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HDT-MB610

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:

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

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。

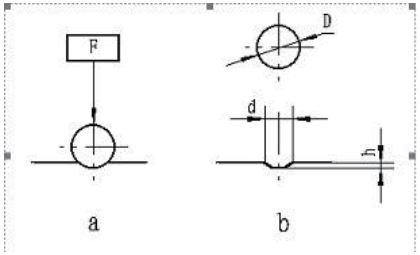


Figure 1

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

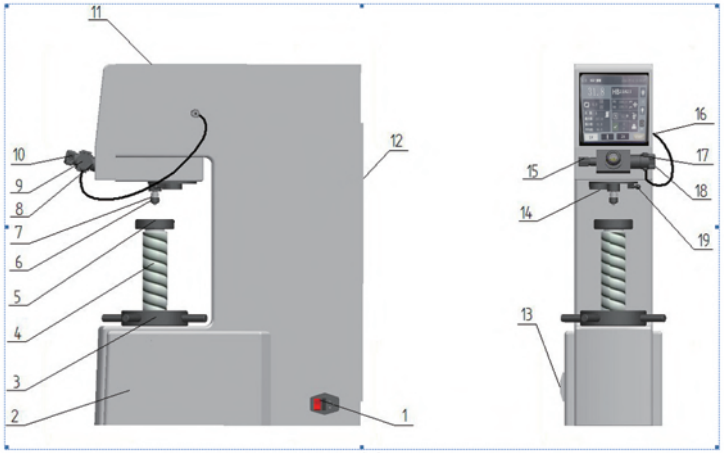
1. Turret rotation: manual
2. Test force: 62.5kgf, 100kgf, 125kgf, 187.5kgf, 250kgf, 500kgf, 750kgf, 1000kgf, 1500kgf, 3000kg
3. Brinell scale: HBW2.5/62.5,HBW2.5/187.5,HBW5/125,HBW5/750,HBW10/100.HBW10/250,HBW10/500,HBW10/1000,HBW10/1500,HBW10/3000
4. Range: 8~650HBW
5. Hardness resolution: 0.1HBW
6. Stage elevation:manual
7. Load control: automatic (load/dwell/unload)
8. Load dwell time: 0-60 second
9. Measuring microscope: Magnification 20X;Resolution 0.1μm
10. Max. workpiece height：200mm
11. Max. testing width：135mm (form the center of indenter to the wall of main body)
12. Data output：built-in printer, RS232
13. Power supply：220V,50/60Hz
14. Dimension：510x210x750mm
15. Weight：130kg

3、Local structure and button functions

3.1 Structural composition and installation of this machine:

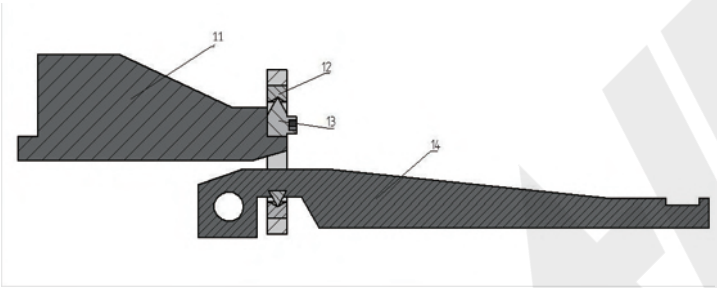
Composition: The Brinell hardness tester consists of several parts, including the body, screw, workbench, lever, sensor, stepper motor and unloading mechanism, and microcomputer control.

Installation: 1. Open the accessory box and install the micrometer eyepiece (9) into the eyepiece tube (8) hole above the hardness tester. Be sure to plug it all the way in. Then, insert a connecting wire with a plug on the micrometer eyepiece (9) into the circular socket (16) above the right side of the hardness tester (pay attention to the direction of insertion). The direction of the micrometer eyepiece is shown in the figure.



（picture）

1. Switch, power socket, fuse box 2. Main body 3. Rotating wheel 4. Lifting screw 5. Test bench 6. Pressure head 7. Pressure head screw 8. Eyepiece tube 9. Micrometer eyepiece 10. Eye mask 11. Upper cover 12. Rear cover 13. Printer 14. Objective lens 15. Left drum wheel 16. Circular socket 17. Right drum wheel 18. Measurement button 19. Handle



11. Auxiliary lever 12. Knife slot 13. Knife edge 14. Large lever

（picture）

2. Remove the test bench (5) from the accessory box, wipe off the rust proof oil on it, and then place it in the hole of the lifting screw.

3.2 Introduction to button functions:

【Calculation】: When the two measuring lines in the electronic eyepiece are infinitely close but do not overlap before the first measurement after each startup, click the button in the D1 dialog box to measure the front zero.

【CLEAR】: Click 

to clear the force value before the pressure test.

【Test force selection】: Click 

to enter the loading force value selection.

【Conversion value selection】: Click 

to enter the Conversion value.

【Data】: Click 
to display the statistical table, with a maximum of 100 current test data displayed.

【Print】: Click 
to print data if the machine is equipped with a micro printer.

【Load time】: Click 
to enter the setting of Load time

【Delete】: Click 
to delete the current measurement data

【Light addition/subtraction】: Click on the light to increase brightness, and then click on the light to decrease.

【Mean】: Click  to enter the second level interface and set the same operation method as the main interface.

Attention: When the test force error of this hardness tester exceeds the national standard, it shall be calibrated by the manufacturer or technical supervision department. The calibration function of this machine requires professional guidance from our technical personnel, which is not covered in this section.

2、Monitoring of status:

Force value: displays the current test pressure.

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

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

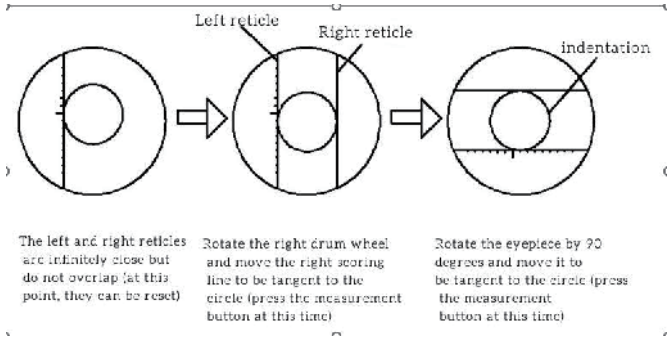
Load setting: displays the current test force setting value.

Brinell hardness: When the system is working, it displays "instrument ready".

3. According to the displayed data, install φ 10mm ball pressure head: Push the pressure head into the main shaft hole, press it tightly against the supporting surface, face the notch plane of the pressure head handle towards the pressure head screw (7), and slightly tighten the pressure head screw (7).
4. Rotate the handle (19) to turn the pressure head to the forward position. At this time, the positioning must be accurate. If the main shaft is offset and applied force, it will damage the instrument. If this situation occurs, please immediately shut down the machine and return it to the test bench. The instrument will automatically adjust.
5. Place the hardness block or test piece on the test bench (5), rotate the rotating wheel (3) to raise the lifting screw (4). When the indenter touches the test piece, slowly raise the test bench (5). At this time, the number in the column of adding initial force on the display screen will change. When the initial force reaches 90kgf (20kgf below 250kgf), stop raising the test bench, and the instrument will emit a "beep" sound. At this time, the instrument will automatically start applying force, and an additional force display will appear on the display screen, When the test force reaches 1000kgf, the holding time starts and the countdown starts from 10 to 0 seconds, then the test force is removed. When the test force is removed, the instrument will emit a "beep" sound to indicate the end of the force application. Rotate the rotary wheel (3) to retract the lifting screw (4) and remove the initial force. If there is still residual force on the display screen after removing the force, press the force value reset button to reset.

   Attention: When selecting a test force of 62.5~250kgf, manually apply the force to about 20-35kgf. If the instrument emits a "beep" sound, the test force will be automatically applied. If the manual force is too large to exceed 35kgf, the instrument will emit a "beep, beep,..." sound continuously, indicating an operation error and inability to work properly. Please step back from the test bench, change the position of the measuring point, and redo. If the manual force is too large, the instrument will make an error. Please immediately shut down and return to the test bench; When selecting a test force of 500-3000kgf, manually apply approximately 80-90kg of force.

   Attention: When the motor is in operation, it is not allowed to move the test piece or rotate the pressure head. It must wait for the end of this loading and unloading before moving, otherwise it may damage the instrument.
6. Step down the test bench (5) by about 2mm, turn the objective lens (14) forward, and you can see the indentation in the field of view of the micrometer eyepiece (9). Based on your own vision, adjust the test bench (5) up and down to make it the clearest. If the two notches in the eyepiece are blurry, the eye mask (10) can be adjusted to make it the clearest, depending on each person's vision.
7. Rotate the right drum wheel (18) and move the reticle in the eyepiece to gradually bring the two reticles closer. When the inner side of the reticle is infinitely close (there is a critical state of no light gap between the inner sides of the reticle, but the two reticles must not overlap), press the "reset key". At this point, the d1: value on the main screen is zero, which is the zero position in the terminology. At this point, the diagonal length of the indentation can be measured in the micrometer eyepiece (9). (Figure 7)
8. Rotate the right drum (18) to separate the scoring lines, then move the left drum (15) to move the left scoring line. When the inner side of the left scoring line is tangent to the intersection point of the left contour of the indentation, move the right scoring line again to make the inner side tangent to the intersection point of the indentation contour (Figure 7). After measuring, press the measurement button (17) on the eyepiece to complete the measurement of the diameter length d1 of the circular indentation; Rotate the eyepiece (7) 90 ° and measure the length d2 of the circular diameter using the above method. Press the measurement button (17), and the screen will display the displayed values for this measurement and the converted hardness values. If you believe there is an error in the measurement, you can repeat the above procedure to measure again.



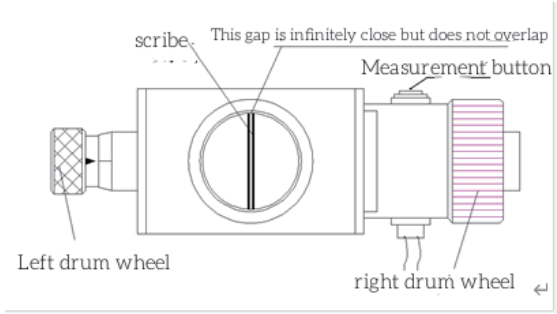


Figure 7

9. At the end of the first test, according to the verification regulations, the first indentation is not counted, so the hardness value of the second indentation is recorded as the first time in the "Measurement Times". At this time, the screen displays the measurement times as No: 01, and the number of measurements will also increase once for each subsequent test.
10. After the current few experiments, the test results have been stored in the instrument, with a maximum storage capacity of 100 times. If you need to look at the previous measurement data, please follow the data and statistical results. Then press the "OK" button, and the instrument will return to working status.
    Storage and printing of display symbols:
    No：Number
    D (mm)： Average value of indentation diameter
    Min:Minimum value AV:Average
    MAX: Maximum value R:Error
11. The holding time of the test force: 10-15 seconds for ferrous metals, 30 seconds for non-ferrous metals, and 60 seconds for hardness values less than 35HBW.
12. Measure the hardness value evenly on the test piece, with the distance between the centers of two adjacent indentations not less than 3 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. If not tested according to this method, there will be asymmetry in the indentation, and the hardness value cannot be obtained from the correct test data.
13. The measurement of the diameter of each indentation is carried out in two perpendicular directions.
14. The electrical system of this machine adopts a closed-loop control system, which can dynamically reflect the real situation of changes in test force during the test process. Throughout the entire load holding time, the instantaneous force value is continuously displayed. As the indenter gradually presses into the specimen, the force value also gradually decreases. When the force value decreases to the specified error range, the instrument will automatically compensate to maintain the test force within the specified range.

4、Correct use of hardness tester

4.1 Push the pressure head into the shaft hole of the pressure head, press it tightly against the support surface, align the notch plane of the pressure head handle with the screw, and slightly tighten the pressure head fastening screw.

4.2 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.

4.3 When starting up, the preset force value of the instrument requires a force value, and the load 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.

4.4 After the preparation work is ready, place the test piece smoothly on the test bench, rotate the rotating wheel to raise the test piece, 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 150-160kg, the machine will start automatic loading test force; If the instrument emits a continuous "beep, beep,..." sound when the manual force is too high (40kg), and it cannot work properly, please step back from the test bench and change the position of the measuring point to redo.

4.5 After the completion of the three stages of loading, holding, and unloading, a hardness test process is completed, the test bench is removed, and the instrument automatically resets. (It is normal for the loading part to have a slight

abnormal noise during load preservation)

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

4.7 Measure the hardness value evenly distributed on the test piece, with the distance between the centers of two adjacent indentations not less than 3 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. If not tested according to this requirement, there will be asymmetry in the indentation, and the hardness value cannot be obtained from the correct test data.

4.8 The measurement of the diameter of each indentation is carried out in two perpendicular directions. Take its 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 changes in experimental force during the experimental process. During the entire load holding time, the force value window continuously displays its instantaneous force value. As the pressure head gradually presses into the specimen to the set value, and then the load holding process occurs, 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. (It is normal for the loading part to have a slight abnormal noise during load preservation)

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. After leaving the factory, due to reasons such as installation, disassembly, transportation, or voltage, certain data changes of the instrument may be handled as follows:

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

5.2 The loading and unloading signals of the instrument at all levels of testing force 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 The instrument will make some slight noises during the loading and unloading process, which is a normal phenomenon for the loading mechanism to make automatic adjustments. It is normal for the loading part to have slight abnormal noise during load holding.

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 verification work at least once a year to ensure the accuracy of the hardness tester.

6、Maintenance precautions for reading microscope

6.1 The accuracy of the reading microscope has been adjusted at the factory and cannot be disassembled by oneself.

6.2 When storing and using a reading microscope, it should be avoided in environments with dust, moisture, and corrosive gases.

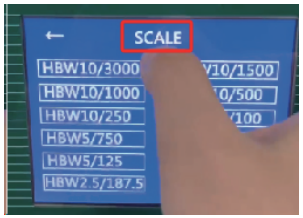
6.3 If there is dirt on the surface of the reading microscope lens, it should be wiped with a soft absorbent cotton or wiping paper. When encountering oil stains or contamination, a small amount of alcohol or ether mixture can be lightly wiped with absorbent cotton.

7、CALIBRATION

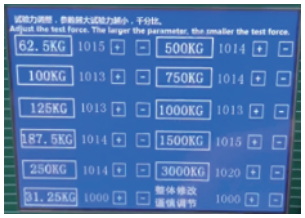
7.1 The use of standard hardness block calibration found hardness block value is not allowed there may be two cases, first of all, the use of instruments to observe the standard hardness block above the box within the original indentation, if their own measured hardness value and the standard block above the standard value in the range of error above the value of the force may be calibrated, if the measurement results relative to the standard block beyond the range of error is required to calibrate the objective lens coefficients.

b.Click on the ruler icon

c.Tap the ruler button icon at the top center of the screen



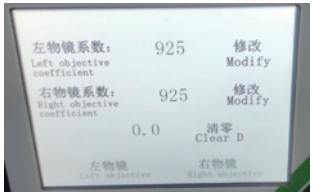
d.Enter the password “22222” to enter the following interface



Find the force value you need to calibrate in this interface, if the measured value is large, then reduce the coefficient next to it, you can fine-tune the value from small to large according to the size of the deviation value; on the contrary, if the measured value is small, then increase the corresponding coefficient.

7.3 Objective Coefficient Calibration

a.Follow the force calibration steps to find the password input screen, enter the password “11111” and enter the following screen.



b.Click on the right objective lens coefficient “modify”, according to the error relative to the standard block for up and down correction, until the measured standard block on the original indentation hardness value and the standard block above the marked value within the error range.

When the objective lens coefficient calibration is completed to re-play two points of measurement, the first point is not counted, measure the second point value whether to meet the standard block error range, if the error is larger that the force value also needs to be calibrated, calibration steps refer to 7.2 force value calibration.