

MANUAL

FH-11 SERIES

Universal Hardness Tester

Firmware Version 1.13



Changes in products and/or product specifications can emerge due to new technologies and continuous development.

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

We recommend you to contact our sales office for up-to-date information.

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USER MANUAL

FOR

FH-11 SERIES

HARDNESS TESTING INSTRUMENT

Thank you for buying this advanced TINIUS OLSEN® hardness testing instrument.

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

Before using this instrument, read through this user manual carefully to use the product properly.

After reading, keep the manual in an easy-to-access place for referencing whenever needed.

Read the "Safety Cautions" and "User's Guide" 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 TINIUS OLSEN® guarantees conditions.

Make sure these signs and symbols are well understood before reading this manual or operating the instrument.

WARNING!

Ignoring this information and mishandling of the equipment can lead to severe bodily injuries and material damage.

- Do not modify this equipment. Doing so can cause fire and/or electric shock.
- Do not fabricate anything with the power cord, forcibly bend it, twist, or pull it, doing so can cause fires and/or electric shock.
- Do not disassemble this equipment. Doing so can cause electric shock. Contact our technical service department for checks, adjustments, or repairs inside the equipment.
- Do not operate the equipment at a voltage other than the power voltage that is indicated. Doing so can cause fires.
- Do not place a vase, or any container holding water, near this equipment.
- Fires can occur if water gets inside the equipment.
- If, by any water does get inside the equipment, turn off the power to the equipment's main unit, pull the plug out of the socket, and call our company's technical service department.
- Always install grounding. If, by any chance a component gets damaged without grounding, electric shock can occur.
- Do not operate the equipment if there is ever any abnormality, such as signs of smoke, unusual smell.
- In such a case, turn off the power to the equipment's main unit, pull the plug out of the socket, and call our company's technical service department.
- Pull out the plug from the socket when exchanging a fuse. Not doing so can cause electric shock.
- Do not insert or unplug the plug with wet hands. Doing so can cause electric shock.
- Do not install the equipment on an unstable base. Doing so can affect the proper working and cause the equipment to fall down and/or cause accidents and injuries.
- Do not scratch or forcibly twist a cable.
- Continued use of a cable after it is scratched or twisted can cause fire and/or electric shock.
- Do not place the equipment in a high temperature and humidity location.
- When cleaning or checking the equipment, make sure the plug is pulled out of the socket for safety.
- Do not use fuses and illumination lamps other than those specified. Doing so can cause fire.
- Do not connect special attachments to this equipment that are not "TINIUS OLSEN®" standard attachments, doing so can cause poor performance or defects.
- Do not use batteries other than the specified ones.
- Do not block the halogen lamp area and ventilation. Blocking the ventilation can cause heat to accumulate inside the instrument, which in turn, can generate fire.
- Never open any of the panel or cover other than when unpacking or assembling.
- High voltages existing in the instrument may cause electrical shocks to personnel.
- Grounding, the power supply of the instrument must be grounded.
- For the power cable, always use the power cable with 3-pins ground wire provided.

INTRODUCTION

Thank you for buying the FH-11 series universal closed loop, force feed back, Rockwell, Vickers, Brinell, Knoop hardness tester.

High-end universal hardness tester with low and high force ranging from 500gf to 3000Kgf.
The latest technology for a reliable fast measurement procedure.

- **Superior Test Control**
- **Superior Accuracy**
- **Superior Gauge Repeatability & Reproducibility**
- **Superior Productivity**
- **Superior Flexibility**

The FH-11 series universal hardness testers combine a practical design with universal specifications.
State-of-the-art closed loop, load cell technology and a - Patent Pending - force feedback system, assure fast test results at the highest possible accuracy.

Unmatched consistency, repeatability and reliability now become affordable.

The TINIUS OLSEN® Instruments design team has used recently developed sensor technology to create a new industry standard for Vickers hardness testing, eliminating weights and complex mechanical control systems.

The closed loop system applies force, calculates, filters and controls digital data in a 32-bits embedded CPU system.

The tester has a 6 position turret which can be customized by using different indentors, objectives, stages or Video systems, meeting your particular request and your budget.

During the assembly process the FH-11 series will be configured to your particular technical requirements or even painted in your company style colours.

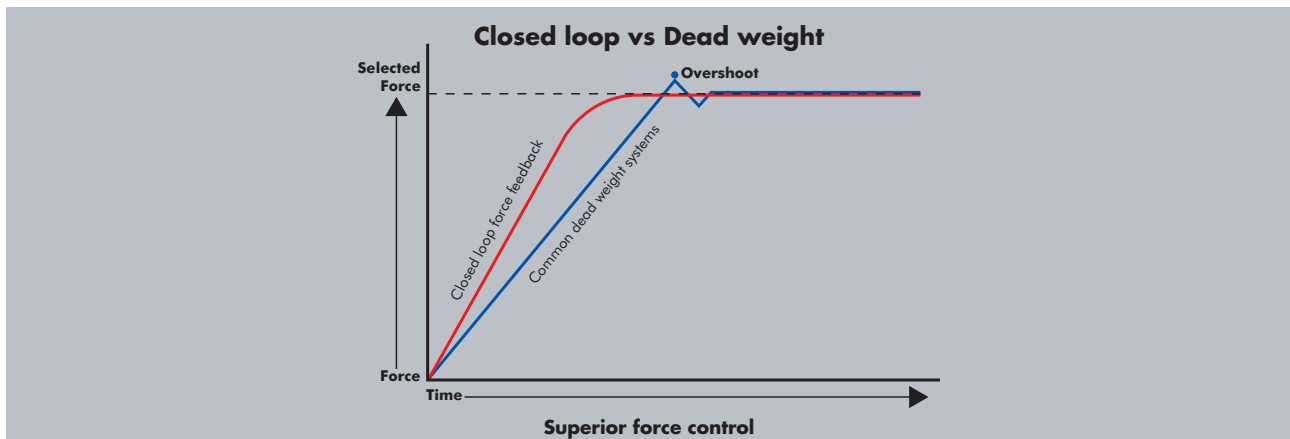
The unique design offers the possibility to start with a basic system and to upgrade at a later stage. Force range, indentors & objectives can be updated at any moment at any location in the world.

The FH-11 series is designed and built in The Netherlands, Europe, and meets all applicable EN, ISO and ASTM standards.

Test procedure control

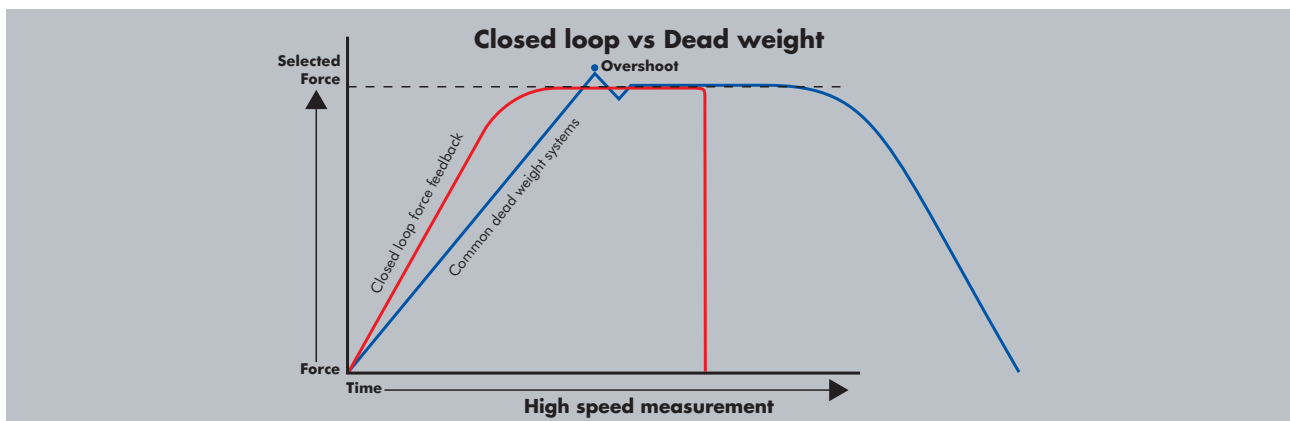
Traditional hardness testing systems use a “dead weight” mechanical design or inaccurate spring force mechanism to apply the test force. Such systems are lacking test control, as there is no feed-back on the actual applied force.

The Closed Loop technology with a force feedback system, as applied in the FH-11 Series, constantly measures and controls the applied force on the tester’s indenter and tested surface. Consequently, this superior control system offers an almost unlimited selection of test loads and test rates for virtually any test condition imaginable.



Accuracy, reliability & efficiency

Elimination of overshoot due to sophisticated algorithms detecting contact with the indenter and the tested object’s surface. The application and removal of the test force is fully automatic, as well as the positioning of the indenter and the pre-determined objective. The result is an absolute vibration free operation while reducing the operator’s workload to a minimum.



CONTENTS

1.	UNPACKING & CHECKING CONTENTS	8
1.1	Unpacking	8
1.2	Accessory Box	9
1.3	Accessories mounted on the tester (depending on purchased options)	10
2.	MAIN UNIT	11
2.1	Hardness tester body	11
3.	INSTALLATION OF THE HARDNESS TESTER	12
3.1	Installation conditions	1
3.2	Levelling	13
3.3	Installation of the indentors	13
4.	PREPARING FH-11 FOR OPERATION	14
4.1.	HORIZON™ Firmware	14
5.	USING FH-11	15
5.1	Power on	15
5.2.	Functions of HORIZON™	16
5.3.	Scale selection	17
5.4.	Manual/automatic	22
5.5.	Conversion mode	23
5.6.	Statistics	24
5.7.	Dwell time	25
5.8.	Diagrams	26
5.9.	Limits	27
5.10.	Archive	28
5.11.	Tester	29
5.12.	Visual	32
5.13.	System	34
5.14.	Service	36
5.15.	Help	37
5.16.	Program function	38
5.17.	Indent measure function	40
5.18.	Single measurement with save function	42
5.19	Delete single measurement	42
5.20	Escape function	42
5.21	Additional functions	43

6.	CALIBRATION PROCEDURES	45
6.1	Force calibration	45
6.2	Objectives calibration	45
6.3	Maintenance advice	45
7.	PERIODICAL INSPECTION	46
8.	TECHNICAL SPECIFICATIONS, STANDARD DELIVERY AND ACCESSORIES	47
8.1	Technical drawings	50
9.	TROUBLE SHOOTING	51
10.	REPLACE OF FUSE	53

1. UNPACKING & CHECKING CONTENTS

This section describes unpacking conditions and standard accessories.

1.1 UNPACKING

When you receive the product, unpack it and check if all components are included.

NOTE:

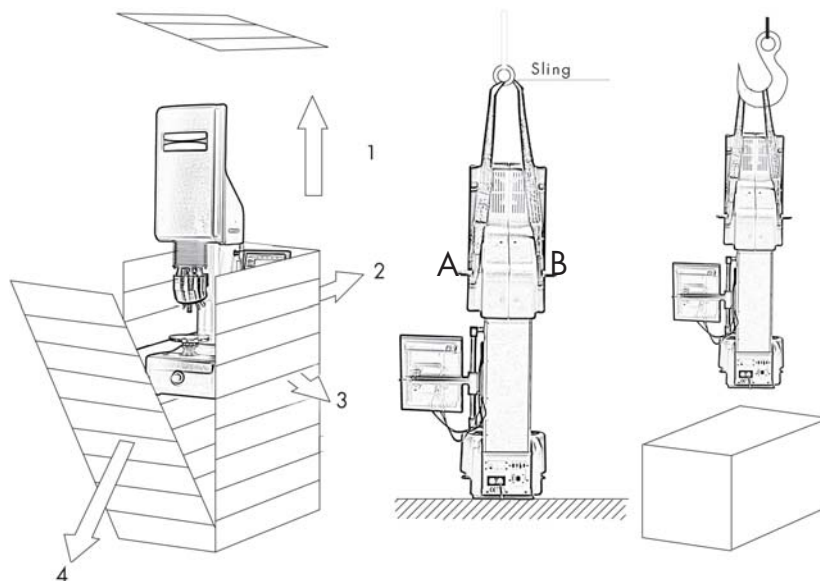
While unpacking the unit, use no extreme force to remove the packing materials. The accessories box is placed next to the instrument and separated by soft materials to avoid damage to the tester. REMOVE the accessory box first! STORE the packing material in a safe place as you might need it again. Never ship or transport the tester without the correct packing materials or with the transportation safety mounted between the turret and the spindle not being in the correct place. This can cause severe damage to the tester.

The hardness testing machine must always be transported standing upright!

Delivered in a wooden case:

Handle the case very carefully. The tester is top-heavy and may topple easily.

- Remove cover from upright case, by taking the steel clamps of the wooden panels.
- Unpack accessories and check - against delivery bill - for completeness. In the case of discrepancy, re-check packing material for hidden items. If the discrepancy persists, please inform your local distributor.
- Remove plastic transport cover (bag).
- Disassemble side walls.
- Remove plastic hole covers at positions A and B.
- Insert steel bar of approx. 75cm length, 25mm diameter through the top of the tester **carefully**.
- Lift hardness-testing machine with care. Use a crane to lift the tester of the pallet and have it transferred to the place of installation. The hoisting slings should be positioned on the steel bar in such a way that no pressure will be made to the ABS top cover of the tester.



Unpacking and transport of hardness tester (wooden case)

- 1 Lift the tester 50cm of the floor.
- 2 Remove four nuts with which the machine is fixed to the floor panel of the case (never transport the tester without fixing it to its original floor panel).

Putting hardness tester into place

When choosing the site of installation of a FH-11 series machine, make sure that the LCD screen will not be exposed to fierce light.

1.2 ACCESSORY BOX

- V-anvil $\varnothing 80\text{mm}$
- Flat anvil $\varnothing 80\text{mm}$
- Testing table $\varnothing 200\text{mm}$
- Power cable
- Adjustable vibration dampers

NOTE 1:

Some components or parts may be packaged separately and may not be included in the accessory box or may have been installed on the hardness tester.

NOTE 2:

Special options may be set in the places which are left blank.

1.3 ACCESSORIES MOUNTED ON THE TESTER (DEPENDING ON PURCHASED OPTIONS)

1. Motorized XY stage, round table inclination stage
2. Large testing table



2. MAIN UNIT

This section describes the individual parts of the main tester body

2.1 HARDNESS TESTER BODY

1. Front head cover
2. Touch screen 15"
3. Adjustable screen lever
4. Screen height adjustment
5. Emergency switch
6. Vibration dampers
7. Table and anvil support
8. Anvil (or table)
9. Motorized turret with 3 objectives and 3 indentors
10. Force actuator protection sleeve
11. Reset button (some models)
12. AC power input
13. 4 USB connectors
14. Power switch
15. Connection for motorized XY stage
16. RJ45 LAN connector
17. Blind plate
18. Built-in W-LAN
19. Wireless keyboard
20. Wireless mouse



3. INSTALLATION OF THE HARDNESS TESTER

This section describes the correct way of installing your FH-11 series hardness tester

3.1 INSTALLATION CONDITIONS

Install the hardness tester system in the conditions shown below in order to make full use of its functions and performances and to avoid defects or inaccuracy of any kind.

VIBRATION

- Install the hardness tester in a place free from floor vibrations.
- Install the hardness tester on a rigid floor securely fixed (Do not install it on a high or infirm floor.)
- Do not install the hardness tester in a place where many people come and go.
- Do not install the hardness tester near equipment generating vibrations.
- Install the hardness tester on the first floor of a building if possible.
- Do not install the hardness tester in a building near a road with heavy traffic.
- Do not install the hardness tester in a building where a crane, vibration tester or similar equipment is installed.

NOTE:

Vibrations transmitted to the hardness tester result in inaccurate measurement in particular in low force application procedures.

WIND, SOUND & HUMIDITY

- Do not install the hardness tester in a place directly exposed to the wind from an air conditioner, etc.
- Do not install the hardness tester in a room with excessive air circulation.
- Do not install the hardness tester near an entrance or an exit. (Wind and vibrations)
- Do not install the hardness tester near equipment generating sound. (Acoustic vibrations)
- Ambient temperature 10°C to 35°C
- Recommended temperature: 21 ± 3
- Ambient humidity 70% RH or less. No dew condensation allowed.

WORKBENCH

Place the hardness tester on a horizontal work bench (such as a cabinet, desk or table).

The installation area needed is not less than 600 mm in width, 850 mm in depth and 700 mm in height.

The work bench should be rigid and withstand a load over 250kg.

NOTE 1:

Do not apply any impacts to the hardness tester when moving it and do not tilt it by 30 degrees or more.

NOTE 2:

When carrying the tester, be careful not to bring your hands, etc. into contact with the turret.

3.2 LEVELING

The FH-11 system is equipped with a unique load application system which is not sensitive to correct leveling. Nevertheless, to eliminate possible wear and tear on the tester's mechanical structure we advise to make sure that your tester is correctly leveled.



Your FH-11 is standard supplied with 4 adjustable vibration dampers.

Install the dampers on the tester if not installed yet and use a correct key to adjust the height of each damper.

3.3 INSTALLATION OF THE INDENTORS

The FH-11 is equipped with pre-installed indentors following your particular request. Indentors for this machine have specific dimensions and quality approval. Replacing the indentors by non-genuine indentors (indentors from another manufacturer which are not original indentors) can lead to severe damage on your instrument (which is not covered by guarantee) **ALWAYS USE ORIGINAL 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. Entirely and securely insert the shank into the holder. Before you test a specimen, install an anvil and run a test on a test block to securely seat the indenter.

4. PREPARING FH-11 FOR OPERATION

The FH-11 is a complex mechanical/electronic equipment which requires professional installation from well trained staff.

We strongly recommend to opt for installation and training by TINIUS OLSEN service personnel.

Defect or damage caused by wrong operation or unsuitable installation are not covered by any warranty.

Make sure that the tester is calibrated (forces & test result) by TINIUS OLSEN® or any authorized service partner at your location.

1. Install the tester in a proper environment as described on previous pages.
2. Adjust the LCD screen in a proper position
3. Connect FH-11 with the mains and with your local area network (LAN)
4. Install a suitable anvil
5. Connect the tester with the main power.
6. Assure yourself that there are no objects between the turret and the test table.
7. Switch on the main power.
8. Wait until Windows has fully started and the user interface (HORIZON™) has been started (automatically).
9. You are now ready to work with the FH-11.

4.1. HORIZON™ FIRMWARE

HORIZON™ is the advanced user operating system of the FH-11 series. The software incorporates, manual and automatic measurement for all scales, image editing, file storing, image storing, report printing, turret operation, manual or automatic focusing and many other advanced functions.

The firmware converts to 3 different hardness (and tensile) scales simultaneously. The conversions can be set to material and standard (ISO/ASTM)

The system also controls an (optional) X-Y stage, rotary or inclining table that can be plugged into the standard built-in driver of the tester. No additional charges, no external devices.

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

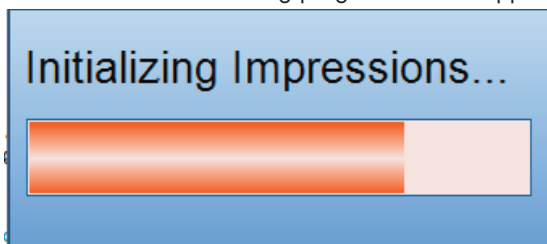
All data can be copied or exported in to MS applications like Word, Excel, or a report generator that emails test results directly to your workstation, or server. All data can be accessed over the LAN or WLAN connections.

5. USING FH-11

This section describes the correct way of getting started

5.1 POWER ON

Switch on the tester using the red color ON/OFF button on the back panel. Windows 7 will automatically start up. Once Windows 7 has been initialized, it will automatically start up the TINIUS OLSEN® hardness testing firmware HORIZON™. The following progress bar will appear.



NOTE 1:

Make sure that the emergency stop switch on the front side of the tester is not activated as the tester hardware won't power on in such case and one or more failure messages will appear on the screen.

NOTE 2:

If the tester has been started with the emergency switch turned off, turn the emergency switch slightly to the right. If the switch was locked it will unlock automatically. Now close the HORIZON™ application in the following way: Press the button SYSTEM and choose the option EXIT in the menu. Now restart the HORIZON™ application on your Windows screen.

NOTE 3:

A correct start up of your HORIZON™ system and the hardness tester hardware will show the following screen without any failure or error messages.



Fill in the user name and password that has been supplied to you in the attached envelop.

Press **ENTER**

The username/password box and keyboard will disappear from your screen and the user interface HORIZON™ is unlocked and ready for operation.

NOTE:

If the tester has been used before, you also might log in with your stored username and password.

5.2. FUNCTIONS OF HORIZON™

Your tester is equipped with a touch screen. Push gently in the middle of the designated buttons for tester operation. Do not use any sharp objects. If you find the touch screen inconvenient, you might use the external keyboard and mouse.



1. Scale selection
2. Handle archive
3. Tester settings
4. Visual settings
5. System settings
6. Service settings
7. Help function/manual
8. Program file indication
9. Manual or automatic tester operation
10. Rockwell depth indication, Vickers, Brinell diameter reading
11. Measured value
12. Results list
13. Conversion mode
14. Statistics ON/OFF
15. Dwell time setting
16. Indentation video screen
17. Statistics bar
18. Diagrams selection
19. Limits settings
20. Program mode
21. Delete one or all
22. Escape to live screen
23. Save test results
24. Measure indentation
25. Full screen mode
26. Zoom indentation
27. Print results report
28. Zero depth reading scale
29. Shape correction settings
30. Test Pattern (optional)

31. Force control indication
32. Position and speed indication
33. Diagrams screen
34. Start/Stop button
35. Illumination control
36. Toggle between light sources
37. XY stage controller, return to centre
38. XY stage direction buttons
39. Start auto focus
40. Focus UP/DOWN button
41. Fast head UP/DOWN buttons
42. Push to turn turret clockwise
43. Turret position indicator

5.3. SCALE SELECTION (1)

Press button number 1 for scale selection.

This function allows you to choose the required test scale and its particular settings



Available scales depend on particular tester configuration (FH-11-0000, FH-11-0001 or FH-11-0002).
Press on the required scale button.

In this particular screen **Rockwell** has been highlighted. Next to the column of hardness testing procedures, you find an overview of Rockwell scales, press the required scale.





After pressing the required scale the tester has been setup for Rockwell testing.
The user interface will display all settings as shown on the left side.



In this particular screen **Vickers** has been highlighted. Next to the column of hardness testing procedures, you find an overview of Vickers forces, press the required force.

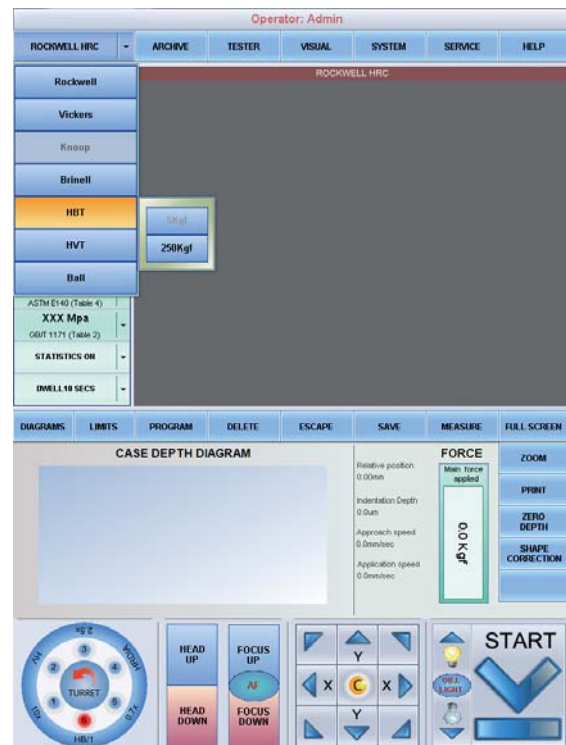
After pressing the required force the tester has been setup for Vickers testing. The user interface will display all settings as shown on the left side.





In this particular screen **Brinell** has been highlighted. Next to the column of hardness testing procedures, you find an overview of Brinell forces, press the required force.

In this particular screen **HBT** has been highlighted. Next to the column of hardness testing procedures, you find an overview of HBT scales, press the required scale.





In this particular screen **HVT** has been highlighted. Next to the column of hardness testing procedures, you find an overview of HVT scales, press the required scale.

In this particular screen **BALL** has been highlighted. Next to the column of hardness testing procedures, you find an overview of Ball indentation forces, press the required force.



5.4. MANUAL/AUTOMATIC (9)

The FH-11 series offers you the possibility to test in the manual or automatic mode.

Manual mode:

In the manual working modus FH-11 requires operator action for each step in the indentation and measuring procedure. After selecting the correct scale, push the START button. FH-11 will now start to make the indentation procedure. This, regardless of the testhead position (make sure the indenter is close to the surface of the workpiece to avoid long approach time). After an indentation has been made, the tester will stop.

In case of a Rockwell test, the test value can be read from the screen on position 11.

In case of Vickers or Brinell tests, the indentation will be shown on the video screen.

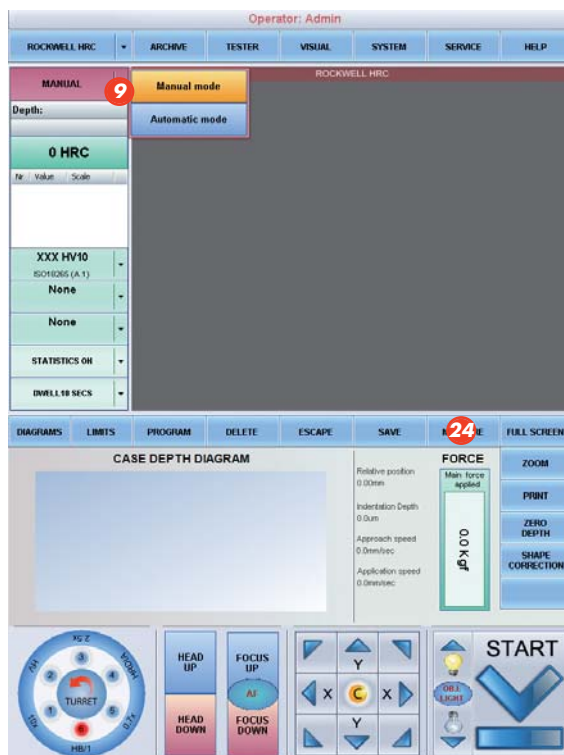
Now press MEASURE (button 24) enter into the measuring menu. Press MEASURE again for automatic measurement of the indentation or measure manually to determine the indentation width or diameter.

Store the values if required.

Automatic mode:

In the automatic mode the FH-11 will not required operator action, besides pressing the START button.

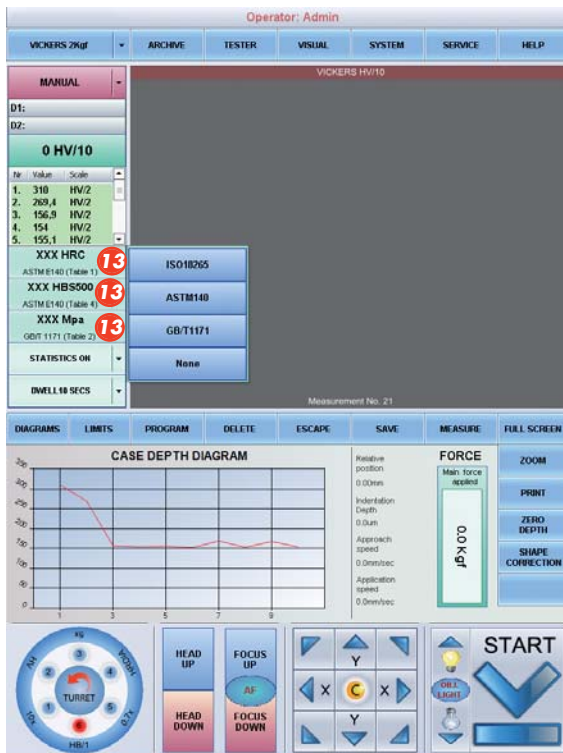
After pressing the START button, the tester will make an indentation according to tester settings and measure the indentation width or diameter (in case of Vickers, Brinell or Knoop), displays and offers the option to delete or store the test values.



In this particular screen **Manual mode** has been highlighted. Press **MANUAL** to proceed the manual operation or **AUTOMATIC** to proceed the automatic operation.

5.5. CONVERSION MODE (13)

Hardness testing values of one certain scale can be converted to three other hardness scales (Tensile scale) simultaneously.



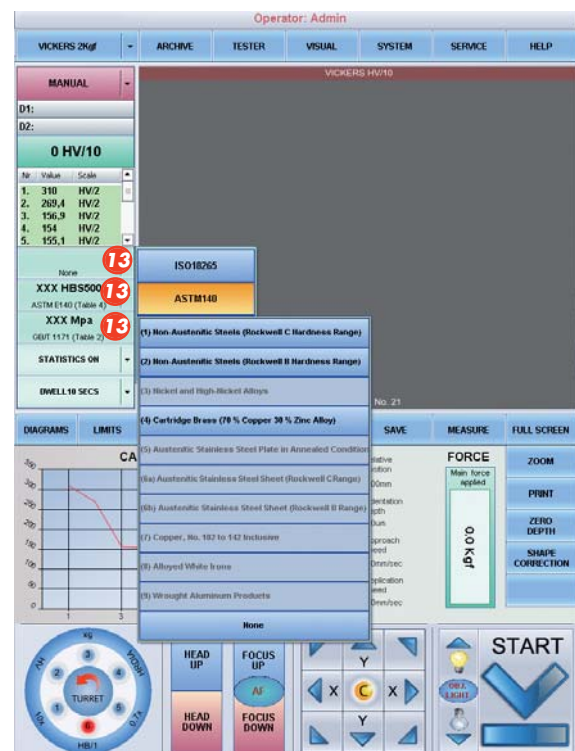
By pressing the button(s) 13 (3 buttons) a screen of applicable standards appears. You can choose from conversions according to ISO 18265, ASTM140, GB/T1171 tables.

In this example we have set a Vickers HV10 test scale with conversion to ASTM140 conversion tables.

Only selectable choices have been highlighted. Press the conversion button that fits to your requirement. Conversion settings that can not be selected in combination with the tester setting (Vickers HV10) have been faded.

Repeat this procedure for any of the 3 conversion displays for simultaneous hardness indication of different hardness scales.

Remember that each possible hardness test scale allows different conversion settings.



5.6. STATISTICS (14)

The video window (16) can show an additional information field also indicated as the statistics bar. If statistics are switched to ON, a light grey bar will appear on the bottom of the video screen showing all online statistics such as quantity of measurements, min. value, max. value, average value, etc.



By pressing the button ON and the statistics bar will appear in the video frame.

By pressing the button OFF, the statistics bar disappears from the video frame.

5.7. DWELL TIME (15)

The dwell time setting (is the time that the indenter will remain under force on the to be tested material) and can be easily changed at any moment (NOT during testing).



By pressing the button DWELL (15) a screen with 3 different dwell time settings will appear.

The most important setting for normal testing circumstances is the MAIN LOAD DWELL TIME.

Use the arrows to in- or decrease the dwell time and press on the dwell time number to save the setting.

NOTE:

Only change pre-load dwell time or recovery dwell time if particular testing circumstances describe off standard values. Make sure that pre-load dwell time and recovery dwell time will match the required ISO, ASTM, or JIS standards.

5.8. DIAGRAMS (18)

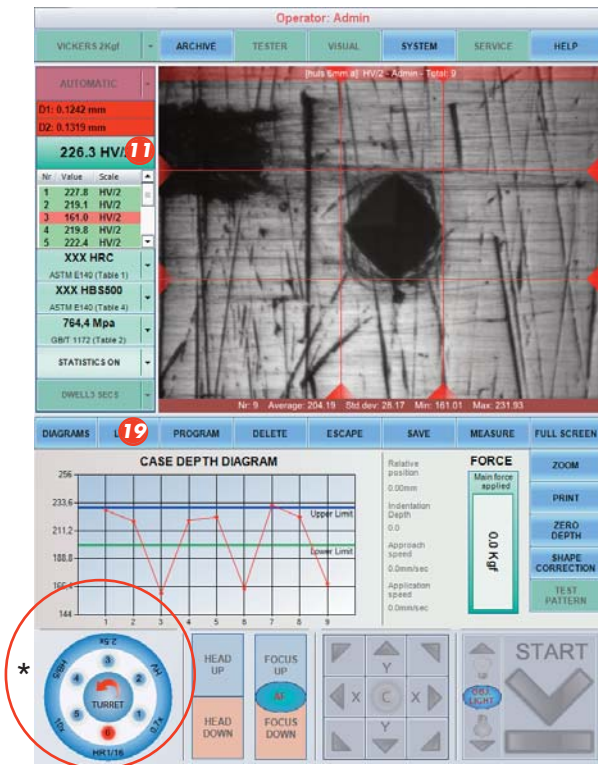
HORIZON™ automatically calculates the hardness diagram, such as CHD and displays the graphic in the graphics window position 33.



By pressing the button DIAGRAM (18) you get access to additional optional diagrams. Ask the sales department for more details.

5.9. LIMITS (19)

To allow fast GO/NO GO procedures, test limits can be set. Once limits has been set the actual measured hardness value will display in either a green field (11) in case of GO or red field in case of NO GO.



By pressing the button 19 you get access to the upper and lower limits settings. Use the keyboard * that appear in the left bottom corner of your screen to enter the required hardness numbers.

Mark the position ACTIVE to activate the limit settings.

Press OK to save the setting.

After LIMITS has been set, upper limit bar (blue) and lower limit bar (red) will appear in the diagram.

5.10. ARCHIVE (2)

Storage of test results.

After one single or a number (batch or test has been performed) the results can be stored for later use. HORIZON™ stores test results, statistics, individual numbers and video images in case of Vickers Knoop and Brinell. The system further stores test dates, user ID and workpiece information.



By pressing the button ARCHIVE (2) the following options will appear on your screen: Open, close, save and delete.

Press the required choice.
In the following example we will store a test result.

By pressing OPEN, the archive opens and shows a list of stored test results.

Press the required choice.
Select the test result storage line if you want to open the file in the testers main screen.

By pressing CLOSE, the selected file closes and the main screen shows the previously selected testing parameters.



By pressing SAVE, you are required to fill in a file name before storing the test results in the data base.

By pressing DELETE, you can delete a test result or a file.

5.11. TESTER (3)

Turret configuration

The FH-11 series is equipped with 6 position (revolver) turret. The turret holds a free definable set of indentors and objectives. The calibration of all 6 positions is a high precision task which can only be done by TINIUS OLSEN® service staff. Never untighten any indenter base or objective base as this will disturb the alignment and the accuracy of each turret position. In order to run successful automatic hardness testing programs the turret configuration needs to be set accurately indicating the correct mounted indentors and objectives. Indentors and objectives can be freely positioned in the therefore preserved spaces.



By pressing the button TESTER (3) a submenu opens and allows you to choose from TURRET CONFIGURATION, XY STAGE and INFO.

TURRET CONFIGURATION allows you to fix and indicates indentors and objectives positions.

INFO shows all relevant tester specifications.

By pressing the button TURRET CONFIGURATION a pop-up window will display the graphic image of the turret and the current settings.

The numbers in the small circle are the respective turret position numbers.

In the large blue circle you can find the corresponding mounted indentors and/or objectives.

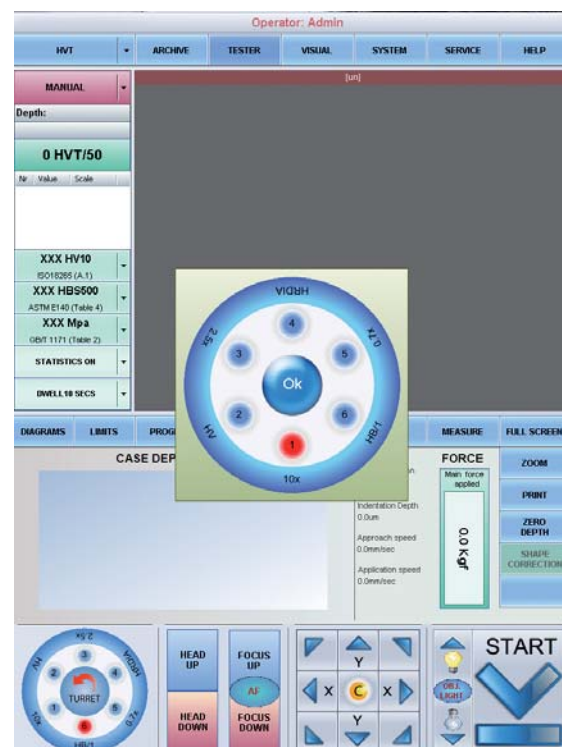
USE OF XY STAGE!

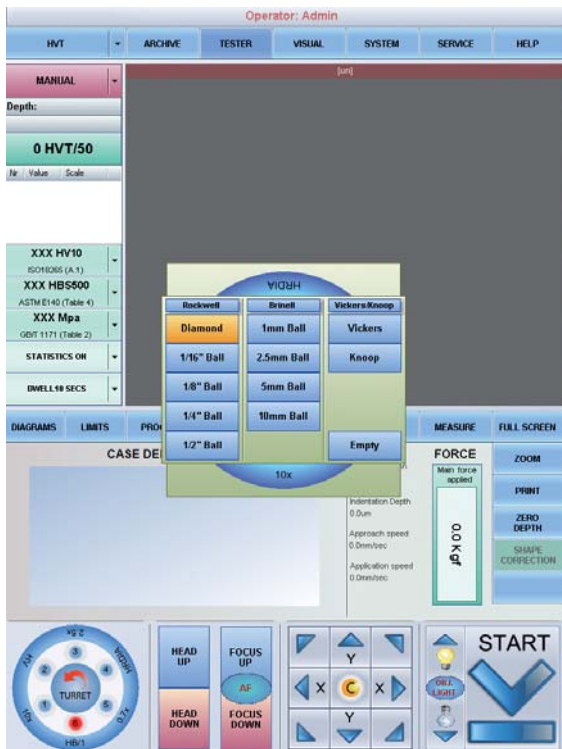
Only use original TINIUS OLSEN® accessories on your FH-11. XY STAGE allows you put it ON or OFF. When the XY STAGE is on, you are limited in your choices of forces, due to the maximum capacity of the XY STAGE.

NOTE:

MAKE SURE THAT WHEN THE XY STAGE IS MOUNTED ON YOUR TESTER, THE SELECTION XY STAGE IS TURNED TO ON.

IF THE SELECTION XY STAGE IS TURNED TO OFF, IT MIGHT BE POSSIBLE TO OVERLOAD YOUR XY STAGE, RESULTING TO SEVERE DAMAGE OR TOTAL LOSS OF YOUR XY STAGE.





Press on the turret position number to open the settings for the corresponding turret position. Choose from the pop-up screen the required indenter setting.

Objective positions can only be set or changed in the service mode. This because calibration of the objectives is required under all circumstances.

After setting the correct indenter a new pop-up screen will be shown. Use the head up and head down function to put the indenter close to the to be tested material and press START. FH-11 will now calibrate the correct indenter length in the turret settings firmware.

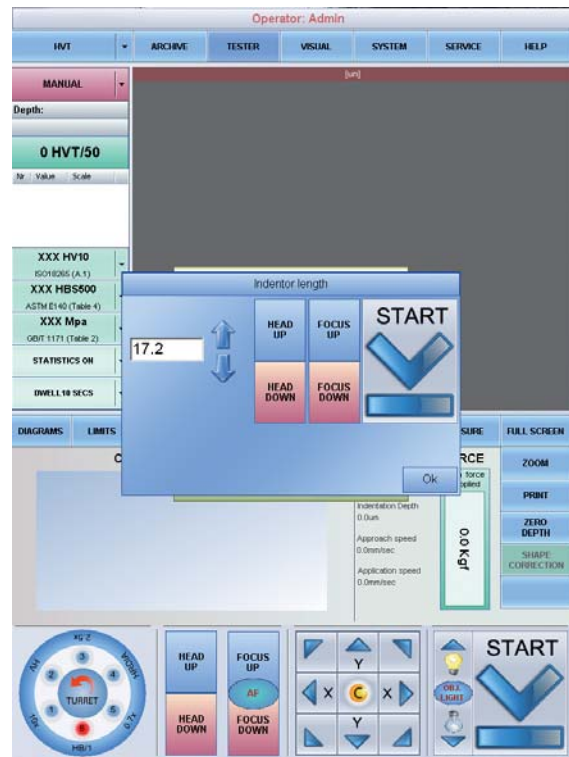
If a larger space between the indenter and workpiece is required, you can use the blue up arrow to simulate a larger indenter.

Understand that a large distance between the indenter and workpiece, will influence test speed in a negative way.

Understand that by shortening the indenter length manually there will be no space between the indenter and the workpiece. And a collision (worse case: crash) with indenter damage could be the result.

BE VERY CAREFULL WITH MANIPULATING THE INDENTOR LENGTH.

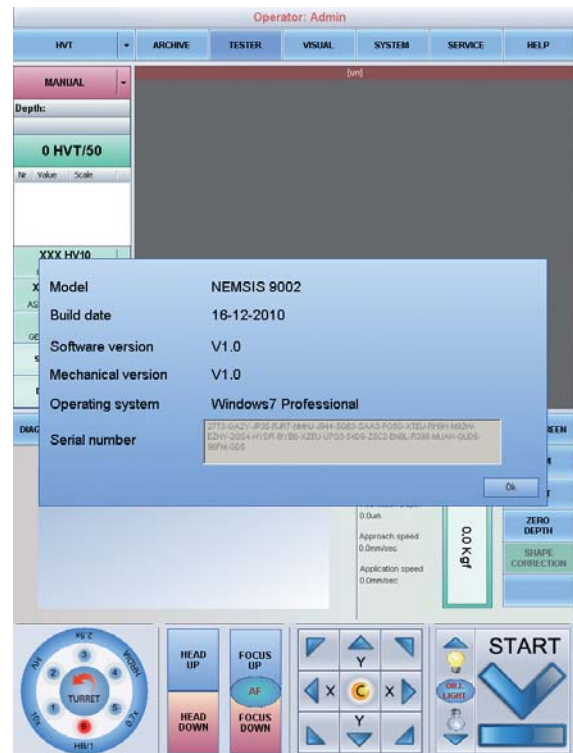
Press OK if the settings are correct.





In case you try to change a objective setting, the following pop-up screen will show you a warning!

By pressing INFO in the TESTER menu, the display shows all relevant tester specifications.



5.12. VISUAL (4)

All settings related to the quality of the video image can be done from this option.



By pressing VISUAL, a subscreen displays the possible video settings.

With CONTRAST you can set the contrast position.

AUTO-FOCUS enables you to focus on the material surface without mechanical surface workpiece detection.

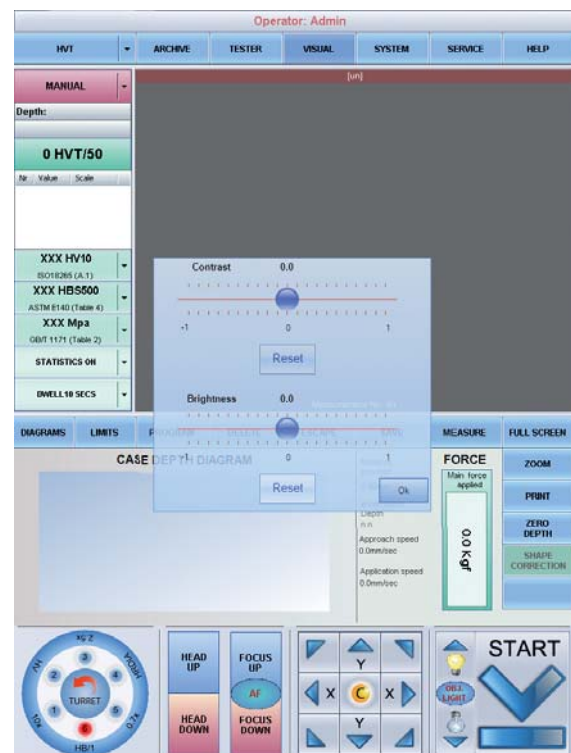
RESOLUTION makes it possible to work in standard in HALF (standard) or FULL RESOLUTION (slow) mode.

By pressing CONTRAST a pop-up screen opens a virtual slider that can be operated by hand or by mouse.

Besides CONTRAST also BRIGHTNESS can be adjusted.

RESET returns the slider to the factory position.

OK stores the setting.





AUTO-FOCUS enables you to focus on the material surface without mechanical surface workpiece detection. Press AUTO-FOCUS and wait until the image in the indent video field has sharpened.

This process normally applies automatically before Vickers or Brinell indentations if the tester is set to automatic.

RESOLUTION makes it possible to work in HALF (standard) or FULL RESOLUTION (slow) mode.



5.13. SYSTEM (5)

This menu allows you to set, change or delete users, usernames, user rights and passwords. The menu allows you to logout from the HORIZON™ firmware as a user or to exit from the HORIZON™ firmware and return to the Windows 7 main screen.



Press position 5 to enter in to the system settings menu.

Press USERS to add or edit usernames and passwords.

Press PASSWORD to change the password of an existing user.

Press LOGOUT to logout the current user.

Press EXIT to exit from the HORIZON™ firmware and return to the Windows 7 mainscreen.

NOTE:
The user ADMIN can not be deleted.

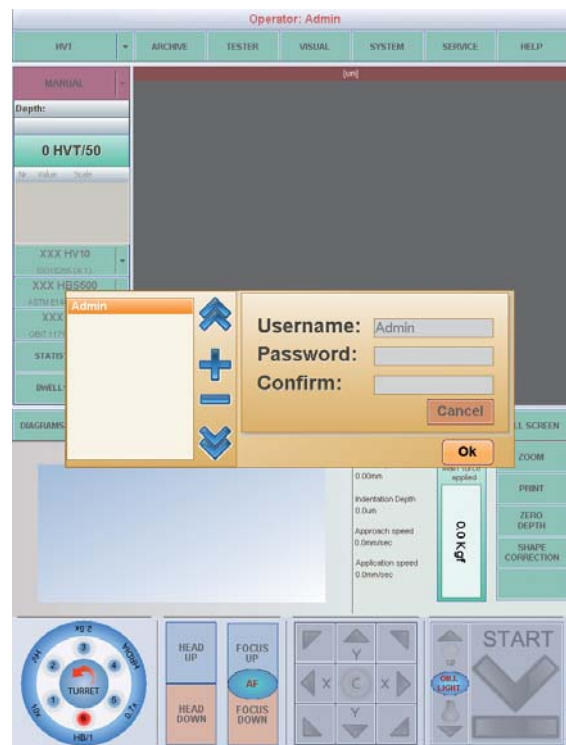
Press USERS to add or edit usernames and passwords.

Press + to enter a new user with a new password.

Press - to remove a user and password (except ADMIN).

The arrows up and down allow you to scroll through the user list.

Press OK to save the changes.





Press **PASSWORD** to change the password of an existing user.

Enter the old password, then enter the new password.
Enter the new password again (at confirm).

If you do not want to store any changes, press **CANCEL**.

5.14. SERVICE (6)

This SERVICE menu allows access to important machine settings. Pending the password certain levels of the machine setting can be reached. Your distributor has access to the password that is required for calibration and adjustments. The TINIUS OLSEN® service engineer has access to a higher level of machine settings.

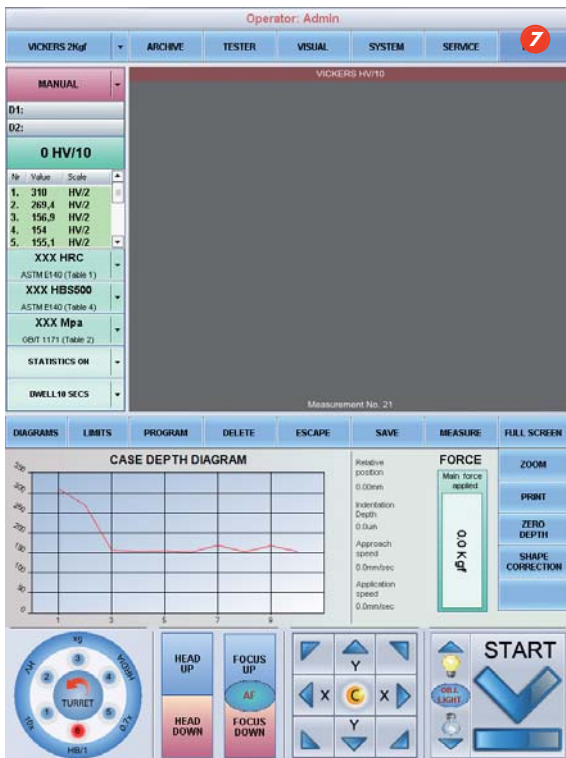


It is strongly recommended NOT TO MAKE ANY CHANGES to the machines factory settings. If any changes are made to the standard factory settings, which result to the malfunctioning of the tester or the firmware and such intervention of TINIUS OLSEN® is required, the support will be charged.

If calibration is required, please contact your supplier or TINIUS OLSEN® directly.

5.15. HELP (7)

Press HELP to enter this manual electronically. The manual is stored as a PDF file.



5.16. PROGRAM FUNCTION (20)

One of the FH-11 functionalities is to store test programs for frequently returning testing tasks/objects. This will reduced the set-up time of your tester.



Set-up your tester for your workpiece as described in the manual.

By pressing PROGRAM you can save the current tester settings.



Enter a program name suitable for your workpiece. It might be text or numbers or a combination of both.

By pressing SAVE you store the program including it's settings.



To select an existing test program, press VIEW in the program screen. The list with previously stored test programs opens.

Press on the required program line.

Press SELECT to load a test program or press DELETE to delete a test program.

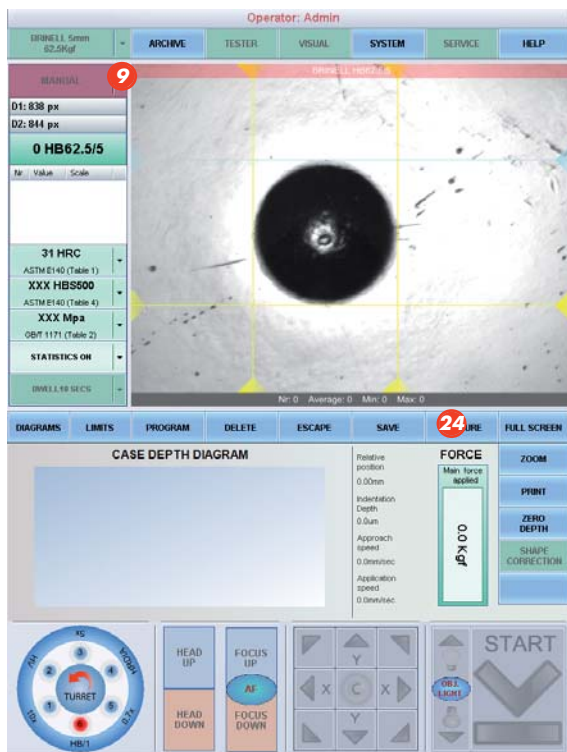
NOTE:

All programs that are created by TINNIUS OLSEN® can not be deleted.

Press CANCEL to exit from this function.

5.17. INDENT MEASURE FUNCTION (24)

After an indentation has been made (Brinell, Vickers, Knoop) the tester will either perform a automatic test if the function 9 has been switched to automatic. If function 9 has been switched to manual the system will not proceed with an automatic measurement.



AUTOMATIC

Make a hardness indentation according to your requirement. After the indentation has been made the turret will position to the original pre-indentation set objective, for image viewing.

After a second 4 crosslines will appear on the screen. The crosslines will than automatically position on the edges of the indentation.

After this process the hardness value will appear on the screen.

MANUAL

Make a hardness indentation according to your requirement. Position the turret with the correct objective for indentation viewing over the indentation.

Focus so that the image is sharp. Now press measure. After a second 4 crosslines will appear on the screen. Press measure again; the crosslines will now automatically position on the edges of the indentation. After this process the hardness value will appear on the screen.

FINE ADJUSTMENT

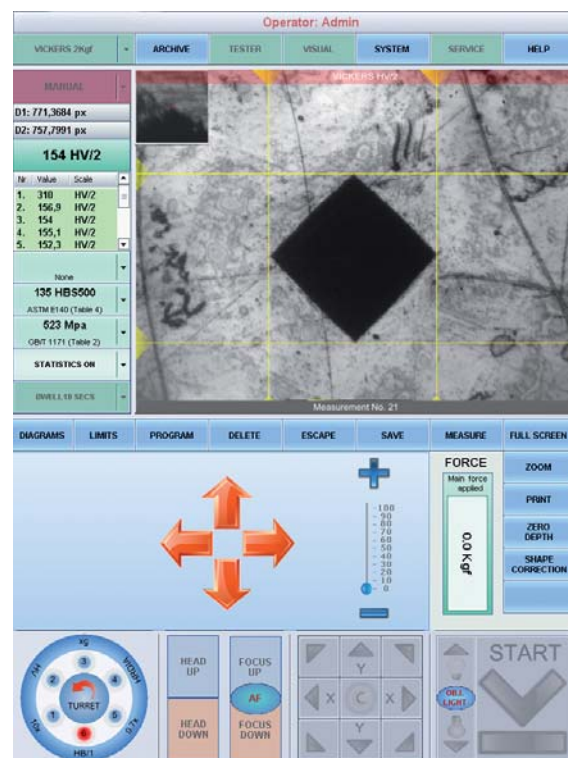
Press on 1 of the yellow pyramids at the end of the crossline. The diagram screen will now change to the fine adjustment and zoom screen.

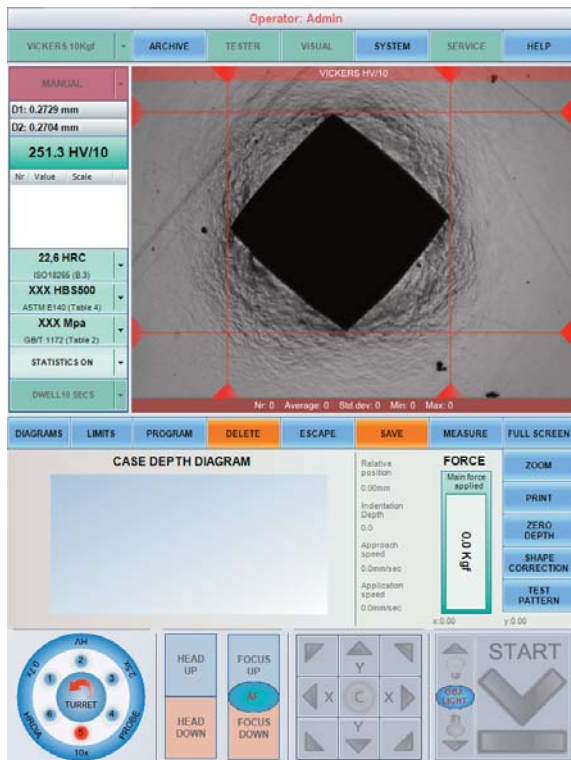
Select 1 of the crosslines by touching the crossline or the yellow pyramid. Use the 4 red arrows to navigate the crossline to the required position. The selected crossline will be highlighted red.

To ease your task a magnified section of the indentation pops up on the left top corner of the video screen.

Press again on the pyramid of the selected crossline to deselect, or select directly another crossline. Repeat this procedure for each crossline if required.

The adjusted hardness value shows directly on the screen.





UNSUITABLE MEASUREMENT

If the difference between length of the horizontal and vertical diagonal varies with 5% or more your measurement is out of ISO/ASTM specification. Therefore the hardness value will be showed in a red background.

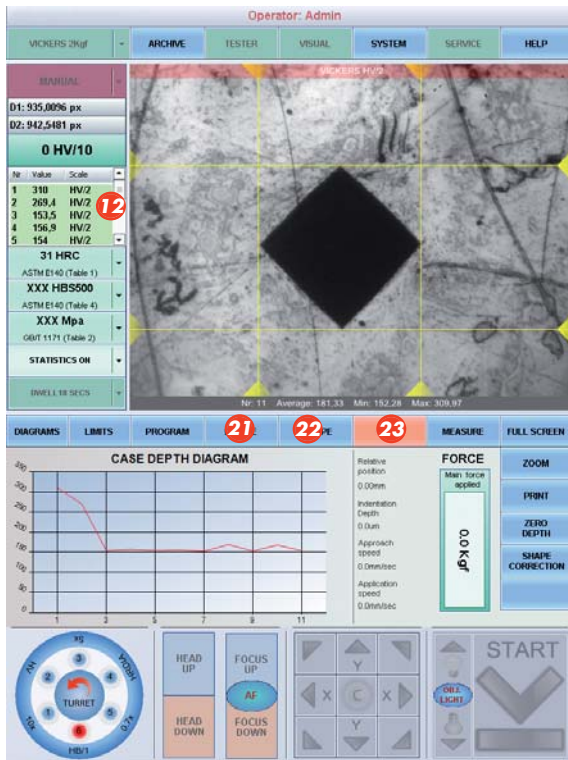
Press SAVE to store the values anyway or press ESCAPE to return to the main screen and make a new indentation.

NOTE:

If a measurement is outside the tolerance of international standards both the SAVE and DELETE button will flash. While the diameter and the test result screen will turn red.

5.18. SINGLE MEASUREMENT WITH SAVE FUNCTION (23)

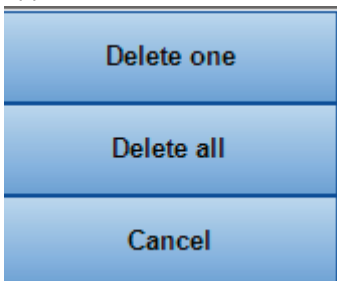
After a measurement has been made you can store the testresult in the batch file of measurements. SAVE stores an individual reading into the batch list.



After a measurement has been made the SAVE button will flash (red), indicating that you can store the results. The result will be added to the batch overview (12) and the system is ready for the next test.

5.19 DELETE SINGLE MEASUREMENT (21)

After a measurement has been made you can store the testresult in the batch file (12) of measurements. You can also delete a selected individual reading from the batch list. Select individual value (reading) and press DELETE. The following screen will appear:



DELETE ONE:
Deletes the selected reading from the batch list.

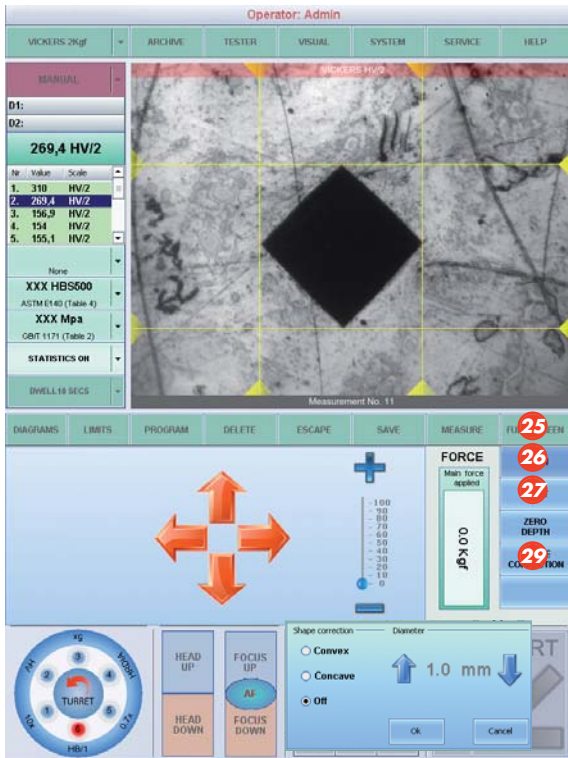
DELETE ALL:
Deletes the entire batch list.

CANCEL:
Closes the delete function without deleting.

5.20 ESCAPE FUNCTION (22)

After or during a measurement pressing ESCAPE will return you to the main screen.

5.21 ADDITIONAL FUNCTIONS



FULL SCREEN function (25)

By pressing FULL SCREEN the video viewing field of the indentation maximizes to full screen mode. Press the button again to returning to normal viewing mode.

ZOOM function (26)

By pressing ZOOM a pop-up screen will appear. A slider allows you to enlarge the indentation size to your requirement. PLUS (+) enlarges the image and minus (-) reduces the size of the image. The red arrows enable to move the zoomed image in 4 directions on the screen.

PRINT function (27)

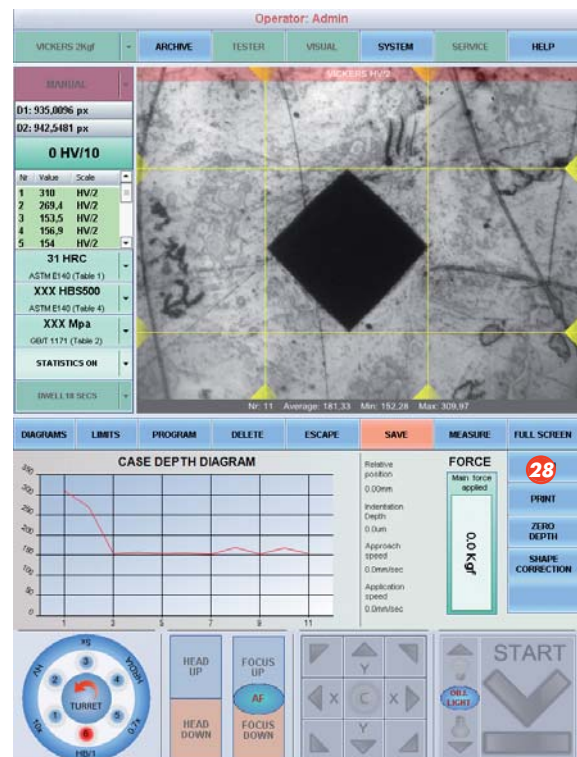
By pressing PRINT a PDF will appear on your screen containing all test data such as all statistics, diagrams, tester settings, measured values, etc. Press OK to print or ESC to the main menu.

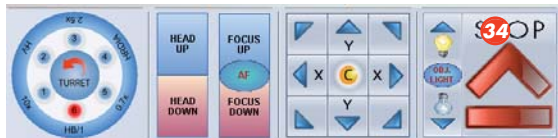
SHAPE CORRECTION function (29)

In cases where round materials are tested the actual readings need to be computed in a different way. By pressing SHAPE CORRECTION a pop-up screen allows you to enter the diameter of the round or curved object to be tested.

ZERO DEPTH function (28)

By pressing ZERO DEPTH the relative position off the indenter is put to zero. This can be useful if in particular cases an absolute position indication of the indenter distance from the workpiece is required.





Start/Stop button (34)

Press this button to START the testing sequence. While the tester is performing a test, or any procedure, the START button turns into a STOP button. Press STOP to stop the tester.

Illumination control (35)

The arrows UP and DOWN allow to control the internal or external illumination source.

Toggle between light sources (36)

Pressing the button 36 changes the light source from internal (through objective) to ringlight.

XY stage controller, return to centre (37)

Pressing this button will return the optional XY stage to its ultimate centre position.

XY stage direction buttons (38)

The XY buttons can be used for positioning the optional XY stage in the required direction manually. (For automatic traverse measurement, purchase the optional software package)

Start auto focus (39)

By pressing this button the tester will perform a fully automatic procedure to focus on the test object surface. The focussing procedure exist of two parts, mechanical auto-focus, image analyzing auto-focus.

Focus UP/DOWN button (40)

Use these buttons for manual focus or fine positioning.

Fast head UP/DOWN buttons (41)

Use these buttons for rough positioning of the test head.

Push to turn turret anti-clockwise (42)

By pushing this button the turret will turn anti-clockwise to the next available position. It is also possible to push directly on the required turret position.

Turret position indicator (43)

The selected turret position will be highlighted red.

6. CALIBRATION PROCEDURES

The FH-11 is equipped with a highly sensitive and accurate load cell system. The settings of the electronic system are calibrated at the TINIUS OLSEN® assembly lab and is brought to ultimate performance before the tester was shipped to you.

It's unlikely that you need to adjust any settings of your FH-11 in the normal product life.

It is recommended however to ask the TINIUS OLSEN® service department to have your tester inspected periodically and to calibrate (if necessary) the force application system.

6.1 FORCE CALIBRATION

In the event that the force application of your tester needs to be recalibrated please seek advice from your supplier or contact the service department of TINIUS OLSEN® directly.

To calibrate the applicable force of your FH-11 hardness tester, specific equipment is required (range of calibrated precision load cells).

6.2 OBJECTIVES CALIBRATION

During the assembly process, the objectives on your FH-11 tester have been calibrated. Such calibration applies to the particular objectives. Replacing objectives requires calibration of the optical path. Such calibration can only be done by your supplier or contact the TINIUS OLSEN® service department directly.

6.3 MAINTENANCE ADVICE

Do not clean your tester with chemical solutions such as "thinner" or white spirit as this can cause permanent damage to the painting, metallic surfaces or plastics.

Do not use aggressive or abrasive materials.

In case any part needs replacement, use genuine TINIUS OLSEN® parts in order not to disturb the performance of your tester.

7. PERIODICAL INSPECTION

Inspect the following before every hardness test and periodically.

Part	Attention	Action	Precaution
Indenters	Tip dirty	Wipe indenters	Do not use excessive force
Objective or lens	Lens surface polluted	Wipe lens	Do not use excessive force
Anvil	Rust	Remove rust	Do not scratch the surface with abrasive materials
Testblock	Rusted	Replace test block	Do not use rusted test block

8. TECHNICAL SPECIFICATIONS, STANDARD DELIVERY AND ACCESSORIES

Hardness resolution	0.01 Rockwell, 0.1 Vickers, 1 Brinell	
Objectives	3 installed for 0.7x to 1000x	
Test loads	1kgf/9.8N, 2kgf/19N, 2.5kgf/24N, 3kgf/29N, 4kgf/39,2N 5kgf/49N, 6.25kgf/62N, 10kgf/98N, 15.625kgf/153N, 20kgf/196N, 25kgf/245N, 30kgf/294.2N, 31.25kgf/306N, 50kgf/490N, 62.5kgf/612N, 100kgf/980.7N; 120kgf/1176N, 125kgf/1225N, 187.5kgf/1838N, 250kgf/2.45kN, 500kgf/4.9kN, 750kgf/7.35kN, 1000kgf/9.8kN, 1500kgf/14.7kN, 3000kgf/29kN	
Rockwell test scales	A, B, C, D, E, F, G, H, K, L, M, P, R, S, V, 15N, 30N, 45N, 15T, 30T, 45T, 15W, 30W, 45W, 15X, 30X, 45X, 15Y, 30Y, 45Y, HRM	
Vickers test range	HV: 1kgf/9.8N, 2kgf/19N, 3kgf/29N, 4kgf/39,2N, 5kgf/49N, 10kgf/98N, 20kgf/196N, 30kgf/294.2N, 50kgf/490N, 100kgf/980.7N, 120kgf/1176N HVT: 50kgf/490N, 100kgf/980.7N	
Brinell test range	HB1: 1kgf/9.8N, 2.5kgf/24N, 5kgf/49N, 10kgf/98N, 30kgf/294.2N HB2.5: 6.25kgf/62N, 15.625kgf/153N, 31.25kgf/306N, 62.5kgf/612N, 187.5kgf/1838N HB5: 25kgf/245N, 62.5kgf/612N, 125kgf/1225N, 250kgf/2.45kN, 750kgf/7.35kN HB10: 100kgf/980.7N, 250kgf/2.45kN, 500kgf/4.9kN, 750kgf/7.35kN, 1000kgf/9.8kN, 1500kgf/14.7kN, 3000kgf/29kN HBT: 5kgf/49N, 250kgf/2.45kN	
Indentors (optional)	Brinell Balls: 1mm, 2.5mm, 5mm, 10mm Vickers Diamond: 136° Rockwell Diamond Cone: 120° Rockwell balls: 1/16", 1/8", 1/4", 1/2"	
Workpiece accommodation	Vertical capacity	300mm (opt. 500mm)
	Horizontal capacity	220mm (from center-line)
Force tolerance	Max. < 1%	
Force control	1 - 99 sec	
Tester color (standard)	Green / Metallic silver	
Light source	White power LED (Opt. green/blue/red)	
Machine dimensions	400mm x 650mm x 1440mm (WxDxH),	
Machine weight	242kg	
Power consumption	1 Amp	
Power supply	100V AC to 240V AC, 50Hz/60Hz, single phase	

Standard delivery

- Flat anvil ø80mm
- V-anvil ø80mm
- Testing table ø200mm
- Certificate
- Installation and user manual

Optional accessories

- Certified indentors and reference blocks (DKD, UKAS, ASTM)
- Large testing table 350mm x 250mm with T-grooves
- Extra large testing table 450mm x 350mm with grooves and support
- Long bar supports, to ease testing long bars
- Motorized X-Y stages, motorized rotary or tilting tables
- Built-in 5 axis support driver

TECHNICAL SPECIFICATIONS

MODELS

FH-11-0000
UNIVERSAL

SCALES/TEST LOADS/FORCE

1kgf to 250kgf

ROCKWELL, A, B, C, D, E, F, G, H, K, L, M, P, R, V

All scales

SUPERFICIAL ROCKWELL, N, T, X, Y

All scales

MACRO ROCKWELL HRM

Yes

VICKERS HV

1kgf/9.8N to 120kgf/1176N

KNOOP

All scales

HVT

50kgf/490N, 100kgf/980.7N

BRINELL

1kgf/9.8N to 250kgf/2.45kN

HBT

5/250

H (Ball indentation) (ISO 2039/1)

Up to 250kgf/2.45kN

FORCE APPLICATION SYSTEM

Linear force actuator

Standard

Load cell, closed loop, force feed back system

Standard

Motorized heavy duty TURRET with 6 positions

Standard

Indenter positions

3

Objective positions

3

LED optical indent illumination

Standard

LED ring light indent illumination

Optional

OPTICAL MEASURING SYSTEM

5 mega pixels VIEW™ optical ZOOM system

Standard

Auto focus

Standard

Manual focus

Standard

Fully automatic indent measuring

Standard

Manual on screen indent measuring

Standard

Zoom and magnification ratio

0.7x to 1000x

Dual view™ working area overview camera

Optional

External Electronic Brinell microscope and objectives

No

DEPTH MEASUREMENT SYSTEM

Heidenhain™ high resolution optical system

Standard

HARDWARE AND USER INTERFACE

Built-in industrial Pentium PC and harddrives (RAID1)

Standard

Adjustable 15" full color industrial touch screen

Standard

MS Windows® 7 Ultimate license

Standard

HORIZON™ hardness testing firmware

Standard

Automatic image and file storage

Standard

Stores and handles 3000 files and images

Standard

Stores and handles 9000 files and images

Optional

Forms™ set of customized certificates

Optional

Universal motorized X-Y stage controls

Standard

CONNECTIVITY

External digital (DVI) TFT screen output

Standard

External keyboard and mouse connections

Standard

LAN (local area network connection)

Standard

WLAN (Wireless network connection)

Standard

Bi-directional RS-232

Standard

Printer / USB-2 output

Standard

Built-in motorized X-Y stage driver

Standard

**FH-11-0001
UNIVERSAL**

3kgf to 750kgf

All scales
All scales
Yes
3kgf/29N to 120kgf/1176N
All scales
50kgf/490N, 100kgf/980.7N
3kgf/29N to 750kgf/7.35kN
5/250
Up to 750kgf/7.35kN

**FH-11-0002
UNIVERSAL**

10kgf to 3000kgf

All scales
No
Yes
10kgf/98N to 120kgf/1176N
No
50kgf/490N, 100kgf/980.7N
10kgf /98N to 3000kgf/29kN
5/250
Up to 3000kgf/29kN

Standard
Standard
Standard
3
3
Standard
Optional

Standard
Standard
Standard
3
3
Standard
Optional

Standard
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Standard
0.7x to 1000x
Optional
No

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0.7x to 1000x
Optional
No

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Standard

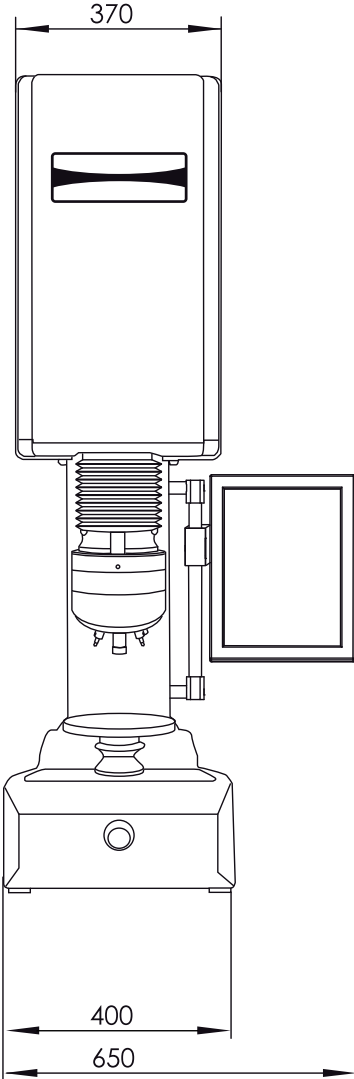
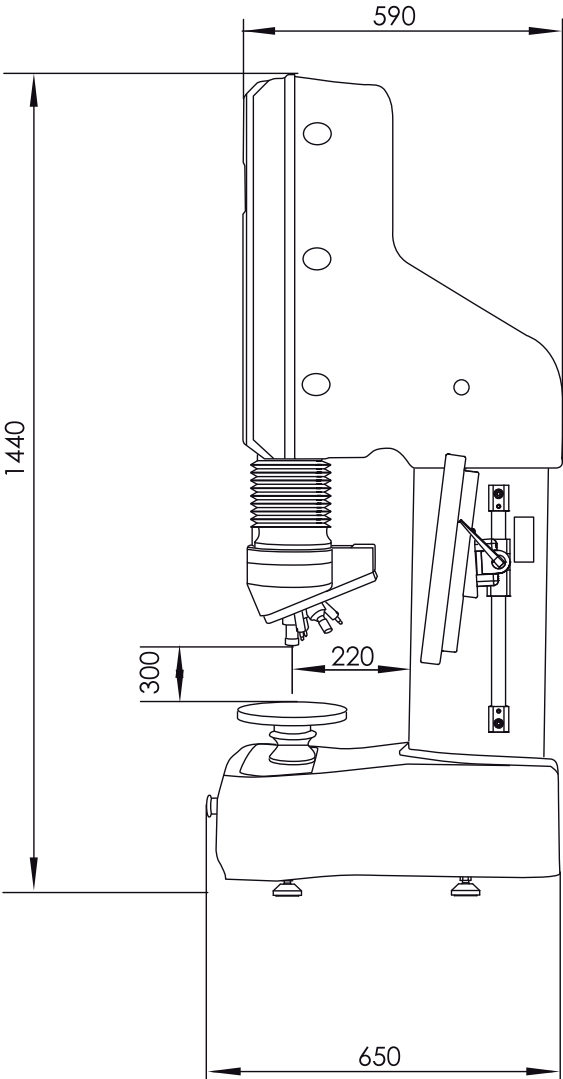
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8.1 TECHNICAL DRAWINGS



9. TROUBLE SHOOTING

In exceptional cases your FH-11 will show particular warning messages.

If you have any doubt about the working of your equipment, please contact the TINIUS OLSEN® service center.



Indentor not present!

No indentor has been selected. Enter into the turret configuration menu and select the installed indentor.



LCA startup

Communication between PC and hardware is failing. Close the HORIZON™ software and start the software again.



Max down Reached!

The maximum down position of the force actuator has been reached. Press OK and use the UP button to release the actuator from its lowest position.



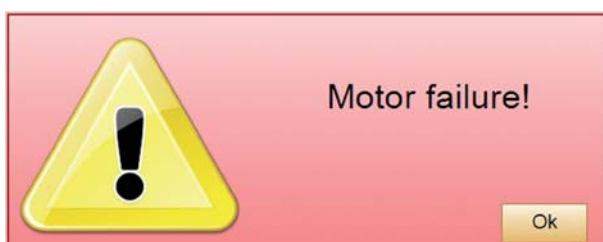
Max up Reached!

The maximum up position of the force actuator has been reached. Press OK and use the DOWN button to release the actuator from its highest position.



Either motor or Heidenhain does not work!

No displacement can be measured. Either the motor or Heidenhain length measuring device fails. Restart the tester and try again.



Motor failure!

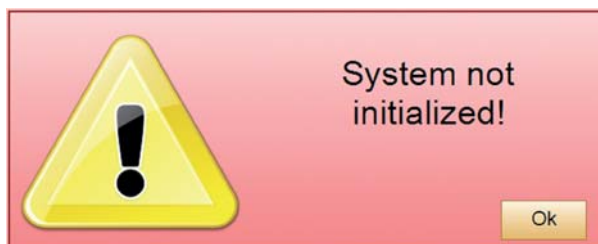
The force application motor fails to work. Restart the tester, if the problem continuous contact the TINIUS OLSEN® service center.



Object detected

While the force actuator is traveling with rapid displacement and an object would touch the turret, the safety system will STOP the force application motor immediately.

Remove the object and continuous the operation.



System not initialized!

WINDOWS failed to communicate with the testers' hardware.

Restart the tester and try again.



Timeout heidenhain readout

Communication failure between heidenhain length measurement device and hardware.

Restart the tester and try again.

If the problem continuous, contact the TINIUS OLSEN® service center.



Trinamic Timeout!

Communication failure between the turret and the testers' hardware.

Restart the tester and try again.

If the problem continuous, contact the TINIUS OLSEN® service center.

10. REPLACE OF FUSE

Disconnect electric power cable from backside of main body after turn off the machine and disconnect remove power line.

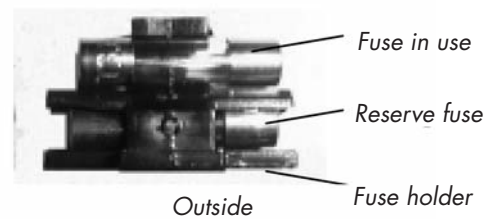
Pull out a fuse holder using screwdriver etc.



Electric power connector

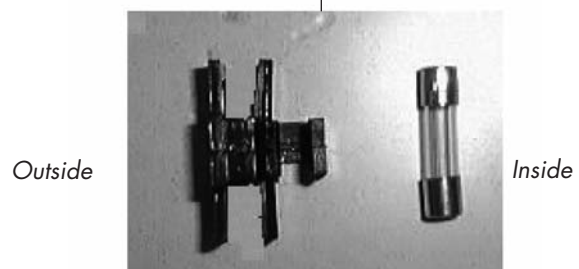
Inside

In the fuse holder, a fuse is stored.



Outside

Take out the fuse which is blown.



Outside

Inside

Mount the spare fuse

Inside

Connect electric power cable



Outside

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