

Operation Manual

Brinell Hardness Tester HBS-3000



Precautions

1.The power socket of this instrument must use a one-way three-pin socket, and the grounding terminal must meet the specified protective grounding requirements.

2.Before using this instrument, please read the instruction manual carefully to understand the operation steps and precautions of the instrument to avoid damage to the instrument or personal safety accidents caused by improper use.

3.The position of each electrical component, switch and socket of the instrument is strictly prohibited to be disassembled by itself.If you disassemble it without authorization, it may cause an accident.

4.The instrument mechanism and electrical appliances are strictly forbidden to disassemble and disassemble, resulting in damage to the instrument or personal accident. The responsibility is borne by the user.

Contents

| | |
|---|----|
| 1 Product Introduction | 3 |
| 2 main technical parameters | 4 |
| 3 Hardness tester installation and commissioning..... | 5 |
| 4 function of each key..... | 7 |
| 5 micrometer eyepiece | 14 |
| 6 Printer | 17 |
| 7 Hardness tester adjustments and precautions | 18 |
| 8 Durability of the hardness tester..... | 19 |
| 9 Micrometer eyepiece maintenance precautions..... | 19 |
| 10 packing list | 20 |

1. Product introduction

Hardness is one of the important indicators of the mechanical properties of materials, and hardness test is an important means to judge the quality of metal materials or product parts. The so-called hardness refers to the ability of a material to resist the pressure of another residual deformation object under certain conditions. The greater the resistance, the higher the hardness, and vice versa.

The HBS-3000 digital Brinell hardness tester is a new generation Brinell hardness tester with advanced domestic level. It is suitable for the determination of Brinell hardness of some non-metallic materials such as ferrous metals, non-ferrous metals and hard plastics, bakelite. This machine uses a pressure sensor and computer closed-loop control loading and electronic micro-eyepiece measurement system. The various operating procedures and Brinell hardness values can be displayed on the lcd screen, and the test data can be output through the micro-printer that comes with the unit. This machine is suitable for all kinds of production and processing enterprises, foundries, universities, research institutions and laboratories.

The Brinell hardness test uses a steel ball of a certain diameter to press the surface of the object to be tested with a specified test force (Fig. 1). After the specified test force is maintained, the test force is removed and the surface of the test piece is measured with a reading microscope. The indentation diameter is calculated by the average pressure (N/mm²) of the spherical surface area of the indentation, that is, the Brinell hardness value. The Brinell hardness value can be obtained from the following formula:

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

Where: F - the test force applied to the specimen by the steel ball, in units of n.

D—The diameter of the steel ball, the unit is mm.

d—Indentation diameter in mm.

0.102 - the specified factor.

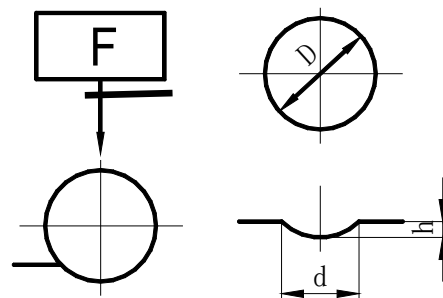


Figure 1 Principle of Brinell hardness test

2. The main technical parameters

| | | |
|------------------------|------------------|------------------|
| 2.1 Test force series: | 612.9N (62.5kgf) | 4900N (500kgf) |
| | 980N (100kgf) | 7355N(750kgf) |
| | 1225N (125kgf) | 9800N (1000kgf) |
| | 1839N (187.5kgf) | 14700N (1500kgf) |
| | 2452N (250kgf) | 29400 (3000kgf) |

2.2 Hardness test range : 8~650hbw

2.3 indication accuracy :

| Standard hardness block | Maximum value of indication δ (%) | Indication repeatability error Hcf (%) |
|----------------------------------|--|--|
| ≤ 125 HBW | ± 3 | ≤ 3.5 |
| 125 HBW $<$ HBW ≤ 225 HBW | ± 2.5 | ≤ 3.0 |
| > 225 HBW | ± 2 | ≤ 2.5 |

$$\delta = \frac{\overline{H_j} - \overline{H_k}}{\overline{H_k}} \times 100\%$$

$$H_{cf} = \frac{H_{max} - H_{min}}{\overline{H_j}} \times 100\%$$

Where:

δ — hardness indication error

$\overline{H_j}$ — Hardness test value(five-point average)

$\overline{H_k}$ — Hardness value

where:

H_{cf} — hardness indication repeatability

H_{max} —maximum hardness value at five points

H_{max} of the hardness block—minimum hardness value at five points

$\overline{H_j}$ — the arithmetic mean of the five point hardness values

2.4 Reading microscope magnification: 20 times

2.5 Micrometer eyepiece minimum division value: 0.00125mm

2.6 Maximum height of sample: 225mm

2.7 Maximum distance from the center of the indenter to the body: 130mm

2.8 Power supply voltage: AC220V/50Hz

2.9 Dimensions:

(760 × 530 × 185) mm

2.10 Weight:

120kg

3. Hardness tester installation and commissioning

3.1 Working conditions of the hardness tester

3.1.1 The hardness test shall be carried out at room temperature (23 ± 5) °C. If it exceeds this temperature range, it shall be stated in the inspection report:

3.1.2 The environment is clean and there is no vibration;

3.1.3 No corrosive gas around:

3.1.4 Installed on a stable workbench (the outer dimensions are for reference only) and adjusted to the horizontal level, the horizontality should not exceed 0.2/1000, and a hole of $\phi 80-90$ is opened on the appropriate seat on the workbench. For pole lifting (Figure 2).

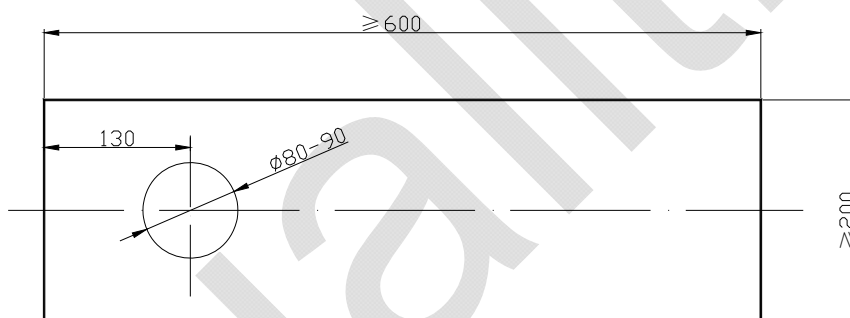


Figure 2 Workbench size chart

3.2 Unpacking and installation

3.2.1 Unscrew the four nuts under the outer box, lift the outer box up, lift the hardness tester, remove the four mounting screws on the bottom plate, and place the hardness tester on the commissioned workbench.

3.2.2 Remove the spacer between the lifting screw and the indenter shaft, wipe off the anti-rust oil on the lifting screw with gasoline, and apply a proper amount of thin oil to lubricate after drying.

3.2.3 Open the accessory box, install the micrometer eyepiece (3) into the eyepiece tube hole above the hardness tester, and then insert an electronic interface (8) with a plug on the micrometer eyepiece into the upper right side of the hardness tester. In the socket, tighten the lock nut.

3.2.4 Turn on the power and turn on the right side of the hardness tester (14). The hardness tester automatically enters the working position.

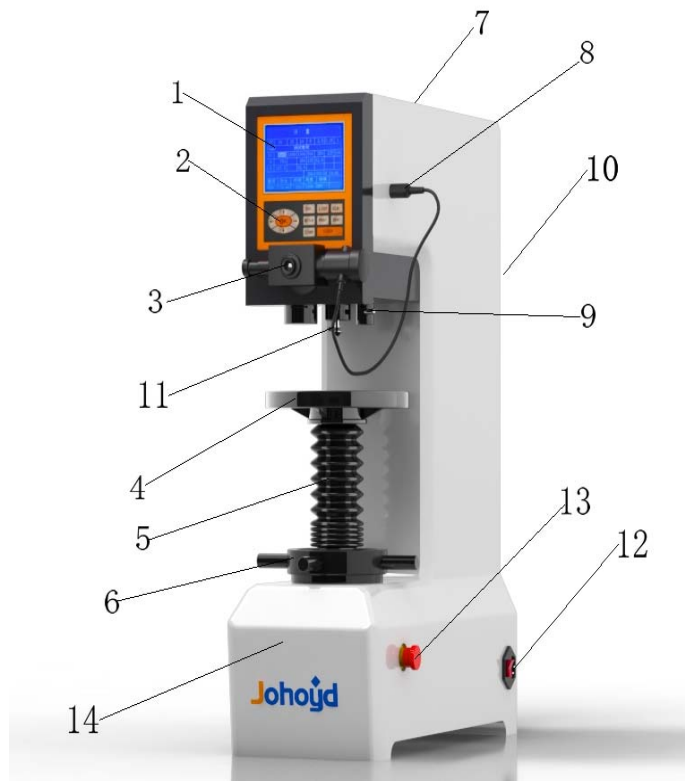


Figure 3 Hardness Tester Outline Drawing

- 1 . lcd screen 2 . keyboard 3 . micrometer eyepiece 4 . workbench**
5 . lifting screw 6 . rotating wheel 7 . upper cover 8 . Electronic interface
9 . Indenter set screw 10 . Back cover 11 . Indenter 12 . Power supply
13 . Switch 14 . Main body

4.Function of each key

Figure 4 shows the front panel of the hbd-3000a digital display Brinell hardness tester. The top half of the figure is lcd, and the details of this manual will be explained in later chapters. The bottom half of the figure is the keyboard. This chapter will explain the functions of the keys on the keyboard and the lcd function and display interface in detail.

4.1 Operation panel function key introduction (Figure 4)

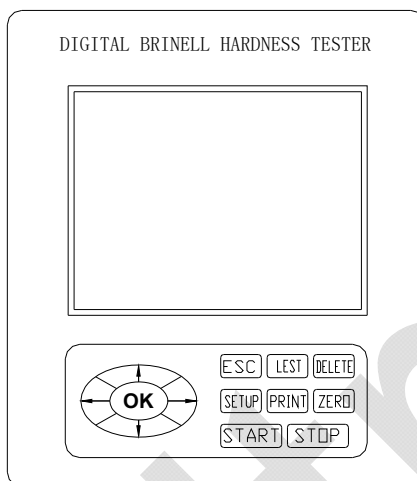


Figure 4 panel function introduction

<Esc> (escape key)

By pressing <Esc >, you can return to the previous menu from a submenu.

<Lest> enters the list of hardness values

(records per test result) menu button (see Figure 5).

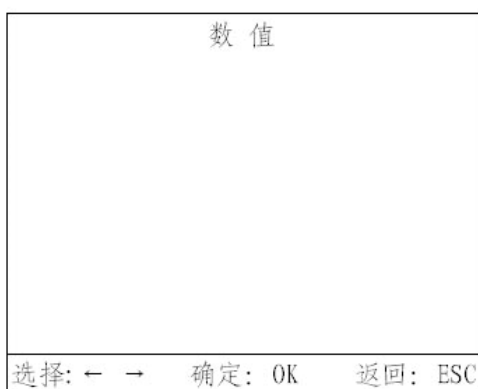


Figure 5 hardness value list menu

<Delete> (delete key)

1. Delete the current test data (in the value list menu), long press this button to delete the previous test data.If you think that the test data is not ideal, you can enter the value list menu and press <Delete> to delete directly;

2. Delete the residual test force. At the end of a test, if the home page displays a force value of f, there is still a number, press this button to clear f.

<Setup>(adjust option button) to enter the setup menu button.

You can select the adjustment option by pressing <↓> and <↑>.

<Print> (data output key) (print key)

If you select the local printout, press the <print> key directly. The print data format and related content have the following meanings:

Test no test number

Data :09-11-16 Test record print date

Time :12:20 test record print time

Test temp:25 test temperature

x : 188.5 hardness average test value

No: 05 Number of test records

Man : 191.3 test record maximum

Mix : 185.5 Test record minimum

r : 5.8 test record maximum difference

01 185.5hbw2.5/187.5/10 The first hardness test value

02 186.0hbw2.5/187.5/10 2nd hardness test value

03 191.3hbw2.5/187.5/10 3rd hardness test value

04 189.6hbw2.5/187.5/10 4th hardness test value

05 190.3hbw2.5/187.5/10 5th hardness test value

<Zero> (zero key) The micro eyepiece is zeroed.

In order to ensure the accuracy of the hardness tester, the system requires that the instrument should first perform the zero return operation of the eyepiece before the power test is performed. If you forget to do this, the instrument will remind you by “zeroing the eyepiece and pressing zero” on the left side of the display (see Figure 6). After the eyepiece is returned to zero, the micrometer eyepiece is rotated to make the system input the measured indentation diameter lengths, that is, d1 and d2 data. Otherwise, the rotation of the micrometer eyepiece will not work, that is, the data cannot be input.

| 布氏硬度测试 | | | | | |
|----------|--------|-----|------------------|-------|------|
| 测量值 | | | 域值 0.000-999.0 | | |
| D1: | mm | | F: 0.000 | | |
| D2: | mm | | 等待输入D1 | | |
| 0.000HBW | | | | | |
| NULL | HRC | 次数 | 2009/11/16 14:28 | | |
| 载荷 | 压头 | 时间 | 亮度 | 厚度 | 温度 |
| 3000. | 10. mm | 10s | 100% | 0.000 | 25.2 |

Figure 6 Eyepiece return to zero display

<Start> (Start test) Press this button and you can start a Brine test.

<stop> (safe operation key) When you want to stop loading or stop abnormally during the loading process, you need to stop loading, press the hardness tester to stop loading, and the lever will return to the initial state.

<←>, <→>, <↓>, <↑> (direction keys).

<ok> (Enter) Press this button to save the set test force and the selected head.

4.2 display interface

4.2.1 Turn on the power switch (14), after the “Drip” sound is heard, the initial screen will be displayed, the motor will automatically detect, and the “Drip” will be issued again, indicating that the self-test is normal and the initial interface is displayed (Figure 7).

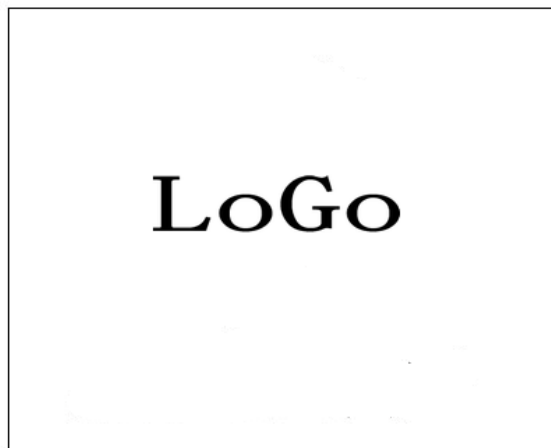


Figure 7 boot interface

4.2.2 Payload time setting

Press **<SETUP>** to enter the setting interface (see Figure 8), press **<→>**, **<←>** to move the cursor to **<DWell>**, press **<↑>**, **<↓>**, and the holding time (1~60 seconds). Make settings (boot setting time is 15S).

| 设置 | | | | | | | |
|------------------|--------|------|------|------------------|------|------|-----|
| F/D ² | 30 | 15 | 10 | 5 | 2.5 | 1.25 | 1 |
| D (mm) | 测试载荷 | | | | | | |
| 10 | 3000 | 1500 | 1000 | 500 | 250 | 125 | 100 |
| 5 | 750 | | 250 | 125 | 62.5 | | |
| 2.5 | 187.5 | | 12.5 | | | | |
| | | | | 2009/11/16 14:30 | | | |
| 载荷 | 压头 | 时间 | 亮度 | 转换 | | | |
| 3000. | 10. mm | 10s | 100% | HRC | | | |

Figure 8 settings interface

4.2.3 Indenter Specifications and Test Force Selection

In the setting interface (see Figure 8), press <→>, <←> to move the cursor to the corresponding test force and indenter to be tested. When selecting the test force, the cursor will automatically follow the D² relationship. Select the indenter ball diameter. In the menu, 2.5, 5, and 10 respectively indicate that the diameter of the indenter ball is Φ2.5, Φ5, and Φ10mm (the head size of the power-on setting is Φ2.5), and press <OK> to confirm.

Note: According to the Brinell hardness test method, the diameter of the indenter ball has a certain relationship with the test force, and cannot be arbitrarily selected. Table 1 should be satisfied.

The test force should be selected so that the indentation diameter is within the following range (Table 1)

$$0.25D < d < 0.6D$$

d—Indentation diameter (To ensure this value, please select the value of $0.102F/D^2$ according to Table 1, where F is N.)

D—steel ball diameter

Table I

| material | Brinell hardness | $0.102F/D^2$ |
|---------------------------|------------------|--------------|
| steel | | 30 |
| cast iron | <140 | 10 |
| | ≥ 140 | 30 |
| Copper and copper alloy | <35 | 5 |
| | 35~130 | 10 |
| | >130 | 30 |
| Light metal and its alloy | 35 | 2.5 |
| | 35~80 | 5, 10 |
| | >80 | 10 |

4.2.4 Time setting

In the setting interface (see Figure 8), press <→>, <←> to move the cursor to year, month, day, ten, minute, and set the time. Press <↑> when the cursor moves. <↓> to complete the setup.

4.2.5 Selecting a conversion ruler

In the setting interface (see Figure 8), move the cursor to <Change> by pressing <→>, <←>, and press <↑>, <↓> to select the conversion ruler.

Note: The original setting of the local load time is 15 seconds, the diameter of the indenter is $\Phi 2.5\text{mm}$, and the test force is 612.9N. The initial setting is displayed after each power-on.

4.3 Use of hardness tester

4.3.1 The hardness tester power supply shall have a reliable grounding and voltage stabilizing device.

4.3.2 Installation of the indenter: Insert the indenter into the shaft hole, rotate the indenter set screw (9) so that it is lightly pressed on the flat part of the indenter axis, and then install the test stand directly on the lifting screw. On the top, the sample is placed firmly on the test bench to ensure that no displacement and winding occur during the test. The rotary wheel (6) causes the test stand to rise slowly, and the sample is gently contacted with the indenter. Set the screw and turn the rotary wheel to disengage the pressure head from the test block and complete the installation of the pressure head.

4.3.3 Turn on the power switch, the machine itself is initialized, the initial interface is displayed, and the large lever is automatically adjusted to enter the work start position. When starting, the force value is set at 612.9N (62.5Kgf), and the startup load time is initially set at 15 seconds. If you want

to select other test force and load time, please refer to the operation panel function key introduction.

4.3.4 Before normal use, the instrument should be pre-pressed 2~3 times with 3000kgf test force to eliminate the gap between the various mechanisms of the instrument, and the electrical components operate normally, reducing the error of the test.

4.3.5 After the preparation of the instrument is ready, the test piece is placed on the table smoothly, and the rotating wheel is rotated. When the workpiece contacts the indenter, the test force also starts to show. When the test force is close to the automatic loading value, it must be slow. When the screw is raised, the instrument will make a “beep” sound when it reaches the automatic load value. At this time, the rotation of the rotary wheel will stop, and the instrument will enter the automatic loading state. The downward arrow (showing that loading is in progress) is displayed on the right side of the display. When the selected force value is reached, the test force holding time starts, the arrow becomes a horizontal line and the holding time starts to count down. When the holding time is over, the unloading state is entered, and the up arrow is displayed on the display to automatically unload and unload. At the end of the load, the arrow on the display disappears and the lever returns to the starting position. Rotating the rotary wheel in the opposite direction disengages the workpiece from the ram, the lever returns to the starting position, and one test ends.

The test force of this instrument has ten grades: 62.5Kgf~250Kgf is the first gear, and the automatic loading value is $\geq 40\text{Kgf}$.

The second gear of 500Kgf~3000Kgf has an automatic loading value of $\geq 160\text{Kgf}$.

After the test is finished, press **<lest>** to enter the list of hardness values. In this list, you can see all the data of the test. Press **<esc>** to return and save the page. For the deletion value, please refer to **<delete>** key usage.

4.3.6 The minimum thickness of the test piece can be found in Table 2. The thickness of the test piece should not be less than 8 times the depth of the indentation. The indentation depth h value

can also be obtained by the following formula:

According to $HB = F / (\pi Dh)$ \longrightarrow Get $h = F / (\pi d \times HB)$

Direct observation: If there are deformation marks on the back and edges of the sample, the test results are considered invalid. The steel ball diameter or test force should be re-selected and retested.

4.3.7 The direction of the test force should be perpendicular to the test surface. The test force retention time is 10-15 seconds for ferrous metals, 30 seconds for non-ferrous metals, and 60 seconds for hardness less than 35hbw.

4.3.8 The distance between the center of the indentation and the edge of the specimen shall not be less than 2.5 times the average diameter of the indentation, and the distance between the centers of two adjacent indentations shall not be less than 3 times the average diameter of the indentation. When the hardness is less than 35 hb, the above distances shall be 3 times and 6 times respectively of the average diameter of the indentation. If the test is not carried out according to this standard, the indentation will be asymmetrical, and the hardness value will be higher or lower, and the correct test data will not be obtained. The indentation diameter should be measured in two mutually perpendicular directions and the arithmetic mean should be taken. The difference between the two diameters of the indentation should not exceed 2% of the smaller diameter.

4.3.9 The sample shall be made into a smooth plane, and its surface roughness shall not be less than 1.6. If the diameter of the steel ball is $\Phi 2.5\text{mm}$, the roughness of the sample shall be above 0.8, so that the edge of the indentation is clear, and the measurement result is guaranteed. The accuracy. The surface of the sample shall be free of scale, plating and heat or other contaminants on the surface.

4.3.10 The hardness tester has multi-level test force, and the test force specified in (Table 3) shall be selected for each test force.

Table II

| Average diameter of indentation d | Minimum thickness of sample | | |
|--------------------------------------|-----------------------------|------|------|
| | Ball diameter | | |
| | D=2.5 | D=5 | D=10 |
| 0.6 | 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 |

Table 3

| Hardness symbol | Steel ball diameter | $0.102F/D^2$ | Test force f |
|-----------------|---------------------|--------------|--------------|
| HBW 10/3000 | 10 | 30 | 29400(3000) |
| HBW 10/1500 | 10 | 15 | 14700(1500) |
| HBW 10/1000 | 10 | 10 | 9800(1000) |
| HBW 10/500 | 10 | 5 | 4900(500) |
| HBW 10/250 | 10 | 2.5 | 2450(250) |
| HBW 10/100 | 10 | 1 | 980(100) |
| HBW 5/750 | 5 | 30 | 7350(750) |
| HBW 5/125 | 5 | 5 | 1225(125) |
| HBW 2.5/187.5 | 2.5 | 30 | 1839(187.5) |
| HBW 2.5/62.5 | 2.5 | 10 | 613(62.5) |

5. Micrometer eyepiece

The micrometer eyepiece shown in Figure 9 is part of the durometer optical system. It can help you observe the actual indentation and measure the length of the diameter. The micrometer eyepiece has two thin wires, one of which remains stationary after moving to one end of the indentation, and the other of which continues to move to the other end of the indentation diameter by rotating the measuring roller. When you think that the two lines are exactly tangent to the ends of the diameter, you can press the input button on the side of the measuring wheel to input the measurement data into the computer system of the hardness tester.

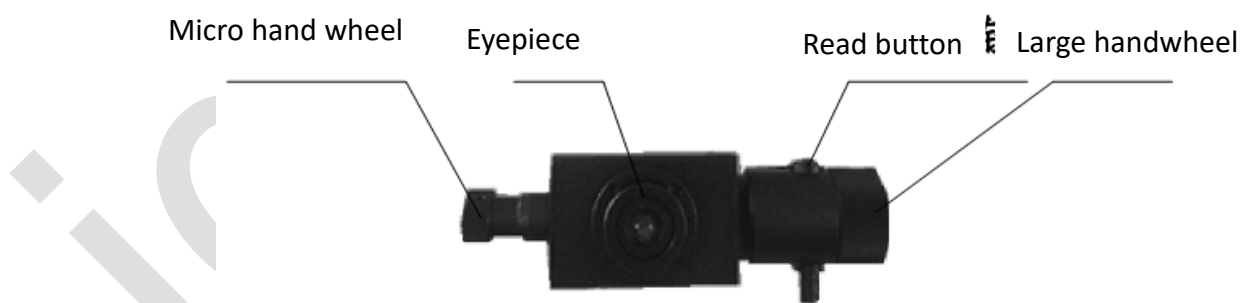


Figure 9 micrometer eyepiece

Rotate the turntable to position the light source directly in front, slowly rotate the rotary wheel, and observe the imaging of the indentation from the surveying eyepiece (3).

Measuring diameter, Step:

5.1 Turn the objective to the center.

5.2 Rotate the eyecup until the two thin lines in the eyepiece are very clear. See Figure 10.

1. Focus adjustment: Observe the image quality inside the eyepiece. Focus with the handwheel until the image of the indentation is very clear.

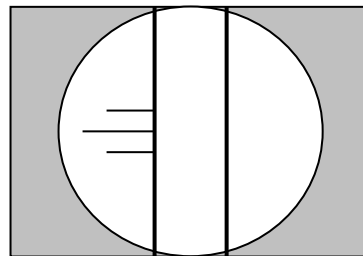


Figure 10 The two thin lines in the eyepiece are very clear

2. Zeroing the micrometers: Rotate the measuring wheel so that the thin lines on the left and right sides are infinitely close, leaving only a very small faint light in the middle, see Figure 11. Press <zero> again to set the d1 and d2 values to zero. Then rotate the measuring wheel to move the right thin line to the right to separate the two thin lines.

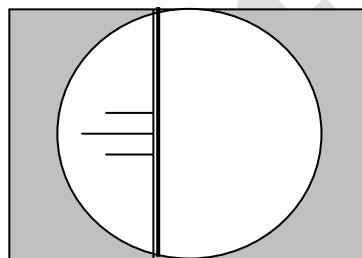


Figure 11 Zeroing the micrometer

3. Measurement: Move the microwire of the micrometer eyepiece to the left to position the drum so that the line on the left just snaps to the left end of the indentation diameter and is perpendicular to it, see Figure 12. This will move both lines together.

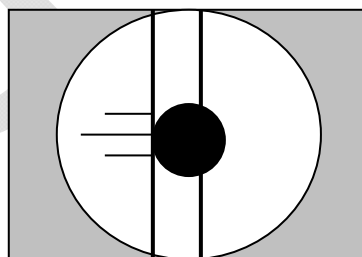


Figure 12 Move the left thin line to the left end of the indentation

• Rotate the measuring wheel so that the thin line on the right just snaps to the right end of the indentation diameter. See Figure 13.

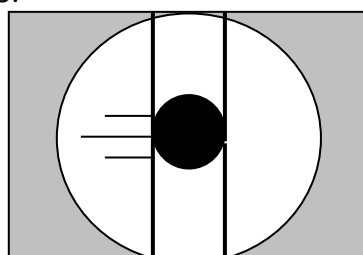


Figure 13 Move the right thin line to the right end of the indentation

- Press the input button on the micrometer eyepiece, the value of d1 is displayed on the lcd screen, and it is automatically transferred to d2, and the value of d2 is required, as shown in Fig. 9.
- Rotate the micrometer eyepiece by 90°. Observe the image inside the eyepiece. The thin line should now be perpendicular to the other diameter of the indentation.
- Rotate the thin wire to position the roller so that it just catches the upper end of the indentation and is tangent to the indentation. This action moves two lines at the same time. See Figure 14.

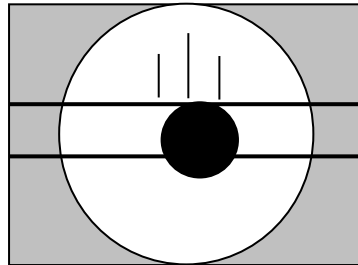


Figure 14 Move the upper thin line to the upper end of the indentation

- Rotate the measuring wheel so that the lower thread just snaps the lower end of the indentation to the indentation. See Figure 15.

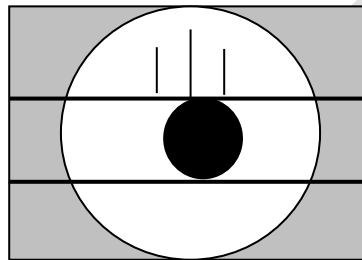


Figure 15 Move the lower thin line to the lower end of the indentation

- Press the input button on the micrometer to input the value of d2. The system automatically calculates the hardness. At this time, the hardness value column will display your test results.

Note: When the system is in test mode, after you input the measurement data of diameter D1, the cursor will automatically move down to D2 position, prompting to input the value of D2. After you input the measured value of diameter D2, the system will automatically convert The average value of D2 and D1 is displayed, and the calculation result of the corresponding hardness value is displayed on the screen (the input D1, D2 value unit is mm, the internal precision of the computer program is 0.0000, but only three decimal places are displayed on the screen display)).

6. Printer

6.1 hbd-3000a Hardness Tester has a micro printer on the body.

The outline structure of the machine is shown in Figure 16.

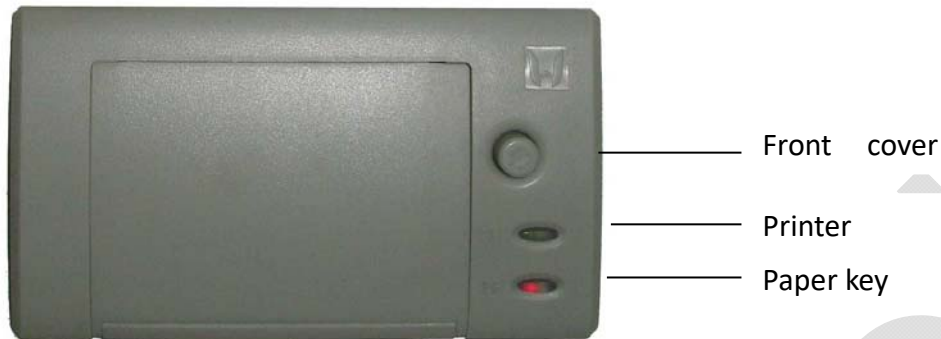


Figure 16 printer outline structure

When the power of the durometer is turned on, the power indicator will be illuminated.

6.2 Replacing the printing paper

If it does not print, please check the printer. If the paper has run out, please replace it. Press the lower right front cover open button, the printer front cover will open, remove the paper roll from the printer, replace it with a new paper roll, and place the new paper roll end into the printer's guide. Cut the paper end into the pattern shown in Figure 17.

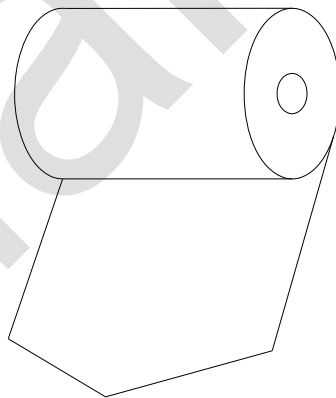


Figure 17 paper end pattern

Note: The paper width is 44mm. If you only have paper output and no print record during printing, you may have reversed the paper and take the roll out of the roll.

7. Hardness meter adjustment and precautions

In the comprehensive test before the factory, all technical requirements have reached the national standard. If the instrument may change some data of the instrument due to assembly, disassembly or transportation or voltage, it can generally be processed as follows:

7.1 Apply 29400 (3000Kgf) test pressure several times each time, so that the deformation of the instrument is eliminated, the electrical components are running normally, and the test error is reduced.

7.2 During the use of the hardness tester, strong electrical interference sources should be avoided around, so as not to affect the accuracy of the test results.

7.3 Hardness tester All screws and caps are tight at the factory. However, since the loading and unloading of the wire rod is always in the forward and reverse rotation during use, if the sound is abnormal when rotating, please check the pulley. If the two caps are loose, if the hair is loose, use a tool to tighten the cap.

7.4 Turn on the power switch and the lever will automatically adjust to the starting position of the work. The lever of the hardness tester has an extreme position when it rises and falls, and a proximity switch head is installed at the tail of the large lever. Install two upper and lower proximity switches on the right side of the main body near the rear cover to control the starting position and total stroke of the large lever. If the improper selection of the hardness tester loading lever is at the lower limit, the hardness tester will automatically stop loading. Then turn off the power and the lever will automatically rise to the initial position.

Note: Under normal use, the loading lever will not be in the lower limit position.

7.5 The instrument will emit some slight noise during the unloading process. This is a normal adjustment of the loading mechanism.

7.6 In order to continuously improve the quality of the instrument, the company will update the structure of the instrument appropriately. Therefore, the contents described in the instruction manual are slightly different from the instrument, but the operation function is not affected without prior notice. Please forgive me.

8. Maintenance of the hardness tester

- 8.1 The surface of the hardness tester such as the lifting screw should be lubricated regularly.
- 8.2 The power should be turned off after the hardness tester is completed.
- 8.3 When the hardness tester is not in use, it should be covered with a dust cover to prevent dust from entering the inside of the machine.
- 8.4 If the hardness tester is not used for a period of time, use it after a period of time after being turned on. In order to preheat the internal electrical components to ensure the accuracy of use.

9. Electronic micrometer maintenance notes

- 9.1 The accuracy of the electronic micrometer eyepiece has been adjusted at the factory, and it is not allowed to disassemble it by itself. Therefore, the accuracy of the reading of the microscope is the responsibility of the customer.
- 9.2 When storing and using electronic micrometers, avoid dust, moisture and corrosive gases.
- 9.3 If there is dirt on the surface of the electronic micro-lens lens, apply soft cotton wool and wipe the mirror paper. When it is contaminated with oil stains, use a cotton wool to pick up a little alcohol and ether mixture.

10. Packing list

| | |
|---|---|
| Host accessory box | |
| Φ 2.5, φ5, φ10mm ball indenter | One each |
| Large and small plane test bench, v-type test bench | One each |
| Standard Brinell hardness block | Hbw/3000/10 (150-250) piece Hbw/1000/10 (75-125) piece Hbw/187.5/2.5 (80-210) |
| fuse | three |
| power cable | One |
| Product certificate | One |
| Instruction Manual | One |
| Plastic dust cover | One |
| Phillips screwdriver | One |
| Slotted screwdriver | One |
| printer paper | One roll |

| Warranty registration card | |
|-----------------------------|--|
| Product number | |
| Host number | |
| Warranty call | |
| Warranty time | One year warranty (except for purchase time, accessories/wear parts) |
| User Info | |
| Purchase date | |
| company name | |
| contact address | |
| Contact | |
| contact number | |
| <p>Copy of invoice copy</p> | |