OPERATION MANUAL

MICROBUL 1000-AT
Digital Auto Turret Micro Vickers Hardness Tester with Pc System

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1. Brief introduction

Test loads from 10gf (0.098N) – 1.000 gf (9.8N)
Measuring the indentation diagonal length (the length of the indentation diagonal), the system automatically calculate and display the hardness value；
During the testing, the position of its indenter and objectives can be shifted automatically; hence the auto position (automatic positioning) of testing point is accuracy
Based on the standard block of different forces, the hardness value is automatically corrected (correct automatically)
Test results can be saved on flash disc.
8”touch-screen interface, easy to operate, two language versions
Two objectives both (Both two objectives) can test hardness value
According to the national standard EN/ASTM to automatically convert the hardness value；
Using a modular design, easy maintenance; can be equipped with software and connect with computer to operate the can deal with image、data, can be upgraded to fully automatic micro hardness tester

2. Technical Specifications

Model	MICROBUL 1000-AT
Test force	10gf, 25gf, 50gf, 100gf, 200gf, 300gf, 500gf, 1000gf
Min measuring unit	0.01μm
Conversion Scale	HRA, HRB, HRC, HRD, HRF, HV, HK, HBW, HR15N, HR30N, HR45N, HR15T, HR30T, HR45T
Hardness measuring range	8~2900HV
Method of testing force applied	Automatic (loading, Dwelling , unloading)
Turret Type	Automatic
Test microscope magnification	100X（observation, measuring）,400X(Measuring)
Test force dwell time	0~60s
X-Y test sets	Dimension：100*100mm Maximum Movement：25*25mm
Data output	Touch-screen display
Maximum specimen height	90mm
Distance from the center to the outer wall of the indenter	95mm
Power supply	AC220V±5%，50-60Hz
Dimensions	630*290*680mm
Net Weight	About 53Kg
Language	Turkish & English
Touch-screen display	8”

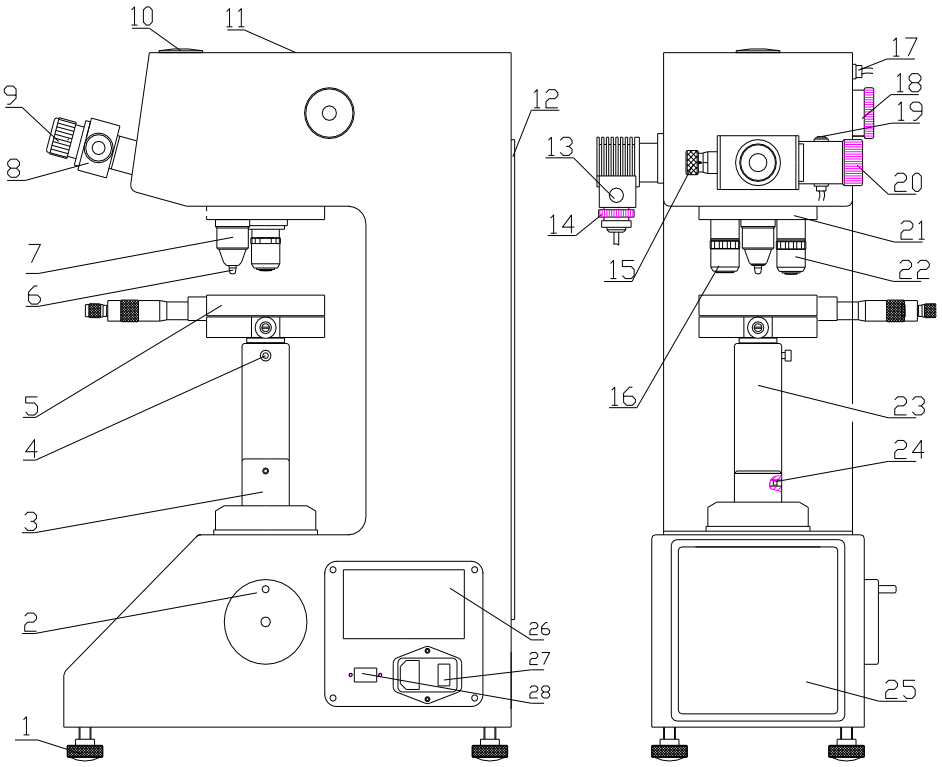
3. Installations and Debugging

3.1 Operational Conditions

Room temperature within 23±5°
Installed in a horizontal position on a solid basement
In an environment without any shock or vibration;
In a surrounding without any corroding agent
Relative room humidity (Room relative humidity) inferior to 65%

3.2 Unpacking and installation

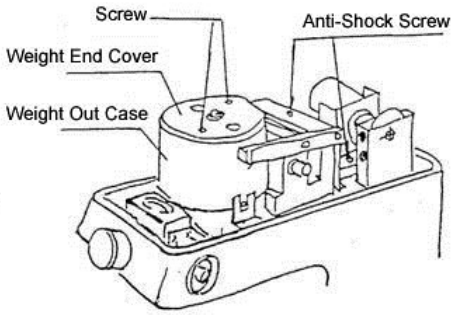
Unpack the outer box, take out the accessories kit and the main hardness tester (Fig.1)
Place the hardness tester on the special working table, remove the gauze band wrapped on the main hardness tester



（Fig 1）

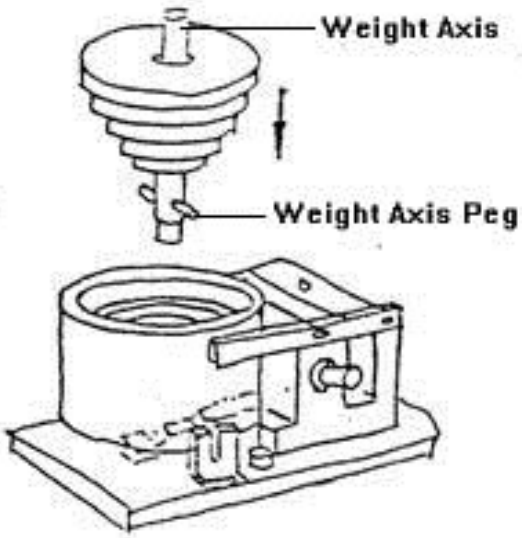
1	Regulating Screw	15	Left Drum Wheel
2	Up and Down Rotating Wheel	16	10^Xobjective
3	Up and Down Lead Screw	17	Round socket
4	Screw	18	Load-Change Hand Wheel
5	Cross Test Table	19	Measuring Button
6	Indenter	20	Right Drum Wheel
7	Protection Cover	21	Motorized Turret
8	Eyepiece	22	40^X objective
9	Eye Guard	23	Extension bar
10	Photo Cover	24	Hexagon socket set screw
11	Upper Cover	25	Touch screen
12	Back Cover	26	Printer
13	Front and Back Adjusting Nut of Light Source	27	Power jacks and switches
14	Up and Down Adjusting Screw of Light Source	28	Socket

Unpack the outer box, take out the accessories kit and the main hardness tester (Fig.1)
Screw off 4 screws on the Upper Cover (12) and remove the Upper Cover (12)
Unscrew 1 Anti-Shock Screws and 2 screws on the Weight End Case (Fig. 2)
Remove off Weight End Cover. Take out Weight Axis and Weights from accessories kit. Put six Weights on the Weight Axis in the order from small to big (Fig 3)



(Fig 2)

Hold the top of the Weight Axis, and put the Weight Axis into the Weight Out Case and rotate the Weight Axis to enable the Weight Axis Peg may fall into the V-Shaped groove (Fig.3)



(Fig 3)

Align the hole on Weight End Cover and the Weight Axis, enable the Weight End Cover fit for install on the Weight out Case closely。

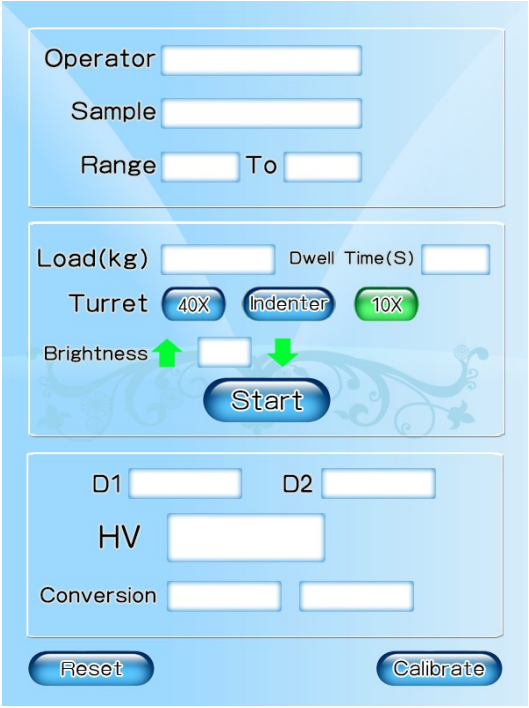
Rotate the Load-Change Hand Wheel (18) to let the Weight out Case to move up and down smoothly in the position groove; then close the Upper Cover (11).

Take off the Dust-Protecting Cover, take out the micro Eyepiece (8) from accessories kit, insert it into the hole and push it to the end, the installing direction shows as Fig.1. The wire plug of the Eyepiece (8) should be inserted into the Round Socket (17) at the left side of the main hardness tester.

Take out the Cross Test Table (5) from the accessories kit, insert the axis of the Cross Test Table into the hole of the Up and Down Lead Screw (3); then screw the Screw (4) tightly.

Take out the Level (the leveling gauge) from accessories kit and put it on the Cross Test Table (5), then adjust the Regulating Screw (1) to enable it in level state.

4. Operation panel and function introduction

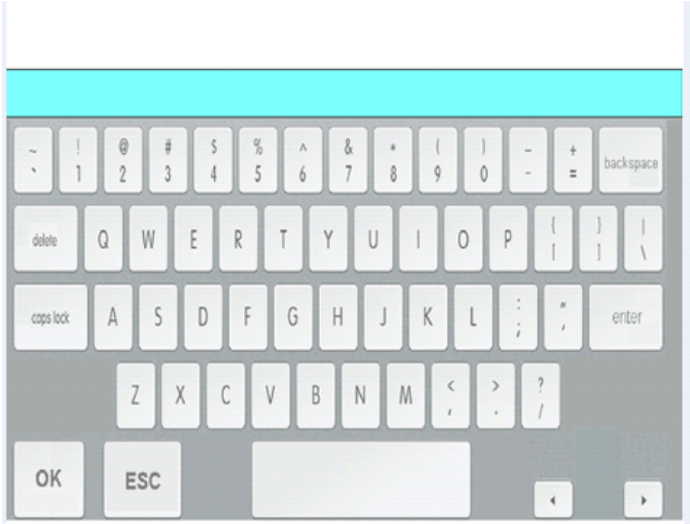


（Fig 4）

Information can be put in the text boxes. Single point will enter into the corresponding input interface

4.1 Input Operator and Sample

Click the textbox to the right of "Operator "and" Sample"  , Then turns out a keyboard in the screen. Input the name of Operator and Sample and click "OK". If don't want to change the name that already exists on the screen, click "ESC". As shown in figure 5



（Fig 5）

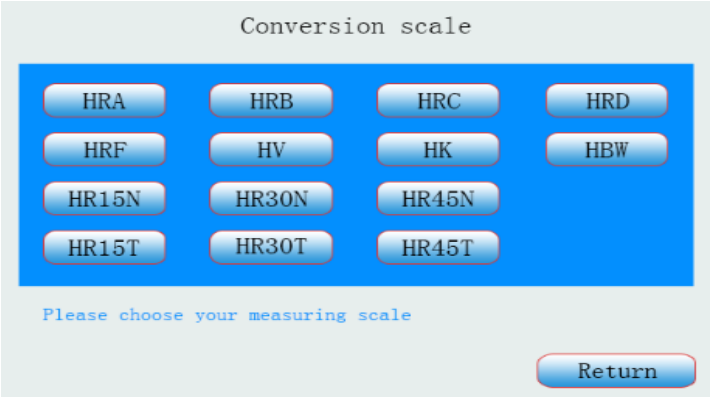
4.2 Input Tolerance and Dwell time

Click the textbox to the right of "Tolerance" and" Dwell time"  , Then input the number as shown in figure 6. And click "OK". If want to cancel, click "ESC".

(Fig 6)

Click up and down arrow keys (↑ ↓) to adjust lightness

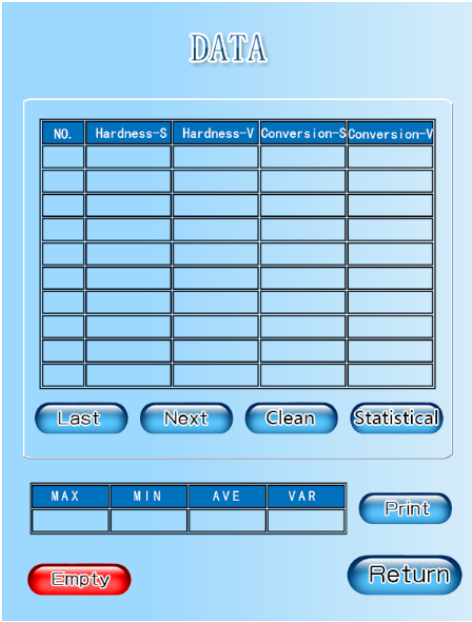
Click “Conversion” and choose the scale. If don’t need to modify, click Return. as shown in figure 7：



（Fig 7）

4.3 Data inquiry

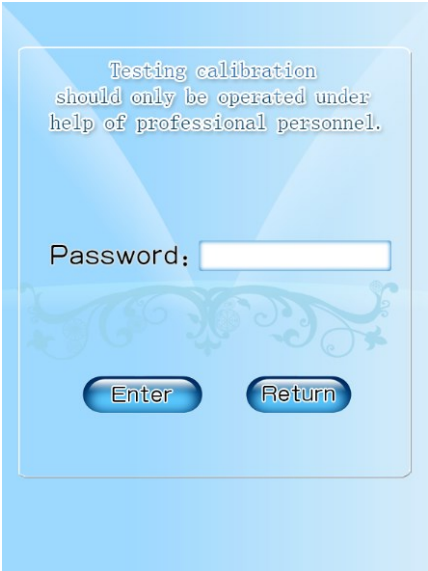
Click “Data”, popup data processing menu, contents include: hardness type、hardness value, conversion type, conversion value, maximum, minimum, average, error. It can save 20 test points, if exceed 20 points, it will delete the first point automatically, always keep the last test point. Click “Return”, screen go back to the main interface. As shown in figure 8:



(Fig 8)

4.4 Language choice

Click “Setting”, turns out the menu, as shown in figure 9:



（Fig 9）

Click  , turns out numeric keyboard, type in 12345678, click “Enter” As shown in figure 10:

(Fig 10)

Click “Language”， choose Turkish-English shift, click “Return” to main interface.

Notice: Calibrate electric shock dislocation of the touchscreen. To be in the boot state. Complete the following steps:

Quickly click on the touch screen 20 times in 4 seconds. (Except the text box)

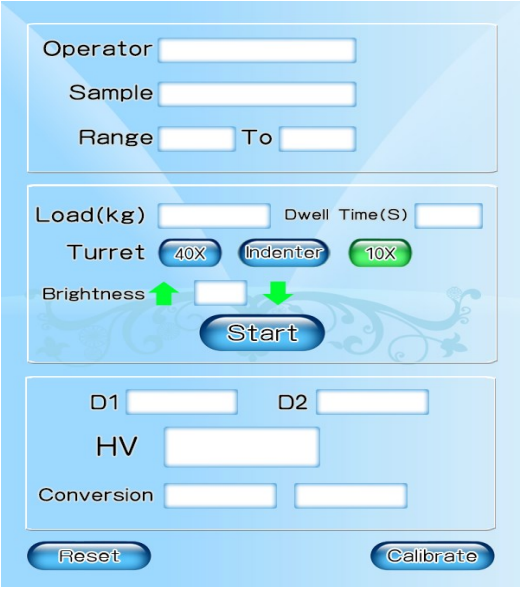
Buzzer blow for 1 seconds. Stop click when buzzer blow.

Enter the calibration mode, according to the cross line click the location on the touch screen to calibrate touch screen.

Calibration over, back to operation page.

4.5 Usage of the hardness tester

When switch on, the indenter turn to the front of the hardness tester, showed main interface. As shown in figure 11, interface was settled before delivery, if need to reset the interface, please operate according to the panel operate instruction



（Fig 11）

4.6 Choose Load and Dwell time

Rotate Load-Change Hand Wheel（18）select the test force

Click dwell time，normally takes 10s

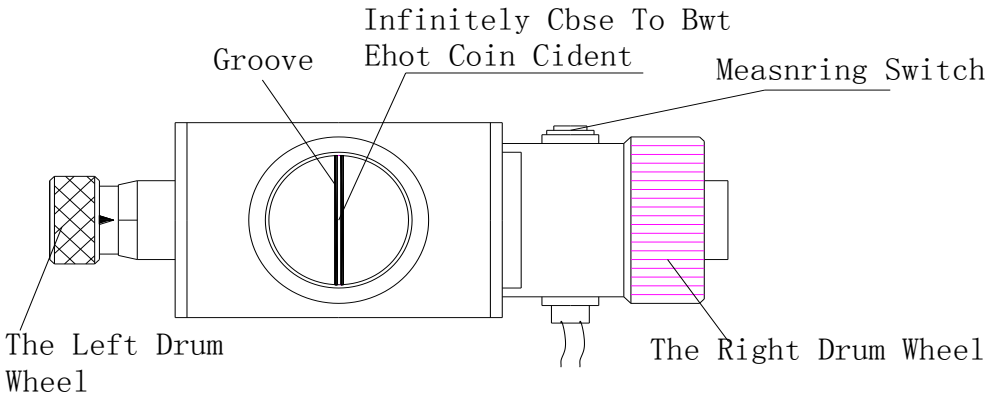
Put the standard test block or the specimen on the Test Table（5），Rotate the Rotating Wheel (2) to rise up the Test Table，when the distance between the specimen and the bottom of the indenter is 0.5～1mm，press “40X” to enable the 40X objective (22) to the front position，system is 400x；If press “10X”，the objective 10X (16) to the front position （Both objectives can test hardness value）.
Put eyes close to the Eyepiece (8) to observe. When a bright spot appears to the vision field in Eyepiece (6), it shows the focusing plane will come closely. At this time, raise the Test Table up slowly and slightly until the surface of specimen forms a clear image, at this point, the focusing process is completed.

Note: When irregular-shaped specimen is to be tested, take more careful to avoid the Indenter is damaged due to the touching between the Indenter and specimen.

Press the "Start" button, the Turret turns to the front position automatically. Then the test force is applying (motor is started), the screen appears “↓”, “LOADING”, “Dwell time”, “Unloading”. When loading and unloading of test force is completed, the Turret returns automatically, the 40x objective (22) gets to the front; the main screen will back to operating page. If click the 10X objective, the 10X objective will turn to the front position.

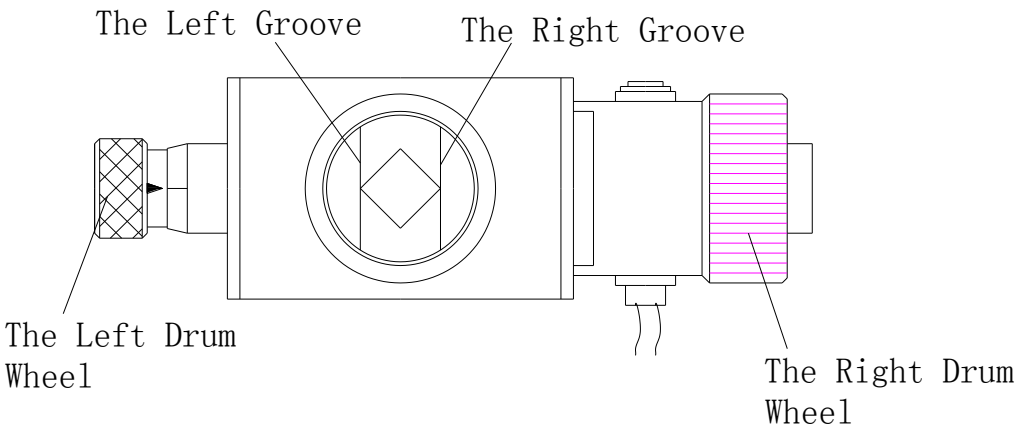
Note: When motor is working, it is prohibited to move the specimen until the loading and unloading test force are finished, otherwise the instrument will be damaged.

Indentation can be seen in the micrometer eyepiece（8）field of view，then you can measure the indentation diagonal’s length in the micrometer eyepiece (8).If the indentation is not clear, you can slowly turn the rotary wheel (2), move up and down the test sets (5) till the image of the Indentation is the clearest. If two graduated lines seem vague in the Eyepiece, adjust the Eye Guard (9) till the graduated lines are the clearest, this is according to personal vision. Rotate the Right Drum Wheel （20）to move the graduated line of eyepiece，enable two graduated lines to be close. When inner side of two graduated lines are closely without limit (the inner side of graduated lines reach critical state with no space between them to allow the light penetrate, but two graduated lines are prohibited to overlap each other), press “Reset”，at this time, the d1: 0000 value on the main screen is zero, at the zero position for technique term. Now the length of diagonal line of indentation can be measured in the Eyepiece.



(Fig 12)

Rotate the Right Drum Wheel (20) to let graduated lines separate each other, turn the Left Drum Wheel (15) to move the left graduated line until it's inner side tangent to the intersecting point at left outside of the indentation, and then move the right graduated line until it's inner side tangent to the intersecting point at right outside of indention (Fig 13)



（Fig 13）

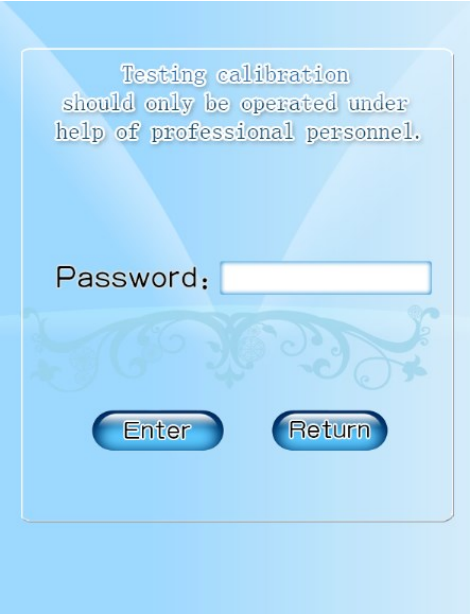
After measurement, press the measuring button (19), the measurement of length d1 of the diagonal is completed; turn micrometer eyepiece (8) 90 °. Use the above methods to measure the diagonal length of the d2, press the measuring button (19). At this time, the screen shows testing display value and exchanged hardness display value measured at present time. If the correctness of the measurement is not sure, you can repeat measuring again as methods described above.

4.7 Regulation of Hardness Displaying Value

The precision of the hardness displaying value of the hardness tester is just calibrated before the instrument is turned out of the factory. If an error is caused due to the transportation or according to the various requirements of the client, the hardness value may be revised by pressing input keys. The method is as following: Load on a hardness block, then click" Calibrate", turns out Fig 12, click the text box to the right of "Hardness Value", Input the value of standard hardness block on the digital keyboard. Then measure the indentation, after the measurement, press the Measuring Switch (19). Last, click "SAVE", hardness value has been calibrated. 10╳ and 40╳ calibrated in the same way.

4.8 Regulation of the instrument and the precautions

The precision of hardness displaying value of the hardness tester is calibrated before delivery. If an error is caused or according to the various requirement of the client, the hardness value may be revised by pressing input keys. The method is as following: Load on a hardness block, then click "Calibrate", turns out figure 14



(Fig 14)

Click , turns out numeric keyboard, input 12345678, and click “Enter”, turns out figure 15

(Fig 15)

Click hardness , input the hardness value of the standard block value, then measure the indentation, press the measuring switch (19), finish the measurement of indentation diagonal’s length d1. Turn the eyepiece 90， then measure the indentation diagonal’s length d2 with same method, click “Calibrate”, after measurement, click “Save”, calibration is finished.

(Fig 16)

It is necessary to read carefully the usage instruction manual before the operation of the present instrument in order to know the operational procedures and the precautions so as to avoid the damages to the instrument caused by the incorrect operation.

It is prohibited to dismount and alternate without permission all the electric component parts, the switches and sockets as well as their fixed positions; otherwise the instrument will be error and caused (cause) unsafe accidents.

It is prohibited to rotate the indenter, unless the testing force has been unloaded, otherwise it would damage the instrument. Only after testing force has been unloaded and the screen turns back to operating page, then the indenter can be rotated.

When the instrument is under testing，do not select test force, if press start button accidentally，do not rotate the indenter, please wait until the loading is finished.

If the height of specimen is higher than 80mm, it must to lose the hexagon socket set screw and take off the extension bar (24).

4.9 The diamond indenter

The diamond indenter and the indenter shaft are important parts of the instrument, and hence it is necessary to take care not to touch the indenter during the operation.

2) In order to assure the precision of the measurement, it is important to keep the indenter clean. If it is covered with grease or dust, the tip of indenter should be cleaned carefully and lightly with absorbent cotton wetted with a little alcohol (industrial use) or ether.

4.10 Eyepiece

Owing to the difference of the personal visions, the graduated lines observed in the vision field of the eyepiece may seem vague. And accordingly, the observer should turn slightly the Eye Guard (9) on the eyepiece so as to observe the graduated line in the vision field clearly.

Note: the Eyepiece should be inserted to the bottom of eyepiece tube and keeping without any space between them, otherwise it would affect the correctness of the measurement. When testing the length of diagonal line of indentation, it is necessary to measuring the tip points of diagonal line, then turn the Eyepiece by 90° and test other a pair of tip points for diagonal lines.

4.11 The specimen

The surface of the specimen must be clean, as the grease or the dirt on the surface would affect the precision of the measurement. Please clear the specimen with alcohol or ether.

When the specimen is thin filament, slice or small pieces, can choose

Filament clamping testing table, Thin Specimen Testing Table and Flat clamping testing table accordingly .If specimen is too small to hold, please test after mounting press and polishing.

The thickness of specimen or detection should be 1.5times diagonal’s length.

4.12 The measurement for Knoop Hardness

Exchange the Indenter

Loosen the screw fixed on the Indenter (5) with a screwdriver to take the Indenter out, change the Knoop Indenter for replacement. Note the direction when assembling. The red point of the indenter should be in face to front direction, the long diagonal line of indentation (the shape of indention is a long rhombus) should be in parallel with testing table. It may be to regulate the center of indentation in vision field after install Knoop Indenter.

Testing hardness value

The hardness testing method of Knoop is mainly same as that of Vickers, besides it is only required to measure the length of long diagonal line for indentation. Press the Measuring Button to confirm, then the HK hardness value will display on the screen.

5. Accessories

The main hardness tester (including a Micro Vickers Indenter, a 10╳ Objective and a 40╳Objective)

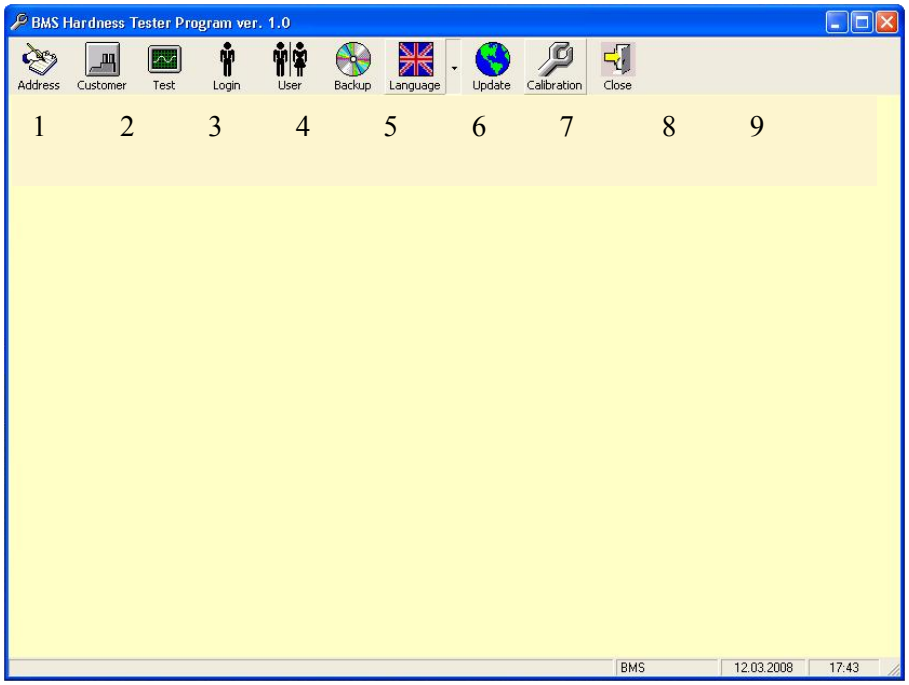
The accessories Kit ：

Description of Goods	Quantity
Weight Axis	1 PC
Weights	6 PCS
Digital eyepiece	1 PC
X-Y Test Table	1 PC
Screwdriver	2 PCS
Regulating Screw	4 PCS
Level	1 PC
HV1 Test Block	1 PC
Power Cable	1 PC
Calibration Certificate	1 PC
Manual	1 PC
Cover	1 PC
Spare fuse	2 PC
Cmos camera	1 PC
Software	1 PC

6. OPTOBUL Hardness Tester Software

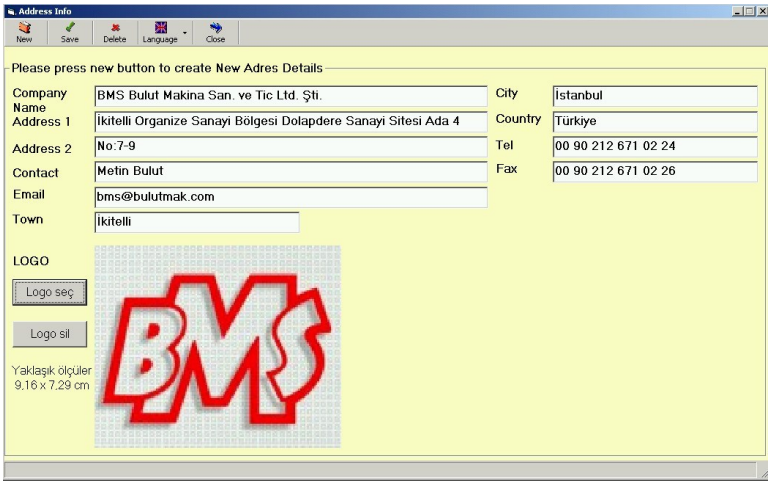
You can enter Login name as "bms" and password "bms" for the first run

The main window includes the following functionalities as below;
1-Address: The address details belongs to company,
2-Customer: The customer address details,
3-Testing the hardness of materials,
4-Login mask,
5-User management,
6-Backup and Restore,
7-Language selection,
8-LiveUpdate of the program,
9-Calibration,



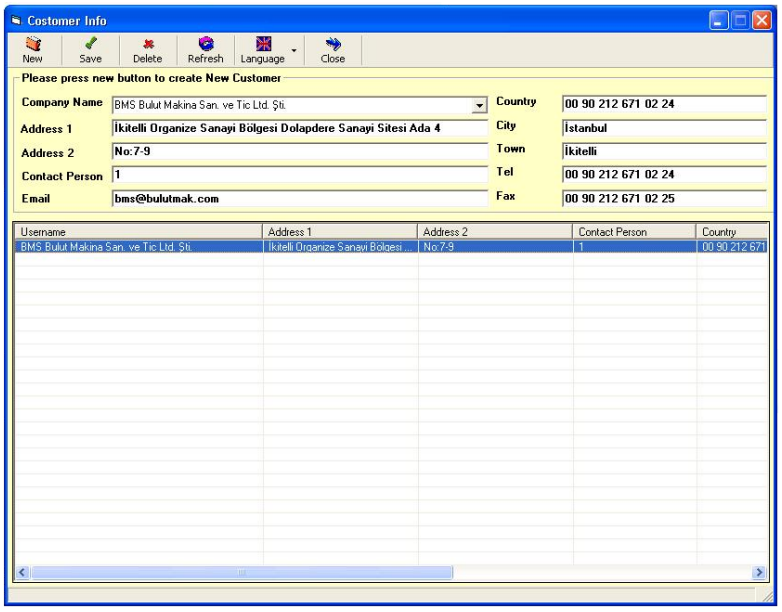
6.1 Address

Enter the company Address details by running "Address" menu button from main dialogue



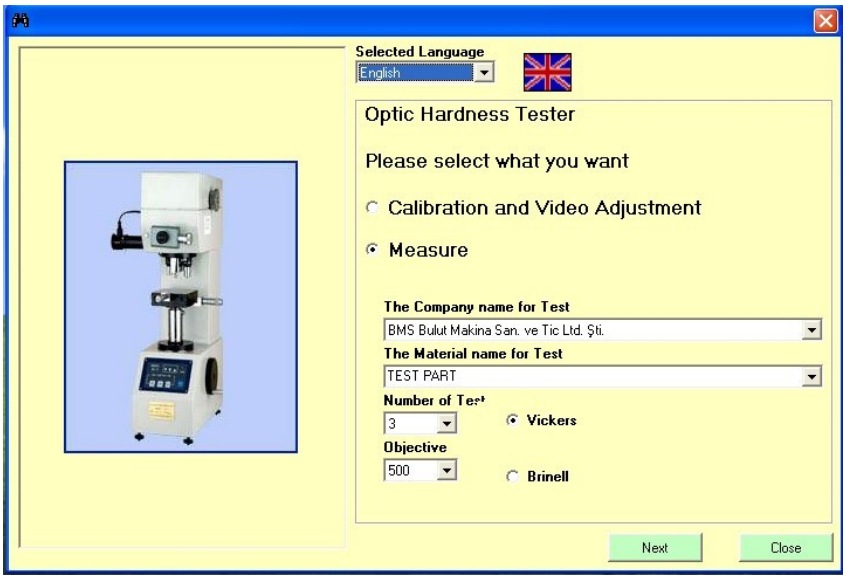
6.2 Customer

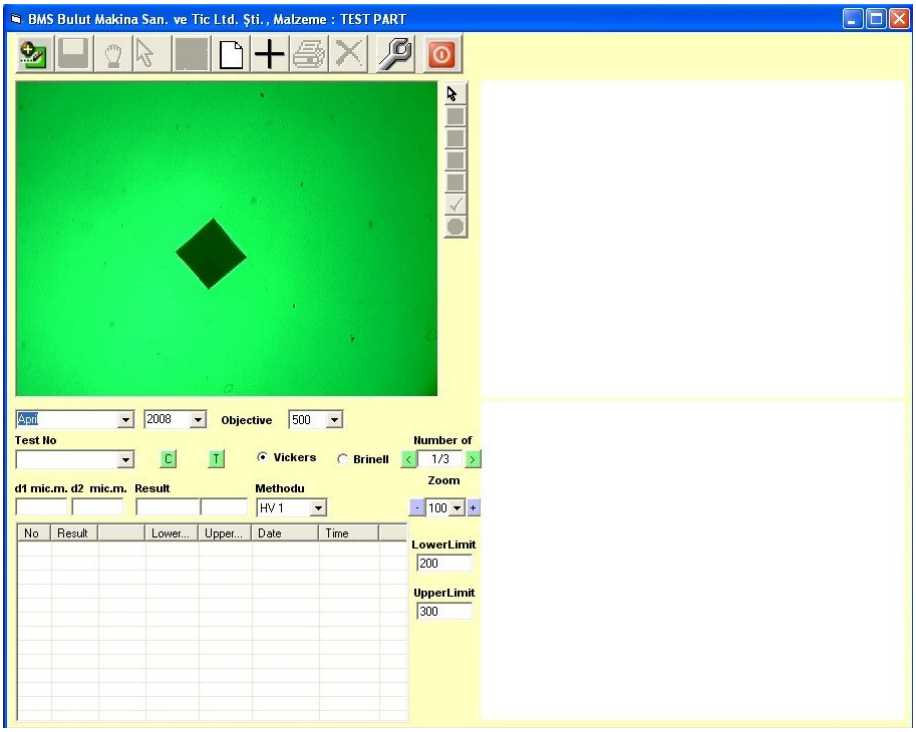
Enter the Customer Address Details by running "Customer" menu button from main dialogue



6.3 Test

The following screen shows the "Test" window to make Hardness test of the materials. Firstly select the Customer name from list below and then write the part name in to the Material selection select Number of test for each sample that planned to make test. Select Objective from selection box, program will remember next time what you selected before. Finally, press Next button to go on.





At first run, you can see the following picture that shows the online camera view at left side

Please select working month and year follow the steps below;

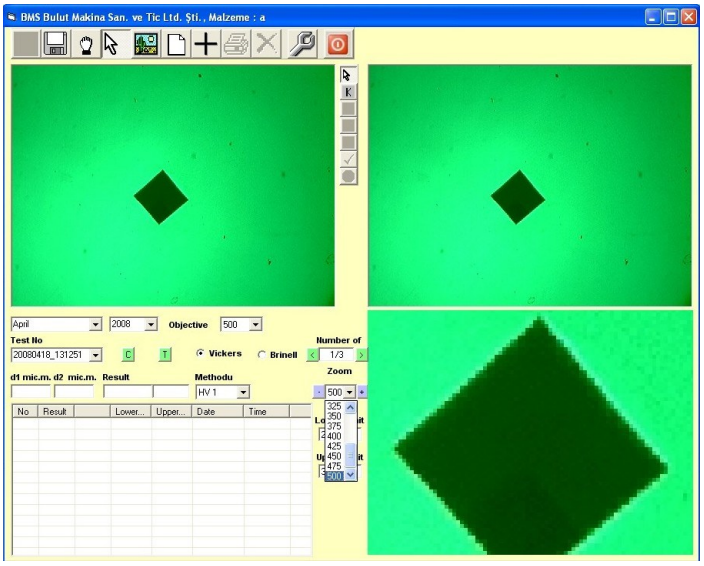
Select Objective

Select Test Method (Vickers)

Press new button at the Toolbar menu

Select the Zoom as the following

Press the button as shown in figure below,



, Saves the test data,

, Moves the zoomed picture,

, release the mouse,

, Load picture from online cam window,

, Starts the new test,

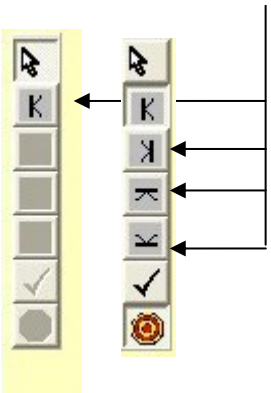
, Draws the cross sign the correct position of sample figure,

, Prepare report in excel file,

, Deletes the selected test,

, Adjust the Camera settings, (SELECT "YUV2" TO GET BETTER VIEW)

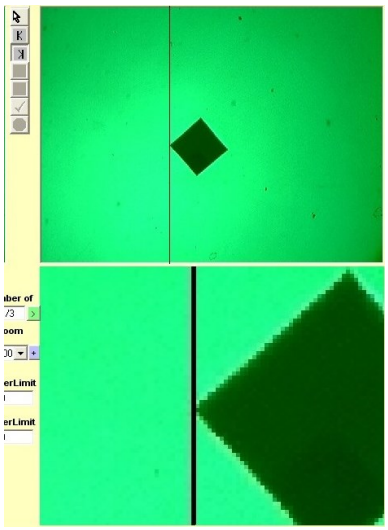
, Exit form dialogue.

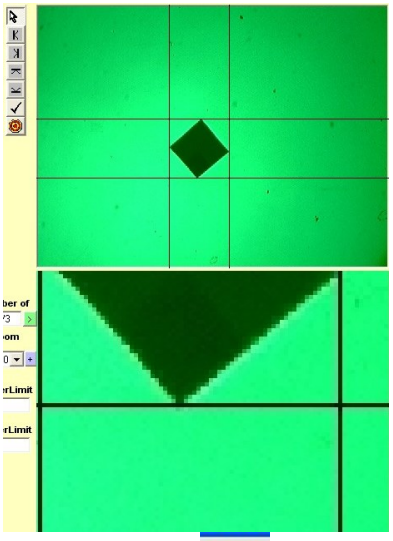


After pressing the button showed with arrow, then move mouse from left to right and stop when the left conner touches the line as shown in below figure. Then click the mouse left button the make first starting point for D1 value. Secondly, do the same for end point for D1 to find distance D1value in µm, and repeat steps for horizontal lines too as show in below figure.

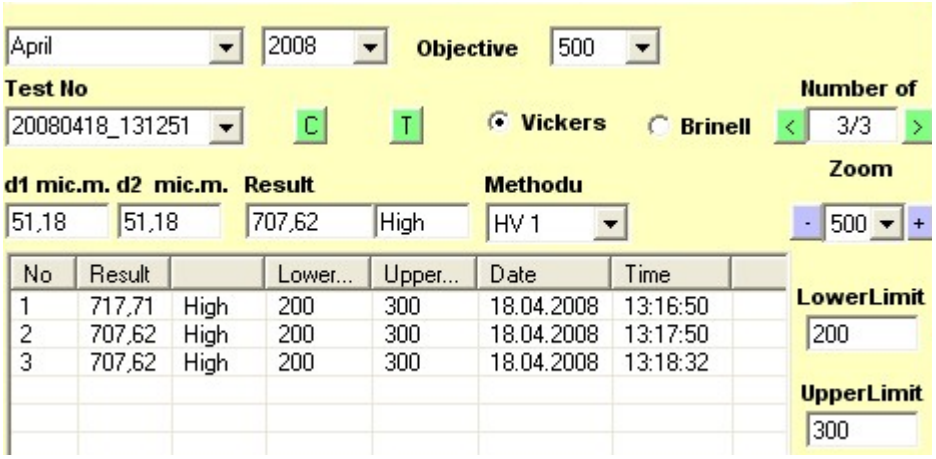
This button calculates the result again, if you need to correct some parameters about test method.

This button is using for sensitive movement of vertical and horizontal lines by keyboard up-down and left-right arrow keys, while the lines approaching to the corners of the below figure





When the result is calculated then press “Save” button in the Toolbar menu, you can continue to make test for new sample from selected part and continue to complete all sample tests.



When all sample tests completed then you can see the above figure. Press “Report” menu from Toolbar and then get the report in excel format as shown in next page;

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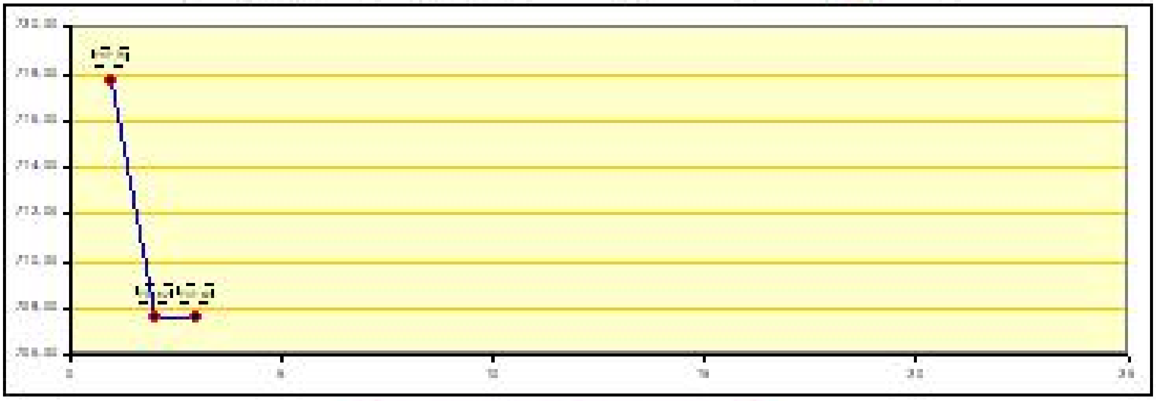
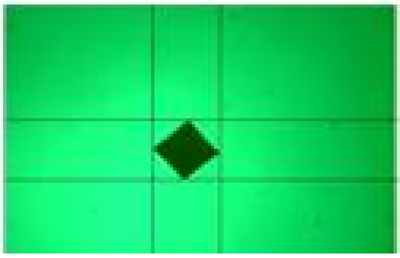
TEST PROTOCOL

TEST BY	
DATE	18-Nis-2008
MATERIAL	a

TEST RESULTS

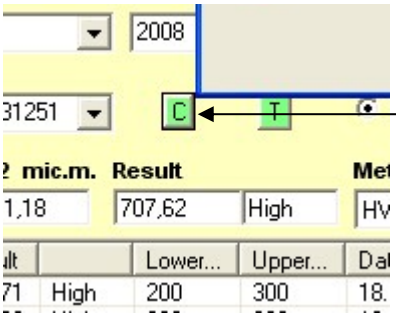
No	Value	Test Method	Result
1	717,71	HV 1,	High
2	707,62	HV 1,	High
3	707,62	HV 1,	High
Up./Low. Limit	**Average**	**Std. Deviation**	**Result**
200 / 300	710,98	5,83	High





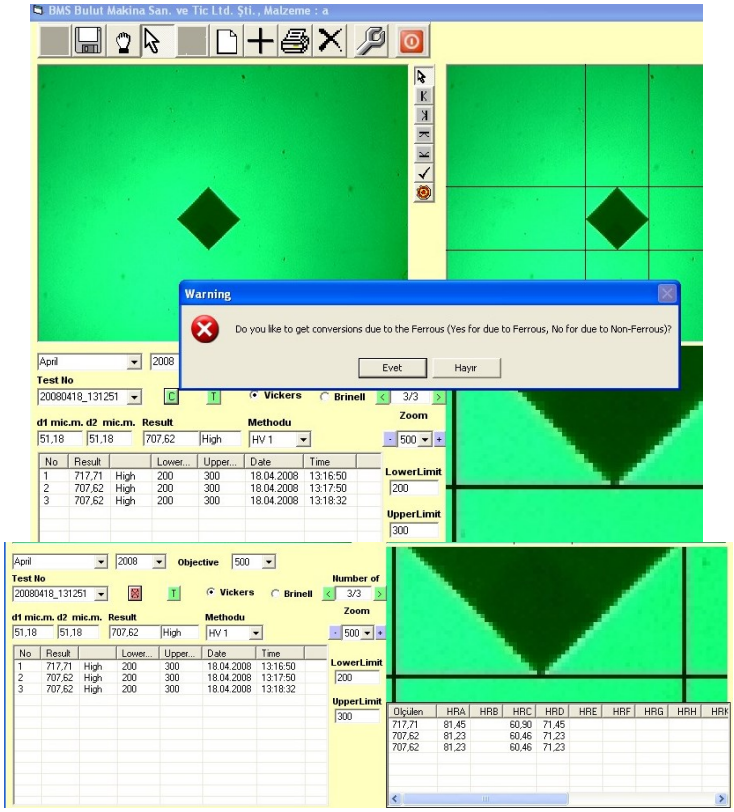
Sign Tester

Sign Qualified

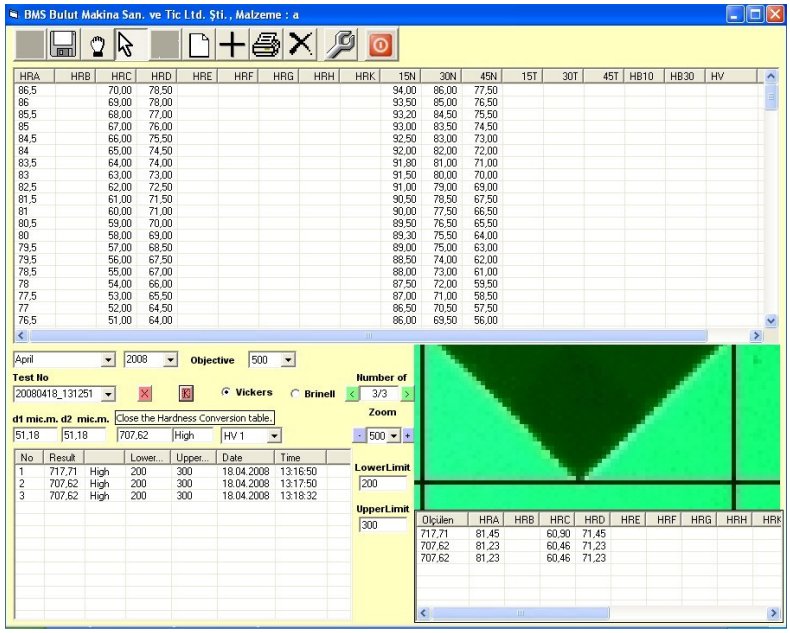


When you press the “C” button then you can get the conversions of the found data as shown below;

When you press the “T” button then you can see the standard conversion table as shown below;



You can get the conversion list for results due to the ferrous or non-ferrous.

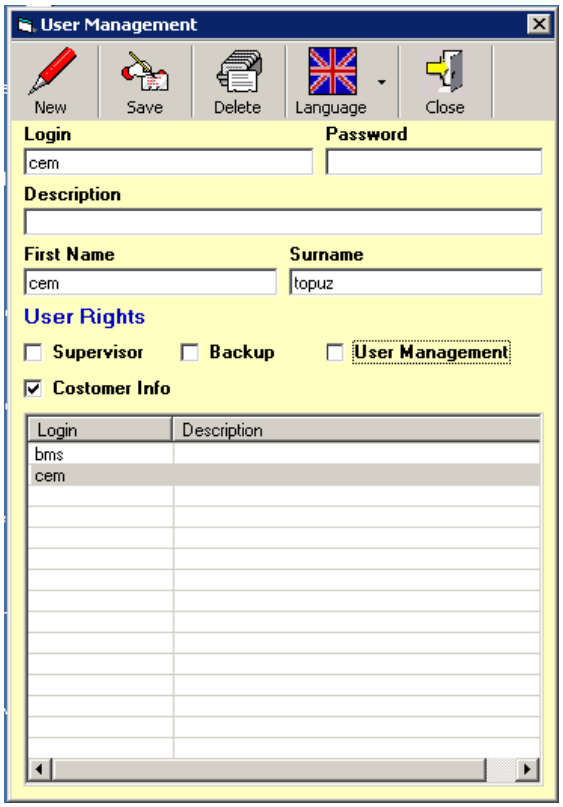


After pressing “T” button, the complete standard conversion list shown at left figure.

6.4 User Management

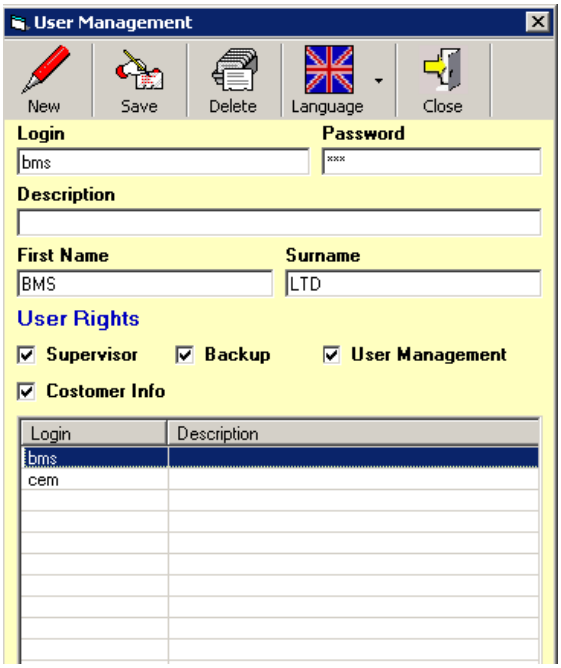
The program allows maximum 5 users to connect database. One client can connect to machine directly by COM port (RS232) and connect to database by ODBC network connection with full functionalities due to the user rights.

The other 4 clients connect database only to see test results and get print outs for Test Protocols by ODBC network connection.



User Management allows that the user rights to manage program functionalities. The selected checkboxes shows that the sections are allowed to use for the selected user. Others is not free for the user. “Name” and “Surname” information must be filled for the user. This information is necessary for Test Protocol document.

You can see the user has got rights only for Customer address details section at the left figure.



You can see the user has got rights for all sections at the left figure.

Supervisor: This allows to user that can use all program sections.

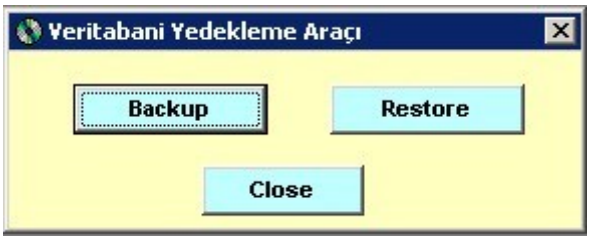
Backup: Only to use Backup Section.

User Management: Only to use User Management section.

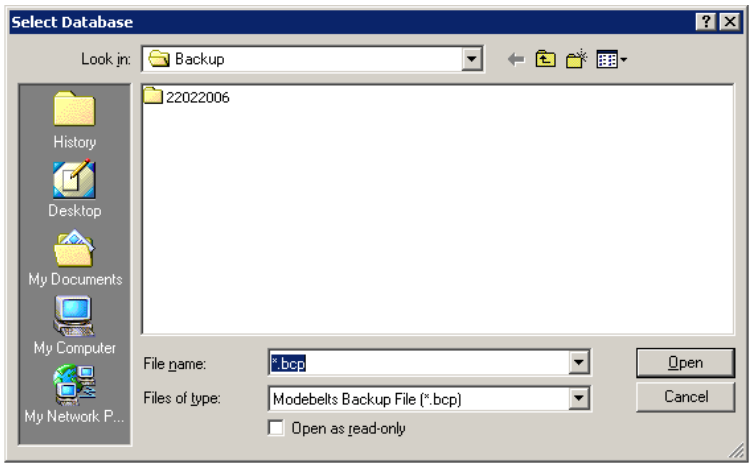
Customer: Only to use Customer section.

6.5 Backup

If you press “Backup” button, program creates a folder under the “Backup” folder in program installation path. This folder name generated by the program due to the backup date in ‘dd/mm/yyyy’ format. The backup file saves in this folder as ‘dd/mm/yyyy_hhmmss.bcp’ format, (example backup file name: 22022006_094631.bcp).

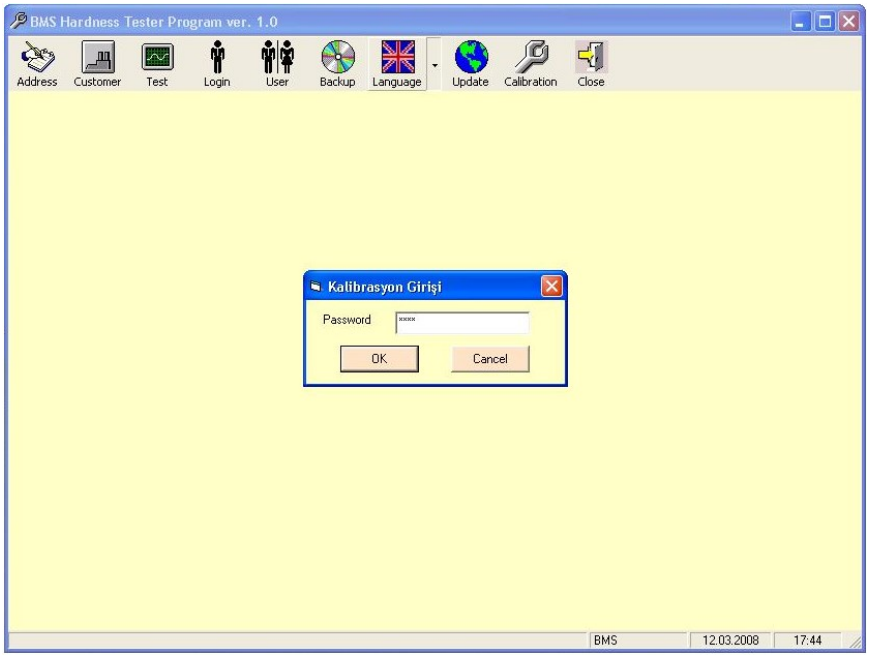


If you press “Restore” button then you can see the following figures to select date and the backup file to restore it.

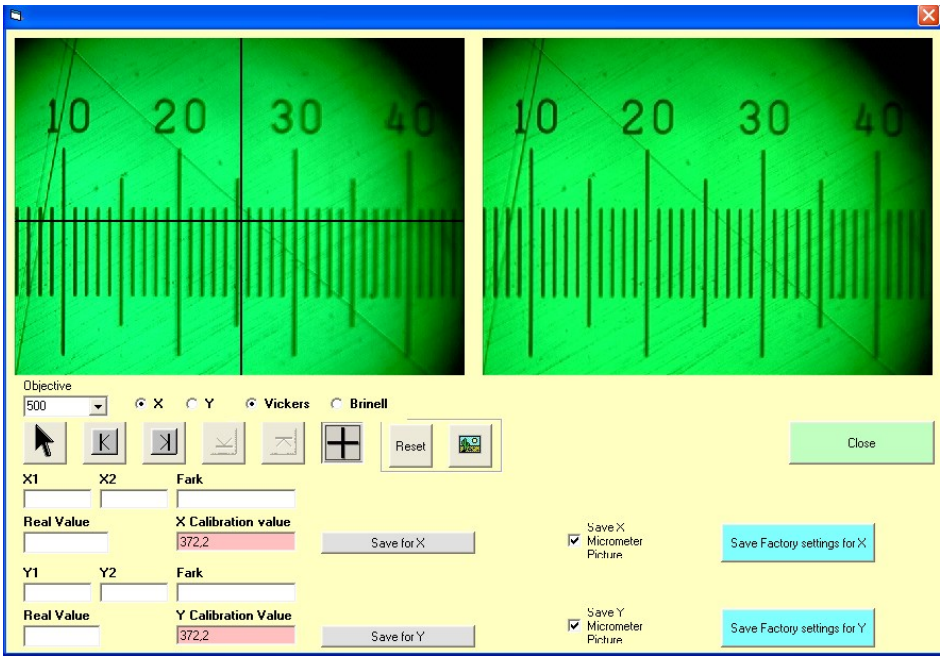


6.6 Calibration

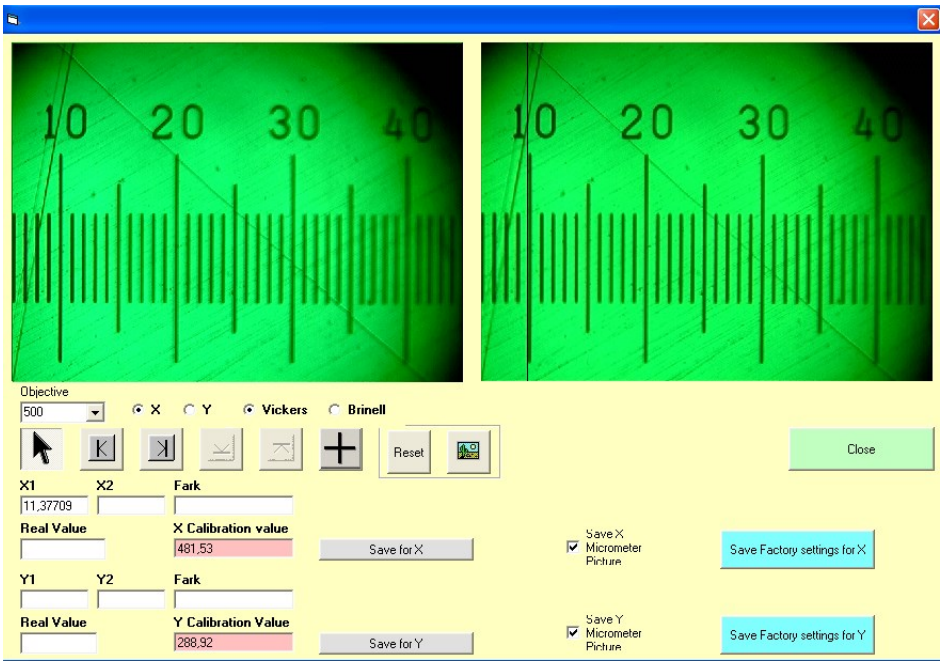
Software has been already calibrated on the tester at our works according to related norms. You do not need to calibrate it again. But, any case, to make Calibration, press “Calibration” button and enter password that will be given by our company when you need it.



Select Zoom and the cross sign to correct the figure by rotating camera it's around as shown below;

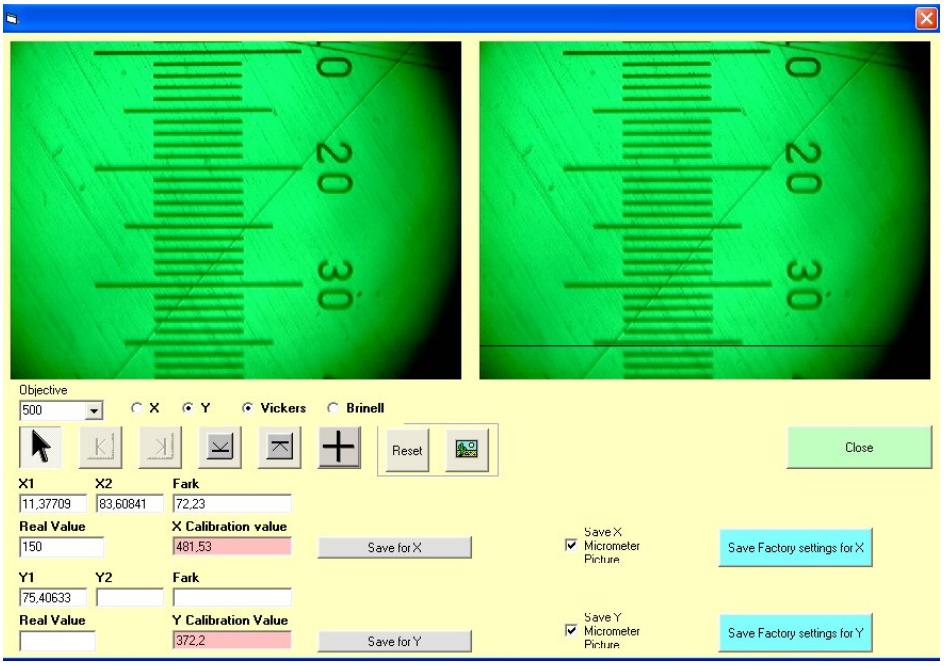


Select the "Objective" and then press "X" option to start by button  from left to right approximation to one reference point like below. Secondly, press button  to measure a distance in □m from reference point to the end point.

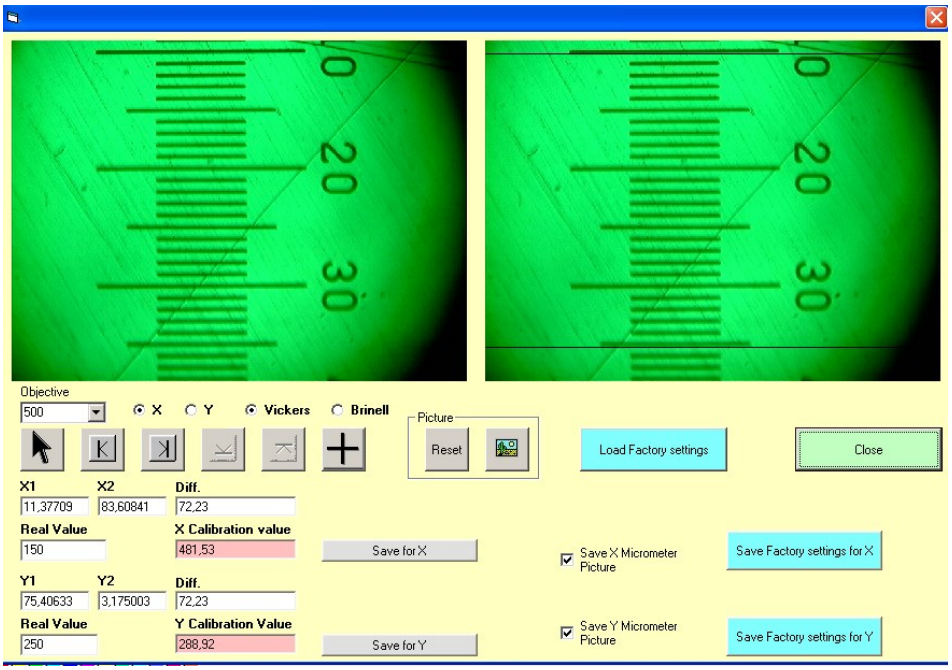


Write the real value to the text box and then press "Save for X" button to calculate the calibration parameter and save it to the database. After saving it, if you want you can press "Save factory settings for X" button and too. Repeat steps for Y as the following;

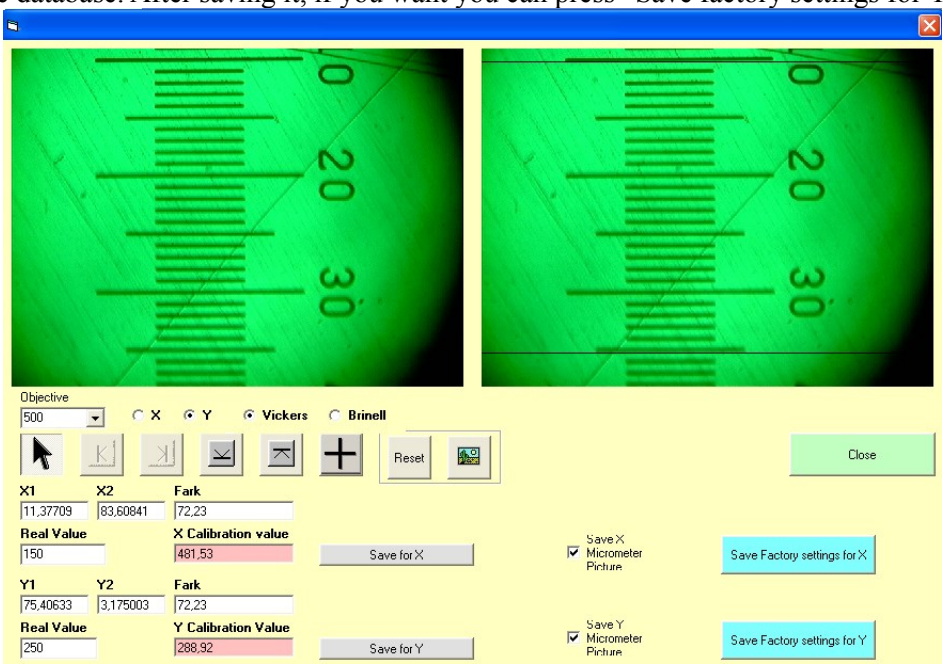
Select the “Objective” and then press “Y” option to start by button  from left to right approximation to one reference point like below. Secondly, press button  to measure a distance in □m from reference point to the end point.



Write the real value to the text box and then press “Save for Y” button to calculate the calibration parameter and



save it to the database. After saving it, if you want you can press “Save factory settings for Y” button and too.



When you made any mistake while you are making calibration, you can “Restore Factory defaults” by pressing button “Load Factory Settings” shown above figure.