OPERATION MANUAL

BMS 3000-OBLC-PC
Brinell Hardness Tester

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1 General Description

Brinell hardness testing is to apply specified test forces onto the surface of test specimen through a quenched steel ball of certain diameter and retain it for a specified period of time, then remove it and measure the diameter of indentation on the surface of specimen，and calculated as per the following formula:

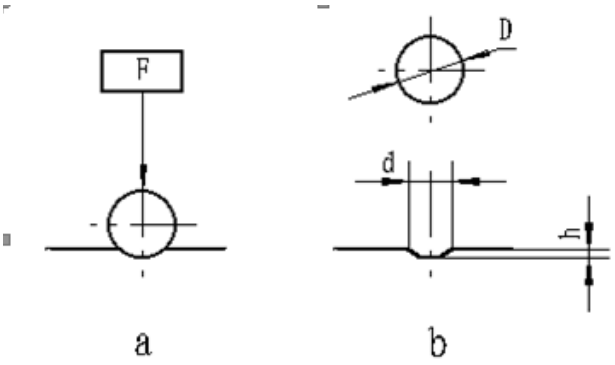
$$HBW=0.102 \times 2F/\pi D(D-\sqrt{D^2-d^2})$$

F-------- Test forces N；

D------- Diameter of hard alloy steel ball mm；

d-------- Average diameter of indentation mm;

HBW--- Brinell hardness。



For example ：

216HBW10/3000/10 means that the hardness is 216 measured with a hard –alloy ball of diameter 10mm , under a test force of 29.42KN which is retained for 10 seconds .Brinell hardness is marked with symbol HBW.

1.1 Range of Application

The machine is a desktop Brinell hardness tester. It can be used to measure the hardness of normalizing and annealed workpieces, casting parts, non-ferrous metals and steel parts. It is suitable for the metal metallurgy, chemical industry, mechanical manufacturing, industrial and university.

Measuring range: 8—650HBW

The hard alloy indenter: Suitable for measuring workpieces below 650HBW.

1.2 Product Characteristic

Unique performance：The hardness tester uses the high precision weighing sensor and microcomputer control stepper motor automatic loading and unloading. This tester has reasonable structure, beautiful appearance and easy to use.

2 Main Performance and Parameters

Grade of test force--------0.613、0.9807、1.226、1.839、2.452、4.903、7.355、9.807、14.71、29.42KN（62.5、100、125、187.5、250、500、750、1000、1500、3000Kg）.

The hard alloy ball diameter ： Φ2.5mm 、 Φ5mm 、 Φ10mm

The keeping time: 1—99 S .

Maximum height of specimen ： 280mm.

Distance between center of indenter and wall of instrument：150mm.

Power supply ： AC220V 2A 50Hz;

The size of the tester（length*wide*height）：520*220*920mm

Net weight ： 140Kg

3 Basic Configuration and Structure

3.1 Basic Configuration

Brinell hardness tester ----------1
CMOS 5 megapixel camera----------1
Large flat anvil----------1
Small flat anvil----------1
V-notch anvil----------1
10mm penetrator----------1
5mm penetrator ----------1
2.5mm penetrator ----------1
Brinell standard block---------- 2
Accessory box----------1

★Accessories that you can choose to buy ：hard alloy ball 、various worktables 、various standard block、internal fitting of this tester、readout microscope、various indenter.

3.2 Structure Composing

Brinell hardness tester consists of machine body, screw, working table, level system, weighting sensor, stepping motor loading and unloading system, microcomputer control system.

3.3 Panel layout

3.3.1 Button function introduction

[Print]: if a printer is connected, print the current latest test record.

[save]: save the current test data and save the test data in the historical data.

[historical data]: view the historical data saved in the past, and you can search up and down, delete, print or export the historical data to USB flash disk.

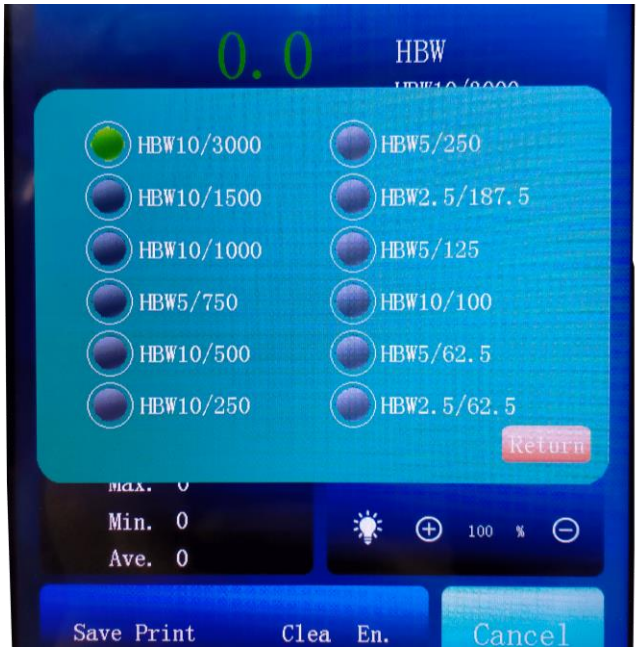
[clear]: clear the encoder of encoder positions D1 and D2 and test hardness.

[Cancel]: press cancel during operation to stop operation and return to the initial state.

[function key]: the icon  is displayed in the upper left corner of the screen. You can choose to use language, force value calibration and encoder calibration.

3.3.2 Status monitoring area

Display the measured hardness value, real-time test force and test scale selection. Click the test scale position to pop up the test force selection interface to select the test scale, as shown in the following figure



Click the circle in front of the ruler to select the test ruler.

3.3.3 Time display area

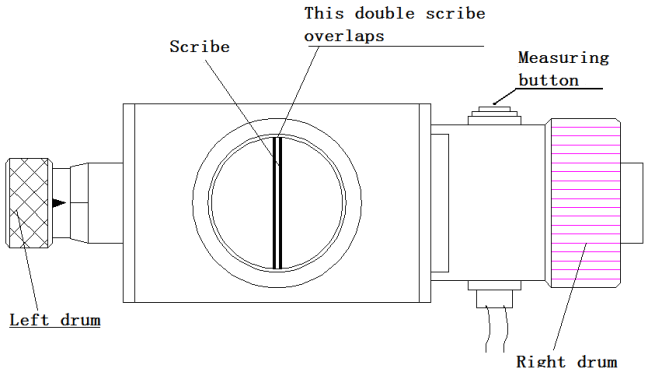
Display the year, month, day and time. Long press the time display area to pop up the time modification numeric keypad for modification.

3.3.4 Measurement display area

Display the measured indentation diameter, press the measurement button to switch D1 and D2 conversion positions, and rotate the right hub on the encoder to change the measured values of D1 and D2. Encoder reset see

Turn the right drum and move the scribed line in the eyepiece to gradually close the two scribed lines. When the inner side of the scribed line is infinitely close (the inner side of the scribed line is in a critical state without light gap, but the two scribed lines must not overlap).

See figure



Press the clear key on the screen to clear D1 and D2. At this time, D1:

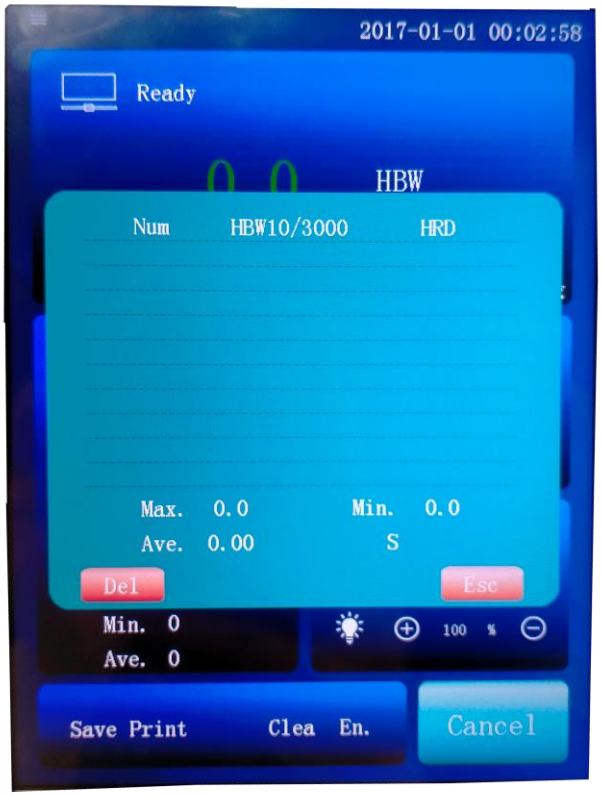
3.3.5 Measuring eyepiece

Press the clear key on the screen to clear D1 and D2. At this time, D1: value on the main screen is zero, which is the zero position in the term. Then measure the diagonal length of the indentation in the eyepiece. (the zero position must be reset every time the machine is started)

3.3.6 Data display area

Display the maximum value, minimum value and average value of the test. You can set the maximum number of tests and display test data.

Click the button  in the data display area to pop up the data list, displaying the measured data (up to ten groups of data) as shown in the following figure:



3.3.7 Light regulation area

Press the plus and minus symbols to adjust the brightness of the light.

3.3.8 7. Hardness conversion area

Press the key  in the hardness conversion area to pop up the Hardness Conversion selection window, and select the hardness scale to be converted, as shown in the following figure:

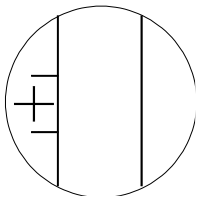
Click the circle in front of the ruler to be converted.

3.3.9 8. Guarantee time setting area

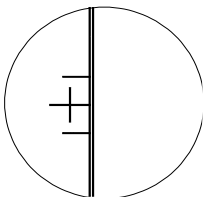
Click the number at the back to pop up the number keyboard. Enter the number to set the holding time.

★Notice : The tester could only be calibrated by manufacturer or technical supervision department, if the test error exceeded the national standard, others could not enter the “Forc Corr” to change the data .

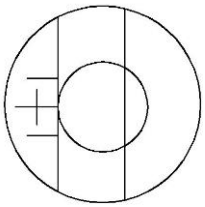
Average diameter of indentation d	Minimum thickness of test piece			
	Ball diameter			
	D=1	D=2.5	D=5	D=10
0.2	0.08			
0.3	0.18			
0.4	0.33			
0.5	0.54			
0.6	0.8	0.29		
0.7		0.4		
0.8		0.53		
0.9		0.67		
1		0.83		
1.1		1.02		
1.2		1.23	0.58	
1.3		1.46	0.69	
1.4		1.72	0.8	
1.5		2	0.92	
1.6			1.05	
1.7			1.19	
1.8			1.34	
1.9			1.5	
2			1.67	
2.2			2.04	
2.4			2.46	1.17
2.6			2.92	1.38
2.8			3.43	1.6
3			4	1.84
3.2				2.1
3.4				2.38
3.6				2.68
3.8				3
4				3.34
4.2				3.7
4.4				4.08
4.6				4.48
4.8				4.91
5				5.36
5.2				5.83
5.4				6.33
5.6				6.86
5.8				7.42
6				8



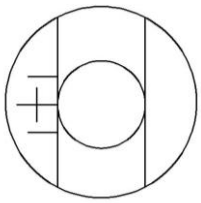
Figur1



Figur2

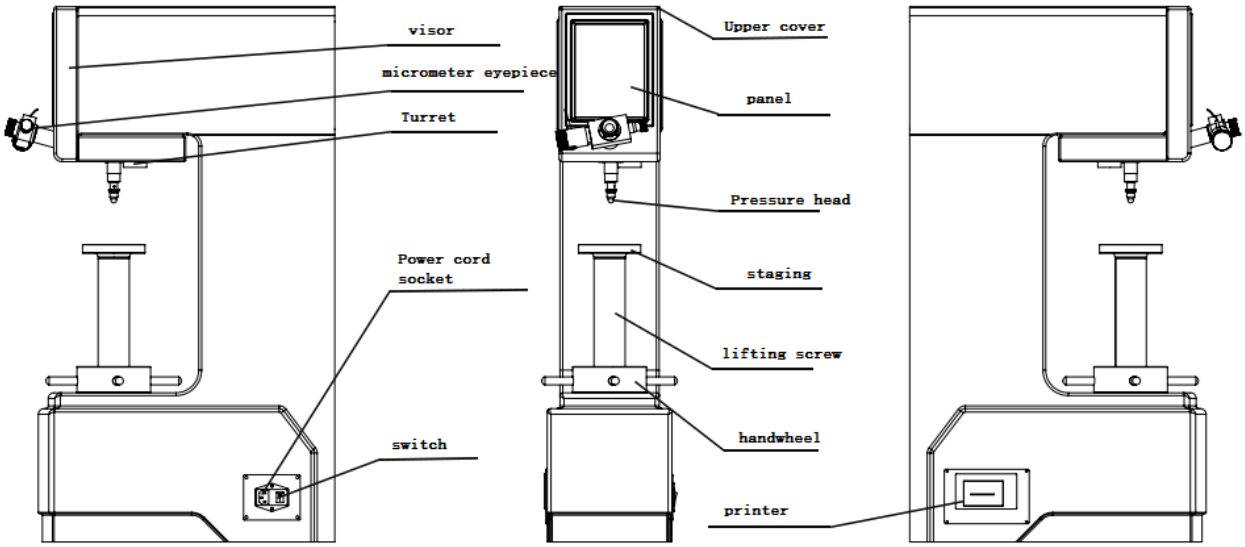


Figur3



Figur1

The adjustment of the zero position of the hardness tester has a memory function. Only after starting and restarting, do you need to reset the zero position. Replace the operator, please adjust the zero position again to ensure accurate measurement.



4 Formal test

Put the workpiece on the working table, turn the hand wheel to make the tested part contact with the indenter, continue to rotate the hand wheel to make it reach the preload force, stop rotating after hearing (dripping), and the equipment will start loading. The loaded real-time force value is displayed in the data display area of the screen. When the set force value is reached, the holding time will be counted down in the holding time area. After reaching the holding time, unload and complete the loading test.

Rotate the handwheel in reverse direction to leave the pattern on the workbench from the indenter, rotate the turret, rotate it to the position of the objective lens, and then measure it.

Note: the machine shall be calibrated with standard Brinell hardness block before each test

5 Guideline for Troubleshooting

Start the machine without display ： Make sure the power is on, the power fuse is in good condition, and the link of the power line is good, the power supply is 220V.

The experiment did not maintain the setting time: there is on specimen or the specimen is too soft. Please choose the correct indenter and the test force refer to “Selection of steel ball diameters and test force in Brinell Hardness Test”.

Experimental error：Check whether the experimental force conforms to standards with the dynamometer.

The tester is controlled by a microcomputer, reset the computer to restore if there is a code crash.

If you have any further problems, please contact the manufacturer or supplier.

6 Maintenance and Precautions

- Fill the lubricant to the moving parts 2 times per month.
- Protect the tester with dust-proof cover when it will not be used for a long period of time.
- If long distance transportation should be restored to the original packing.
- When loading and unloading the indenter must be carefully to protect the hard-alloy ball from damaging and polluting. The indenter should be unloaded and properly kept when it is not used for a long time.
- The surface of working table and Brinell standard block should be no pollution, no scratches and no bruises. Preservation with antirust oil after use.
- Working environment should be free of vibration and corrosive medium.
- Machine must be grounded to avoid accidents.
- Fill adequate machine oil to the lead screw and hand wheel periodically. Take off the cover of the lead crew, fill the lubricating oil onto it, then rotating hand wheel and repeat lifting the screw to make the lubricating oil evenly. At last put back the cover of the screw. Notice: The lubricating oil cannot be injected too much.
- Hardness testing and calibration shall be carried out according to national standards.
- This machine belongs to precision instrument, do not disassemble and adjust any part in the machine. Any abnormality in the machine please contact us for repair.

Correlation table of steel ball diameters and test force for Brinell hardness test

Materials	Range of hardness HBS(W)	Thickness of specimen (mm)	0.102F/D	Steel ball diameter D (mm)	Test force F KN (kgf)	Test force retaining time (S)
Ferrous metals	140～450	6～3 4～2 ＜2	30	10.0 5.0 2.5	29.42（3000） 7.355（750） 1.839（187.5）	12
	＜140	＞6 6～3	10	10.0 5.0	9.807（1000） 2.452（250）	12
Nonferrous \metals	＞130	6～3 4～2 ＜2	30	10.0 5.0 2.5	29.42（3000） 7.355（750） 1.839（187.5）	30
	36～130	9～3 6～3	10	10.0 5.0	9.807（1000） 2.452（250）	30
	8～35	＞6	2.5	10.0	2.452（250）	60

7 PACKLING LIST

No.	Descriptions	Specification	Quantity
1	Brinell Hardness Tester		1 set
2	Large flat anvil		1
3	Small flat anvil		1
4	V-notch anvil		1
5	Indenter	¢2.5mm	1
6	Indenter	¢5mm	1
7	Indenter	¢10mm	1
8	Brinell standard block	100±25HBW	1
9	Brinell standard block	200±50HBW	1
10	Accessory box		1
11	Dust cover		1
12	Operation Instruction		1
13	Certificate		1
14	Power line		1