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HDT-MBE320

MOTORIZED DIGITAL BRINELL HARDNESS TESTER OPERATION MANUAL

INSIZE

1、Machine Overview

The metal Brinell hardness test uses a certain diameter hard alloy ball, which is pressed into the surface of the tested material with a specified test force (Figure 1a). After holding for a specified time, the test force is removed, and (Figure 1b) the diameter of the indentation on the surface of the sample is measured to calculate the Brinell hardness, which is calculated using the following formula:

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

In the formula：F--------Test forceN；

D-------Ball diametermm；

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

HBW--- Brinell hardness measured using a hard alloy ball indenter。

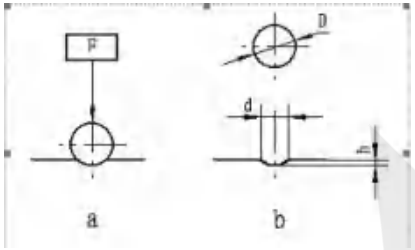


Figure 1

For example:216HBW10/3000/10, When using a hard alloy ball with a diameter of 10mm and maintaining a test force of 29.42KN (3000kgf) for 10 seconds to determine the hardness of 216, its Brinell hardness is represented by the symbol HBW, and so on.

1.1 sphere of application

This hardness tester is a desktop Brinell hardness tester. This machine is used to measure the Brinell hardness of annealed and normalized workpieces, cast parts, non-ferrous metals, and various soft components or unhardened steel parts. Suitable for use in metrology, metal metallurgy, chemical engineering, mechanical manufacturing, industry, and scientific research units in colleges and universities.

The range of Brinell hardness measurement is: 8 – 650HBW

Hard alloy ball - suitable for measuring workpieces below 650HBW.

1.2 Characteristics of the product

Unique performance: This hardness tester adopts high-precision sensors, and the microcontroller controls the stepper motor to automatically load and unload.

This machine has a reasonable design structure, beautiful appearance, and convenient use.

2、Main performance and parameters

1. Test force: 62.5kgf, 100kgf, 125kgf, 187.5kgf, 250kgf, 500kgf, 750kgf, 1000kgf, 1500kgf, 3000kg

2. Brinell scale: HBW2.5/62.5,HBW2.5/187.5,HBW5/62.5, HBW5/125, HBW5/250,HBW5/750,HBW10/100.HBW10/250, HBW10/500,HBW10/1000,HBW10/1500,HBW10/3000

3. Range: 8~650HBW

4. Hardness resolution: 0.1HBW

5. Stage elevation:manual

6. Load control: automatic (load/dwell/unload)

7. Load dwell time: 0-60 second

8. Measuring microscope: Magnification 20X;Resolution 0.01mm

9. Max. workpiece height：230mm

10. Max. testing width：140mm (form the center of indenter to the wall of main body)

11. Power supply：220V,50/60Hz

12. Dimension：510x210x750mm

13. Weight：130kg

3、Instrument structure

3.1 Composition of the local machine structure

The Brinell hardness tester consists of several parts, including the body, screw, workbench, lever, sensor, stepper motor with unloading mechanism, microcomputer control, etc.

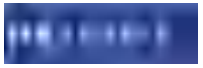
3.2 Panel diagram

1. Introduction to Button Functions：

【count】: Click on the space area behind the D1  button, and a numerical dialogue input box will pop up. Enter the measured diameter length(unit:mm) and press Enter to confirm completion. Then click D2, enter D2 using the same method as D1, and press Enter to confirm. The corresponding hardness value will be displayed in the display window.

Note: Manually enter the diagonal value (mm) measured by the reading microscope and the program automatically converts it to μm.

【zero clearing】: click  used to clear the force value before the compression test

【Experimental force selection】: click  can

enter loading force value selection

【Conversion value selection】: click  enter conversion value selection

【data】: click  display a statistical table that can display up to 100 current test data.

【print】: click  If the machine is equipped with a micro printer, clicking can print data (regular micro printers are optional and will incur additional costs)

【Dwell time】: click  can enter the setting of the warranty time

【delete】: click 

【Increase and decrease in lighting】: click  enter the second level interface,click  Increase light brightness, Reduce  light brightness.

2. Monitoring of status

Force value: displays the current test pressure.

Status: When measuring hardness, four stages of prompts are displayed: "Load", "Hold", "Return", and "Stop".

Holding time: When measuring hardness, when in the holding stage, the holding time of the loss is displayed.

Load setting: displays the current test force setting value.

Brinell hardness: The system displays "instrument ready" during operation.

4.Correct use of hardness tester

4.1 The dismantling and installation of the hardness tester

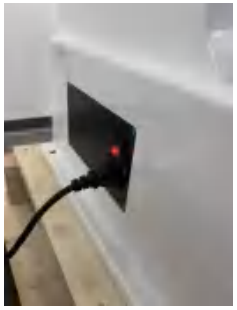
First, open the wooden box packaging and remove the main unit of the hardness tester

Second, remove the fixing screws between the main unit and the bottom of the wooden box, install the four feet, and then carefully lift the hardness tester onto a level workbench. Use a level to adjust the level of the main unit through the four feet

Third unscrew the screws of the upper cover, open the upper cover, and untie the ribbon bound inside the machine,then cover the upper lid

Fourth, install the measuring platform and the correct indenter properly

Then plug in the power cord and turn on the power switch to start the measurement



4.2 operation details

4.2.1 Push the indenter into the shaft hole of the indenter, press it tightly against the supporting surface, align the notch plane of the indenter handle with the screw, and slightly tighten the fastening screw of the indenter.

4.2.2 Turn on the power switch, the panel displays countdown, and the instrument is in automatic adjustment position. When the test force display window (A) is 0, the instrument enters standby mode.

4.2.3 When starting up, the preset force value of the instrument requires a force value, and the holding time is set to 15 seconds. If you want to choose other test forces and times, please refer to the function introduction of the operation panel.

4.2.4 After the preparation work is ready, place the specimen steadily on the test bench, rotate the rotary wheel to lift the specimen, and when the test force is applied, the window begins to display the test force. Attention: When selecting 62.5kg-250kg for manual loading force of about 29-35kg, the machine will start automatic loading test force. When selecting 500kg-3000kg for

manual loading force of about 80-90kg, the machine will start automatic loading test force; If the instrument emits a continuous "beep, beep,..." sound when manually exerting too much force (40kg), and cannot function properly, please step back from the test bench, change the position of the measuring point, and redo.

4.5 After the three stages of loading, holding, and unloading are completed, a hardness test process is completed. The test bench is removed and the instrument automatically resets. (Slight abnormal noise in the loading part during load holding is a normal phenomenon)

4.6 Holding time of test force: 10-15 seconds for black metals, 30 seconds for non-ferrous metals, and 60 seconds for hardness values less than 35HBW.

4.7 Uniformly distribute the hardness values on the specimen, with the distance between the centers of two adjacent indentations not less than three times the diameter of the indentation; The distance from the center of the indentation to the edge of the specimen shall not be less than 2.5 times the diameter of the indentation. Failure to test according to this requirement will result in asymmetric indentation and incorrect hardness data.

4.8 The measurement of the diameter of each indentation is

carried out in two perpendicular directions. Take the average value, and the ratio of the difference in diameters in two vertical directions to the diameter with the shorter diameter should not exceed 1%.

4.9 The electrical equipment of this machine adopts a closed-loop control system, which can dynamically reflect the real situation of the test force changes during the experimental process. Throughout the entire holding time, the force value window continuously displays its instantaneous force value. As the indenter gradually presses into the specimen to the set value, followed by the holding process, the force value gradually decreases. When the force value decreases to the specified error range, the instrument will automatically compensate to keep the test force within the specified range. (Slight abnormal noise in the loading part during load holding is a normal phenomenon)

5. Maintenance and precautions of hardness tester

During the comprehensive testing of this instrument before leaving the factory, all technical requirements have met the standards. However, due to installation, disassembly, transportation, or voltage reasons after leaving the factory, some data of the instrument may change. Generally, the following measures can be taken:

5.1 Without installing a pressure head, first apply a test force of 3000kgf (29420N) several times to eliminate the deformation together, ensure that the electrical components operate normally, and reduce testing errors.

5.2 The loading and unloading signals of the testing force at all levels of the instrument are fed back by sensors, and the output signal of the sensor is quite weak. Therefore, we have installed anti-interference components in the circuit. However, to ensure the normal operation of the instrument and avoid unnecessary damage, strong electrical interference sources should be avoided around the instrument during use.

5.3 The instrument power supply should have a reliable grounding and voltage stabilizing device.

5.4 During the loading and unloading process, the instrument may make slight noises, which is a normal phenomenon as the loading mechanism is automatically adjusting. A slight abnormal noise in the loading part during load holding is a normal phenomenon.

5.5 The active surfaces such as the hardness tester screw are regularly lubricated with oil.

5.6 After the hardness tester is tested, the power should be turned off.

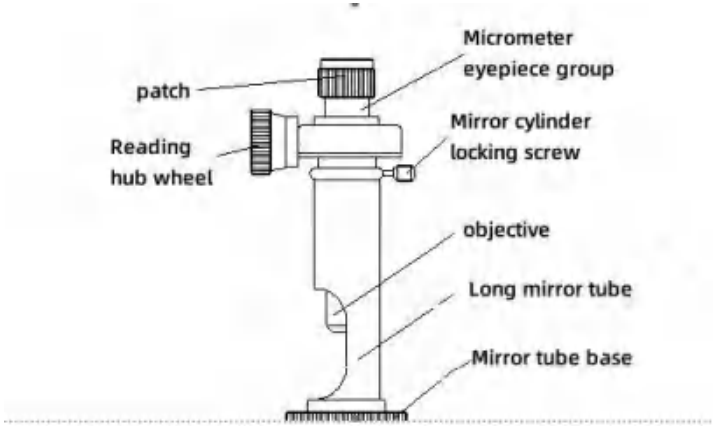
5.7 The hardness tester should be kept clean and covered with a dust cover after testing. Apply anti rust oil to the hardness block and ball indenter after use to prevent rusting.

5.8 The hardness tester should perform periodic identification work at least once a year to ensure the accuracy of the hardness tester.

6. Use of reading microscope

6.1 Introduction to Microscope

The matching reading microscope is mainly used for measuring Brinell hardness indentation, with a simple structure and convenient operation. (Figure 5)



6.2 Technical parameters of reading microscope

6.2.1 Measurement of microscope magnification: 20X

6.2.2 Minimum reading of hub wheel: 0.01mm

6.2.3 The effective measurement range of the field of view is 6mm.

6.3 Reading microscope usage

6.3.1 Example: Testing the Brinell hardness value of HBW10/3000. Install φ 10mm ball pressure head, after selecting the test force, place the specimen on the test bench, rotate the rotary wheel (4) to raise the test bench. When the pressure head touches the specimen, slowly raise the test bench until the window test force reaches 85kgf. When a "beep" sound is heard, stop and the instrument will automatically apply force to 3000kgf. Then, maintain the test force and remove the test force. After adding and removing the force, return the test bench.

6.3.2 Place the specimen with Brinell hardness indentation on a stable surface, place the reading microscope on the specimen, and place the notch of the long mirror tube facing natural light or illuminated with light. Rotate the eye mask on the eyepiece to make the indentation edge clear.

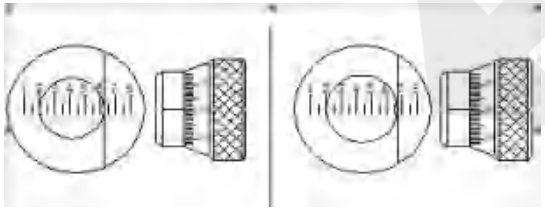


Figure 6

Figure 7

6.3.3 Choose any fixed numerical line in the eyepiece as the starting

line (number 2) and be tangent to the left side of the indentation. Fix the reading microscope, rotate the reading hub, and move the marking line in the eyepiece to be tangent to the other side (Figure 6)

The observed value in the eyepiece is 6-2=4mm

If the hub reading is 41 grids, and each small grid of the hub is 0.01mm, the reading is 41 × 0.01=0.41mm

Brinell hardness indentation with a diameter of 4mm+0.41mm=4.41mm

According to the Brinell Hardness Comparison Table P9, it is found that 186HBW10/3000

When the diameter of the Brinell indentation exceeds half a grid on the other tangent edge observed by the eyepiece, add 0.5mm when calculating the indentation's longitudinal direction (Figure 7)

Brinell hardness indentation with a straight diameter of 4mm+0.5+41 × 0.01mm=4.91mm

According to the Brinell Hardness Comparison Table P9, it is found that 148HBW10/3000

7. Maintenance precautions for reading microscopes

7.1The accuracy of the reading microscope has been adjusted at the factory and cannot be disassembled or disassembled on its own.

7.2When storing and using a reading microscope, it should be kept

away from dust, moisture, and corrosive gases.

7.3 If there is dirt on the surface of the reading microscope lens, it should be wiped with a soft degreased cotton or wiping paper. When it comes into contact with oil stains or contamination, a small amount of alcohol or ether mixture can be dipped in degreased cotton and gently wiped.

8. Schedule 4

Average diameter of indentation	Minimum thickness of the sample			
d	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		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	
2.0			1.67	
2.2			2.04	
2.4			2.46	1.17
2.6			2.92	1.38
2.8			3.43	1.6
3.0			4	1.84

3.2				2.1
3.4				2.38
3.6				2.68
3.8				3
4.0				3.34
4.2				3.7
4.4				4.08
4.6				4.48
4.8				4.91
5.0				5.36
5.2				5.83
5.4				6.33
5.6				6.86
5.8				7.42
6.0				8

Attention: Before each experiment, use a standard Brinell hardness block to calibrate the machine. This machine is a precision instrument and should not be disassembled or adjusted by yourself for any internal components.