

NEMESIS 5100G2

Universal Hardness Testers | Rockwell, Vickers, Knoop, Brinell

USER **MANUAL**



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Universal Hardness Testers | Rockwell, Vickers, Knoop, Brinell

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

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

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

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

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

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1

INTRODUCTION

This user manual contains essential information for the operator to make (safe) use of the hardness tester. This manual includes a description of the system functions, capabilities, safety provisions and instructions for the further life cycle of the machine.

1.1 GENERAL INSTRUCTIONS

WARNING

Before using, servicing or transporting the machine, read the “Safety chapter” of this manual thoroughly. In case of doubt, the manufacturer should always be consulted.

The user manual contains important warnings to use the **NEMESIS 5100G2** series, (models 5100G2/A, 5100G2/B, 5100G2/C), also referred to as “**machine**” hereinafter, safely, professionally and economically. By following this information, hazards can be avoided, repair costs and downtime can be reduced and the reliability and service life of the machine can be increased.

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

Text indicated as following: “**EXAMPLE**”, refers to a button or selector in the IMPRESSIONS™ 4 software.

1.2 TARGET GROUPS

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

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

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

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

1.3 LIABILITY AND DISCLAIMER

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

1.4 REORDER

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

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6222 AA Maastricht
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www.innovatest-europe.com

1.5 COPYRIGHT

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

1.6 INTENDED USE

The intended use is the hardness testing of products. The machine is to be used in an industrial or laboratory setting. The machine is intended to be used by non-disabled trained full aged people. The machine may only be operated as described in this manual. The manufacturer is not liable for the damage caused by incompetent use (unintentional use). Only use the machine when it is technically in good working order and use it according to the intended use, paying attention to the safety and potential hazards referred to in this manual. Manufacturer responsibilities expire when:

- Not or insufficiently complying with the information in this manual.
- Using spare parts or parts not approved by the manufacturer.
- The machine is operated incorrectly.
- Removing, manipulating or not using safety features.
- Changing functions of the machine.
- Unauthorized modifications to the machine are applied.
- Maintenance is not carried out according to instructions.
- The machine is used unintentional.

1.7 IMPROPER USE

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

1.8 LAYOUT OF THE USER MANUAL

This NEMESIS 5100 series user manual may only be used with INNOVATEST® equipment covered by this user manual. This complete user manual consists of:

- This NEMESIS 5100G2 series user manual.
- IMPRESSIONS™ 4 user manual.
- NEMESIS 5100 series unpack instruction.
- Declaration of Conformity.

2

DESCRIPTION AND FUNCTION

3

SAFETY

The second generation of the NEMESIS 5100, the G2, Rockwell / Vickers / Knoop and Brinell hardness tester provides exceptional performance, designed to match the most demanding user tasks. The NEMESIS 5100G2 contains a revolutionary force application range and renewed optical system.

The all new 9 position tool changer (turret) accommodates a wide range of indenters, indenter actuators with load cells, objectives, a cross-laser positioning system and a load cell supported touch probe. It also provides a base to the 18 megapixel full color measurement camera and 18 megapixel full color overview camera with variable field of view, motorized zoom and auto focus system.

2.1 IDENTIFICATION

This manual belongs to the NEMESIS 5100G2 series, model 5100G2/A, 5100G2/B and 5100G2/C. The type / identification plate with the CE mark is placed on the back of the machine and is shown in the following figure:



A first requirement for the safe handling and trouble-free operation of this machine is knowledge of the basic safety instructions.

Throughout this manual, warnings, cautions and notes have been used to direct the attention to:

- Potentially hazardous or dangerous situations.
- Actions that could lead to potentially hazardous or dangerous situations.

Definitions

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

CAUTION:
Situation, operation or action that could damage the machine.

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

3.1 USED SYMBOLS

The following symbols are used on the machine or in this manual:



This symbol indicates a **WARNING** or **CAUTION**.



This symbol indicates hazards that could be dangerous for the environment.



This symbol indicates a laser beam hazard.

WARNING

Class 2 laser product, 650 nm. Do not stare into the light beam



This symbol indicates an electricity hazard



This symbol indicates that for disposal certain regulations must be considered. All electrical and electronic products and batteries must be taken to a separate collection point at the end of their working life. Do not dispose of these products as unsorted municipal waste: take them for recycling. For information on your nearest recycling point, check with your local waste authority.

3.2 FUNDAMENTAL SAFETY REQUIREMENTS

WARNING

The machine complies with the essential health and safety requirements of the EC. Nevertheless, dangerous situations can arise.

1. To ensure safety, all persons who come into contact with the machine must take note of the contents of this user manual. Only then possible risks can be reduced to a minimum.
2. It is not allowed to use the machine for any other purpose provided by the manufacturer. Unintended use can lead to unexpected risks.
3. Local applicable safety regulations and laws must always be followed. The same applies to environmental regulations.
4. If the personnel detect any errors or dangers, the user/owner or his authorized representative must be informed immediately.
5. When several people are working on the machine, good cooperation and precise coordination is necessary.
6. The professional knowledge and sense of responsibility of the employer and the employee largely determine the safe and efficient use of the machine.
7. Safety devices, such as protective covers/safety switches, must never be removed or bridged during normal use of the machine.
8. If disassembly of safety devices during installation, inspection, maintenance or repair is necessary, the reassembly and inspection of the safety devices must be done immediately after the completion of these activities.
9. Work on the technical equipment (e.g. electrical) may only be carried out by the relevant professional personnel.
10. When handling oils, greases and other chemical substances, the safety regulations applicable to that product must be observed! Contact with chemicals should be avoided as much as possible. Before working with these materials, the instructions on the package must be read and followed. This applies to all chemicals, including cleaning agents.
11. When handling electric motors, be aware these can get warm during use. Let the motors cool down before you work on them. If this is not possible, appropriate safety measures should be taken, for example the use of gloves.
12. Untrained persons or persons present during a general training, may only perform work under the permanent supervision of a competent person.
13. All safety and hazard warnings on the machine must always be kept in a legible condition.
14. Hot parts should not come into contact with explosive or highly flammable chemicals.

3.3 SAFETY PROVISIONS

WARNING

All safety provisions must be kept in perfect condition.

3.3.1 SAFETY DEVICES

Safety devices may in principle only be removed/deactivated by authorized persons and only if this is absolutely necessary. Immediately after carrying out this work, the safety devices must be mounted/activated again and checked for their functionality. Only the original fixing material of the safety devices may be (re)used for this purpose.

3.3.2 EMERGENCY STOP

In an emergency, one of the emergency stop devices must be operated, causing the machine to stop immediately.

Emergency stop devices must be used in case of danger to a person or machine. In all other cases, the machine must be switched off in a normal way. By using an emergency stop, under certain circumstances, an undefined (switched-off) condition can occur. Therefore, the machine must be checked before a restart. Before the machine can be started permanently, the emergency stop device must be reset. An emergency stop device is red/yellow in color.

The emergency stop device is located at the front of the machine, in reach for the operator.

When operating the emergency stop devices, the following functions or machine parts are disabled:

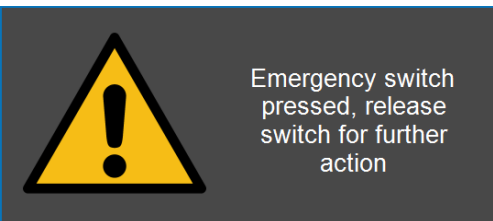
- All electrical components.
- All drives.

When operating the emergency stop devices, the following functions or machine parts remain switched on:

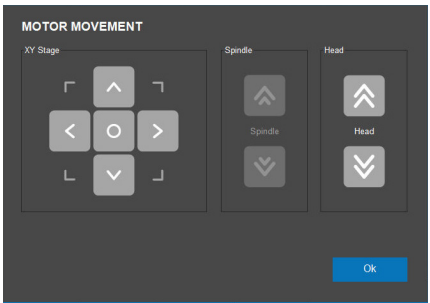
- Control.
- Lighting.

Activation/deactivation

- When activating the emergency stop device, all drives are disabled. The following screen will be displayed.



- To reset the emergency stop, turn the emergency stop button until it unlocks. The following screen will be displayed.



In this state the user is only allowed to move the head up or down. In any case of collisions or jams causing the emergency stop activation, the collision can be cleared by moving up or down the head.

3. SAFETY

- Press **“OK”** once ready. IMPRESSIONS™ will close and the machine will return to the basic Windows home screen environment.
- By pressing the IMPRESSIONS™ icon as shown, the IMPRESSIONS™ application will start up again.



- Further instructions for starting IMPRESSIONS™, see the dedicated IMPRESSIONS™ 4 manual.

3.3.3 FIXED GUARDS

The fixed guards on drives such as a belt drive, chain drive and gear drive are fitted with fasteners. These safety features prevent contact with these moving parts and therefore protect against severe injuries. Removing fixed guards or operating the machine without these guards is not permitted!

4

INSTALLATION

For the execution of the activities described in this chapter, qualified persons with relevant professional knowledge are required. The machine must always be easily accessible, in a way that operation, maintenance and troubleshooting can be carried out easily and safely.

The required space must be considered, as indicated in the [technical specifications](#).

For detailed unpacking instructions refer to the dedicated unpacking instruction. After unpacking, store the original packaging. Avoid shipping or transporting the machine without the complete and original packing materials.

Install the machine according the conditions described in this chapter in order to make full use of its functions and performances and to avoid defects or inaccuracy of any kind.

4.1 LIGHTING

The machine may only be used in an environment where sufficient lighting is available, in accordance with the ergonomic regulations.

4.2 VIBRATION

NOTE:

Vibrations reaching the machine can result in inaccurate measurements in particular during low force Hardness tests.

To avoid unwanted vibrations reaching the machine, the following points must be considered:

- Install the machine in a place free from floor vibrations.
- Install the machine on a solid floor.
- Do not install the machine in a place where many people come and go.
- Do not install the machine near equipment generating vibrations.
- Install the machine on ground level of a building if possible.
- Do not install the machine in a building near a road with heavy traffic.
- Do not install the machine in a building where a crane, vibration generator or similar equipment is installed.

4.3 WIND, SOUND AND HUMIDITY

To avoid environmental factors such as wind, sound and air humidity affecting the hardness measurement, the following points must be considered:

- Do not install the machine near an air conditioner or similar equipment.
- Do not install the machine in a room with excessive air circulation.
- Do not install the machine near an entrance or an exit.
- Do not install the machine near sound generating equipment.
- The ambient temperature should be between 10 °C and 35 °C.
- The recommended ambient temperature is: 23 ± 2 °C.
- The relative humidity in the room should be $\leq 70\% \pm 10\%$.

4.4 WORKBENCH

Place the machine on a sturdy and stable workbench, cabinet, desk or table which can carry the weight of the machine. For the weight and installation area needed see the [technical specifications](#) of the machine.

CAUTIONS

When carrying or moving the machine, make sure not to hit any objects and the machine does not tilt by 30 degrees or more.

When carrying or moving the machine, make sure you do not touch the turret.

4.5 INSTALLATION

Before starting the installation, please check the following:

- The assembly and/or mounting of machine parts.
- Electrical connectors on the machine.
- The supporting surface has to be distributed evenly along all supporting points, avoiding critical tension.

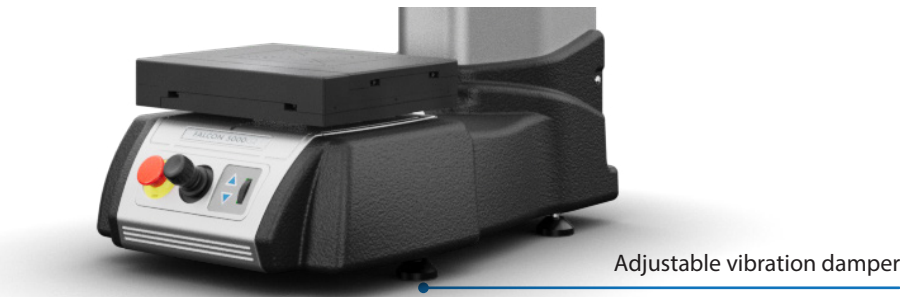
WARNING

In case of doubt, the manufacturer should always be consulted.

4.5.1 LEVELING

The machine is equipped with a unique load application system which is not sensitive for incorrect leveling. Nevertheless, to eliminate possible wear and tear of the mechanical structure of the machine we advise to verify your machine is correctly leveled.

Your machine is standard equipped with 4 adjustable vibration dampers. Install the dampers on the machine, if not installed yet, and use a correct tool to adjust the height of each damper.



4.5.2 ELECTRICAL CONNECTIONS

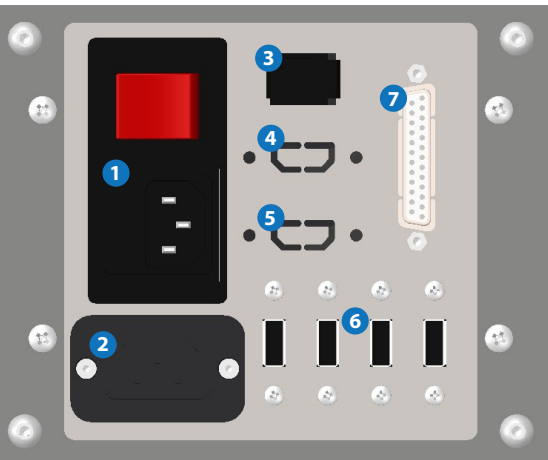
This section describes the correct way of connecting electrical components of the machine.

CAUTION

Make sure that the power requirement of the machine is in compliance with the local power mains to which the machine will be connected. The voltage details can be found on the reference label on the back of the unit.

WARNING

Connecting your machine to an incorrect main power supply could cause severe damage to the machine and could create fire.



1. Main power
2. Power out (touch screen)
3. Network
4. HDMI 2d touch screen (Optional)
5. HDMI Touch screen
6. 4x USB (touch screen, wireless keyboard + mouse, bluetooth (Optional))
7. RS232 for Motorized XY-Stage

4.5.3 INSTALLATION OF INDENTERS

The NEMESIS 5100G2 can be equipped with pre-installed indenters, following customer's needs. Indenters for this machine have specific dimensions and quality approvals. Replacing the indenters by non-genuine indenters (non INNOVATEST®) can lead to severe damage to the machine (which is not covered by guarantee). Always use original INNOVATEST® parts.

Use a soft cloth to wipe any dirt or debris from the indenter holder or shoulder. The shank surface must face the screw hole in the indenter holder when being inserted. Insert the shank into the holder, entirely and securely. Before testing a specimen, install an anvil and run a test on a test block to securely seat the indenter.

4.5.4 INSTALLATION OF ANVILS/CLAMPS/FIXTURES/VICES/SAMPLE HOLDER

An anvil supports the specimen during a hardness test. Use a V-type anvil for cylindrical specimens. Use a flat type anvil for flat specimens. Please make sure to use the appropriate anvil. The anvil can be installed as following:

- Be sure that there is enough room between the indenter and the spindle, to install the anvil.
- Use a soft (fiber-free) cloth to wipe any dirt or debris from the mat surfaces of the anvil and spindle.
- Carefully place the anvil into the spindle.
- Before testing a specimen, perform a few hardness tests on a test block, to securely seat the anvil.

4.6 BASIC SETTINGS

It is not allowed to modify settings without the written permission of the manufacturer. In addition, program changes (software) of programmable control systems are not allowed. Should, after agreement, changes be necessary, they must be done by a qualified professional.

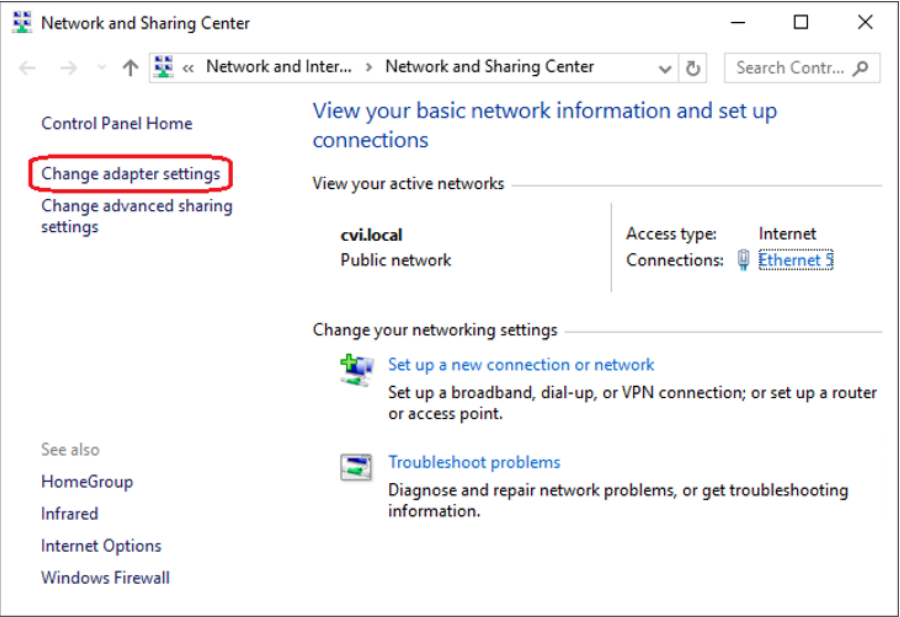
4.6.1 WINDOWS 10: SETTING A FIXED IP-ADDRESS

Windows 10 is by default configured to use a dynamic IP address (DHCP). This network settings may be changed to use a fixed IP address.

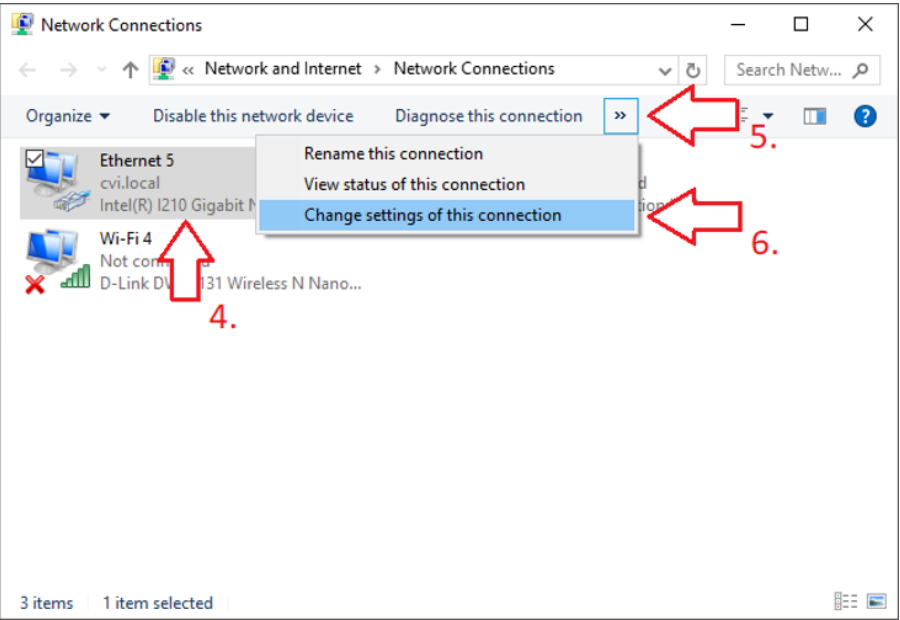
1. Click with the right mouse button on the network icon



2. Select Open Network and Sharing Center

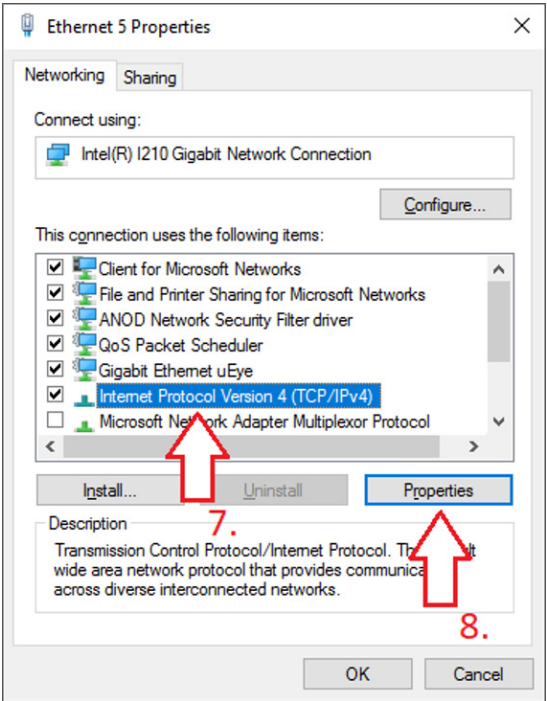


3. Select Change adapter settings

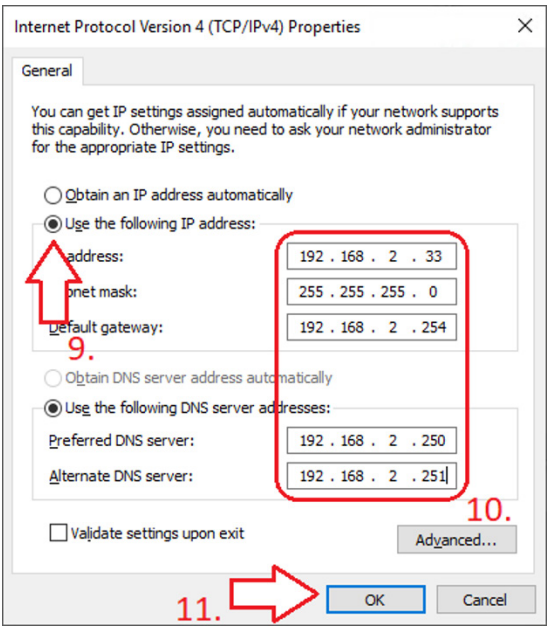


4. INSTALLATION

4. Select the connected Network Adapter
5. Click on the arrows to expand the settings bar
6. Select Change settings of this connection



7. Select Internet Protocol Version 4 (TCP/IPv4)
8. Click on the Properties button



9. Select Use the following IP address
10. Fill in the desired IP address, subnet mask, gateway and DNS server
11. Click on the OK button
12. Close all dialog windows

5

OPERATION

This section describes the basic (hardware) controls of the machine and gives some basic instructions on how to get started.

5.1 MACHINE OVERVIEW

1. Power LED banks
2. Up to 8 objectives (depending on number of installed indenters)
3. Laser positioning and touch probing system
4. Protection system



1. 9 Position precision Turret and laser. Houses the indenters and objectives.
2. Stage overview camera (Optional)
3. Z-axis & focus control
▲▼: Moves the Z-axis up and down in high speed (rough focusing).
Scroll wheel: Moves Z-axis slowly up and down (fine focus).
4. Motorized X-Y stage. Controlled by the virtual joystick in or the joystick (8) on the front panel.
5. LCD touch screen.
6. Shock resistant ABS covers.
7. Emergency switch. In an emergency the emergency switch must be operated, causing the machine to stop immediately.
8. Joystick control. Controls the motorized XY stage.

CAUTION

Do not use any sharp objects to operate the touch screen.



5.2 INITIALIZATION

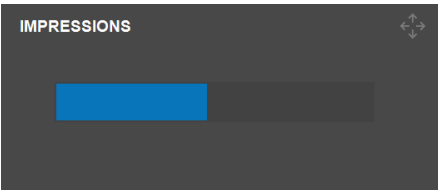
NOTE:

Make sure that the emergency stop switch on the front side of the machine is not activated when switching ON the machine, this will result in not powering up or failure messages. To unlock the emergency stop, see chapter 3.3.2 Emergency stop.

WARNING

Do not operate the machine during initialization and keep your hands away from motorized parts (e.g. turret, stage and spindle).

1. Switch on the machine using the red ON/OFF button on the back panel. The machine will start the initialization. During this initialization several system functions and parameters will be checked, in case there are any problems, a message will appear on the user interface. When there are no issues during initialization, successively, Windows® and the INNOVATEST® hardness testing software IMPRESSIONS™ 4 will be started. The following progress bar can appear on your screen:



A correct start-up will show the following screen without any failure or error messages.



Fill in the username and password.

Username: Admin

Password: none

Press "ENTER"

The "USERNAME/PASSWORD" box and keyboard will disappear from the screen and the user interface is unlocked and ready for operation.

NOTE: If the machine has been used before, it is also possible to log in with a stored username and password.

NOTE: For more detailed information concerning the user interface and advanced (software) controls, please see the dedicated IMPRESSIONS™ 4 user manual. Some items in the user manual may differ or are disabled, depending on the type of your machine series.

5.3 PERFORMING A HARDNESS TEST

1. Select the objective which is suitable for the selected indenter and expected indentation.
2. Check that the objective and indenter types on the screen match with the objectives and indenter that are actually installed in the Turret.
3. Select a hardness scale and the desired load that will be applied for the indentation.
4. Set the dwell time to the desired value.
5. For cylindrical sample surfaces set the shape correction to the correct shape and enter the sample (specimen) diameter.
6. Position the specimen. Ensure that the specimen surface condition complies with the required standards. Put the specimen in the center of the flat anvil or XY-stage. The specimen surface must be in parallel with the flat anvil. Use a proper clamp or fixture when using a specimen with complicated geometric shapes.
7. Select the objective and adjust the focus until the specimen surface is in focus, giving a sharp and crisp image. Be sure the objective does not collide with the specimen; this can cause severe damage to the turret. Adjust the light level if necessary.
8. Adjust the light level so the specimen is clearly visible, meaning not too bright nor too dark. Put the specimen in focus.
9. Start the indentation. When starting an indentation, the turret will rotate to the selected indenter (scale). Make sure the specimen is positioned in such way that it cannot collide with the objective or indenter. Select the **“START”** button to start the indentation. Select the **“STOP”** button to stop/abort the indentation process. The turret rotates to select the indenter. The indenter will slowly move downward towards the specimen's surface. The indenter position will be shown on screen. The status bar shows the current state of the indentation process.
10. Measuring. Depending on the manual/auto setting the measurement will be started automatically or the software waits for the operator to press **“MEASURE”** or take further actions. The turret rotates to the last objective used or in case of a program, the programmed objective. The software will automatically put the measuring lines on the indentations. The hardness value will be calculated.
11. Manual adjustment of the measuring lines afterwards is possible, the hardness value will be re-calculated.

 WARNING:

The procedure to perform a hardness test depends on the type of the machine series.

NOTE:

For more detailed information concerning the user interface and advanced (software) controls, please see the dedicated IMPRESSIONS™ 4 user manual. Some items in the user manual may differ or are disabled, depending on the type of your machine series.

6

PROBLEM MESSAGES

 WARNING

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

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

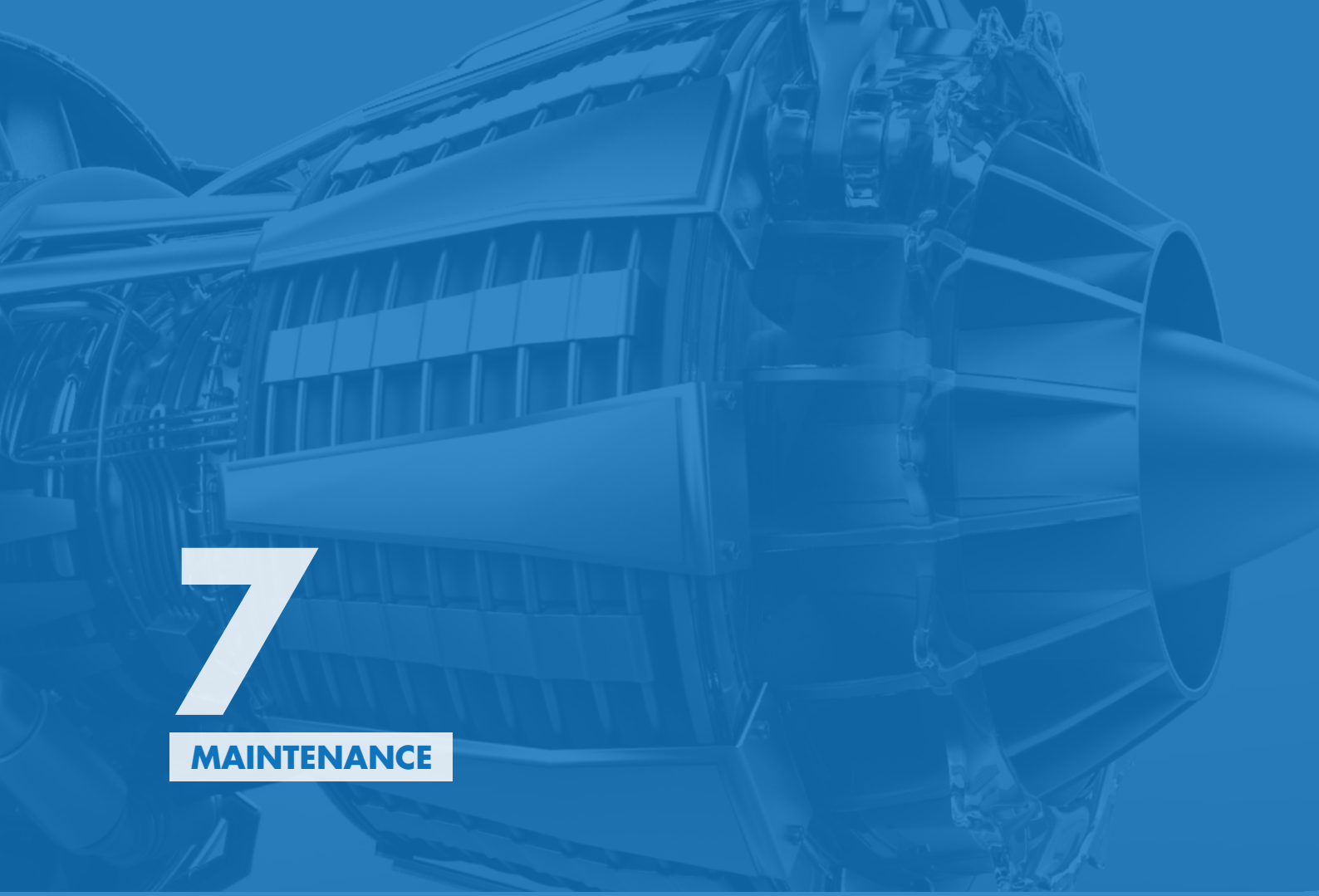
Following table shows the possible messages during such a problem and their description.

Message	Description
 Collision switch active	Turret is hitting an object. Spindle too far up, or head too far down. If above is not the case, contact your service representative.
 Emergency switch pressed, release switch for further action	See chapter 3.3.2 Emergency stop for an instruction to release the emergency switch. If above does not solve the problem or if the message occurs without activating the emergency switch, contact your service representative.

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

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

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



This chapter describes the procedures for maintenance. Regular maintenance and inspection of the machine is of great importance. This reduces potential downtime and increases operational safety.

 WARNING

Assembly, disassembly, maintenance and repair may only be carried out by a professional.



Consider safe and environmentally friendly disposal of operating and auxiliary materials as well as replacement parts. Harmful substances must be disposed in such a way that there is no danger to people and the environment. Leakage of hazardous substances also leads to an environmental hazard. The locally applicable regulations must be observed.

7.1 CLEANING

 WARNINGS

When using cleaning agents, the instructions on the packaging must be observed.

Avoid contact with chemicals as much as possible. For example, if your hands come into direct contact with chemicals, clean them immediately.

 CAUTIONS

Avoid contact of electric live parts with liquids as this can lead to “short circuits”.

Avoid using compressed air to clean the machine. Although dirt particles are blown away with compressed air, there is a risk that these dirt particles enter vital parts (e.g. bearings). This can result in increased wear, tear and malfunction.

The machine must be kept clean during operation.

- Keep the surfaces of the machine clean.
- Make sure the surrounding is clean, meaning free of packaging materials, chemicals, tools, brooms, vacuum cleaners etc.

The following is to be observed:

- Avoid aggressive and/or abrasive cleaning agents.
- Do not use wire brushes or other hard tools.
- Always use fiber-free cloths for cleaning the machine.
- Use a soft brush in combination with a vacuum cleaner to remove dust.

Procedure:

1. Before cleaning the machine with cleaning agents, cover all openings in which no cleaning agent may enter (for safety and/or functional reasons). This especially applies to all electrical components. Do not use water or a steam cleaner/high-pressure cleaner for cleaning.
2. After cleaning, the protective covers, previously applied to openings, must be removed.
3. After cleaning, check the machine for any damage or defects. Fix any defects immediately.

 WARNING

Any defects observed must be repaired before using the machine.

7.2 MAINTENANCE GENERAL

 WARNINGS

If it is necessary to dismantle safety devices during installation, maintenance or repair, the reassembly and inspection of the safety devices must be done immediately after the completion of these activities.

The machine must be disconnected from the mains during all maintenance, repairs and inspections.

When handling oil, grease and other chemical substances, the safety regulations applicable to that product must be observed!

Loosened connections during the maintenance or repairs must always be tightened.

Instructions for handling the machine:

1. Installation, inspection, maintenance or repairs on the electrical equipment of the machine must be performed by qualified personnel in accordance with technical regulations.
2. When installing, inspecting or maintaining live parts, a second person must be available, who can handle the emergency stop in case of an emergency. Only use voltage isolated tools!
3. Before connecting or disconnecting cables, make sure that the power is switched OFF, to prevent electric shock or malfunction of the machine.
4. Disassembly of springs or parts subject to mechanical stress must be carried out with caution, the mechanical energy stored in these parts can cause injury.

7.2.1 PERIODICAL INSPECTION

Part	To be checked	Action & tool	Precaution
Indenter	Indenter tip dirty	Wipe indenter Soft fiber-free cloth (e.g. micro-fiber, cotton)	Do not bend the indenter shaft
Lens ^A	Lens surface polluted	Wipe lens Lens brush, Lens cleaning tissue or Lens cloth (microfiber) ^B	Do not scratch the lens
Anvil ^A	Rust	Remove rust Rust solvent and a Soft cloth (e.g. microfiber, cotton)	Do not bring stage into contact with turret, etc.
Test block	Rust	Replace test block	Do not use a rusted or expired test block

A) Depending on the configuration of the machine

B) Only use special lens products and take notion of the instructions on the packaging of the lens cleaning product.

7.2.2 FORCE CALIBRATION

If the application forces of your machine need to be recalibrated, please seek advice from you supplier or contact the service department of INNOVATEST® directly, hence for the calibration of the application force specific equipment is required.

7.2.3 OPTICS CALIBRATION

During the assembly process, the lens(es) on your machine have been calibrated. Replacing lens(es) requires calibration of the lens(es). Such calibration can only be done by your supplier. Contact your supplier or the service department of INNOVATEST® directly.

7. MAINTENANCE

7.3 REPLACEMENT OF THE FUSE(S)

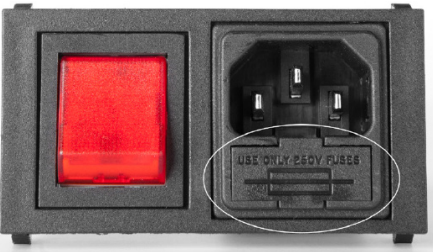
⚠ CAUTION

Only use fuses with the correct **(specified ratings)**.

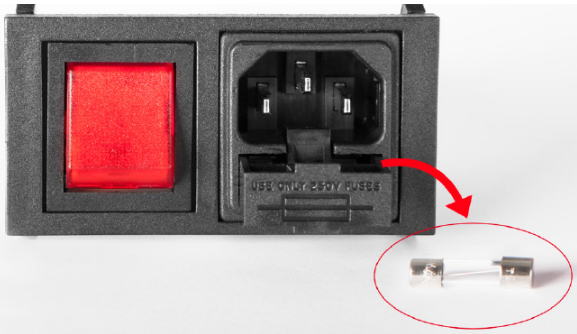
For this machine the fuse dimensions and ratings are:
5x20mm
3.15AT, 250V

Replacement procedure

- Turn off the machine and disconnect the main power cable.
- Pull out the fuse holder using a small flat-headed screwdriver.



- Inside the fuse holder a spare fuse is stored.
- Replace the broken blown fuse with the new fuse.



- Reconnect the main power cable and turn on the machine again.

7.4 SPARE PARTS

⚠ CAUTION

Only use spare parts or parts approved by the manufacturer.

Spare parts must meet the technical requirements specified by the supplier. This is always guaranteed with original spare parts. The installation and/or use of spare parts not supplied by the supplier can potentially affect certain machine properties and active and/or passive safety provisions, negatively. For ordering spare parts you can contact your supplier. After replacing parts, always perform a functional test.

7.5 FUNCTIONAL TEST

To verify the machine is in good working order, perform a functional test when in doubt and after, maintenance, repairs or replacing any parts. A functional test is performed on a valid and certified test block and by following the instructions of [chapter 5.3 “performing a hardness test”](#). The measured hardness value should match the hardness value of the test block.

8

DECOMMISSIONING OR DISPOSAL

This section gives some guidance for the decommissioning or disposal of the machine.

8.1 DECOMMISSIONING

NOTE:

The machine has different hazardous parts that must be handled with care. Therefore, please note the following comments.

Consider:

- Government regulations, inspections of certain authorities.
- Conditions and/or status for exterior or interior configurations, depending on condition.
- Instructions for temporary decommissioning:
 1. Planning.
 2. Sequence.
 3. Special procedures.
- Work to be performed during decommissioning.
- Special measures for continuity.
- Special measures for safety and the environment.

The following must be observed:

1. All electrical parts must first be completely de-energized and discharged before disassembly.
2. Disassembly of springs or parts subject to mechanical stress must be carried out with caution, the mechanical energy stored in these parts can cause injury.
3. Batteries that may have been used in the machine must be disposed of separately according to local regulations.
4. In addition, instructions mentioned in the other manuals, which are part of this user manual, are to be observed, see chapter [“layout of the user manual”](#).

8. DECOMMISSIONING OR DISPOSAL

The following actions should be carried out:

- Disconnect from all supply connections.
- Releasing all attachments from the floor, wall or ceiling.
- Fixation of individual parts.

8.2 DISPOSAL

For disposal certain regulations must be considered. All electrical and electronic products and batteries must be taken to a separate collection point at the end of their working life. Do not dispose of these products as unsorted municipal waste: take them for recycling. For information on your nearest recycling point, check with your local waste authority.

The following actions should be carried out:

- Remove and destroy the reference label with the CE marking, at the backside of the unit.
- Complete removal/disposal of machine parts.

9

TRANSPORT AND STORAGE

This section gives some guidelines in the event the machine needs to be transported or stored.

9.1 TRANSPORT/MOVEMENT

Transport or movement of the machine must be performed by authorized, trained and experienced personnel, capable of transporting or moving the machine (e.g. a specialized industrial moving company).

⚠ WARNINGS

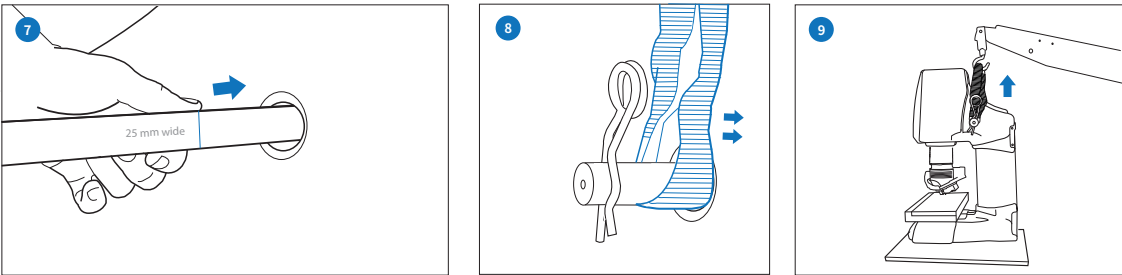
Use only undamaged transportation equipment and tools that are suitable for the load. Cabling should be stored and fixated to prevent hazards and damage during transport. Care and cleanliness are required.

⚠ CAUTIONS

When carrying or moving the machine, make sure not to hit any objects and the machine does not tilt by 30 degrees or more. When carrying or moving the machine, make sure you do not touch the turret.

9. TRANSPORT AND STORAGE

The picture below indicates important lifting information, relevant for transport or moving the machine.

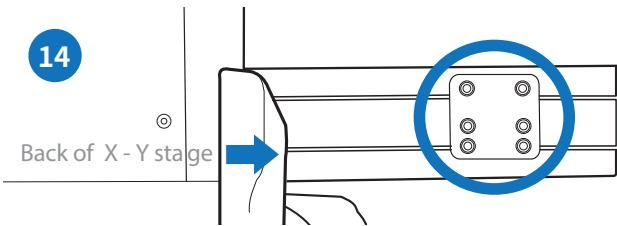


Lifting bar, to lift the machine (weight 210 kg) with hoisting slings (see dedicated NEMESIS 5100 unpacking instruction for mounting).

9.2 PACKAGING

After unpacking, store the original packaging. Avoid shipping or transportation of the machine without the complete and original packing materials.

When the machine is equipped with a motorized XY-stage, be sure the transportation safety strip is placed correctly to the machine, otherwise the load application system could be damaged (see the unpack instruction).



To avoid possible damage, the packaging of the different parts must be carried out professionally. The measures taken in this context must fulfill the following objectives, depending on the situation (outdoors or indoors):

- Protection against rain during transport.
- Protection against damage caused by doors, walls and other objects.
- Protection against high (air)humidity (risk of corrosion due to condensation!).

9.3 STORAGE

When storing the machine, the following points must be considered:

- Protect the corrosion-sensitive parts (bare metal).
- Store the machine only in dry rooms.
- Store the machine in a way that any damage is avoided.
- Store the machine including all parts, avoiding important parts are missing when putting it back into operation.

10
TECHNICAL SPECIFICATIONS

Hardness scales (scales available depends on hardness tester configuration)					
Rockwell	Regular Rockwell scales; Pre Load 10kgf Main Load 60kgf 100kgf 150kgf		A, B, C, D, E, F, G, H, K, L, M, P, R, S, V		
	Superficial Rockwell scales; Pre Load 3kgf Main Load 15kgf 30kgf 45kgf		15N, 30N, 45N 15T, 30T, 45T 15W, 30W, 45W 15X, 30X, 45X 15Y, 30Y, 45Y		
Vickers	HV 0.010	HV 0.1	HV 1	HV 10	HV 100 HV 120 HV 150
	HV 0.015	HV 0.2	HV 2	HV 20	
	HV 0.020	HV 0.3	HV 2.5	HV 25	
	HV 0.025	HV 0.5	HV 3	HV 30	
	HV 0.050		HV 4	HV 40	
			HV 5	HV 50	
				HV 60	
Knoop	HK 0.01	HK 0.1	HK 1		
	HK 0.02	HK 0.2	HK 2		
	HK 0.025	HK 0.3	HK 5		
	HK 0.05	HK 0.5			
Brinell	HBW 1/1	HBW 2.5/6.25	HBW 5/25		HBW 10/100
	HBW 1/1.25	HBW 2.5/7.8125	HBW 5/31.25		HBW 10/125
	HBW 1/2.5	HBW 2.5/15.625	HBW 5/62.5		HBW 10/250
	HBW 1/5	HBW 2.5/31.25	HBW 5/125		HBW 10/1000
	HBW 1/10	HBW 2.5/62.5	HBW 5/250		HBW 10/1500
	HBW 1/30	HBW 2.5/187.5	HBW 5/750		HBW 10/3000
Plastics	49,03 N; 132,0 N; 357,9 N; 961 N				

Carbon	HR 2.5/7	HR 5/7 HR 5/15 HR 5/20 HR 5/40 HR 5/60 HR 5/100 HR 5/150	HR 10/20 HR 10/40 HR 10/60 HR 10/100 HR 10/150		
K_{IC} fracture toughness	HV 0.010 HV 0.015 HV 0.020 HV 0.025 HV 0.050	HV 0.1 HV 0.2 HV 0.3 HV 0.5	HV 1 HV 2 HV 2.5 HV 3 HV 4 HV 5	HV 10 HV 20 HV 25 HV 30 HV 40 HV 50	HV 100 HV 120 HV 150
HVD (HVT)			HV 5 HV 10 HV 20 HV 30 HV 50		HV 100 HV 120
HBD (HBT)	HB 1/5 HB 1/10 HB 1/30	HB 2.5/6.25 HB 2.5/15.625 HB 2.5/31.25 HB 2.5/62.5 HB 2.5/187.5	HB 5/25 HB 5/125 HB 5/250 HB 5/750		HB 10/100 HB 10/500 HB 10/1000 HB 10/1500 HB 10/3000
Conversions	Conversions to other hardness scales according to ASTM E140, ISO 18265 and GB/T 1172				
Standards	ISO 2039 ISO 4545 ISO 6506 ISO 6507 ISO 6508	ASTM E92 ASTM E10 ASTM E384 ASTM E18			

Test forces	
Force application	Servo drive, precision gearbox, motion & torque feedback system
Test forces	NEMESIS 5100/A 200gf - 250kgf NEMESIS 5100/B 200gf - 750kgf NEMESIS 5100/C 200gf - 3000kgf
Optional force ranges	OPTION 1 10gf - 200gf OPTION 2 250kgf - 3000kgf
Test force tolerance	< 0.5% for test force below 100gf < 0.25% for test force 100gf to 250kgf < 0.25% for test force 250kgf to 3000kgf
Dwell time settings	Default 10 seconds, user defined. Up to 999 seconds

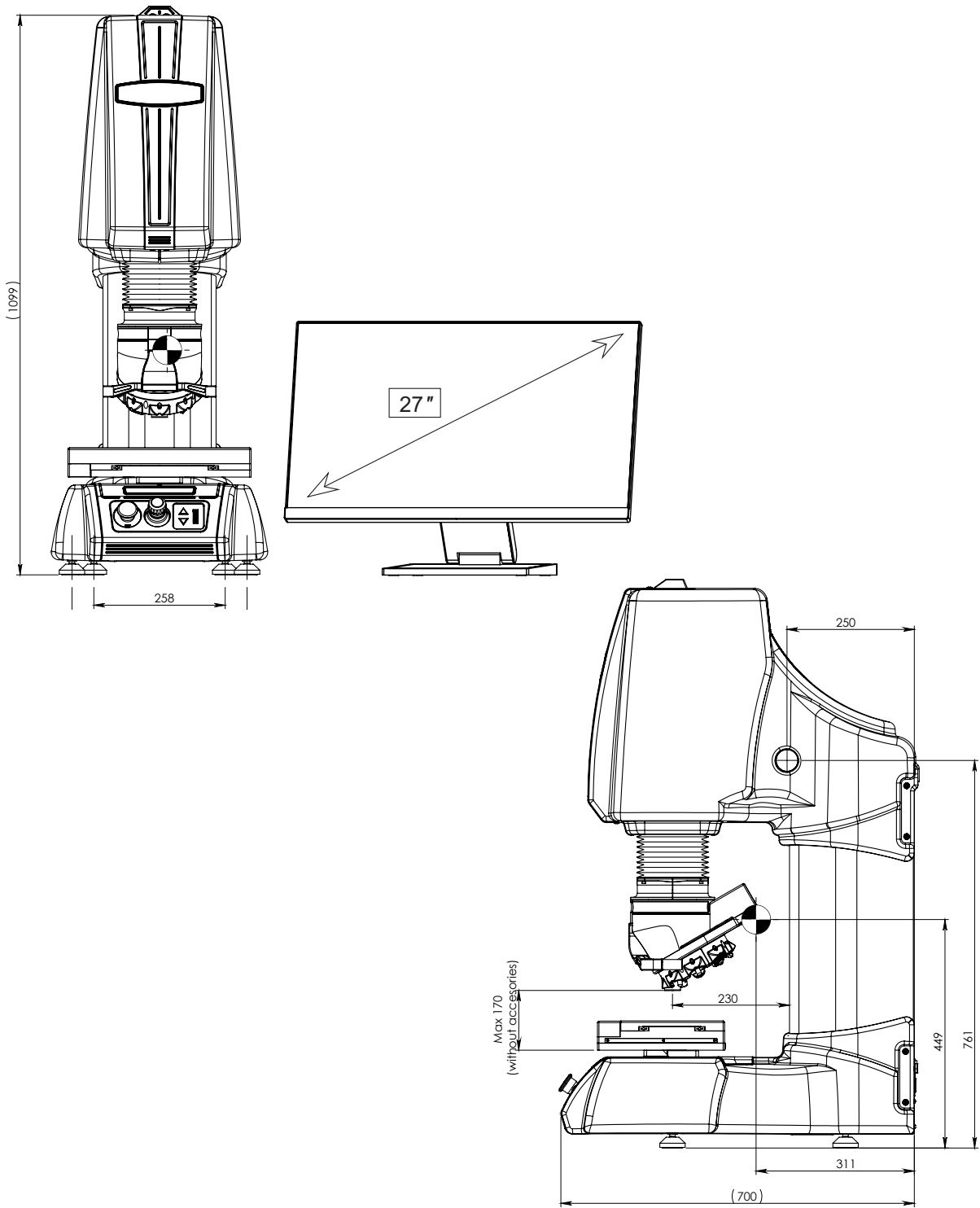
Turret	(depending on configuration)
Motorized turret	Ultra-fast, 9 position turret, 8 free to configure, 1 fixed
Free tool positions	8 for indenters, 8 for objectives (8 max total)
Fixed tool positions	1 for cross laser & touch probe
Objectives	Long working distance 0.7x, 2.5x, 5x, 10x, 20x, 40x, 60x, 100x
Indenters	Certified indenters (ISO/ASTM)
Camera 1 (objective)	18 Mpx, HD, 4K+, Machine vision system
Camera 2 (overview)	18 Mpx Full HD, Full Color, Optical zoom system, variable FOV 40 x 30mm - 140 x 110mm

System	
Electronic system	High performance embedded controller, i7, mSSD 120 GB MS Windows 10 operated. Up to 8 years* INNOVATEST warranty
CNC Support	CNC controller for motorized XY-stages
Screen(s)	Capacitive touch screen, second screen option.
Display resolution	0.01
Statistics	Total test, max., min., average, range, standard deviation
Hardness conversion	Rockwell, Rockwell Super_cial, Vickers, Brinell, Knoop, Leeb & Tensile
Software	IMPRESSIONS™ 4, work-flow system & tester control
Data storage	Internal mSSD
Data output	XML, CSV, Q-DAS certified (optional)
Data input	Keyboard, touchscreen, barcode scanner, database
Connectivity	4 USB, RJ45 Ethernet LAN, Wi-Fi, RS232, Bluetooth, 5 axis CNC & motorized XY-Stage connector, Dual HDMI screen connectors (depending on configuration)
Printer	A4, A3 full color laser printer (optional)

General	
Dimensions	D 695 x W 425 x H 1100mm
Weight	180 kg
Power supply	100 – 240 VAC, 50/60Hz, single phase
Operating temperature	10 – 35 °C
Power consumption	Max. 200 W
Humidity	10 – 90 %, non-condensing
Noise emission	< 70 dB(A)

10.1 TECHNICAL DRAWING

All dimensions in these drawings are in mm, approximate. Working heights and or workpiece accommodation varies depending on the stages and/or (stage) accessories used.



10.2 STANDARD DELIVERY AND (OPTIONAL) ACCESSORIES

- Power cable
- Four adjustable vibration dampers
- User manual

10.3 OPTIONAL ACCESSORIES

- INNOVATEST calibration certificate
- Certified indenters
- Certified hardness reference blocks
- Anvils
- Testing tables
- etc.

For detailed information about available accessories, please contact the sales office of INNOVATEST Europe BV for up-to-date information.

MANUFACTURER

Declares fully under own responsibility that the Hardness Tester:

Make: INNOVATEST Europe BV

Product name: NEMESIS 5100G2 series

Model: NEMESIS 5100G2/A, 5100G2/B

Serial number: 5100G2/X(r)mmyysssss

(5100G2/X=model, (r)=hardware revision, mmyy=manufacturing month year, sssss=IDnr.)

To which this declaration refers,
is in accordance with the provisions of the Directive(s):

2006/42/EC	Machinery directive
2014/30/EU	Electromagnetic Compatibility

And is in compliance with the following standard(s) or other standard documentation:

EN 61000-4-2:2009

EN 61000-4-3:2006

EN 61000-4-4:2012

EN 61000-4-5:2014

EN 61000-4-6:2014

EN 61000-4-8:2010

EN 61000-4-11:2014/A1:2017

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