

## **MICROBUL 10-DN** Micro Vickers Hardness Tester



OPERATIONAL MANUAL

**BMS Bulut Makina Sanayi ve Ticaret Ltd. Şti.**

Kocaeli KOBİ Organize Sanayi Bölgesi  
Köseler Mahallesi, 6.Cadde No:20/2 Dilovası / KOCAELİ

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

Web: [www.bulutmak.com](http://www.bulutmak.com) e-mail: [bms@bulutmak.com](mailto:bms@bulutmak.com)

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# 1 Main Description

The hardness tester is suitable for measuring the micro hardness of micro, thin, surface coating specimens, and determination of glass, ceramics, agate, artificial gemstones such as more brittle and hard materials Knoop hardness. It is an ideal hardness testing instrument for scientific research institutions, enterprises and quality inspection departments to study and test.

# 2 Technical Specifications

1. Measuring indentation diagonal length system automatically calculates and displays hardness value;
  2. Calibrate according to the scale or standard hardness block, the hardness value is automatically corrected;
  3. Data statistics save, easy to query and print output;
  4. 8寸 touch screen, easy to operate, bilingual selection;
  5. Double objective measurement, increase the measurement range;
  6. Hardness value conversion according to the standard ASTM;
- Modular design, easy maintenance; the software can be connected with the computer. The computer can control the hardness tester image, data processing;
7. Six block test force: 0.3Kgf (2.94N), 0.5Kgf (4.9N), 1.0Kgf (9.8N), 3.0Kgf (29.4N), 5.0Kgf (49.0N), 10Kgf (98.0N)
  8. Hardness test range: 8HV~2900HV
  9. Test force method: Automatic loading and unloading test
  10. The magnification of the microscope: 200×, 100×
  11. Tester force duration time: 0~99s
  12. Minimum detection unit: 0.01μm
  13. Maximum height of specimen: 160mm
  14. Distance from indenter center to outer wall: 135mm
  15. Weight of the main hardness tester: 55Kg
  16. Power supply: AC220V/50Hz
  17. Exterior dimension : ( 600×220×700) mm

# 3 Installations and Regulation (Debugging)

## 3.1 Operational Conditions

- a) Room temperature 10 to 35°C
- b) Installed in a horizontal position on a solid basement;
- c) In an environment without any shock or vibration;
- d) In a surrounding without any corroding agent;
- e) Room relative humidity less than or equal to 65%

## 3.2 Unpacking and Installation

Remove the outer packing box, lift the box, and take out the accessory box

Raise the bottom plate, with the wrench unscrewed the two M10 bolt under the floor, the hardness tester and the bottom plate are separated, take out the hardness tester (pay attention to safety).

Put the hardness tester on the stable working table., At the same time, open hole on the proper position of the working platform . ( Fig.1 ), make the screw work normally

Remove the adjustment screw (1) from the accessory case and screw it to the bottom of the main body (Fig. 2) and transferred to the level

Turn the wheel (2) make the screw (3) down smoothly through the work table opened hole, The specific size of the hole is Fig 1

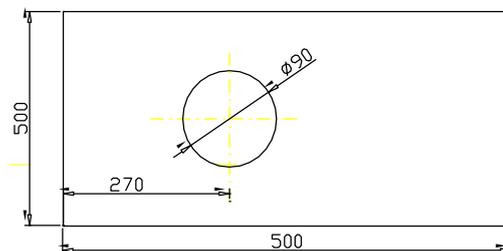


Fig (1)

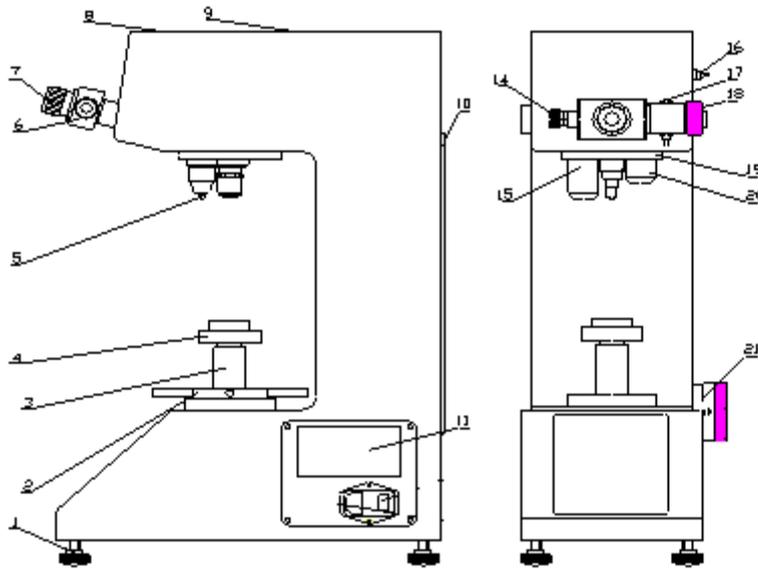


Fig (2)

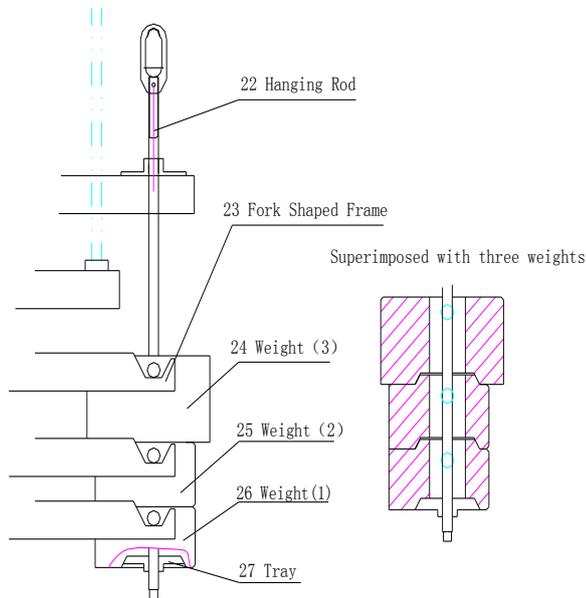
1. Adjusting screw
2. Wheel
3. Lifting Screw (protection cover)
4. Testing Table
5. Indenter
6. Micrometer eyepiece
7. Eye Patch
8. Camera cover plate
9. The Upper Cover
10. The Back Cover
14. Light source
15. 10×Objective
16. Eyepiece socket
17. Measuring button
18. The Right Drum Wheel
19. Rotating Plate
20. 20×Objective
21. Load-change hand wheel

Open the camera cover plate (8), remove all the straps on the lever, then put on the cover

Take out the testing table(4) from the accessory box, put it into the lifting screw (3) hole, insert one end of eyepiece (6) into the hole of eyepiece tube and make sure it is fixed at the bottom. The eyepiece wire plug is inserted in the eyepiece socket (16)

### 3.3 Installation of Weights

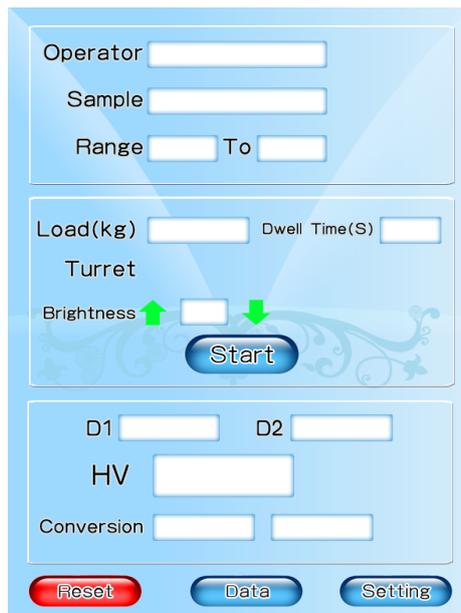
Open the back cover (10), unpack gauze bands wrapped between the Hanging Rod (22) and the Fork Shaped Frame (23), take out the weight group from accessories kit, and clean the weights. Rotate the Hand Wheel 21 to position of 0.3 kgf, enable the Fork Shaped Frame (23) at horizontal level. Put Weight1 (26), Weight2 (25), Weight3 (24) on the Tray (27) respectively in proper order, and then place each Weight's cylindrical pins into the according Fork Shaped Frame (23)'s groove, then turn the Hand Wheel (21) to position of 10kgf. When Weights are impending, they should not touch with inside wall of the Fork Shaped Frames (23). Turn the Hand Wheel (21) in opposite direction to position of 0.3 kgf, and then observe the cylindrical pins on both side of weights and see if they are properly placed into the groove of the Fork Shaped Frames (23). Then re-cover the Back Cover (10).



(Fig 3)

## 4 Operator Panel and Menu Description

Connect the power, turn the power switch (11) the main screen will light up and the operation interface will appear (Fig 4)



(Fig 4)

“Tester, sample name, qualification range, stress, dwell time, conversion “Those text box on the right side of the text is clicked for information entry. The operation method is as follows: the single point with finger and entered 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, click “ESC”. As shown in figure 5.



(Fig 5)

#### 4.2 Tolerance

Click the text box to the right of “Tolerance” . Then input the number as shown in figure 6. and click “OK”. If want to cancel, click “ESC”.



(Fig 6)

#### 4.3 Choose Dwell Time

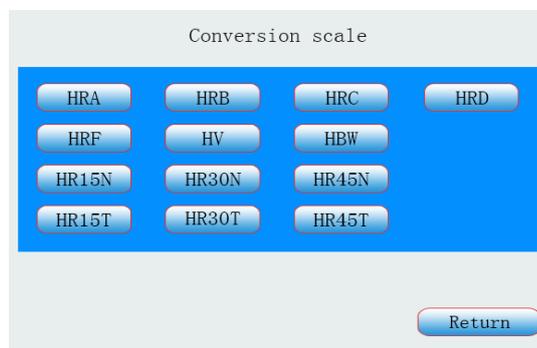
Click dwell time , normally it is 10s, click “OK”, go back to the main screen.

#### 4.4 Light Source Adjustment

Click  to adjust the brightness

#### 4.5 Conversion

Click “Conversion” and choose the scale. If there is no need to modify, click Return (  ). as shown in fig. 7:



(Fig 7)

#### 4.6 Data Inquiry, Print

Click “Data”, shows data processing menu: hardness type, hardness value, conversion type, conversion value, maximum, minimum, and average and variance value. Totally save 20 test points, will auto delete first point when 20 points exceed, always keep 20 test points. Click “Return”, go back to the main screen. As shown in fig 8:

DATA

NO.	Hardness-S	Hardness-V	Conversion-S	Conversion-V

MAX	MIN	AVE	VAR

(Fig 8)

#### 4.7 Language selection

Click “”, pop out menu. As shown in fig 9:

Testing calibration  
should only be operated under  
help of professional personnel.

Password:

(Fig 9)

Click “”, pop out numeric keypad, input 12345678, click “”, pop out interface as shown fig 10

Calibration

Magnification:

Load(Kg):

Pulses: X  Y

Scale

Hardness

(Fig 10)



Click “”, Chinese -English shift, click “”, go back to the main interface.

## 5 Usage of the Hardness Tester

Turn on the power, the screen is on.

Rotate the load-change hand wheel to make the test force meet the selection requirements. When rotating the hand wheel, be careful to proceed slowly. When rotating to the maximum force value of 10kgf, the rotating position has been reached to the end, and it cannot continue to turn forward, but should turn backward. The minimum force value of 0.3kgf should also be reversed. The requirements on the screen can be set.

For example: test 10kgf scale

Rotate the load-change hand wheel to the position of red 10, indicating 10kgf test force click dwell time



normally input 10s, click OK, and go back to the main screen.

Place the standard block or test piece on the test table (4, Rotation The wheel (2) make test table rise, when the distance between test piece the lower end and the indenter is about 0.5 ~ 1mm, Turn the Rotating Plate (19) to enable The20×Objective (20) to the front position, At this time, the general magnification of light path system is 200. 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.

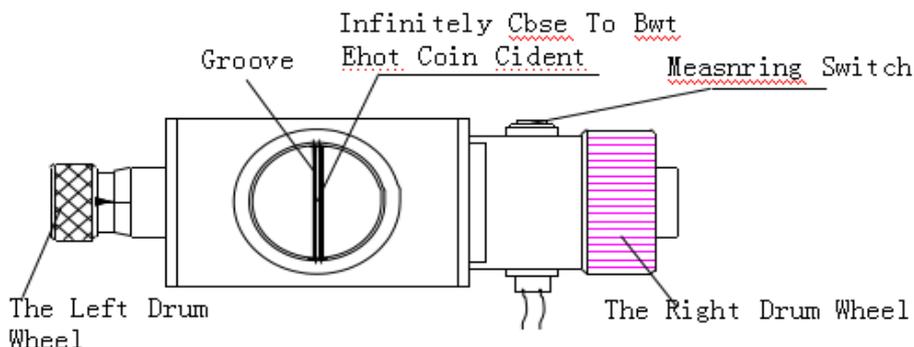
Caution: When irregular-shaped specimen is to be tested, take more careful to avoid the indenter is damaged due to the collision between the indenter and specimen.

Turn the Rotating Plate (19) to enable indenter to the front position press “start “button, the indenter automatically comes forward and test force is applied, “↓” appears on screen which shows the test force is loading. “DWELL” means to keep the test force. When loading and unloading of test force is completed, the main screen will back to operating page.

**Caution:If choose 10X objective to test, Turn the Rotating Plate (19) to enable 10X objective to the front position**

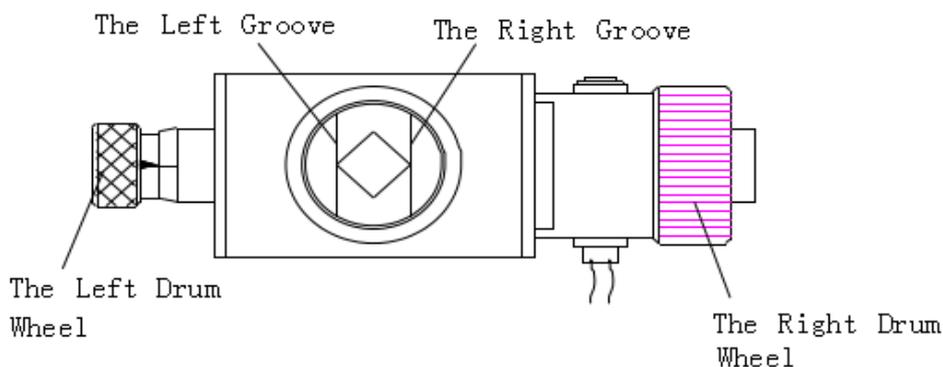
Indentation can be seen in the micrometer eyepiece field of view, then you can measure the indentation diagonal’s length in the micrometer eyepiece. If the indentation is not clear, you can slowly turn the rotary wheel (2), move up and down the test sets (4) till the image of the Indentation is the clearest. 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 (18) 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 (FIG.11), at the zero position for technique term. Now the length of diagonal line of indentation can be measured in the Eyepiece.



(Fig 11)

Rotate the Right Drum Wheel to let graduated lines separate each other, turn the Left Drum Wheel 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 (Fig12).



(Fig 12)

After measurement, press the measuring button, 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. 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.

After several tests, the results has been stored in the instrument. If you want to check the test data, click “Data”, if need to print, click “Print”

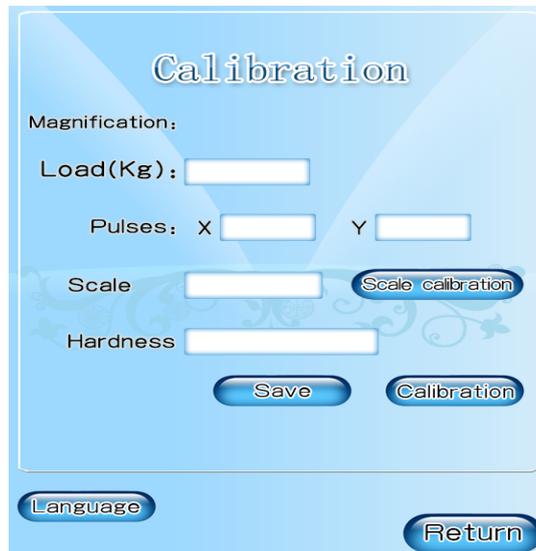
## 6 Calibration of Hardness Value

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 load on the test block, click “Calibrate”, turn out the interface (Fig 13)



(Fig 13)

Click , turn out the numeric keypad, input 12345678, Click “Enter”, and turn out the interface fig 14



(Fig 14)

Click hardness , input the hardness value of the numeric keypad, then measure the indentation, after measurement click the measure button, the measurement of diagonal length is completed; rotate the eyepiece to 90, the measurement of diagonal length D2 can follow the above method, after measurement, click “Save”, the calibration of hardness value is finished. Click “Return”, go back to the main screen

## 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 unsafe accidents. It is prohibited to move the sample during loading and unloading, otherwise it would damage the instrument. Only after testing force has been unloaded and the screen returns to operating page, then the sample can be rotated.

### 7.1 The Diamond Indenter

1) 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.

### 7.2 The Eyepiece

Owing to personal difference of 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.

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.

The measurement for Knoop Hardness (force of 1 kgf (9.8 N) or less can switch between Vickers and Knoop)

### 7.4 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.

### 7.5 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 Accessory (Packing list)

The main hardness tester (Including a micro Vickers indenter, a 20x objective and a 10xobjective)

Item	Specification	Quantity
1	Weight	3
2	Middle, Large, V shape testing table	Each 1
3	Regulating Screw	4
4	10 <sup>x</sup> eyepiece	1
5	Vickers test block	1
6	Spare Fuses (2A)	1
7	Level	1
8	Power cable	1
9	Dust bag	1
10	Manual	1