iBrin-3000SA
Image Processing Brinell Hardness Tester

Instruction Manual



Anhui Mikrosize Precision Instrument Co.,Ltd

Add: A-4035 RuiFeng Business Expo, Wuhu City, China, 241000.

Web: www.mikrosize.com **Email:** mikrosize@mikrosize.com

Contents

1.Overview 1

2.Introduction 2

3.Main Technical Parameters 3

4.External Structure 4

5.Working Conditions 5

6.Unpacking and Installation 5

7. Interface Introduction & Operation 6

8.Formal Test Procedure 10

9.General Fault Troubleshooting 10

10.Maintenance and Safety Precautions 11

11.Appendix Table 12

1.Overview

In the Brinell hardness test of metals, a cemented carbide ball with a specified diameter is indented into the specimen surface under a designated load (Figure 1a). After the load is maintained for a set dwell time, the load is released (Figure 1b). Measure the diameter of the residual indentation, then calculate the Brinell hardness value with the formula below:

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

Where: F--------Test force, unit: N,

D-------Diameter of carbide ball, unit: mm,

d--------Mean diameter of indentation, unit: mm,

HBW---Brinell hardness measured with cemented carbide ball indenter.

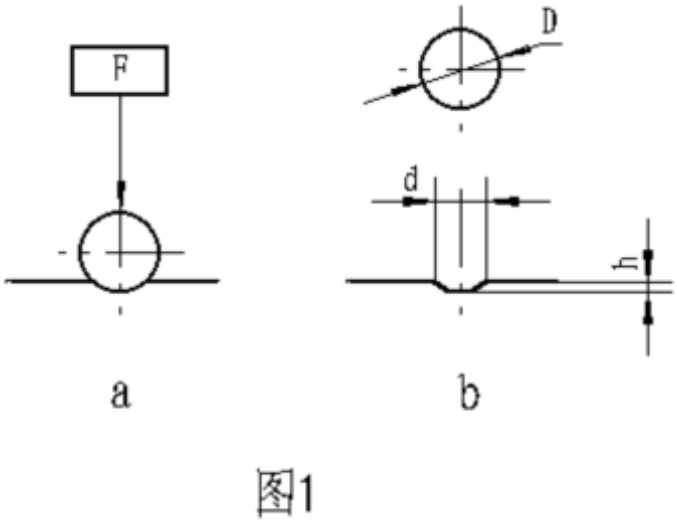


图1

For example: 216HBW10/3000/10. This notation means the measured hardness value is 216, obtained with a 10 mm diameter carbide ball, a test force of 29.42 kN (3000 kgf) and a dwell time of 10 seconds. The symbol HBW denotes Brinell hardness values, and the same rule applies to other specimens.

2.Introduction

This Brinell hardness tester has a cast iron frame with high rigidity and superior measuring precision. It features a sophisticated mechanical structure, where the test load is directly regulated by a load sensor, delivering a compact layout as well as smooth, precise load application and release.

The entire testing cycle is managed by a CPU control system, supporting automatic switching between the objective lens and indenter. Positioning during switching is realized via integrated mechanical and electronic components to boost alignment accuracy. Fitted with a built-in touch screen and microcomputer, the unit enables intuitive parameter configuration and data display for easier operation. It also relieves eye strain and visual fatigue induced by the light source, minimizing measurement deviations.

Upon selection of the corresponding scale, the tester automatically switches the indenter and objective lens. Once the indentation image is sharply focused, the instrument will conduct automatic hardness measurement.

▲This instrument provides 11 grades of test force and supports 14 Brinell hardness testing scales, suitable for testing a wide range of metallic and non-metallic materials.

▲Automatic switching between the objective lens and indenter is available.

▲The hardness tester is integrated with a microcomputer running the Windows operating system and features full computer functionality.

▲Built-in automatic CCD image measurement system with touchscreen operation and display. It supports presetting load dwell time, adjusting light source brightness, and displaying indentation diameter, hardness value, hardness measuring range, measurement counts and other parameters.

▲The built-in software supports calibration and manual fine adjustment, as well as upper/lower limit alarm settings to guarantee measuring accuracy.

▲Equipped with hardness scale conversion function for users to select conversion values among different hardness scales.

▲Hardness test reports can be exported in Word or Excel formats. Reports can be saved locally or printed via an external printer for later review and analysis.

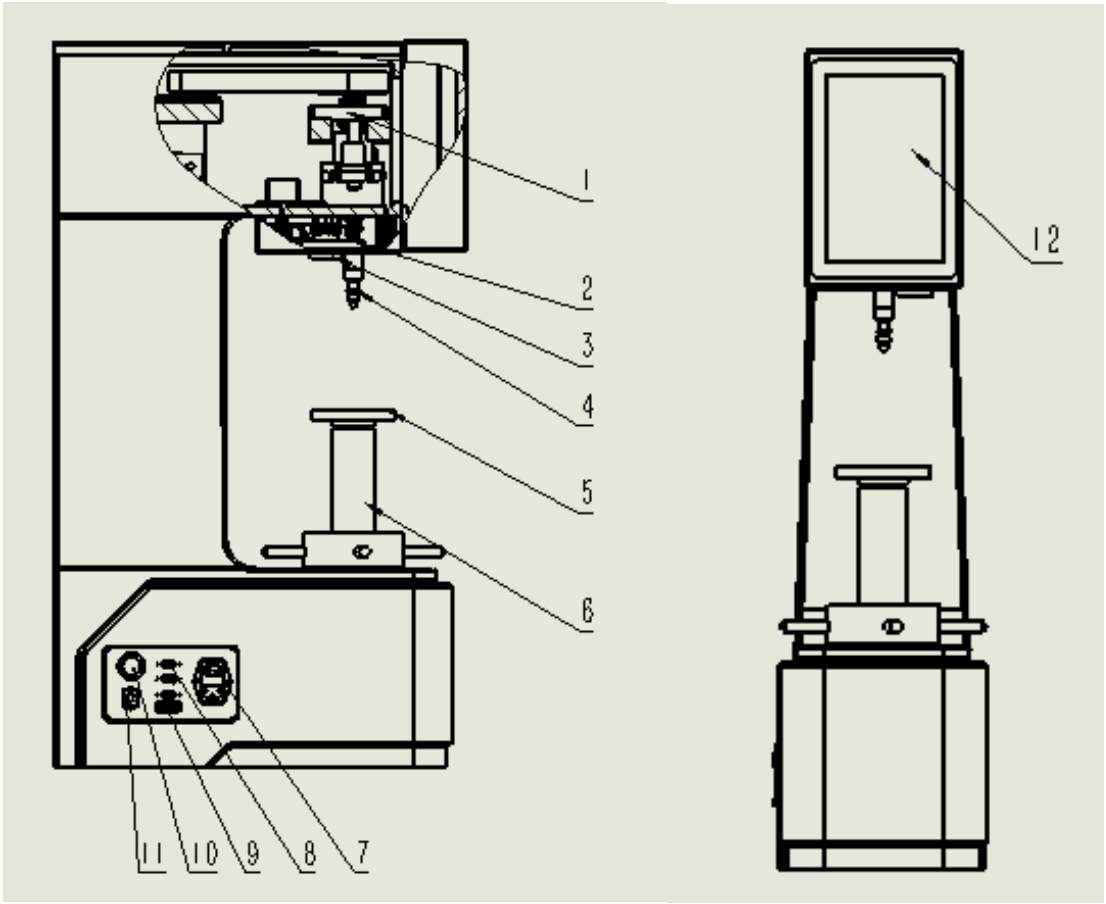
▲Equipped with USB, VGA and Ethernet ports, the instrument supports network connection and peripheral expansion to enrich functional options.

▲It is applicable to hardness testing of cast iron, carbon steel, non-ferrous metals and soft alloys, as well as certain non-metallic materials including rigid plastics and bakelite.

3.Main Technical Parameters

Name	Specification
Test Force	306.4N（31.25kgf）、612.9N（62.5kgf）、 980.7N（100kgf）、1226N（125kgf）、1839N（187.5kgf、2452N（250kgf）、4903N（500kgf）、 7355N（750kgf）、 9807N（1000kgf）、14710N（1500kgf）、29420N（3000kgf）
Test scale	HB 10/3000、HB 10/1500、HB 10/1000、HB 5/750、HB 10/500、HBW 10/250、HB5/250、HB 2.5/187.5、 HB 10/125、HB5/125、HB10/100、HB 5/62.5、 HB2.5/62.5、HB2.5/31.25、
Measurement range	8~650HBW
Maximum allowable height of the specimen	250mm
Distance from indenter center to machine body Max. throat depth	150mm
Main test force loading time	5~8S
Dwell time of test load	0-99S
Indenter & objective lens switching	Automatic
Optical path switching	Automatic
Indenter diameter (mm)	Φ2.5, Φ5, Φ10 (installed separately)
Operating mode	Automatic loading, dwell, unloading & automatic measurement
Indentation image measuring method	Automatic measurement
Repeat measurement precision of indentation image	Repeatability up to ±0.8%
Data display	10-inch industrial touch screen
Data output	Test reports can be exported in Word & Excel formats and printed; graphic engine supports multiple extended functions
Data statistics	Hardness conversion: automatic conversion between Brinell, Rockwell, Vickers, Knoop hardness values in accordance with national standards, real-time display
Light source	LED
Function adjustment	Stepless light intensity regulation
Communication interfaces	USB, RJ45 LAN, WLAN, RS232
Overall dimensions mm (L×W×H)	600*230*920mm
Power Supply Voltage	AC 220V/110V±5%,50~60 Hz

4.External Structure



1.Loading Assembly

2.Turret

3.Objective Lens

4.Indenter

5.Anvil

6.Lifting Lead Screw

7.Power Supply Socket

8.USB Port

9.232 Port

10.Metal Control Button

11.LAN Port

12.Display Screen

5. Working Conditions

(1)The ambient temperature shall be maintained within 10℃ ~ 30℃.

(2)The indoor relative humidity shall not exceed 65%.

(3)Place the instrument horizontally on a stable, vibration-free surface and keep it away from corrosive substances.

(4)Connect the equipment to a stabilized power supply with reliable grounding.

6. Unpacking and Installation

(1)Cut off the packing straps of the outer carton.

(2)Unscrew the fixing screws on both sides of the carton bottom.

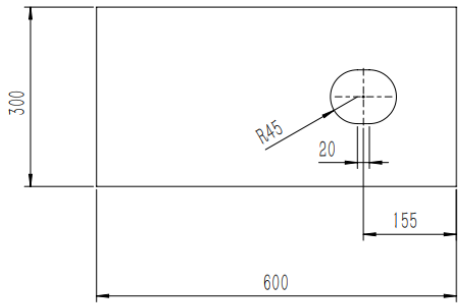
(3)Lift away the wooden crate to expose the instrument, then take out the accessory box and dust cover.

(4)Use a socket wrench to remove the four hex head bolts beneath the wooden base.

(5)Open the accessory box and mount the four handles onto the threaded holes on the instrument bottom.

(6)Lift the hardness tester and set it on a pre-installed stable anvil. (the recommended height of the anvil is 450 mm.).

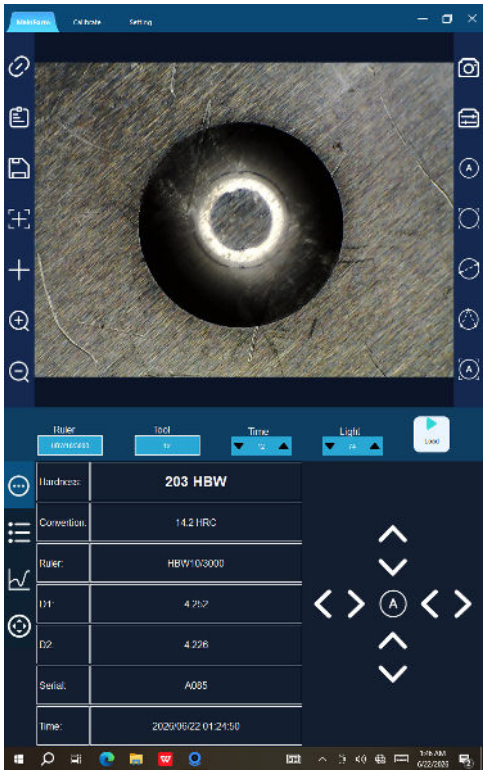
(7)The anvil surface shall be pre-drilled with mounting holes. Relevant specifications are shown below:



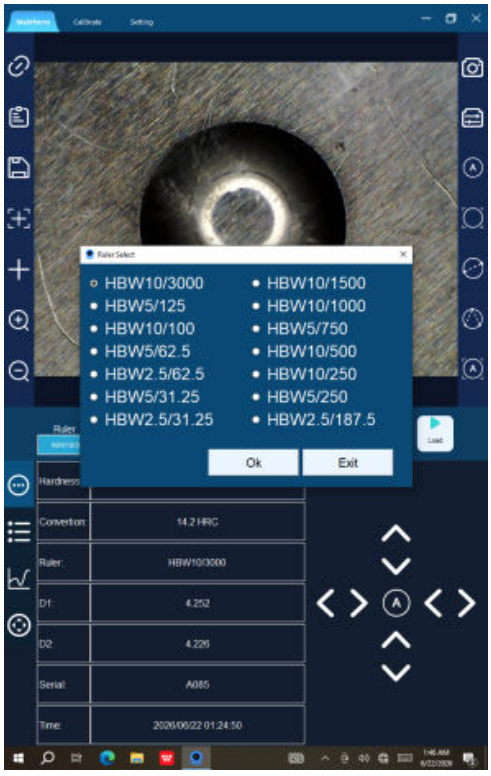
(8)Take out the power cord for power connection, then plug the USB security dongle into the tester's USB port.

7. Interface Introduction & Operation

Main Interface:



Click on the measurement scale to switch it. After selecting, click "OK".





7. Interface Introduction & Operation

•Open Image: Load indentation images stored on the computer.

•Save Image: Export captured indentation images to the computer.

•Reset Crosshair: The crosshair in the image view can be dragged to any position on screen. Click Reset to move the crosshair back to the center.

•Show/Hide Crosshair: Toggle this button to display or hide the crosshair.

•Zoom In: Magnify the indentation image.

•Zoom Out: Shrink the indentation image.



•Real-time Live & Freeze Button: Shows live indentation preview. Click this button to freeze the live image in the display window.

•Automatic Measurement: Select this option to freeze the captured image and automatically calculate the indentation dimension and hardness.

•Two-Tangent Manual Measurement: Align the upper and left tangents to one edge of the indentation, hold the left mouse button, and align the right and lower tangents to the opposite edge. Release the mouse to display the hardness reading.

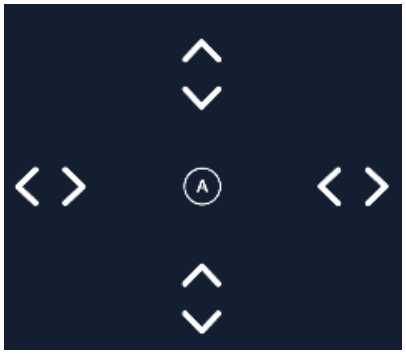
•2-Point Circle Manual Measurement: Click and hold a point on the indentation edge, drag to the diametrically opposite edge point, then release the mouse to acquire the hardness value.

•3-Point Circle Manual Measurement: Click three arbitrary points on the indentation circumference to calculate the hardness result.

•Multi-Indentation Auto-Measurement: For test images containing more than one indentation in the viewing area.

•Hardness Fine Adjustment Function: If the measured hardness value deviates from the actual indentation, manually fine-tune the reading by increasing or decreasing the value to correct the deviation.

7. Interface Introduction & Operation



Calibration Interface Operation Steps:

Locate the standard indentation on the certified reference block through the CCD imaging system.

Select the corresponding measurement scale and click Automatic Measurement to complete indentation measurement.

Click the Calibration button to enter the calibration page.

Input the nominal standard hardness value of the reference block in the designated input field, click Calculate Coefficient, then click Calibration to finish the calibration procedure.



7. Interface Introduction & Operation



Settings interface:

•Hardness Scale Conversion: Select the target hardness scale for conversion.

•Upper Hardness Limit & Lower Hardness Limit: Input the hardness range required for the workpiece.

•Language Selection: Switch between Chinese and English. Confirm the selection, then exit and restart the software to apply the language setting.

8. Formal Test Procedure

Place the test specimen on the work stage.Select the corresponding test scale on the touch screen.Rotate the handwheel to adjust the stage height until a clear image of the specimen surface appears on the display, then tap the on-screen Start button.

The turret will automatically rotate to align the indenter with the specimen. The unit will then complete automatic loading, dwell and unloading cycles.After force application finishes, the turret rotates to the optical objective for automatic indentation measurement, and the hardness result will be displayed on screen. One test cycle is complete.

Note: Calibrate the instrument with a standard Brinell reference block before every test.

9. General Fault Troubleshooting

•No display after power-on: Check whether the power switch is switched on, the power fuse is intact, and the power cord is connected securely. Also confirm the mains socket supplies rated 220V voltage.

•Test load dwell time fails to run as set: This fault occurs when the specimen is overly soft or no specimen is placed on the stage. If the workpiece material is too soft, reselect a suitable indenter and test force by referring to the Test Force vs. Indentation Diameter Comparison Table, then repeat the test.

•Test force deviation: Use a force gauge to verify whether the output test force complies with standard specifications.

•For all other malfunctions, please contact the equipment manufacturer or authorized supplier for support.

10. Maintenance and Safety Precautions

•Cover the instrument with the dust cover after every use to prevent dust ingress into internal components.

•Lubricate all moving mechanical parts regularly (twice per month).

•Restore the unit to its original packaging for long-distance transportation.

•Take extra care when installing or removing the indenter and indenter sleeve. Avoid contamination or damage to the tungsten carbide ball; ensure all mating mounting surfaces are clean and free of debris. Remove and properly store the indenter if it will not be used for an extended period.

•Keep the work stage surface and standard reference blocks clean, free of contamination, scratches and indentations. Coat with anti-rust oil for storage after use.

•The working site must be vibration-free and isolated from corrosive substances.

•The equipment grounding wire must be connected to reliable earth ground to prevent safety hazards.

•Periodic verification and calibration of the hardness tester shall be performed in compliance with applicable national standards and regulatory requirements.

•This is a precision measuring instrument. Do not disassemble or adjust any internal components without authorization. If abnormal operating conditions occur, contact our service department for professional maintenance.

11.Appendix Table

1.Test Force vs. Indentation Head Diameter Table

Metal Type	Brinell Hardness Range HBS(W)	Minimum Specimen Thickness(mm)	0.102F/D²	Ball Diameter D(mm)	Test Force F KN(kgf)	Dwell Time of Test Force (S)
Ferrous Metals	140~450	6~3 4~2 ＜ 2	30	10.0 5.0 2.5	29.429(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
Non-ferrous 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

11.Appendix Table

2.Specimen Minimum Thickness Selection – Brinell Hardness Test:

Average indentation diameter d	Minimum thickness of the specimen			
	Ball diameter D			
	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

Packing List

iBrin-3000SA Image Processing Brinell Hardness Tester

Item No.	Description	Specification	Unit	Quantity
1	Brinell Hardness Tester		Set	1
2	Large Square Anvil		Pc	1
3	Small Flat Anvil		Pc	1
4	V-shaped Anvil		Pc	1
5	Standard Brinell hardness block	Φ10	Pc	1
6	Hard alloy indenter	Φ5	Pc	1
7	Hard alloy indenter	Φ2.5	Pc	1
8	Standard Brinell hardness block	200±50HBW 100±25 HBW	Pcs	2
9	Accessory box		Pc	1
10	Dust cover		Pc	1
11	User Manual		Copy	1
12	Power cord		Pc	1
13	Certificate of Conformity		Copy	1
14	Encryption dongle		Pc	1
15	Software USB drive		Pc	1