

FALCON 600G2

Vickers, Micro Vickers, Knoop & Brinell

USER **MANUAL**



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FALCON 600G2

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

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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 **FALCON 600G2** series, 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™ software.

1.2 TARGET GROUPS

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

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

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

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

1.3 LIABILITY AND DISCLAIMER

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

1.4 RE-ORDER

This 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 re-ordered at the address below:

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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 of the machine 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 FALCON 600G2 series user manual may only be used with INNOVATEST® equipment covered by this user manual. This complete user manual consists of:

- This FALCON 600G2 series user manual.
- IMPRESSIONS™ 4 user manual
- FALCON 600 series unpack instruction (attached to the packaging).
- Declaration of Conformity.

2

DESCRIPTION AND FUNCTION

The FALCON 600G2 Automated Hardness Testing System provides a fully integrated platform for your complete Vickers, Knoop & Low Force Brinell hardness testing needs.

Coming from a leading edge of mechanical design, with a range of CNC stages and best in class optics, 18 Megapixels, 4K, full color image technology, to a fully featured, easy to use, User Interface. A standard force range of 10gf to 62.5kgf, optional going down to forces as low as 0.1gf, to be used in combination with any thinkable software application, provides a micro hardness testing machine for today, tomorrow and better... for the future.

2.1 IDENTIFICATION

This manual belongs to the FALCON 600G2 series; models 600G2FAO1, 600G2FAO2, 600G2FAO3, 600G2FAO4, 600G2FAO5 and 600G2FAO6. The type / identification plate with the CE mark is placed on the back of the machine and is shown in the following figure:



3

SAFETY

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 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:

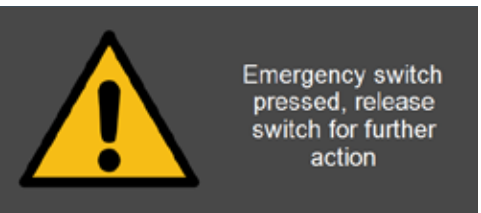
- All electrical components.
- All drives.

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 operating system, see the dedicated operating system 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 workbench.
- 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.

4.4.1 SPINDLE

Machine has a spindle that can go lower than bottom of machine.

In order to make use of the full range of vertical capacity, choose from:

- Place machine on a Anti Vibration Stage (UN-AVS-150)



- Install the range of the spindle, by installing the limit switch relocater (AS500XL-150-16)
- Make a hole in the workbench; read chapter [“10 Technical specifications”](#) to see how far the spindle can move downwards.

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.

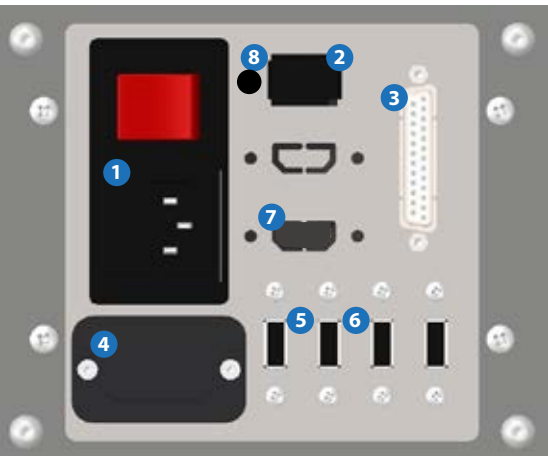
CAUTION

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.

Rear of machine:



1. Main power ON/OFF switch, mains entry and fuses.
2. Network.
3. RS232 to (Optional) Motorized XY-table.
4. Power to touch screen.
5. 1x USB 3.0 (blue)
6. 3x USB 2.0 (non-blue) for receiver for keyboard and mouse.
7. HDMI to touch screen.
8. iSmart XY-stage

4.5.3 INSTALLATION OF INDENTERS

The machine 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.



The indicated Head Cap must be temporal unscrewed to access the screw of the indenter holder

Use a soft cloth to wipe any dirt or debris from the indenter holder. The shank surface must face the screw hole in the indenter holder when being inserted. Insert the shank into the holder, entirely and securely and fasten the fixating screw.

NOTE:
 After replacement, the indenter length must be calibrated; see dedicated software user manual.
 After indenter replacement, inform software about change in turret/test head configuration

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.

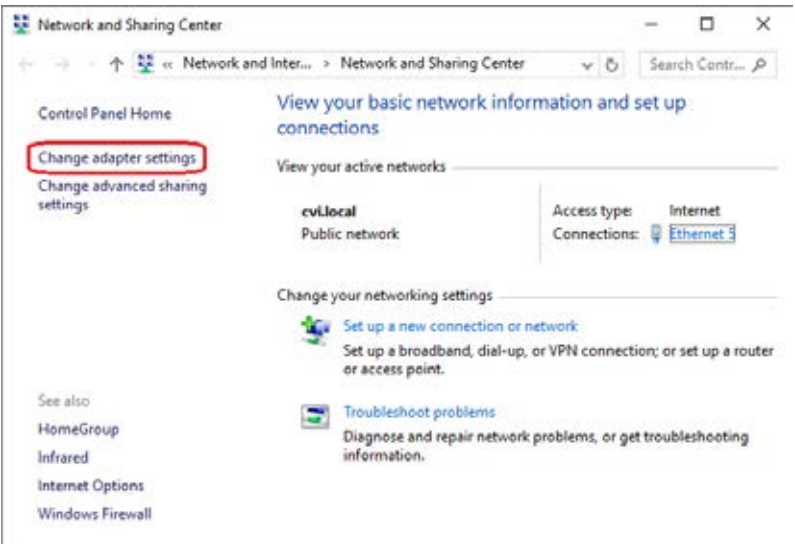
4.6.1 WINDOWS 10: SETTING A FIXED IP-ADDRESS

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.

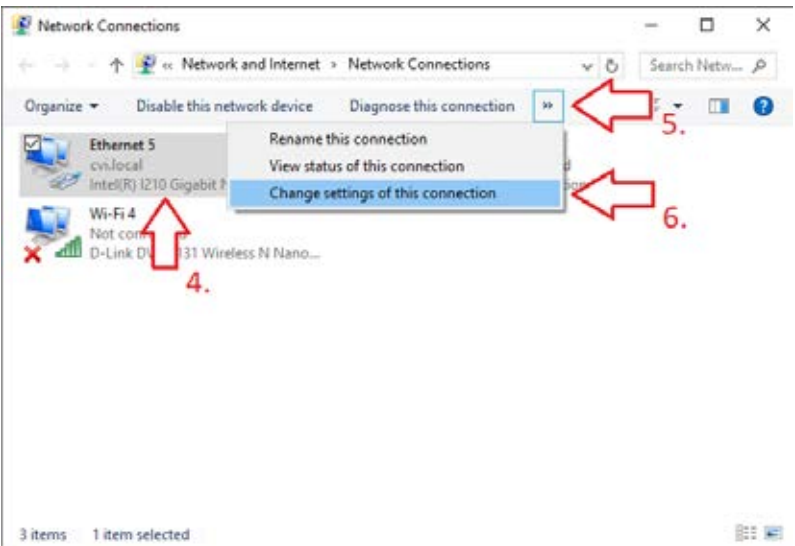
1. Click with the right mouse button on the network icon



2. Select Open Network and Sharing Center

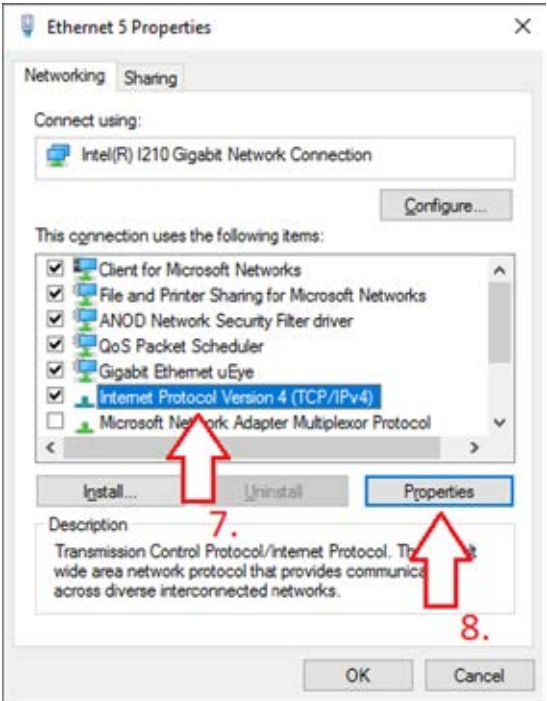


3. Select Change adapter settings

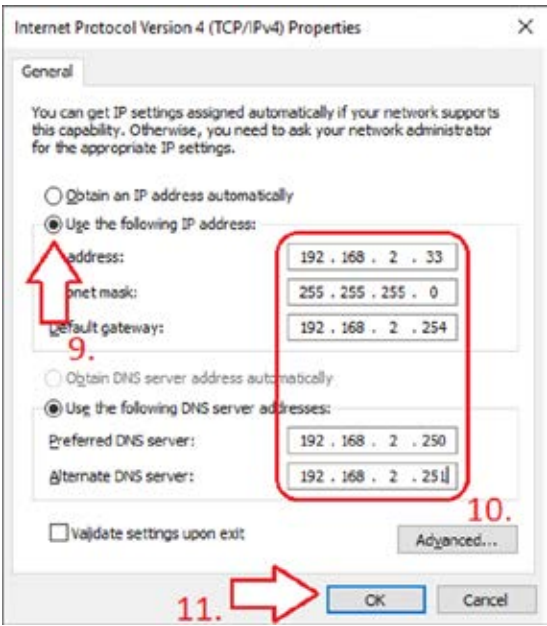


4. INSTALLATION

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. ABS Front head cover
2. USB port.
USB port for import/export of test patterns and export of measurements.
3. **Test head**
4. Motorized XY stage (Optional).
Controlled by the software virtual joystick.
5. Spindle protection cover.
6. Emergency switch with power on indicator light.
In an emergency the emergency switch must be operated, causing the machine to stop immediately.
7. 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).
8. 27" LCD touch screen.
9. Wireless keyboard and mouse.
10. Joystick control.
Controls the motorized XY stage.



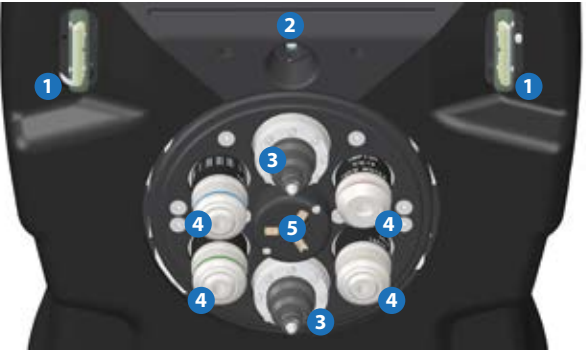
CAUTION
Do not use any sharp objects to operate the touch screen.

5.1.1 TEST HEAD

1. Overview light
2. Overview camera (Optional)

Motorized 6 position turret for:

3. 1 Indenter (2nd Optional)
4. 4 Objectives (Optional with ring lights)
5. Ringlight connectors



5.2 POWER ON THE MACHINE

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](#).

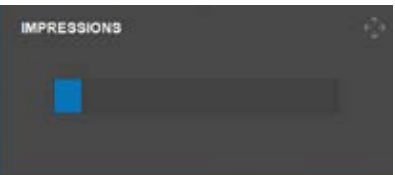
⚠ WARNING

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

1. Switch on the machine using the red ON/OFF button on the back panel.
 - a. Light in emergency button gets on
2. 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.

5.3 STARTING HARDNESS TESTING SOFTWARE

1. When there are no issues during initialization, successively, Windows® and the INNOVATEST® hardness testing software IMPRESSIONS™ will be started. The following progress bar will appear on your screen:



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

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 IMPRESSIONS™ 4 user manual may differ or are disabled, depending on the type of your machine series.

5.4 PERFORMING A BASIC HARDNESS TEST WITH IMPRESSIONS

Focus on the sample surface:

1. Select the objective which is suitable for the expected indentation.
 - Brinell: low magnification, like 0.7x or 2.5x
 - Vickers/Knoop: high magnification, like 10x
2. Put the sample on the stage under the objective.
 - Take care for sufficient distance between the sample and the objective so that no collision can happen when the turret is turned.
3. Bring the surface of the workpiece into focus:
 - Use the control buttons to move the stage up/down:

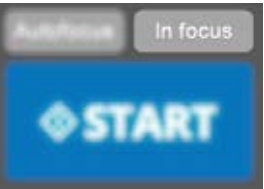


Spindle up/down: fast movement
Autofocus Up/Down: slow movement
Autofocus button: Automatic focussing

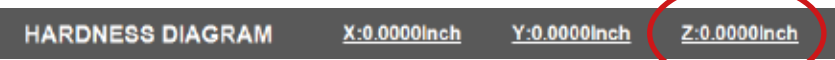
NOTE:

- A high magnification objective gives a more accurate focussing but is more difficult because of the very narrow focus depth.
- Use a low magnification objective for the manual focussing, and change to a higher magnification objective for the automatic focussing.

4. After manual focussing you can use the 'Autofocus' button for automatic and user independent focussing.
 - After a manual focus you need to confirm the focus position by pressing the 'In Focus' button.

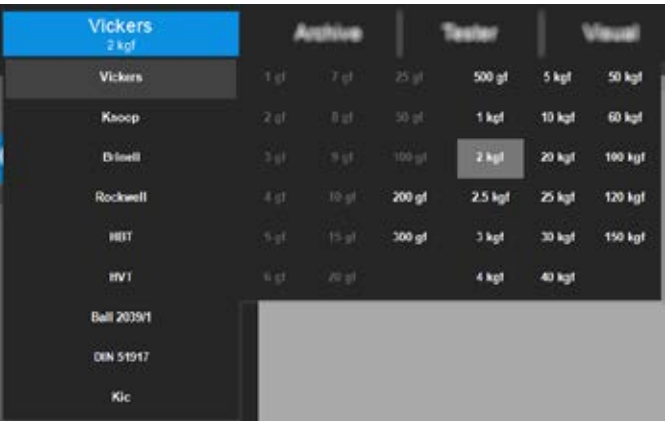


- Be sure that after focussing the Z value is 0.000mm. This happens automatically after an autofocus.



Select Vickers scale and start a test:

5. Select the required hardness scale.
 - If a scale is not selectable it can be that the correct indenter is not installed in the turret (check the Impressions user manual).



6. Start the measurement with the START button.
 - **"STOP"** button available to stop/abort the indentation process.
 - The turret rotates to the correct indenter, and starts the indentation cycle.
7. After indentation, the turret rotates to the last objective used.
 - Automatic positioning of the Vickers measuring lines; see IMPRESSIONS user manual.
 - Vickers hardness value is visible above the result field.

5.4.1 ADDITIONAL SETTINGS BEFORE STARTING A MEASUREMENT

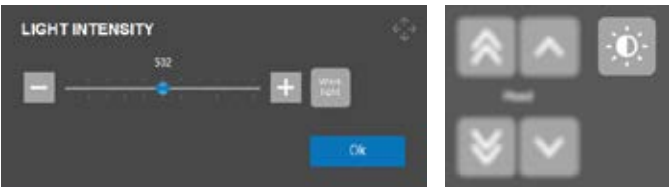
1. Go to the 'Test settings' menu.



- Verify the Dwell times, if required.
- Set up the hardness conversions (up to five scales simultaneously)
- Enter the tolerance limits if required.
- For measuring cylindrical parts shape correction is required. Select the shape (convex, concave, cylindrical) and enter the sample diameter.

2. Optimize the intensity of the light.
 - For Vickers tests the object light intensity is important.
 - By pushing the 'Object light' button, you can toggle between object light and ring light.
 - For Brinell tests the ring light intensity is important.

For more informations read the Impressions 4 user manual.



5.4.2 REPORT AND EXPORT POSSIBILITIES



1. PDF or printed reports: select, 'Report' / 'Print'. Snapshots can be integrated in the report. Go to the 'Snapshots' tab and select/deselect the available snapshots.
2. Export to CSV or Excel format: Select, 'Report' / 'Export'.

For more informations read the IMPRESSIONS™ 4 user manual.

5.5 EXIT HARDNESS TESTING SOFTWARE IMPRESSIONS

Exit IMPRESSIONS by following instructions as in dedicated software manual.

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

⚠ WARNING

Do not turn off the machine in this state.

5.6 POWER OFF THE MACHINE

1. Shut down Windows via shortcut on taskbar.
2. Wait some seconds till screen is fully black.
3. Switch the machine OFF with the main **ON/OFF switch**.
 - a. Light in emergency button gets off

6

PROBLEM MESSAGES

6. PROBLEM MESSAGES

6.2 SOFTWARE

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.

NOTE:

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

⚠ 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.

6.1 HARDWARE

If proposed solution does not solve the problem, contact your service representative.

Problem	Possible cause	Possible solution
Irregular indentation shape.	• Indenter tip is dirty. • Indenter tip is chipped off. • Specimen surface is coarse (or dirty). • Specimen is tilted. • Specimen is curved (spherical or columnar). • Hardness tester is faulty (such as indenter shaft is broken).	• Clean Indenter tip. • Replace indenter. • Polish specimen surface. • Make specimen surface in parallel with fine adjustment stage. • Make an indentation at highest position, if specimen curved. • Contact service representative.
No indentation is made.	• Indenter tip is chipped off. • Hardness tester is faulty. • Indenter shaft curve. • Abnormal position of Indentation.	• Replace indenter. • Contact service representative. • Contact service representative. • Adjust the indentation position.
Abnormal hardness value.	• When using a digital eyepiece and the digital eyepiece is not zeroed properly after powering ON, the measurement of the diameter will be incorrect. • Indenter tip is dirty. • Installed in bad conditions.	• Switch OFF the device, wait for a few seconds and switch it ON again. Then execute the zeroing properly. • Wipe indenter. • Improve installation conditions.

7

MAINTENANCE

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.

7. MAINTENANCE

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.

7.2.4 INDENTER CALIBRATION

When the indenter has been replaced or another type of indenter has been installed, the indenter length may need to be calibrated again so the device knows the exact length of the indenter. The software needs the exact length of the indenter in order to determine the position at which the indenter will touch the specimen.
 For details see dedicated software user manual.

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 5.4 "performing a hardness test"](#). The measured hardness value should match the hardness value of the test block.

8

DECOMMISSIONING OR DISPOSAL

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.

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”](#).

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.

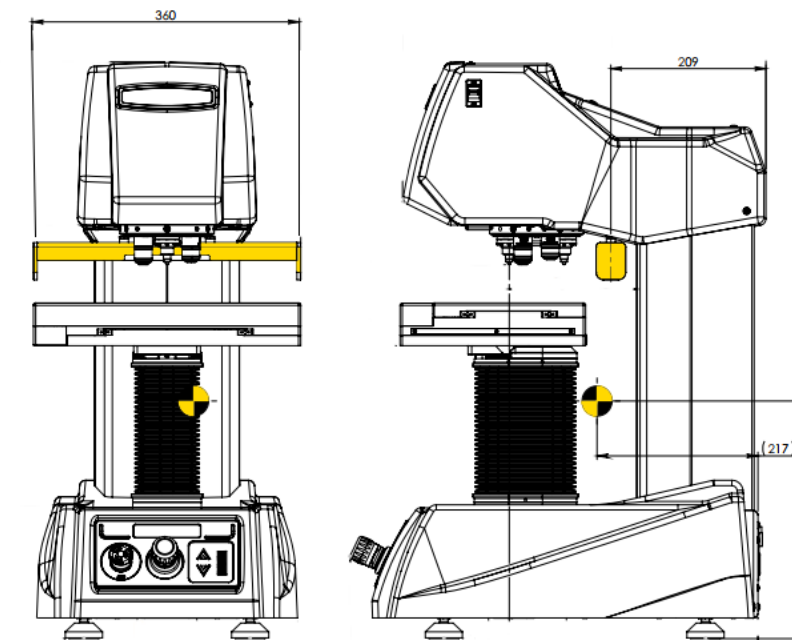
⚠ CAUTIONS

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.

1. Lifting bar, to lift the machine with hoisting slings (see unpacking instruction for mounting).
2. Center point of gravity (machine weight 101 Kg).



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 dedicated 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)					
Vickers ISO 6507 ASTM E384, E92 JIS B 7725	HV 0.001	HV 0.01	HV 0.1	HV 1	HV 10
	HV 0.002	HV 0.015	HV 0.2	HV 2	HV 20
	HV 0.003	HV 0.02	HV 0.3	HV 2.5	HV 25
	HV 0.004	HV 0.025	HV 0.5	HV 3	HV 30
	HV 0.005	HV 0.05		HV 4	HV 40
	HV 0.006			HV 5	HV 50
	HV 0.007				
	HV 0.008				
	HV 0.009				
	Extended range: HV0.0001 - HV0.0009 increases with steps of HV 0.00005				
Knoop ISO 4545 ASTM E92 JIS Z 2251	HK 0.001	HK 0.01	HK 0.1	HK 1	
	HK 0.002	HK 0.015	HK 0.2	HK 2	
	HK 0.003	HK 0.02	HK 0.3	HK 2.5	
	HK 0.004	HK 0.025	HK 0.5	HK 3	
	HK 0.005	HK 0.05		HK 4	
	HK 0.007			HK 5	
	HK 0.008				
	HK 0.009				
Brinell ISO 6506, ASTM E10 JIS Z 2243	HBW 1/1	HBW 2.5/6.25	HBW 5/25		
	HBW 1/1.25	HBW 2.5/7.8125	HBW 5/31.25		
	HBW 1/2.5	HBW 2.5/15.625	HBW 5/62.5		
	HBW 1/5	HBW 2.5/31.25			
	HBW 1/10	HBW 2.5/62.5			
	HBW 1/30				
	HBW 1/31.25				
K_{IC} fracture toughness	All available Vickers forces and scales.				
Conversions	Conversions to other hardness scales according to ASTM E140, ISO 18265 and GB/T 1172				
Standards	ISO 4545 ISO 6506 ISO 6507	ASTM E10 ASTM E92 ASTM E384			

10. TECHNICAL SPECIFICATIONS

Test forces	
Force application	Multi-load cell, closed loop, force feedback
Test forces	0.001 kgf – 62.5 kgf (depending on model)
Test force tolerance	< 0.25 % for test forces ≥ 0.1 kgf < 0.5 % for test forces < 0.1 kgf
Dwell time settings	Default 10 s, adjustable up to 999 s.

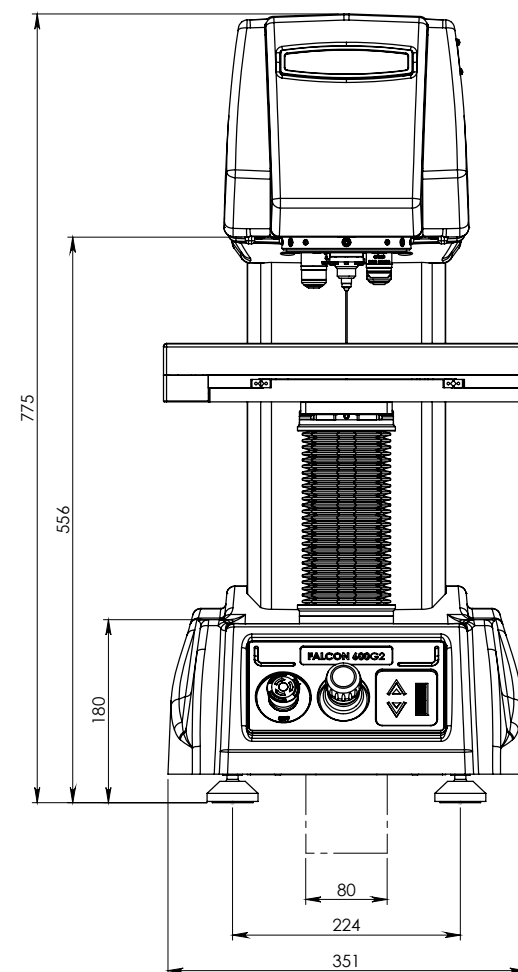
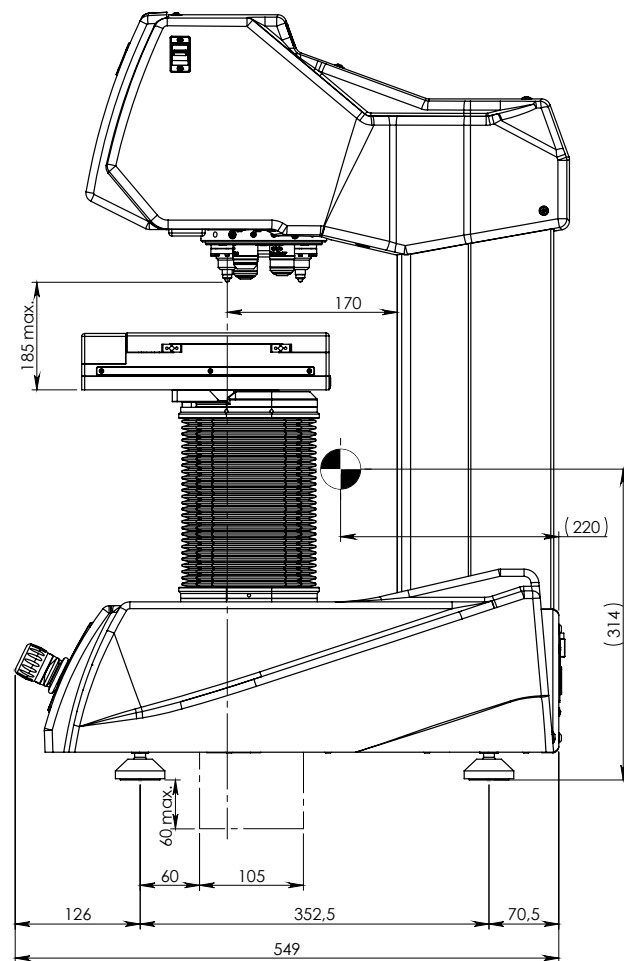
Turret	(depending on configuration)
Motorized turret	Ultra fast 6 positions: 2 indenter positions, 4 objective positions
Objectives	Long working distance 2.5x, 5x, 10x, 20x, 50x, 100x (depending on configuration)
Indenter	Certified indenters (ISO/ASTM) available at choice
Camera 1 (objective)	18 Megapixels, HD, Machine vision system
Camera 2 (overview)	(Optional) Full HD, Optical zoom system, variable FOV 40x30mm – 150x110mm

System	
Electronic system	High performance embedded controller, i7, mSSD 120 GB MS Windows 10 operated.
CNC Support	CNC controller (for motorized stages) or stage accessories
Screen(s)	1x27" landscape mode capacitive touch screen, second screen option
Display resolution	0.01 HV, 0.01 HK, 0.01 HB
Statistics	Total test, max., min., average, range, standard deviation
Hardness conversions	Rockwell, Rockwell Superficial, Vickers, Brinell, Knoop, Leeb & Tensile
Software	IMPRESSIONS™ 4, work-flow system & tester control
Data storage	Internal and external mSSD, SSD or HDD
Data output	XML, CSV, Q-DAS certified (optional)
Connectivity	5x USB, Ethernet LAN, Wi-Fi, RS232, Bluetooth, HDMI, iSmart XY
Printer	A4, A3 full color laser printer (optional)

General	
Dimensions	H 775 x W 351 x D 549 mm
Weight	102 kg
Power supply	100 – 240 VAC, 50/60Hz, single phase
Operating temperature	10 – 50 °C
Power consumption	100 W
Humidity	10 – 90 %, non-condensing
Fuse size/rating	5x20 mm, 3.15AT, 250V
Noise emission	< 70 dB(A)
Workpiece Depth (Throat depth)	170 mm
Workpiece Height (Vertical capacity)	185 mm

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
- Fuses
- Four adjustable vibration dampers
- User manual
- Limit switch relocater (AS500XL-150-16)

10.3 OPTIONAL ACCESSORIES

- Certified indenters
- Certified hardness reference blocks
- Calibration certificate
- Anvils
- Machine stands
- Vibration isolation stage
- Anti-Static machine cover
- Ring lights
- Overview camera
- Etc.

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

EC DECLARATION OF CONFORMITY

MANUFACTURER

INNOVATEST Europe BV
Borgharenweg 140
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The Netherlands

Declares fully under own responsibility that the Hardness Tester:

Make: INNOVATEST
Product name: FALCON 600G2 series
Model: FALCON 600G2
Serial number: 6xxG2(FA)(Ox)(r)mmyysssss
(6xxG2(FA)(Ox)=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
2011/65/EU incl. 2015/863	RoHS
2012/19/EU	WEEE
2014/30/EU	Electromagnetic Compatibility Directive

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

EN ISO 12100:2010	EN IEC 61000-3-2:2019/A1:2021
EN ISO 13850:2015	EN IEC 61000-3-3:2013/A1:2019/A2:2021/C1:2022
EN ISO 13849-1:2015	EN IEC 61000-4-2:2009
EN ISO 13849-2:2012	EN IEC 61000-4-3:2020
EN 60204-1:2018	EN IEC 61000-4-4:2012
EN 55011:2016/A1:2017/A11:2020	EN IEC 61000-4-5:2014/A1:2018
EN 61326-1:2021	EN IEC 61000-4-6:2014
EN-IEC 63000:2018	EN IEC 61000-4-8:2010
EN 50419:2022	EN IEC 61000-4-11:2020/C1:2020

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Place and Date

Edwin Lansink

Maastricht, 16-05-2022

R&D Manager/CTO



NOTES

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting or typing. There are no margins, text, or other markings on the page.

NOTES

This image shows a full page of white paper with horizontal dotted lines, typical of primary school writing paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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