and print the error list. The error list can only be deleted by the Service team.

- Select General – error list to display the error list.



- Select the Print button to print the error list.
- Select the Save as button to save the error list to a desired path (e.g. USB stick)


## 6.3.1.7 Serial export

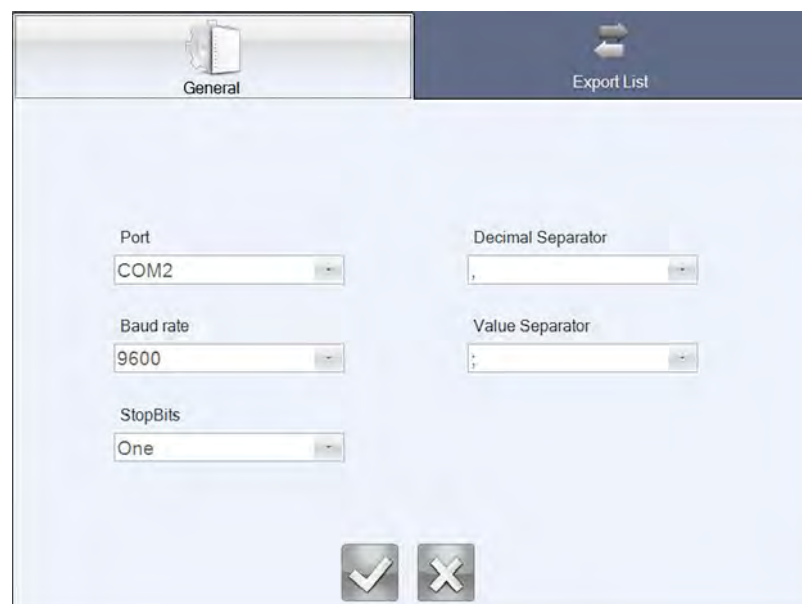
Via the serial interface (RS232) at the back of the machine data can be output in ASCII format after every testing. You can individually adjust this serial output.

- Select General – Serial export






- Select the Export button to enable the serial output.
- Select the  button to individually adjust the serial export.



- Under General set the required settings for port, baud rate, stop bits, decimal mark and value separator.



- Select the Export List button to set up which data should be output.
- In order to consider values for the serial output, they must be selected previously. In order to do so, the fields displayed in the list Not exported values must be marked and by means of the arrow key moved to the list on the right hand side Exported values . If the values should not be considered, they can be moved back by means of the arrow key – left.
- If required, the values in the list Exported values can be arranged by means of the up and down arrow keys.
- For confirmation of the settings press 

#### 6.3.1.8 Export editor (option)

The export editor enables you to automatically or manually export measured data from the program to various file formats (.csv, .txt, .xls, .xlsx).

The export editor is described under "Export Editor" on page 100

#### 6.3.1.9 Defining user fields (User Fields)

You can freely define ten user fields to bring the test reports provided into line with your requirements.

To make selections in the menu item User Fields you must at least have the user rights "User".



- Select the menu item User Fields to define the user fields.

- Enter your data in the fields Userfield 1 to Userfield 10.

Further information about test reports can be found under "Printing report", page 72.

#### 6.3.1.10 User administration (rights)

After the machine has been switched on or after a change in user, the ecos Workflow displays the login screen. All users have to log in here with their name and password. Configuring users is generally the responsibility of an administrator, who not only allocates passwords, but also assigns users various user rights. The menu item User Rights is used to configure users.



To make selections in the menu item User Rights you must at least have the user rights "User".

The ecos Workflow is characterized by a role-based utilization concept with three different user levels. The table shows the main user rights per level:

Level	User rights
View	View results
User	All rights as for "View", perform additional measurements, change general settings (e. g. user administration) and carry out simple calibration
Cal	All rights as for "User", additionally perform load calibration



To avoid operating errors due to incorrect machine settings, you should be very careful when assigning user rights. Users with "Cal" rights should be given appropriate training without fail.

- Select the menu item User Rights to open User Administration.

**Add User**

- Select the Add User button.

Additional input fields are displayed on screen.



- Enter the name under User Name.
- Select the user level with the rights to be assigned to the user.
- Enter a password for the user.
- Select the OK button.

The new user will be added to the list.

If you are the administrator, pass the login data on to the user. When entering the password, pay attention to the use of lower and upper-case letters. Users can only log in if they enter exactly the same password as you.

**Change User**

- Select the user whose name, user level or password you wish to change.
- Select the Change User button.
- Amend the relevant data.
- Select the OK button.

The data are amended.

### Delete User



One user with the relevant name (View, User, Cal) is preconfigured per level. These preconfigured users and the user currently logged in cannot be deleted.



#### Caution

Delete will be carried out at once without any confirmation prompt!

- Select the user you wish to delete.
- Select the Delete User button.

The user is deleted immediately.

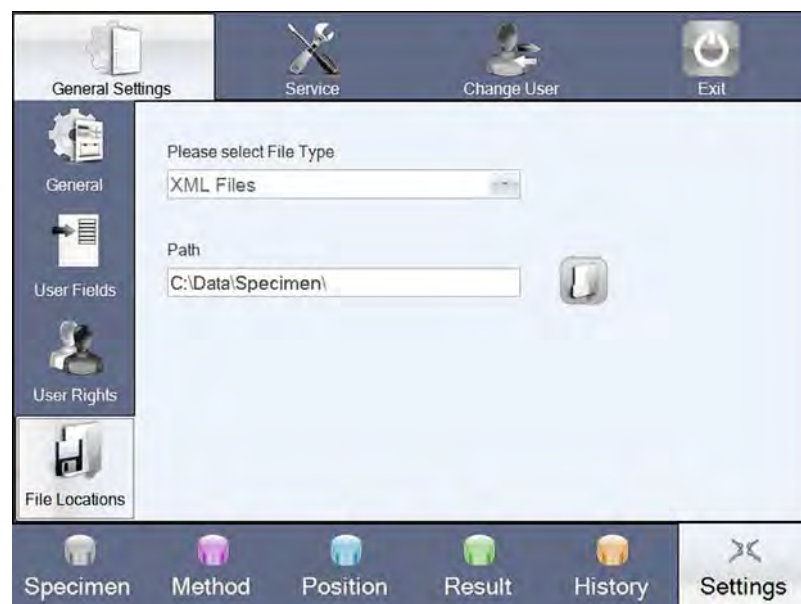
### 6.3.1.11 Specifying file locations (File Locations)




To make settings in the menu item File Locations , you must have "User" rights as a minimum.

Your results (XML files), indent images, export files, export lists, QR-codes, samples and autoexport files (optional) are filed in standard directories. In the menu item File Locations you can change the default settings.

- Select the menu item File Locationsto determine the file locations.



- Select the file type whose file location you wish to change.
- Select the corresponding  button.
- Select the file location you require.

The data will in future be stored in the new directory.

### 6.3.2 Calibration with Configuration Assistant



The machine has already been calibrated and adjusted by the manufacturer or stockist. After transportation and fitting the indenter / lenses, new settings however have to be made with the so-called "configuration assistant". Calibration should only be carried out by trained technicians.

- Select Settings in the Workflow bar.
- In the menu bar select Service.

The Service screen opens. The menu item Assistant with the first tab Turret is active.



With this button you can show the slider for moving the test unit in the configuration assistant.



With this button you can hide the slider for moving the test unit in the configuration assistant.



To make all selections in the menu item Assistant which are necessary for proper and accurate functioning of the machine you require "Cal" rights. If users have not yet been configured (initial startup), you can log in as user "Cal" (without password). If you have the rights "User", you can adjust the position and focus of lenses and the turret equipment.

#### 6.3.2.1 Equipping turret (Assistant - Turret)

The Turret tab is used to allocate the mechanically inserted indenters and lenses to the turret positions and to inform the machine accordingly. The position numbers are marked on the turret.

- Select the Turret tab (if not already active).



The possible positions are displayed depending on the type of turret – manual or motorized turret (optional).

##### **Manual turret**

Three positions are available with the manual turret: Position 1 is for the indenter (Vickers or Knoop). Positions 2 and 6 are used for the lenses.

##### **Motorized turret**

Six positions are available with the motorized turret: max. two indenters and four lenses or one indenter and five lenses. Position 1 is for the indenter (Vickers or Knoop). Positions 2 to 6 are available to fit an optional second indenter and the lenses.





*Example of view with motorized turret*

- Select the equipped positions of the turret one by one and use the list to specify which indenter / lens is mechanically inserted in the position.
- Check that what is shown on screen corresponds to the actual allocation of equipment.



Take great care to allocate indenters and lenses correctly or the machine will not otherwise function properly.

### 6.3.2.2 Checking load calibration (Assistant - Load Calibration)

To check load calibration you will need digital calibration equipment.


- Select the Load Calibration tab.



The first sub-menu Manual is enabled.





- In the fields Measurement Type and Test Method , select the measurement type and the test method for which you wish to check load calibration.
- Select the  button to show the slider for the operation with the test unit.
- Use the slider to move the test unit up.
- Place the load cell of the calibration equipment on the test anvil.

With load calibration, the tip of the indenter touches the load cell of the calibration equipment. You should therefore preferably place a workpiece on the load cell as an intermediate layer and set the display of the calibration equipment to zero.

- Select the Start.
- Read off the measured value from the calibration equipment and enter it in the field provided for this purpose (using the unit "g").



- Select the Apply button.

The machine will perform measurement with the corrected value. If no error message is displayed, the value is confirmed.

Repeat the process if an error message is displayed.

- Repeat these steps for the other measurement types and test methods for which you wish to check load calibration.

The difference in values is calculated automatically and load correction carried out. All load corrections are listed in a table.

### Table

- Select the sub-menu Table.

The table lists all possible loads for the machine and the load corrections applied.

Name	Preload 1	Correction value preload 1	Time to Preload 1	Mainload	Correction value mainload
HV 1				1	-0.007
HV 2				2	0
HV 2.5				2.5	-0.002
HV 3				3	-0.023
HV 5				5	-0.007
HV 10				10	-0.015
HV 20				20	0
HV 30				30	-0.03
HV 50				50	-0.031
HV 100				100	0.495
HK 1				1	0.022

You can change individual values in the table.

- Select the value you wish to correct.
- Select the Change button.

Another screen will open.

Time to Main Load

2 s

Correction value mainload

0 kg

OK Cancel Apply

*Example view for Vickers testings*

- Use the virtual keyboard to change the values in the input fields and finish inputting with the Enter key.
- Confirm your change with the OK or with the Apply button.



OK will apply the new value and close the view. Cancel will close the view without the changes. Apply button will apply the new value and leave the display open for further corrections.

### 6.3.2.3 Adjusting lenses (Assistant - Objective Lenses)

It is necessary to adjust the position, focus and magnification factor for the lenses.

- Select the Objective Lenses tab.

On the right-hand side you will see three submenus: Position, Focus and Magnification.

#### Adjusting position

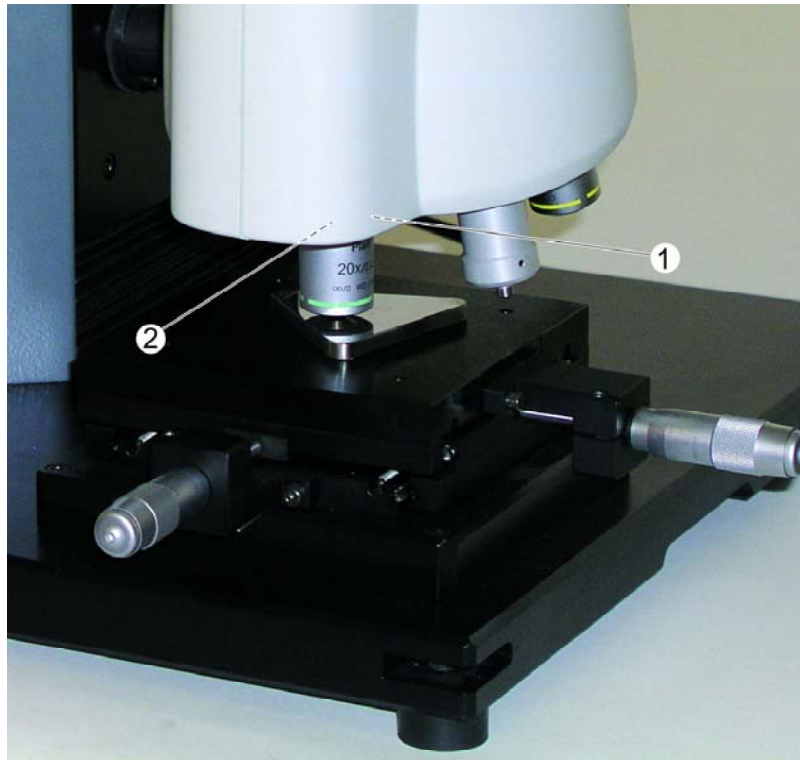
The set screws should be used to adjust the lenses so that they are positioned right above the indentation of the indenter.

- Select the sub-menu Position subtab (if not already enabled).
- In the field Test Method , select the test method (e.g. HV 1) for which you wish to adjust the setting
- Place a workpiece suitable for the test method on the test anvil.
- Select the Start Measurement button.

Measurement will start with the indenter fitted at position 1 of the turret. With a manual turret you are prompted to swivel in the relevant indenters and lenses. With a motorized turret they are swivelled in automatically. The image is shown by the lens with the lowest magnification.



- When prompted, use the set screws on the lens to adjust the position so that the crossline is centered in the indent.



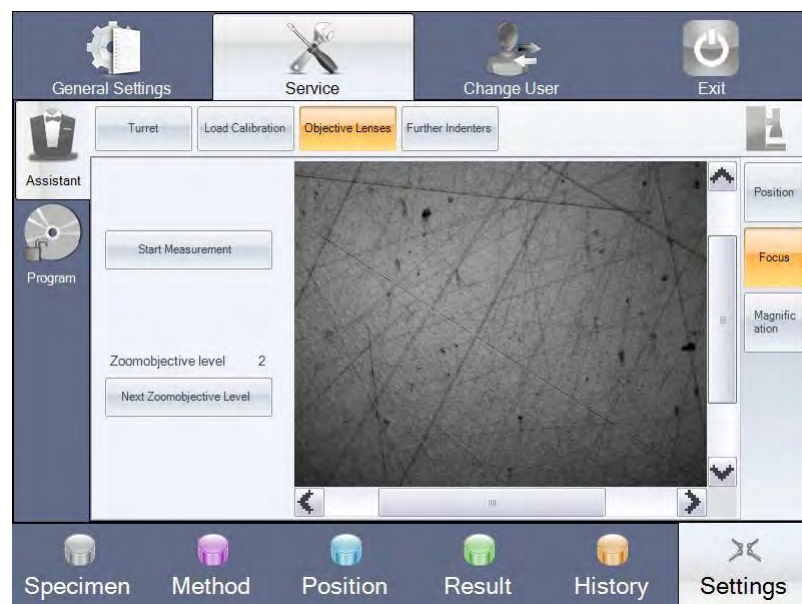
Position of set screws: in the front and 90° to the right

- Repeat these steps for the other lenses.

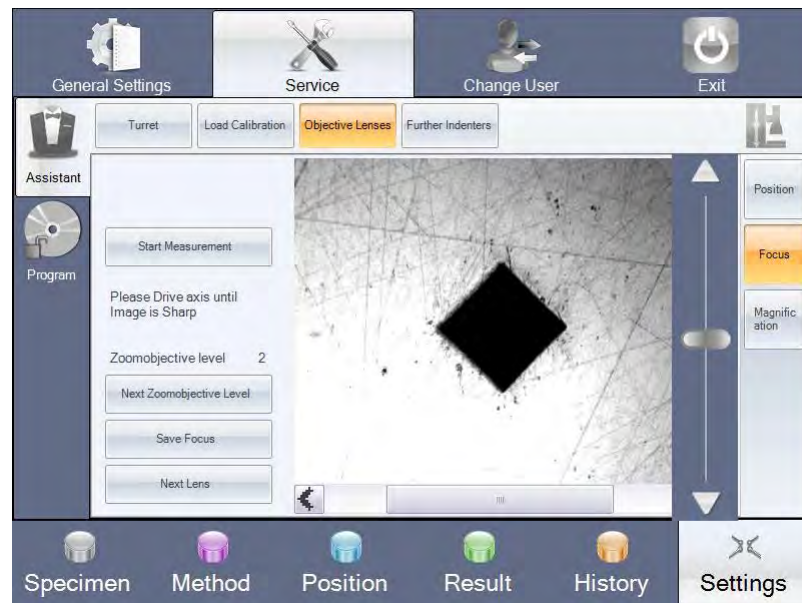
### Adjusting focus

For all lenses it is necessary to adjust the position on the Z-axis at which a sharp image is displayed. This calibration operation has to be carried out by eye.


- Select the sub-menu Focus subtab.



- Place a workpiece suitable for the test method on the test anvil.
- Select the Start Measurement button.



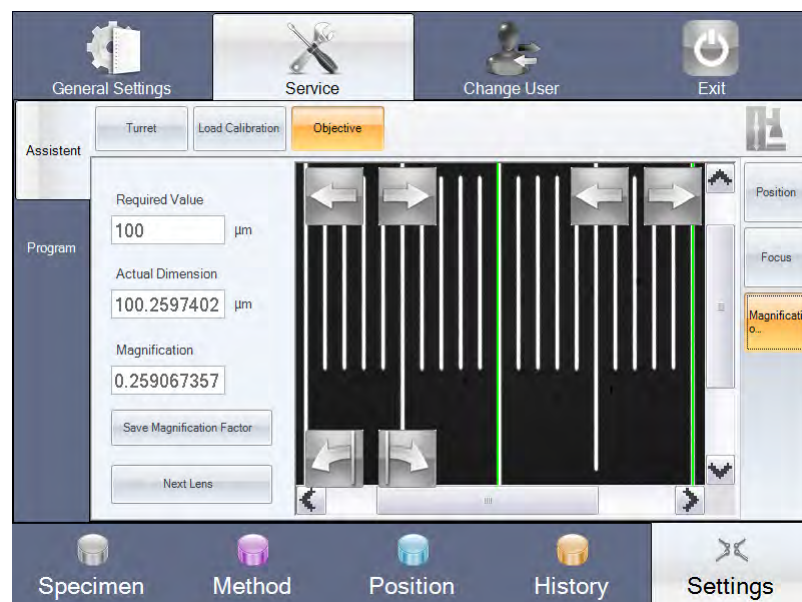
Measurement will start with the indenter fitted at position 1 of the turret. The image is shown by the lens with the greatest magnification.

- Select the  button to show the slider for the operation with the Z-axis.
- Use the slider to focus the image.
- Select the Save Focus button.
- Select the Next Lens button if you wish to adjust further lenses.





### Adjusting magnification factor

To adjust the magnification factor you require a calibrated test block (micrometer objective).

- Select the Magnification submenu.
- Place the test block on the test anvil and align so that the scale is visible.
- In the field Required Value enter the required value of the test block for the scale distance you are remeasuring.





The upper buttons  and  can be used to move the green lines to the right and left. The lower buttons  and  can be used to rotate the image slightly if required.

- Use these buttons to align the green lines to the scale so you can measure the scale distance entered.



Make sure that the green lines are precisely aligned, e. g. to the left-hand edge of a scale marking.

- Select the Save Magnification Factor button when the green lines are precisely positioned.

The actual dimension is displayed and the magnification factor calculated automatically.

- Select the Next Lens button if you wish to adjust other lenses.

#### 6.3.2.4 Calibrating a second indenter (Assistant – 2. Indenter)

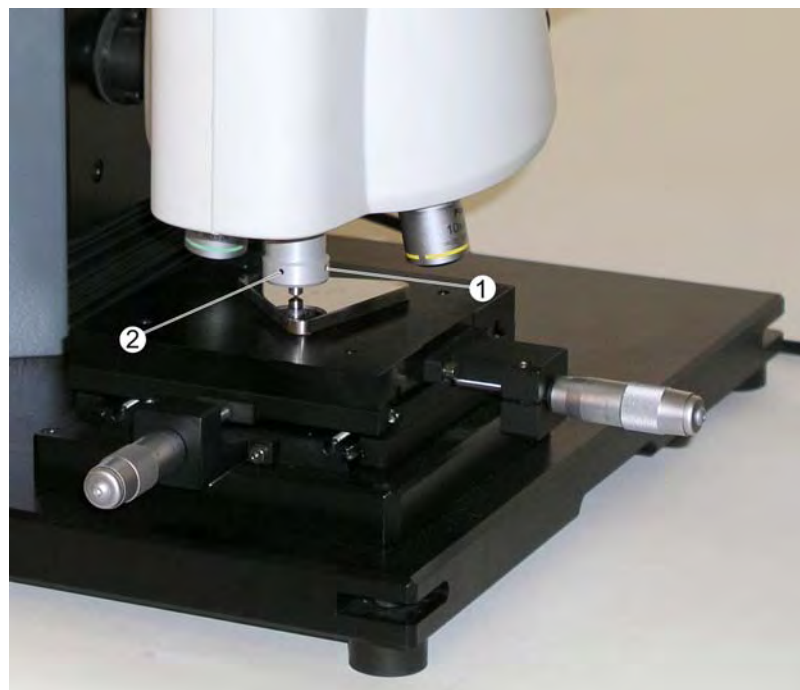
If your machine is fitted with a second indenter (optional with motorized turret), an additional tab appears 2. Indenter.

In the tab 2. Indenter you can adjust the focus of the lenses for the second indenter.

##### Adjusting position



The position of the second indenter must also be adjusted so that the indentation is centered in the image with all lenses. This adjustment calls for a certain amount of experience and should be preferably carried out by the Service team.



To adjust the position you have to create an indentation with the second indenter and use the set screws 1 and 2 to perform alignment to the lenses already adjusted. Here the lenses already adjusted should not be readjusted again.

- In the tab 2. Indenter select the sub-menu Position



- Place a workpiece suitable for the test method on the test anvil.
- Select the Start Measurement button.

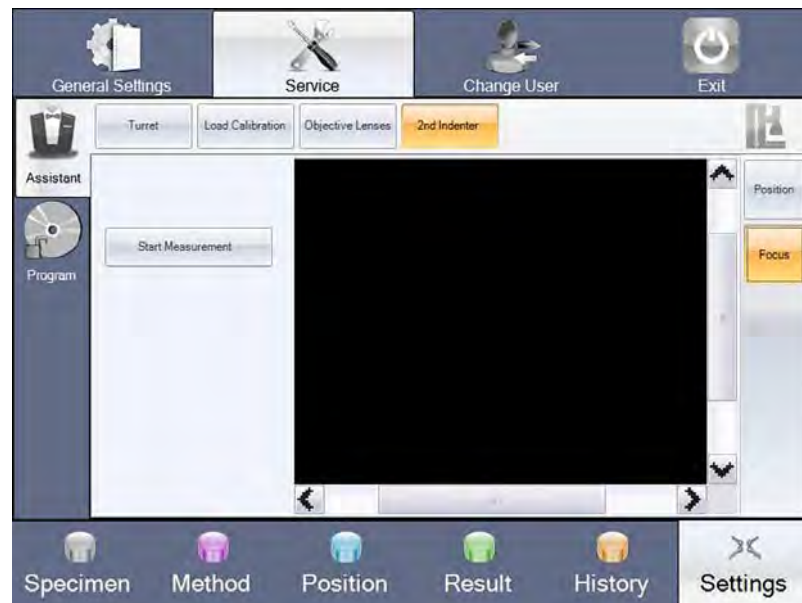
Measurement is performed with the second indenter.

- If necessary: Swivel in the relevant lens. The lens with the lowest magnification is swivelled in automatically.
- Use the set screws 1 and 2 to adjust the second indenter so that the indentation is centered in the image.
- Repeat calibration until you have a precise result.
- If necessary, check the result with the other lenses.

### Adjusting focus


- Select the 2. Indenter.
- In the tab 2. Indenter select the sub-menu Focus subtab





- Place a workpiece suitable for the test method on the test anvil.
- Select the Start Measurement button.

Measurement is performed with the second indenter. The image is shown by the lens with the lowest magnification.

- Select the  button to show the slider for the operation with the Z-axis.
- Use the slider to focus the image.
- Select the Save Focus button.

#### 6.3.2.5 Releasing optional software modules

You can use the menu item Program to release optional software modules without any major effort in terms of subsequent installation.

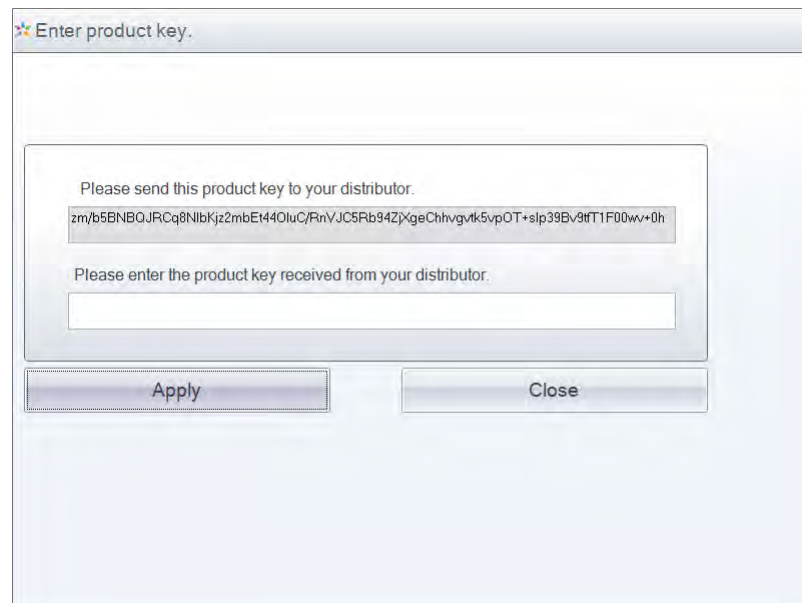
Further information about optional software modules is available from your authorized dealer or service partner.



- Select Settings in the Workflow bar.
- In the menu bar select Service.

The Service screen opens.

- Select the menu item Program.



The screenshot shows a dialog box titled "Enter product key." with a star icon. Inside, there is a text area containing a long alphanumeric string: "zm/b5BNBQJRCq8NlbKjz2mbE1440luC/RnVJC5Rb94ZxGeChhvgvK5vpOT+slp39Bv9fT1F00wv+0h". Below this, there is a prompt "Please enter the product key received from your distributor." followed by an empty text input field. At the bottom, there are two buttons: "Apply" and "Close".

- Enter the product key provided by your dealer on purchase.
- Select the Apply button.

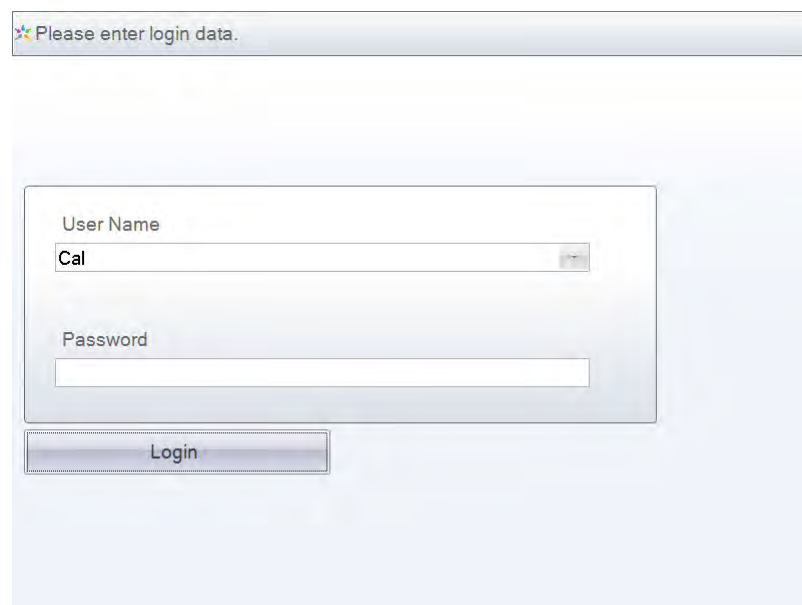
The login screen opens.

### 6.3.3 User login

The login data are generally available from the administrator. For further information about user administration and user rights see "User administration (rights)", page 81.

- Select Settings in the Workflow bar.
- In the menu bar select Change User.

The login screen with the current login data opens.



The screenshot shows a login screen with a title bar that says "Please enter login data." with a star icon. Below the title bar, there is a form with two input fields: "User Name" and "Password". The "User Name" field contains the text "Cal". Below the form, there is a "Login" button.

- Enter your user name and password.



During entry, pay attention to the use of lower and upper-case letters.

- Select the Login button.



Different user rights are linked to the login data. Further information about user administration and user rights can be found under "User administration (rights)", page 81.

#### 6.3.4 *Exiting application (Exit)*



This function is only available if you are logged in with the user rights "Cal". Further information about user rights can be found under "User administration (rights)", page 81.

- Select Settings in the Workflow bar.
- In the menu bar select Exit.

You will then access the operating system.

## 7 Maintenance and Care

### Cleaning the machine

Regular cleaning is not required.

If the machine is left idle for a long period of time, ensure that it is protected from dust and dirt, and lightly oil the anvil.

### Cleaning the touch screen



#### Caution

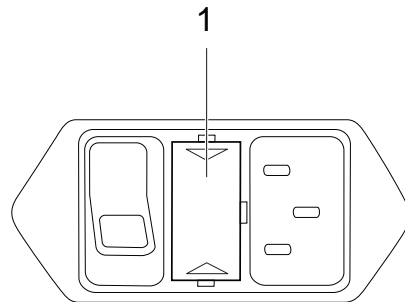
The control unit touch screen must only be cleaned using cleaning products specially designed for TFT/LCD screens.

### 7.1 Replacing fuses



#### Caution

Only trained personnel are permitted to replace the fuses.



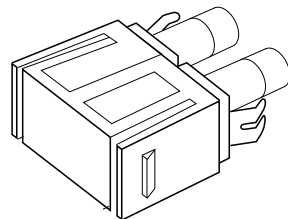
The fuse cover (1) is located between the main switch (with the green pilot light) and the mains connection.



#### Caution

Use the main switch to turn the machine off before replacing the fuses.

- Turn the main switch to the OFF position.
- Unplug the power cable.
- Carefully raise the fuse cover on both sides. Use a screwdriver as a lever if necessary.
- Remove the cover and the fuses.



- Carefully remove both fuses from their holders.
- Insert the replacement fuses provided into the fuse holders.
- Slot the fuses in their holders back into the machine.

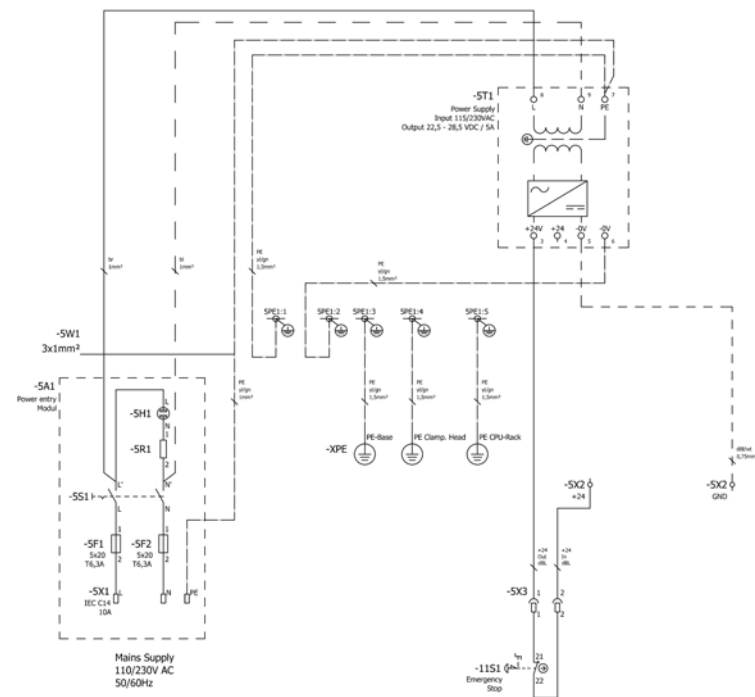
Replace the fuses using the same steps used to remove them but in reverse.



Ensure that the two fuse clips are pressed together slightly when mounting them in the housing.

- Plug the power cable into the mains connection.
- Turn the main switch to the ON position.

## 7.2 Circuit diagram



### Danger

The machine must be connected to a grounded electrical outlet with a protective conductor contact. Do NOT touch any of the machine's electrical/electronic components.

## 8 Startup and Fitting with Optional Accessories



Look at the home page of your sales partner if you are interested in additional accessories.

### 8.1 USB ports

#### USB ports

The USB ports (1) are located on the rear of the machine.



Various USB devices can be connected to the USB ports (1):

- USB stick
- USB printer

### 8.2 Digital micrometer spindles

Instead of the analog micrometer spindles you can also order and install digital micrometer spindles for the cross slide.



Operation is described in the operating instructions for bought-in digital micrometer spindles.

Digital micrometer spindles are installed in exactly the same way as the analogue micrometer spindles, see chapter "Micrometer spindles" page 20.

### 8.3 Indenters and test methods

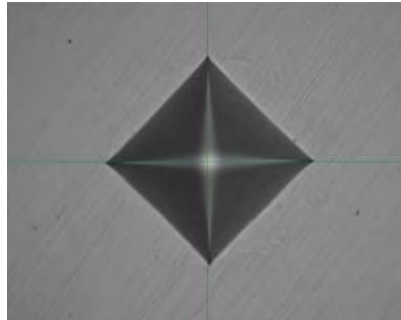
#### Indenters and methods

Various indenters can be supplied for the different test methods. The machine can be equipped with a Vickers or a Knoop indenter.

If you wish to fit two indenters, you require a motorized 6-fold turret.



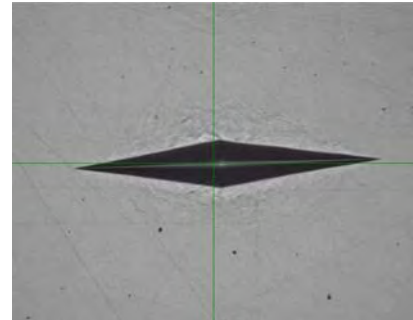
*Vickers indenter*



*Vickers indent*



*Knoop indenter*



*Knoop indent*



#### Caution

Indenters should always be stored in their plastic case when not in use in order to avoid damage.

### 8.4 Indenter adapter

The additional indenter adapter is intended for operation with 2 indenters on the 6-fold turret.



#### Caution:

The indenter is delivered with a transport lock. This may not be removed prior to installation of the adapter on the turret!





- Fasten the adapter with 4 Allen head screws in any desired position of the turret.

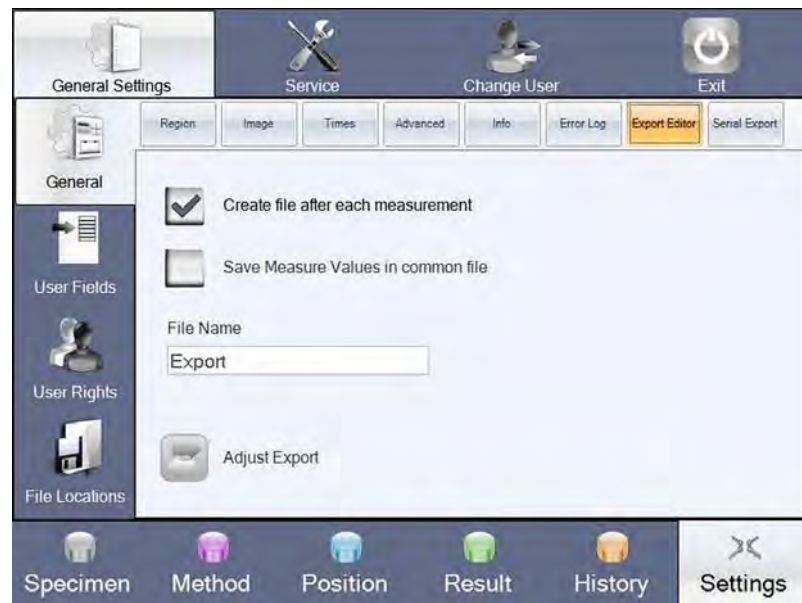



- After installation of the indenter adapter remove the transport lock by means of an Allen wrench.

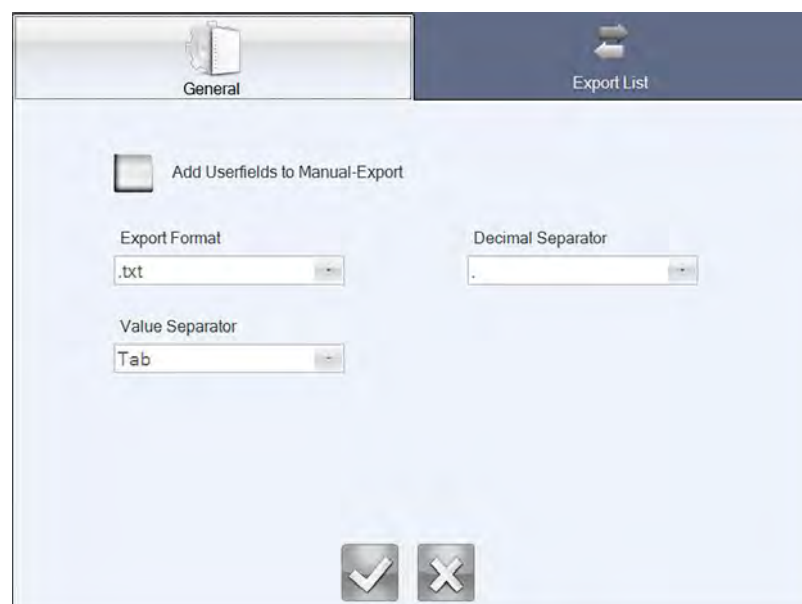
## 8.5 Export Editor

The export editor enables you to automatically or manually export measured data from the program to various file formats (.csv, .txt, .xls, .xlsx). In the process data can be individually adjusted for the export.

- Select General – Export editor



- If required, select the Create file after each measurement to automatically create a separate file for every value. These are saved in the set file location for autoexport files. The file name is composed of Date/time/file type.
- If required, select the save measured values in common file button to automatically save all values in a common file.
- In order to save the values in a common file, the file name field must be additionally filled in. The file is saved in the set file location for autoexport files. The file name is composed of file name/file type.
- If you do not select any of the two buttons, no automatic data export is performed. The manual data export, however, can be performed as before.
- Select the  button to individually adjust the export.



- Under General, adjust the required settings for output format, decimal marks and value separators.
- Select the Add user fields to manual export button if the user fields should be contained in the manual export.



- Select the Export List button to set up which data should be contained in the export. The settings are used both for the manual and the automatic export.
- In order to consider values for the export, they must be selected previously. In order to do so, the fields displayed in the list Not exported values must be marked and by means of the arrow key moved to the list on the right hand side Exported values. If the values should not be considered, they can be moved back by means of the arrow key – left.
- If required, the values in the list Exported values can be arranged by means of the up and down arrow keys.
- For confirmation of the settings press

## 8.6 Hand-held scanner

The available hand-held scanner serves for the reading of hardness testing data via QR-code.



- Connect the hand-held scanner with the machine via USB interface.

## 9 Messages and Problems



Errors are listed in the error list, see "Viewing and printing error list (General - Error List)", page 78.