

MICROBUL 1000-DN

Micro Vickers Hardness Tester with Pc System



BMS Bulut Makina Sanayi Ve Ticaret Ltd. Şti.

Kocaeli KOBİ Organize Sanayi Bölgesi

Köseler Mahallesi, 6.Cadde No: 20/2 Dilovası / KOCAELİ / **TURKEY**

Phone: +90 262 502 97 73-76 / +90 262 503 06 51

Web site: www.bulutmak.com e-mail : bms@bulutmak.com

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1 Main Description

1.1 The MICROBUL 1000-DN standard 8-speed force, from 10gf (0.098N) - 1kgf (9.8N), users can customize the test force;

1.2 Measuring the indentation diagonal length (the length of the indentation diagonal), the system automatically calculate and display the hardness value;

1.3 Two objectives both (Both two objectives) can test hardness value

1.4 Based on the standard block of different forces, the hardness value is automatically corrected (correct automatically);

1.5. The touch-screen interface, easy to operate, in any language version;

1.6 U disk data is saved directly to EXCEL format for easy editing and processing;

1.7. Enter, save more test samples and the operator and other information (the test information); setting password to protect setting parameters.

1.8 According to the national standard /ASTM to automatically convert the hardness value

1.9 Using a modular design, easy maintenance; larger sample place, place larger sample.

1.10 External camera or upgrade to automatic hardness (Can be equipped with software and connect with computer to operate the MICROBUL 1000-DN, can deal with image data, and can be upgraded to fully automatic micro hardness tester).

2 Technical Specifications

Model	MICROBUL 1000-DN
Test force	10gf (0.098N);25gf (0.245N); 50gf (0.49N);100gf (0.98N); 200gf (1.96N);300gf (2.94N);500gf(4.9N);1kgf (9.8N)
Standard Conformed to	GBT4340.1, GBT4340.2, ASTM_E92
Min measuring unit	0.031μm
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	Manual
Test microscope magnification	100X (observation) ,400X(Measuring)
Test force dwell time	0~60s
X-Y test sets	Dimension: 100*100mm Maximum Movement: 25*25mm
Data output	Touch-screen display,
Touch-screen display	8 inch
Maximum specimen height	90mm
Distance from the center to the outer wall of the indenter	95mm
Power supply	AC220V±5%, 50-60Hz
Dimensions	405*290*480mm
Net Weight	About 32Kg

3 Installations and Regulation

3.1 Operational Conditions

Room temperature within 10 to 35;

Installed in a horizontal position on a solid basement;

In an environment without any shock or vibration;

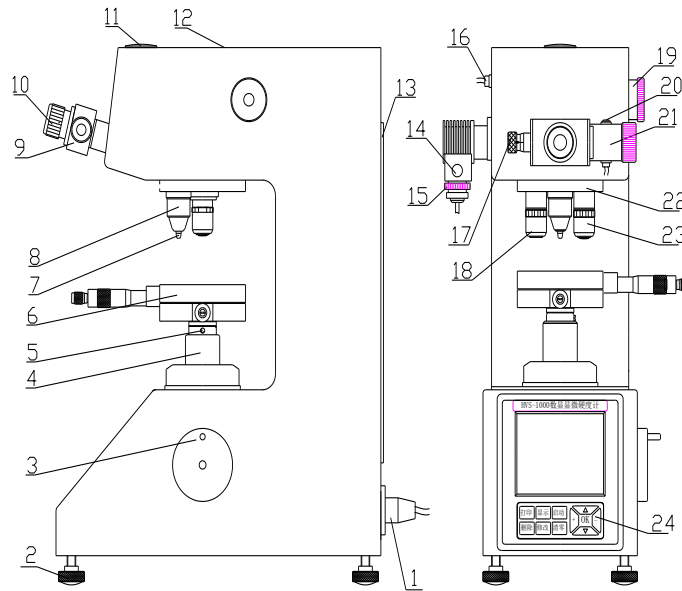
In a surrounding without any corroding agent;

Relative room humidity (Room relative humidity) inferior to 65%.

3.2 Unpacking and Installation

(1) Unpack the outer box, take out the accessories kit and the main hardness tester (Fig.1);

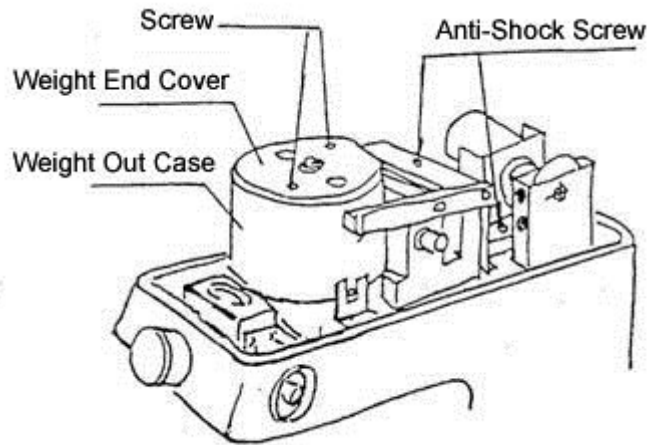
- (2) Place the hardness tester on the special working table, remove the gauze band wrapped on the main hardness tester;
- (3) Take out 4 Regulating Screws (2) from the accessories kit, and screw them into the bottom of the main hardness tester.
- (4) Screw off 4 screws on the Upper Cover (12) and remove the Upper Cover (12).
- (5) Unscrew 1 Anti-Shock Screws and 2 screws on the Weight End Case (Fig. 2)
- (6) 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).



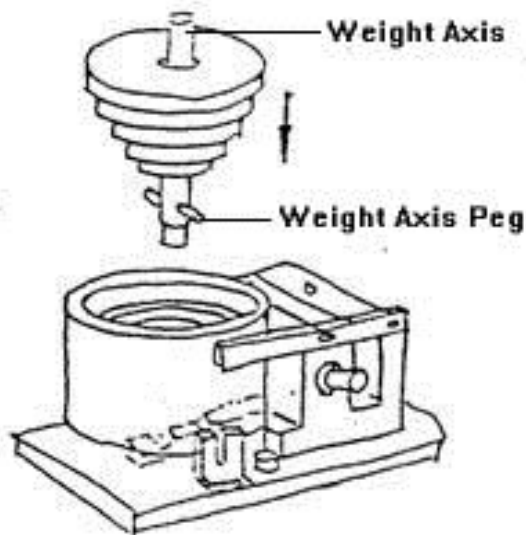
(Fig1)

1. Power Plug and Switch	15. Front and Back Adjusting Nut of Light Source
2. Regulating Screw	16. Round Socket
3. Up and Down Rotating Wheel	17. Left Drum Wheel
4. Up and Down Lead Screw	18.10^x Objective
5. Screw	19. Load-Change Hand Wheel
6. Cross Test Table	20. Measuring Button
7. Indenter	21. Right Drum Wheel
8. Protection Cover	22. Turret
9. Eyepiece	23.40^x Objective
10. Eye Guard	24. Operation Panel
11. Photo Cover	
12. Upper Cover	
13. Back Cover	
14. Up and Down Adjusting Screw of Light Source	

(Fig2)



(7) 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)

(8) 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;

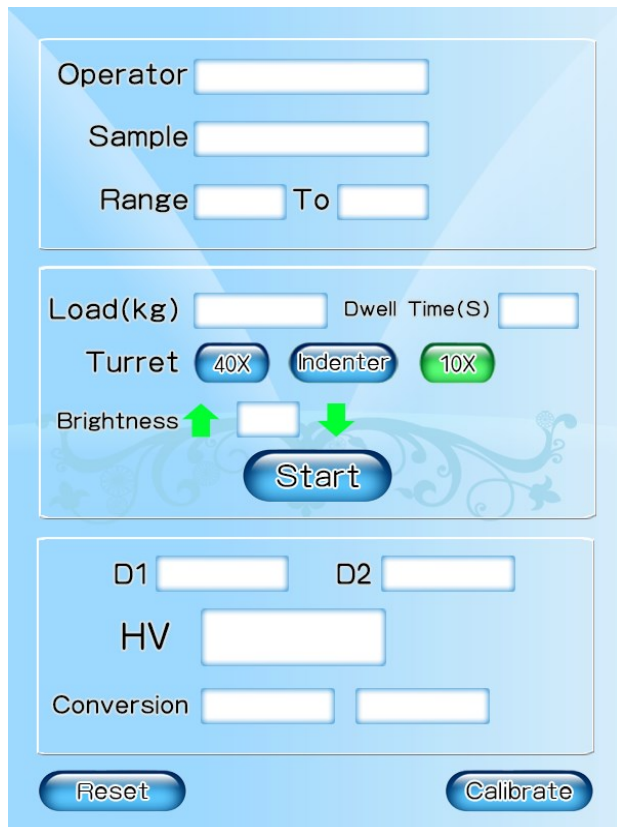
(9) Rotate the Load-Change Hand Wheel (19) to let the Weight out Case to move up and down smoothly in the position groove; then close the Upper Cover (12). Screw the Photo Cover (11) tightly.

Take off the Dust-Protecting Cover, take out the micro Eyepiece (9) 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 (9) should be inserted into the Round Socket (16) at the left side of the main hardness tester.

Take out the Cross Test Table (6) from the accessories kit, insert the axis of the Cross Test Table into the hole of the Up and Down Lead Screw (4); then screw the Screw (5) tightly.

Take out the Level (the leveling gauge) from accessories kit and put it on the Cross Test Table (6), then adjust the Regulating Screw (2) to enable it in level state.

4 Operator Panel and Menu Description




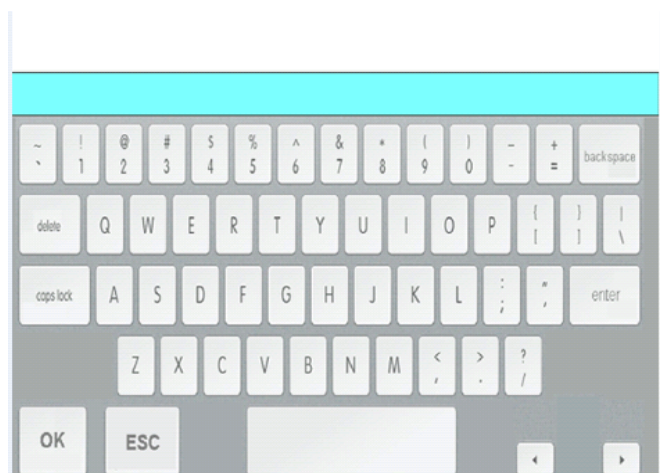
The Operator Panel and Menu Description interface is a light blue rectangular window. It contains several input fields and buttons. At the top, there are three input fields: "Operator", "Sample", and "Range" followed by "To" and another input field. Below these are two more input fields: "Load(kg)" and "Dwell Time(S)". In the center, there are three buttons: "40X", "Indenter", and "10X". Below these is a "Brightness" label with a green up arrow and a green down arrow, and a "Start" button. At the bottom, there are two input fields: "D1" and "D2", followed by "HV" and a large input field, and "Conversion" followed by two input fields. At the very bottom, there are two buttons: "Reset" and "Calibrate".

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

4.1 Information input

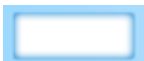
4.1.1 Input Operator and Sample

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(4).




(Fig4)

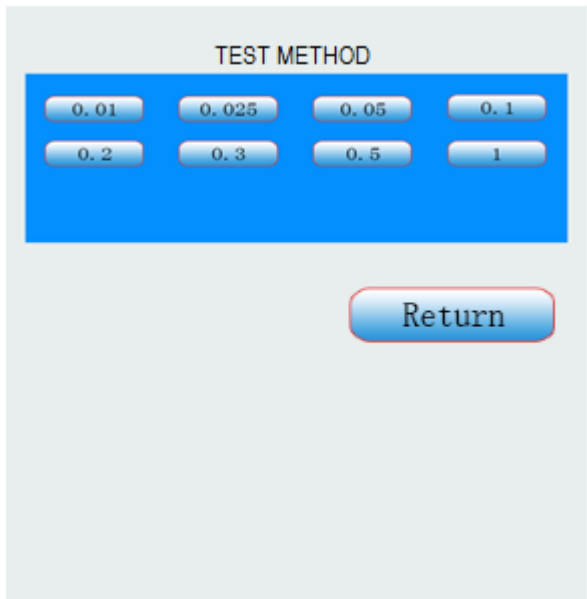
4.1.2 Input Tolerance and Dwell time

Click the textbox to the right of “Tolerance” and” Dwell time” . Then input the number as shown in figure 5. And click “OK”. If want to cancel, click “ESC”.



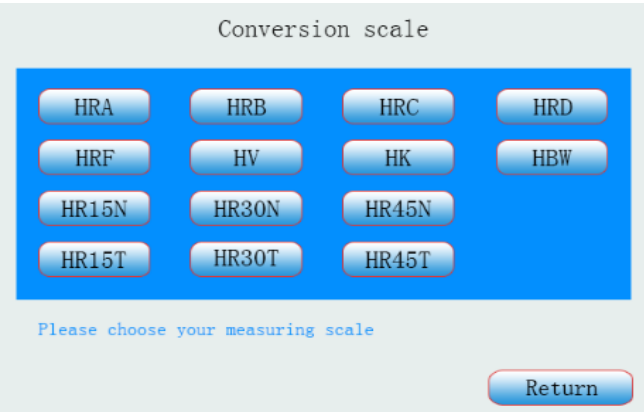
(Fig 5)

Choose test force, Click the textbox to the right of “Load” . Click the test force as shown in figure 6.



(Fig6)

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



(Fig7)

5 Usage of the Hardness Tester

The image shows a control panel for a hardness tester. It features several input fields and buttons. At the top, there are fields for 'Operator', 'Sample', and 'Range' (with a 'To' field). Below these are fields for 'Load(kg)' and 'Dwell Time(S)'. A 'Turret' section has three buttons: '40X', 'Indenter', and '10X'. A 'Brightness' control has a green up arrow, a slider, and a green down arrow. A large blue 'Start' button is in the center. Below the 'Start' button are fields for 'D1', 'D2', and 'HV'. At the bottom, there are 'Conversion' fields and two buttons: 'Reset' and 'Calibrate'.

(Fig8)

Choose Load and Dwell time

Put the standard test block or the specimen on the Test Table (4). Rotate the Rotating Wheel (2) to rise up the Test Table, when the distance between the specimen and the bottom of the indenter (5) is 0.5~1mm, press



to enable the 10× Objective (19) to the front position. At this time, the general amplification of light

path system is 100×. If press 20X, the 20× Objective to the front position. Put eyes close to the Eyepiece (6) 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.

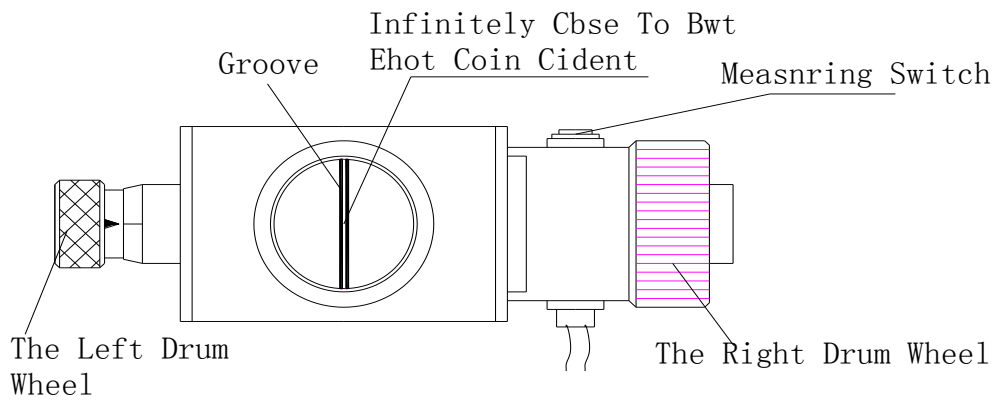
Note: When irregular-shaped specimen is to be tested, take more careful to avoid the Indenter is damaged due to the touching between the Indenter and specimen.

The Turret (18) turns to the front position manually. Then the test force is applying (motor is started), the screen appears “LOADING”, which shows the test force is loading. “DWELL” means to keep the test force. When loading and unloading of test force is completed, the Turret (18) returns manually, the 10x objective (19) gets to the front; the main screen will back to operating page.

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.

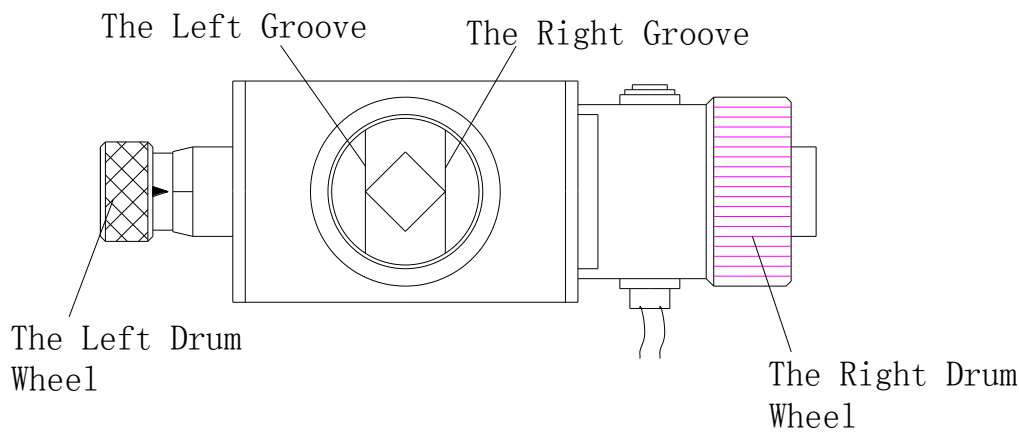
Indentation can be seen in the micrometer eyepiece (6) field of view, then you can measure the indentation diagonal's length in the micrometer eyepiece (6). If the indentation is not clear, you can slowly turn the rotary wheel (2), move up and down the test sets (4) till the image of the Indentation is the clearest. If two graduated lines seem vague in the Eyepiece, adjust the Eye Guard (7) till the graduated lines are the clearest, this is according to personal vision.

Rotate the Right Drum Wheel (17) 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.



(Fig9)

Rotate the Right Drum Wheel (17) to let graduated lines separate each other, turn the Left Drum Wheel (12) to move the left graduated line until its inner side tangent to the intersecting point at left outside of the indentation, and then move the right graduated line until its inner side tangent to the intersecting point at right outside of indentation (Fig 10).



(Fig10)

After measurement, press the measuring button (16), the measurement of length d_1 of the diagonal is completed; turn micrometer eyepiece (6) 90° . Use the above methods to measure the diagonal length of the d_2 , press the measuring button (16). 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.

6 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 textbox 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 (16). Last, click "SAVE", hardness value has been calibrated. 10X and 40X calibrated in the same way.

7 Regulation of the Instrument and the Precautions

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.

7.1 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.

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.

7.2 The 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 (7) 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.

7.3 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.

7.4 The measurement for Knoop Hardness

Value of test less than 1kgf (9.8N) can be exchanged between Vickers and Knoop.

7.4.1 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 indentation 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.

7.4.2 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.

8 Accessories (The Packing List)

- A. The main hardness tester (including a Micro Vickers Indenter, a 10[×] Objective and a 40[×] Objective)
- B. The accessories Kit

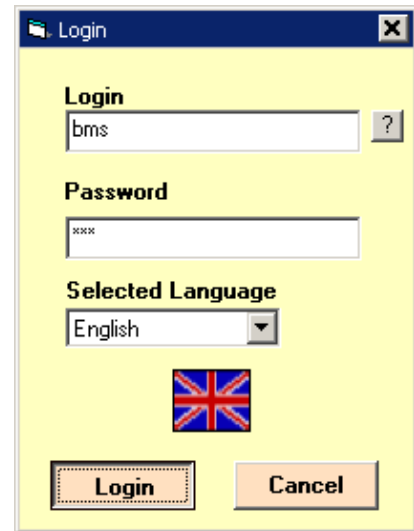
Description of Goods	Quantity
Weight Axis	1 PC
Weights	6 PCS
Digital eyepiece	1 PC
X-Y Test Table	1 PC
Screwdriver	2 PCS
Regulating Screw	4 PCS
Level	1 PC
HV1 Test Block	1 PC
Power Cable	1 PC
Calibration Certificate	1 PC
Manual	1 PC
Cover	1 PC
Spare fuse	2 PC
CMOS Camera	1 PC

9 OPTOBUL Hardness Tester Software



The Login dialog box has a yellow background and a blue title bar. It contains three input fields: 'Login' (empty), 'Password' (empty), and 'Selected Language' (set to 'English'). Below the language dropdown is a small UK flag icon. At the bottom are two buttons: 'Login' and 'Cancel'.

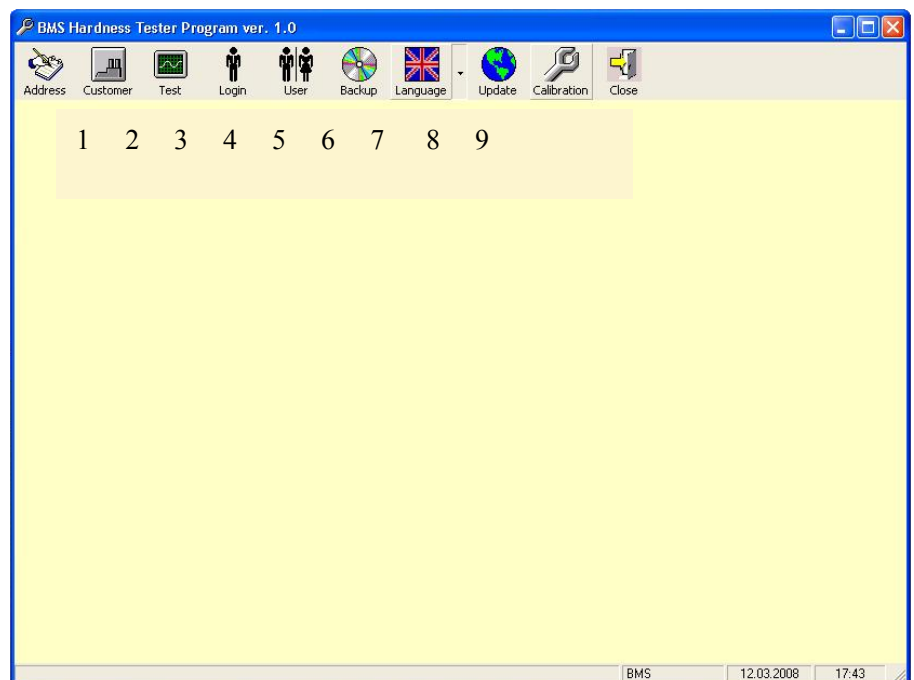
You can enter Login name as “bms” and password “bms” for the first run



The Login dialog box is shown again, but now the 'Login' field contains the text 'bms' and the 'Password' field contains 'XXXX'. The 'Selected Language' remains 'English' and the UK flag icon is still present. The 'Login' and 'Cancel' buttons are at the bottom.

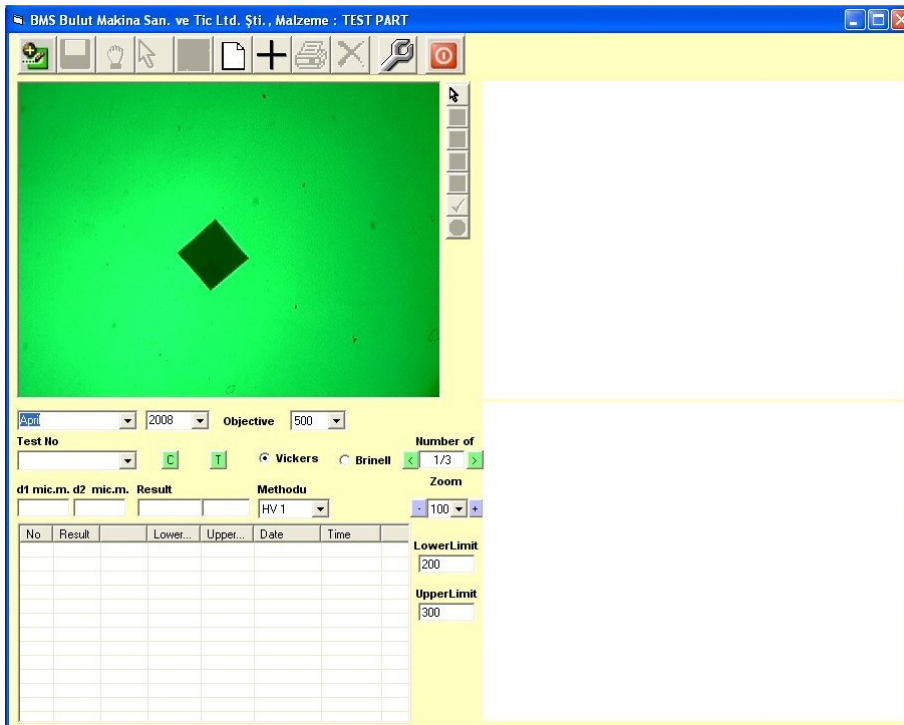
The main window includes the following functionalities as below;

- 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,



9.1 Address

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



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;

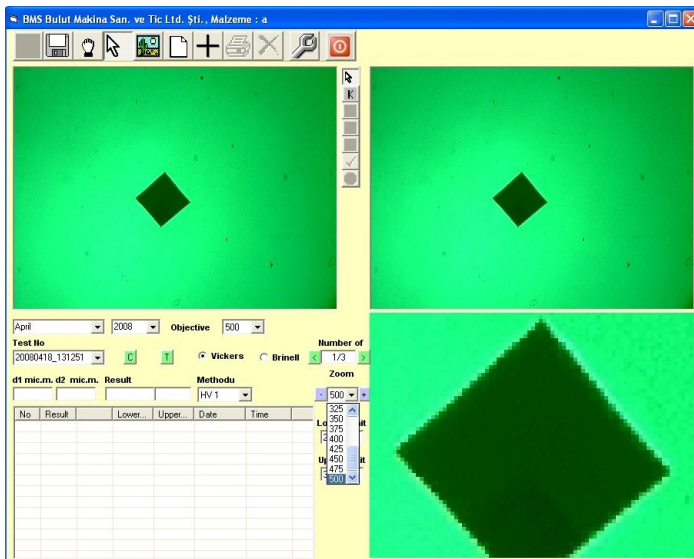
Select Objective

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,



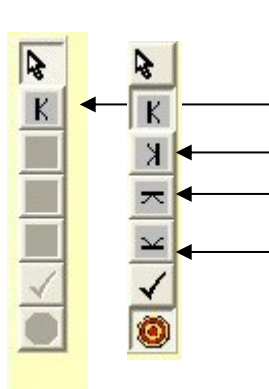
, Draws the cross sign the correct position of sample figure,




, Prepare report in excel file,




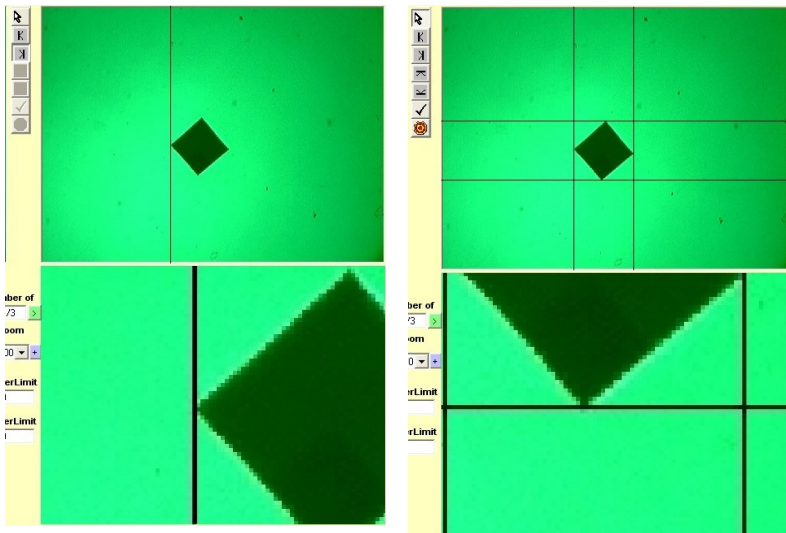
, Deletes the selected test,



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 D1 value 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.

April 2008 Objective 500

Test No 20080418_131251 C T ☒ Vickers ☐ Brinell Number of 3/3

d1 mic.m. d2 mic.m. Result Methodu Zoom

51.18 51.18 707.62 High HV 1 500

No	Result		Lower...	Upper...	Date	Time	
1	717.71	High	200	300	18.04.2008	13:16:50	
2	707.62	High	200	300	18.04.2008	13:17:50	
3	707.62	High	200	300	18.04.2008	13:18:32	

LowerLimit 200

UpperLimit 300



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;

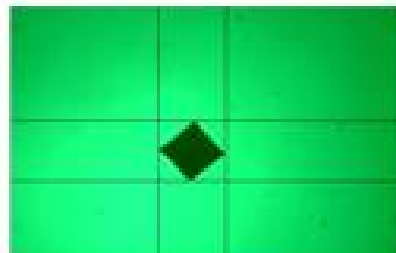
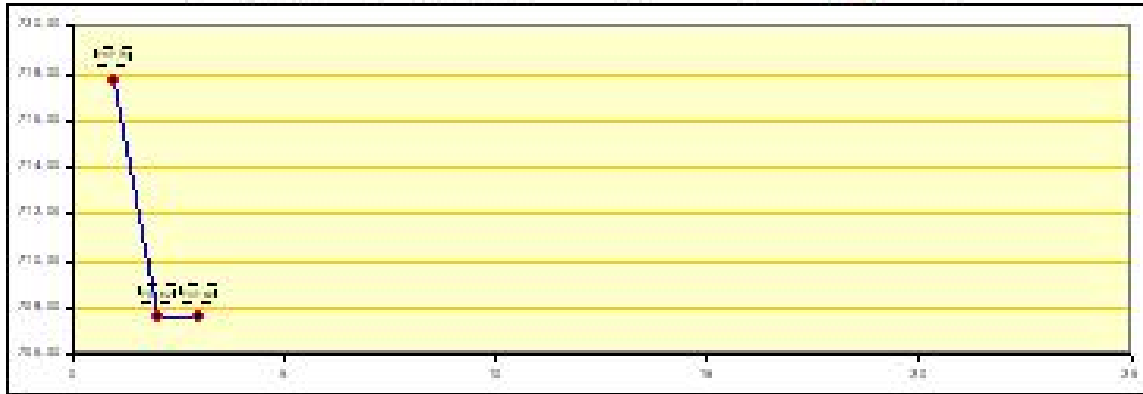


TEST PROTOCOL

TEST BY	
DATE	18-NE-2008
MATERIAL	a

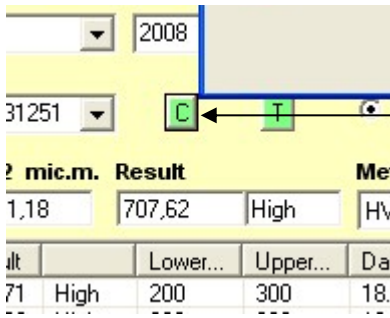
TEST RESULTS

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	710,38	5,83	High



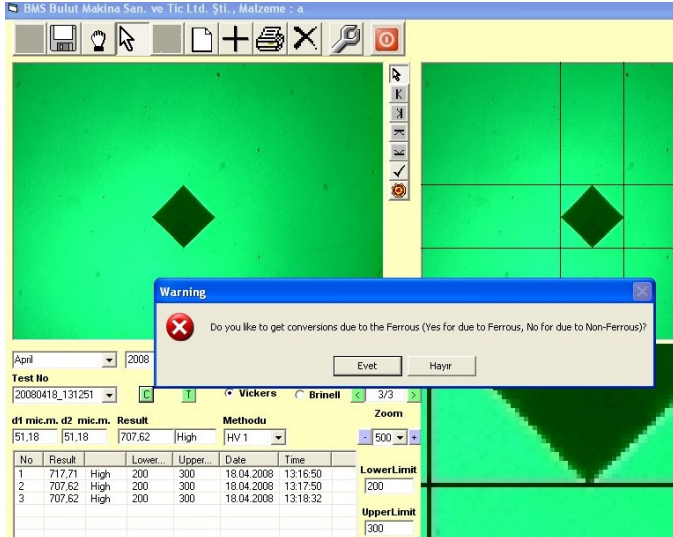
Sign Tester

Sign Qualified

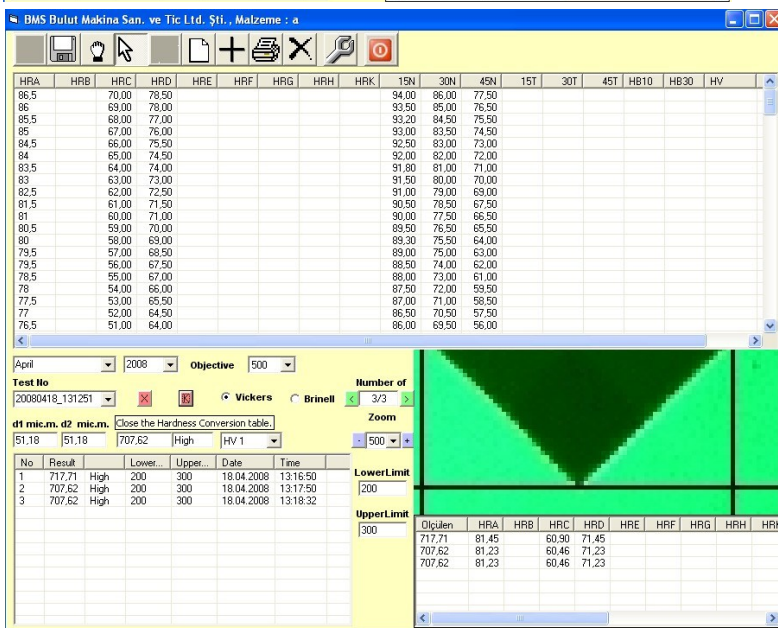
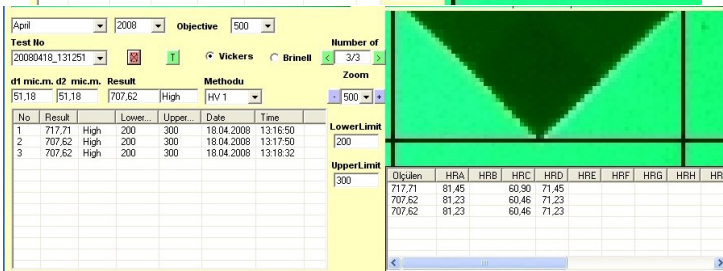


When you press the “C” button then you can get the conversions of the found data as shown below;

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.

9.3 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.

The screenshot shows the 'User Management' window. At the top are buttons: New (pencil), Save (floppy), Delete (trash), Language (UK flag), and Close (X). The form fields are: Login (cem), Password (empty), Description (empty), First Name (cem), and Surname (topuz). Under 'User Rights', the checkboxes are: Supervisor (unchecked), Backup (unchecked), User Management (unchecked), and Customer Info (checked). At the bottom is a table with columns 'Login' and 'Description'.

Login	Description
bms	
cem	

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.

The screenshot shows the 'User Management' window for user 'bms'. The form fields are: Login (bms), Password (xxx), Description (empty), First Name (BMS), and Surname (LTD). Under 'User Rights', all checkboxes are checked: Supervisor, Backup, User Management, and Customer Info. The table at the bottom shows 'bms' and 'cem' as existing users.

Login	Description
bms	
cem	

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.

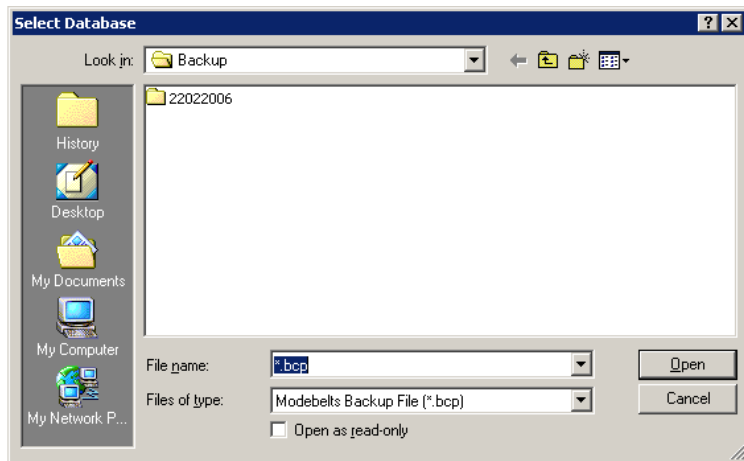
9.4 Backup

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).

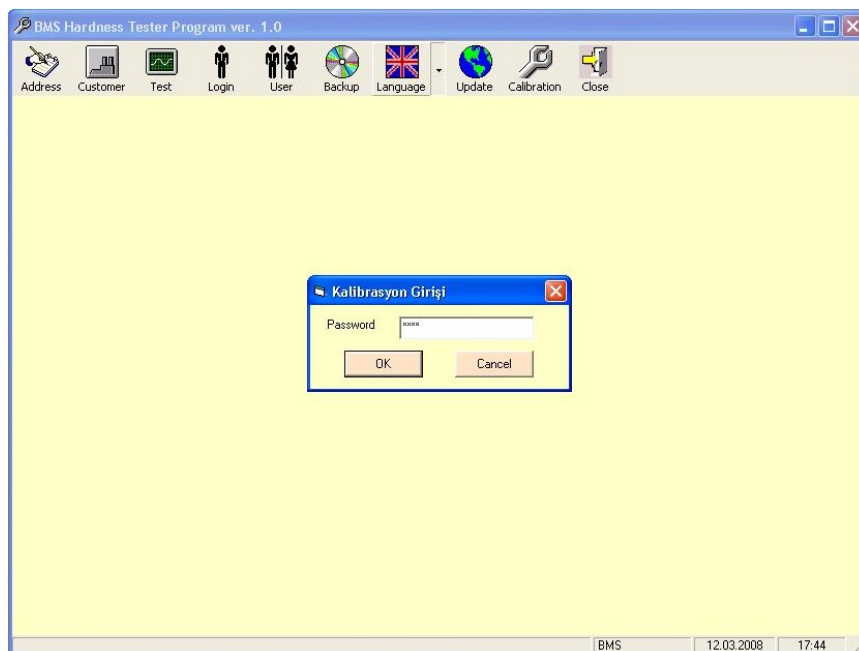


If you press “Restore” button then you can see the following figures to select date and the backup file to restore it.

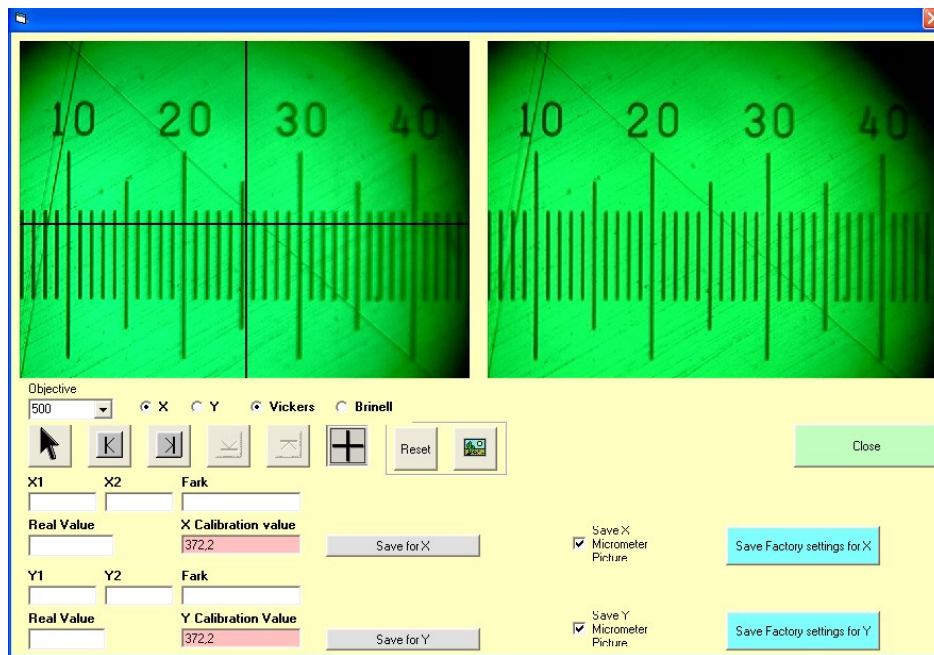


9.5 Calibration

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.

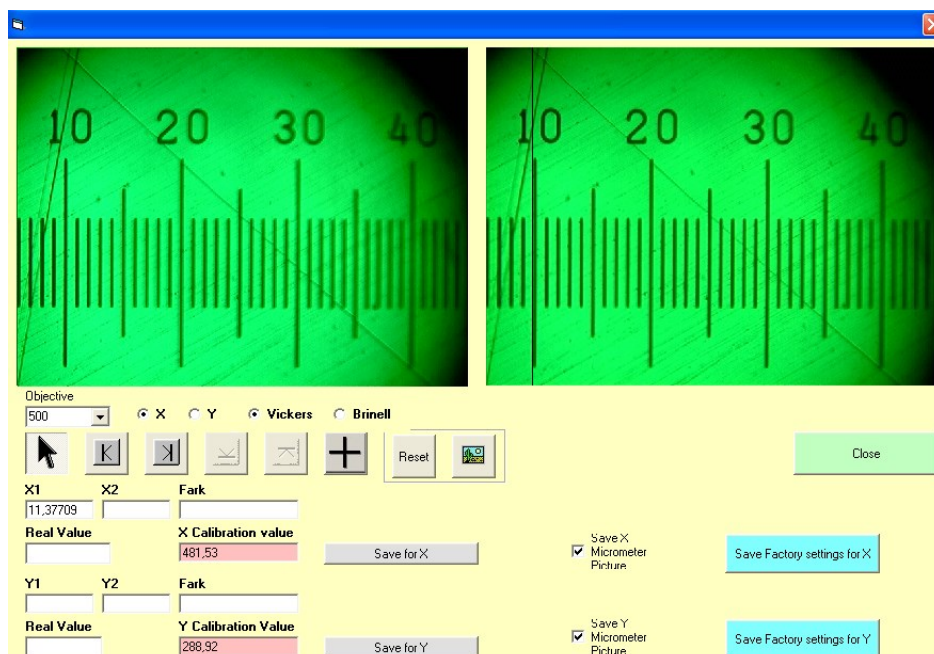


Select Zoom and the cross sign to correct the figure by rotating camera it's around as shown below;




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 μm from reference point to the end point.

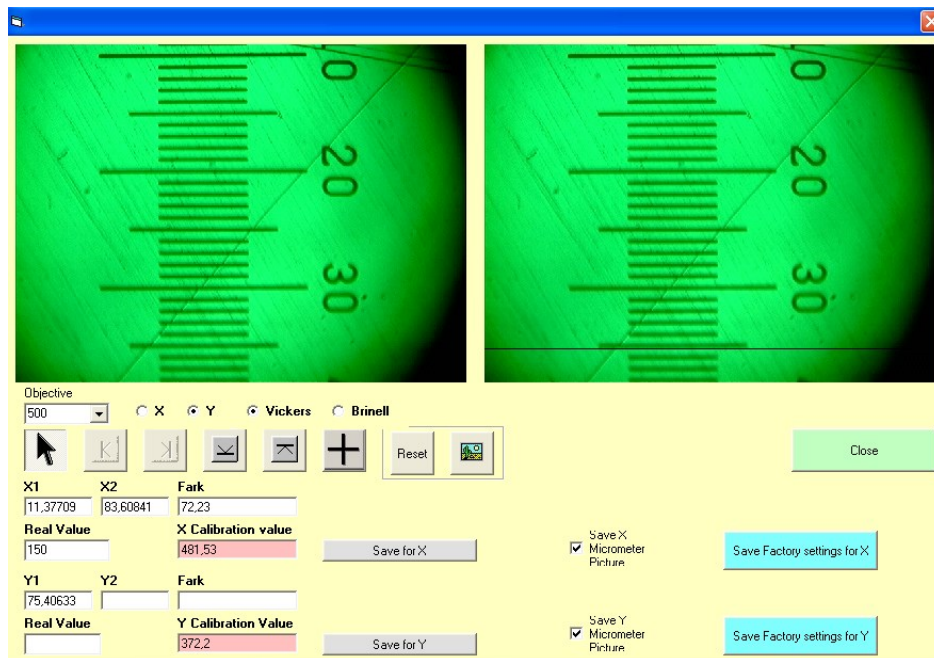


Write the real value to the text box and then press “Save for X” button to calculate the calibration parameter and save it to the database. After saving it, if you want you can press “Save factory settings for X” button and too.

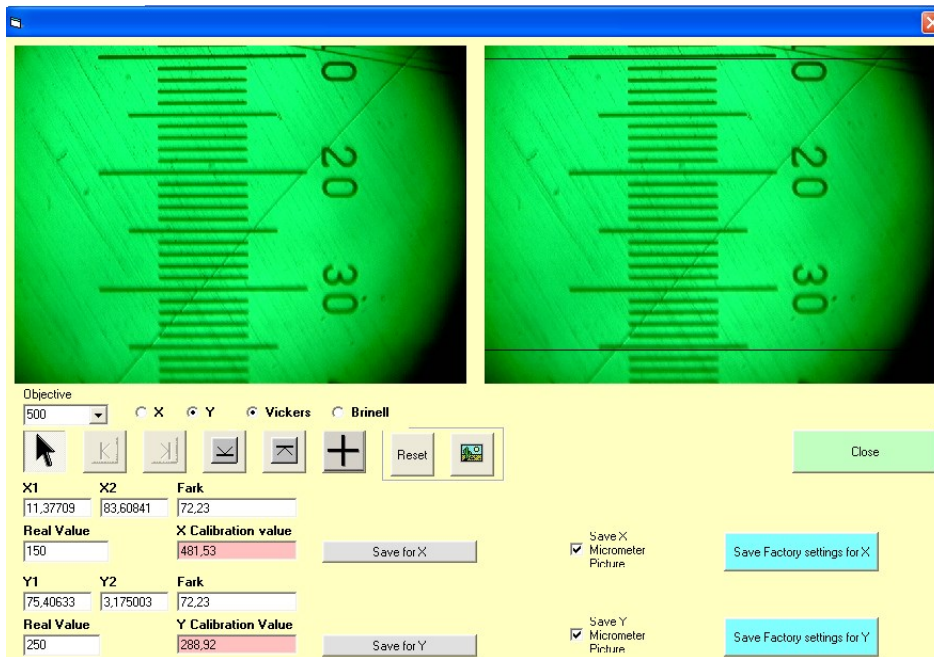
Repeat steps for Y as the following;

Select the “Objective” and then press “Y” option to start by button  from left to right approximation to

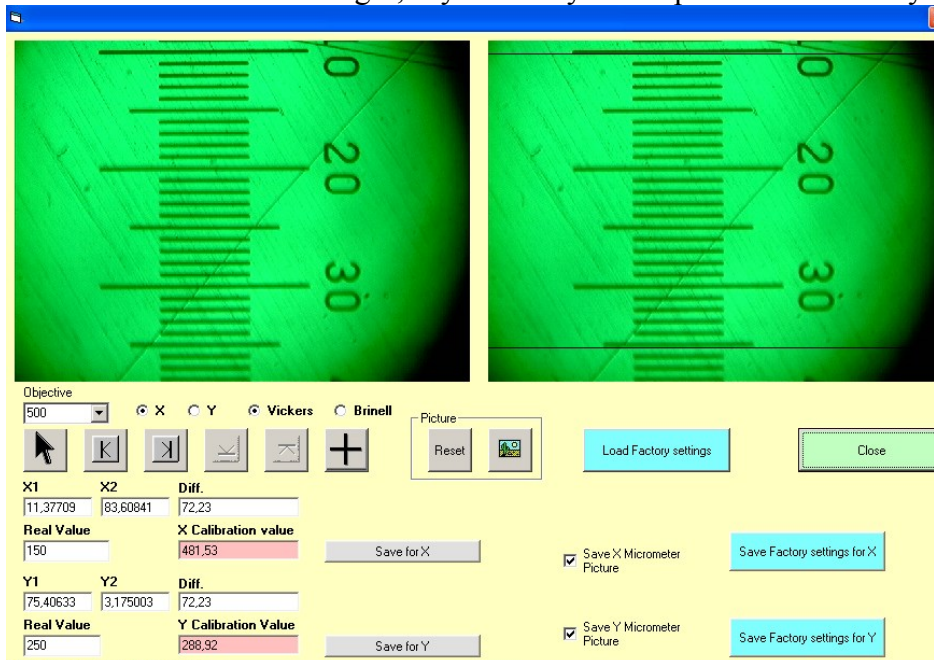
one reference point like below. Secondly, press button  to measure a distance in μm from reference



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.