



Brinell Hardness Tester Vexus SHB-3000D Operation Manual

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1、 Brief Introduction

Hardness is one of important mechanical properties of metallic materials, while hardness determination is a principal index to judge the quality of metallic materials and mechanical parts made thereof. Hardness means material's capability to resist the pressure applied by another object of no residual deformation itself. Higher resistance corresponds higher hardness.

Brinell hardness test is mainly used in hardness determination of cast iron, steel, non-ferric metals and soft alloys, also can be used for some other nonmetallic materials such as hard plastics, bakelite etc. It is suitable for applications in factories, workshops, laboratories, colleges and research institutes. Vexus SHB-3000D differs from like products is the close loop loading system, key panel and touch screen double input methods, blue tooth transferring technology and digital measurement indentation technology.

- High accuracy close loop loading sensor replace traditional weights loading method, to realize automatic loading, dwell and unloading, makes easier installation and better measurement accuracy.
- Equips with 5.2" color touch screen with innovative interface design, makes force selection, dwell time setting, scale conversion and data reading, transferring, printing more convenient and fast.
- One touch operation of indentation measurement by high resolution objective, largely eliminate human error and avoid annoyance to check indentation comparison table.
- Auto hardness conversion from Brinell scale HBW to HK, HV, HRA, HRB, HRC, superficial rockwell scales, etc.
- Equips with Bluetooth Device, optional Bluetooth printer and computer acceptor is available to realize wireless printing and data transferring.

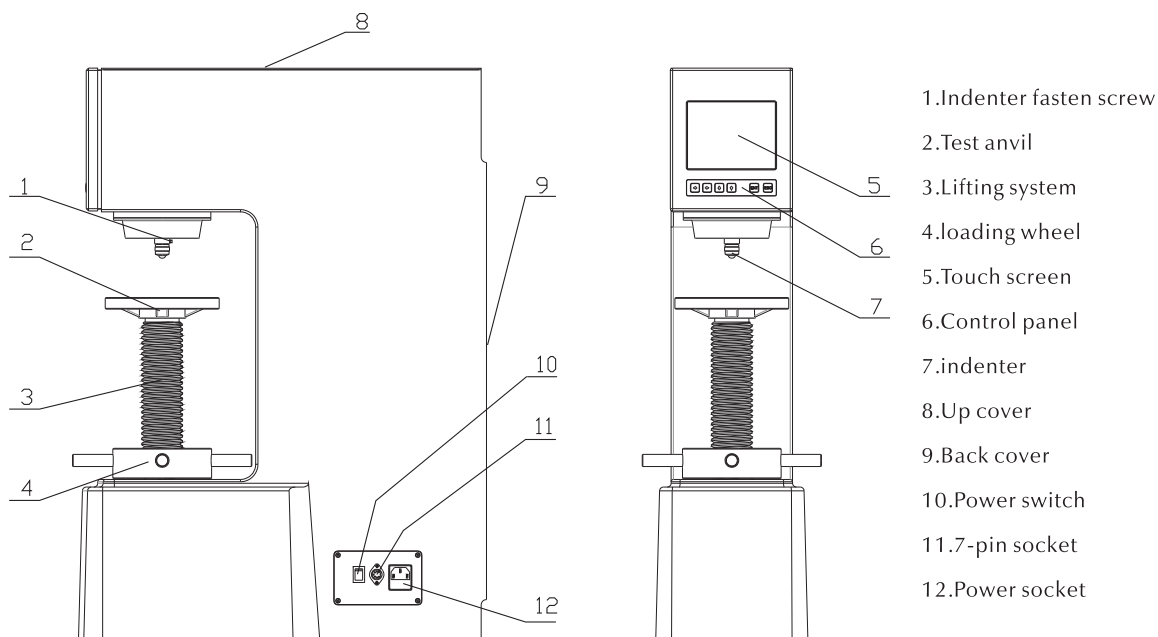


Fig. 1

2、Special Attention(a)

- Carefully read the Operation Manual before you use the hardness tester and get to know thoroughly the operation procedure and the usage precautions so as to avoid the damages to the hardness tester and the safety accidents caused by the improper operation.
- All the bands and the anti-shock tapes should be carefully removed before the hardness tester is installed and calibrated.
- The single-phase 3-pin socket should be used for the power source of the hardness tester and the ground connecting cable should meet the safety requirements.
- It is strictly prohibited to tamper with the installed position of all the electric component parts, switches, and sockets of the hardness tester without permission, otherwise it will cause accident.
- It should not to turn the force knob or the Rotating Wheel during the loading and unloading operations and the dwell time of the test force.
- Our company tries to improve the quality of the hardness testers and renew their structure. In case the contents in the Operation MANUAL are a bit different with the actual structure of the instrument, it is hoped and apologized for the fact that the further notice will not be given.

3、Installation

3.1 working condition:

- 3.1.1 Under the room temperature between 10~30℃;
- 3.1.2 The relative humidity in the test room $\leq 65\%$;
- 3.1.3 Without vibration, corrosive medium and serious dust in the surrounding environment.

3.2 Installation:

- 3.2.1 Cut the belts on the packing box, screw off the screws on the bottom plate of the box and remove off the upper body of packing box. Take out the accessories kit.
- 3.2.2 Unscrew the two (2) M10 outer hexagonal bolts under the bottom plate with a spanner, to separate the hardness tester from the bottom plate (take care of the safety).
- 3.2.3 After unpacking, the tester shall be placed on a stable and solid working table with horizontal deviation less than 1mm/m (There is a level in the accessories kit). A hole shall be drilled at a proper location on the working table (see Fig.1) to enable the Up and Down Lead Screw to operate properly. We suggest that the height of working table should be about 500mm, see Fig.2.

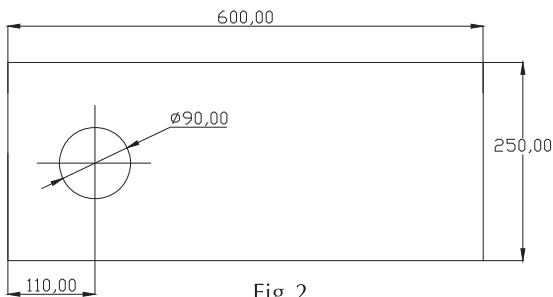


Fig.2

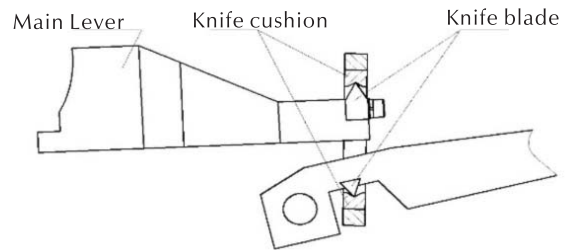


Fig.3

- 3.2.4 Installation indenter, and indeter fasten screw.



Before install indenter, please make sure ball and indenter frame are clean, then fasten, also need check frequently if the ball is loosen, if loosen, then the test value is invalid.

- 3.2.5 Observe the knife blade is in the knife cushion, if not, then press lever and make sure knife blade in the knife cushion.
- 3.2.6 Take off test anvil and install on the lifting system.

3.2.7 Install eyepiece, take off from accessories box and connect the 7-pin connector on the tester.

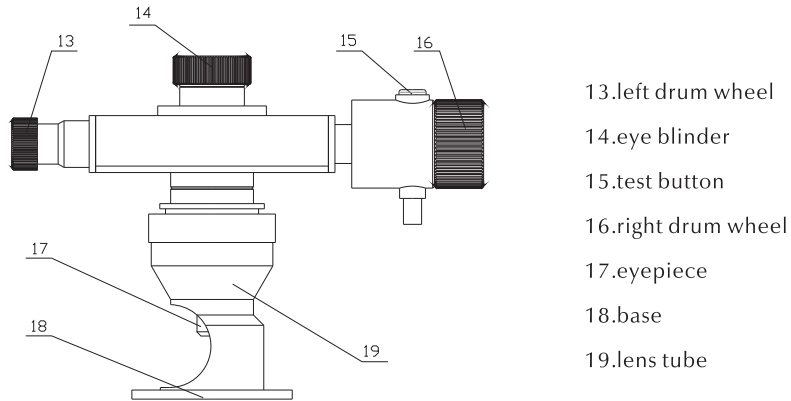


Fig. 4

3.2.8 Finally install back up cover, back cover.



- 1.Take care during unpacking and installation, avoid damage of tester parts.
- 2.Understand well components structure and avoid wrong operation.

4、Technical Data

Product Name		Color Touch Screen Digital Brinell Hardness Tester	
Model		Vexus SHB-3000D	
Code#		831-120	
Loading Force	N	612.9, 980.7, 1226, 1839, 2452, 4903, 7355, 9807, 14710, 29420	
	kgf	62.5, 100, 125, 187.5, 250, 500, 750, 1000, 1500, 3000	
Data Transfer		Bluetooth; RS232 is optional	
Measuring Range		(8~650) HBW	
Hardness Display		LCD Display	
Hardness Conversion		HRC、HV、HBS、HBW、HK、HRA、HRD、HR15N、HR30N、 HR45N、HS、HRF、HR15T、HR30T、HR45T、HRB	
Magnification of Eyepiece		20X Digital Measurement Eyepiece	
Max.height of Specimen		225mm	
Instrument Throat		135mm	
Power supply		AC220V/50Hz; 110V/60Hz	
Conversion Standard		ASTM、DIN	
Languages		Chinese, English, German, Portuguese, Turkish, Czech, Korean	
Dimension		545 x235 x755mm	
Gross/Net Weight		160kg/130kg	
Executive Standard		GB/T4340、JIS Z2245、ASTM—E92、ISO6507	
Accuracy of Brinell Hardness Testing	Hardness Range	Max. Tolerance	Repetition
	HBW \leq 125	$\leq \pm 3.5\%$	$\leq 3.5\%$
	125< HBW \leq 225	$\leq \pm 2.5\%$	$\leq 3.0\%$
	HBW> 225	$\leq \pm 2.0\%$	$\leq 2.5\%$

5、Interface Description

5.1Power on:

- 5.1.1 Connect power supply by 3-pin socket.
 - 5.1.2 Power on, then start page like Fig. 5-1.
 - 5.1.3 After enter to main page, system will tell you do zero clearance, see Fig5-2, according to this manual, please read part 7.2.8, then click the button on eyepiece, after hear “Di” sound, means finished zero clearance.
Then we can start measure the indentation diameter.
- ▲ Note: If above zero clearance is not good, we also can make more times zero clearance steps.



Fig. 5-1

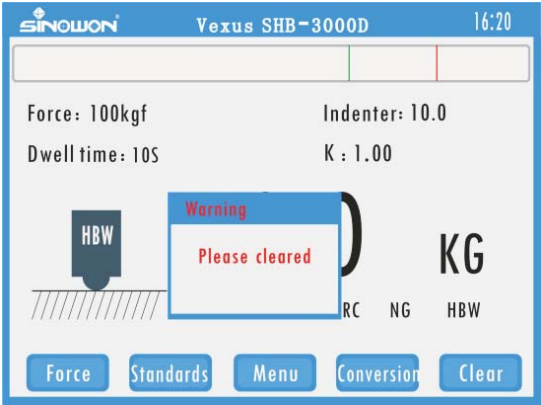



Fig. 5-2



1)If you do not want to zero clear, just press eyepiece button. While the first time to measure, we have to do zero clearance.

2)In non-measurement mode, there is no need to do zero clearance.

5.2Main Interface:

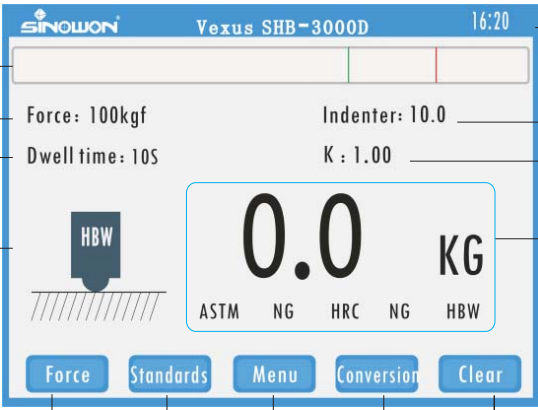
Loading Slot

loading force

dwell time

test scale

indentation display



Force: 100kgf

Dwell time: 10S

Indenter: 10.0

K: 1.00

0.0 KG

ASTM NG HRC NG HBW

Force Standards Menu Conversion Clear

status information

indenter

K value

Test result area)

Function Key

Fig. 5-3

- **Status information:** From left to right “Brand” “Model” “System Time”.
- **Loading Slot:** Shows the loading force, normal is gray, once reach the set force, turns to green, while if exceed set force, it turns to red.
- **Test result area:** Display test process and result, below is hardness conversion standard and value.
 - 1) Because of Brinell sensor character, the force will bounce, click zero clearance, it is normal.
 - 2) Clock-wise rotate loading wheel, once hear “Di” sound, then stop rotate. (if the set force from 62.5 kgf to 500kgf, trigger value is 30kgf; set force from 750kgf to 3000kgf, trigger value is 90kg).
 - ▲ Click force unit and switch KG/N.
 - 3) Once start trigger value, loading status shows from loading....Dwell.....Unloading.... And instantaneous force.
 - 4) Measure indentation diameter to get hardness value and conversion value.
- **Indenter:** Show indenter specification
- **K Value:** According to force and indenter ball diameter, auto calculate K value (see part 7.1.3)
- **Test scale/indentation display:** Standby/loading/unloading show scale HBW, after unloading shows indentation.
- **Dwell Time:** Shows dwell time, it counts down to zero.

5.3 Touch Screen

- **Loading force:** main page click loading force enter to force setting.
- **Main Menu:** Enter system setting.
- **Standard:** Hardness conversion standard, like DIN, ASTM, GB.
- **Conversion:** hardness conversion from Brinell to others scales.

See Fig.4-2, HRC, HV value are converted from HBW, click conversion can change to others scales.

 - ▲ Remark: if not unload, click conversion is effective only display HBW value.
- **Zero clearance:** after unloading, but still value on display, then please click zero clearance.



Please just use hand to click touch screen, and do not use others objects, it will damage the screen.

5.4Control Panel:



Fig.5-4



Left direction, press can move to left object.



Right direction, press can move to right object.



Up direction, press can move to up object, adjust lightness, press adjust more light.



Down direction, press can move to down object, adjust lightness, press adjust less light.



To confirm the selected item.



Esc button, quit to previous item, after measured indentation, press can quite and save results.

6、System Setting

6.1 【 Loading force and ball diameter 】

Click loading force/ball diameter to select, shows on main page the loading force, ball diameter, K value; the frequently used force: 62.5kgf,100kgf,125kgf,187.5kgf,250kgf, 500kgf,750kgf,1000kgf,1500kgf,3000kgf; Ball diameters: 1mm,2mm,2.5mm,5mm, 10mm; See Fig6-2。

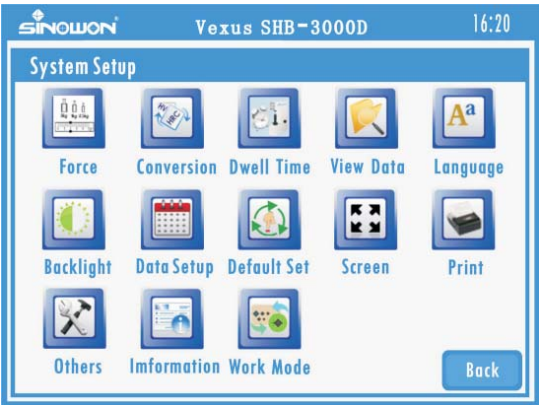


Fig.6-1

6.2 【 Conversion scale setting 】

6.2.1 【 Conversion scale 】 ——Click the box on right of scale, can select 2 scales at a time: HRC、HV、HBS、HBW、HK、HRA、HRD、HR15N、HR30N、HR45N、HS、HRF、HR15T、HR30T、HR45T、HRB, see Fig6-3.

6.2.2 【 Conversion standard 】 ——Under conversion scales, there are 2 options ASTM and DIN. see Fig6-3.

- ▲ Remark: 1.If the converted hardness value is invalid, it will show NG
- 2.When change hardness conversion value, it can also change saved scale and show corresponding value.
- 3.Click one more time for selected scale, means cancel the selection.



Fig.6-2



Fig.6-3

6.3 【 Dwell Time 】

See Fig.6-4, dwell time from 1-60seconds adjustable. Default time is 5 seconds. Normally the set dwell time is 10-15 seconds, for nonferrous metals, dwell time can be lengthen to 30 seconds.

6.4 【 Language 】

See Fig.6-5, following are the selections for different countries customers.

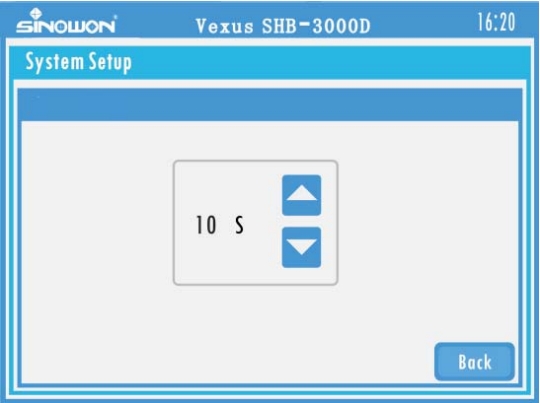


Fig.6-4



Fig.6-5

6.5 【 Date Setup 】

Click to modify year, month and date, click ENTER update system time. (Fig 6-6); Enter date setup, direction key set year, click ENT to confirm, then press ENTER to finish. Same step for Month and Day setup.

6.6 【 Backlight setup 】

Click backlight to enter interface, drag dot to update backlight, see Fig.6-7.

6.7 【 Screen Calibration 】

Calibrate screen according to display, see Fig. 6-8.

6.7.1 Enter calibration screen, click the small black cross one by one.

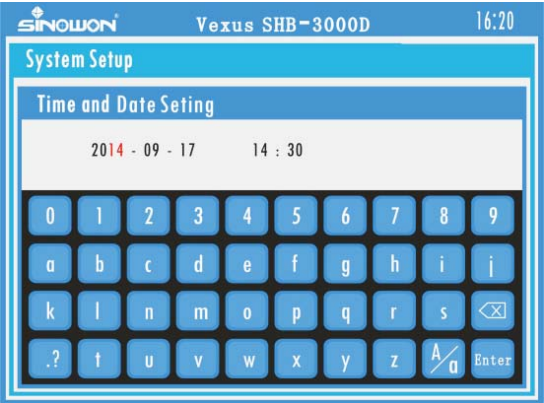


Fig.6-6

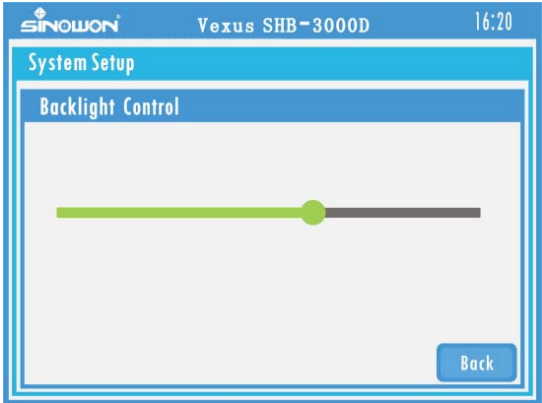


Fig.6-7

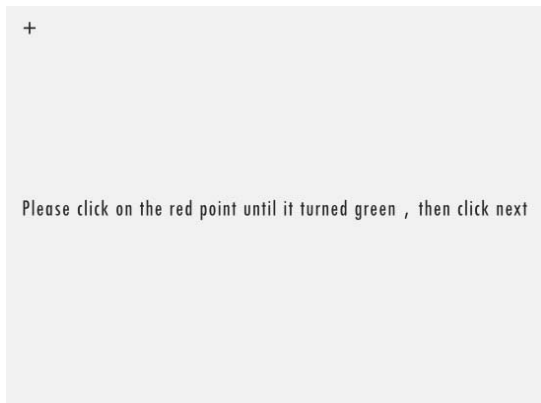


Fig. 6-8

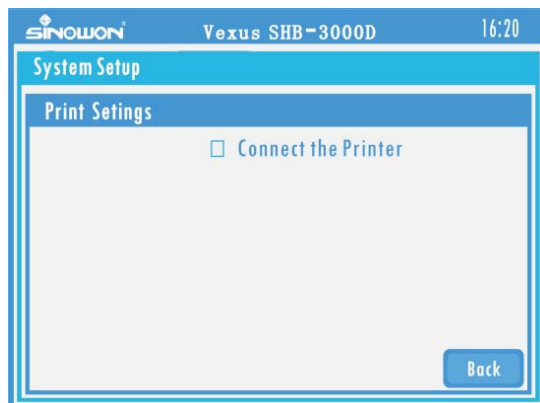


Fig. 6-9

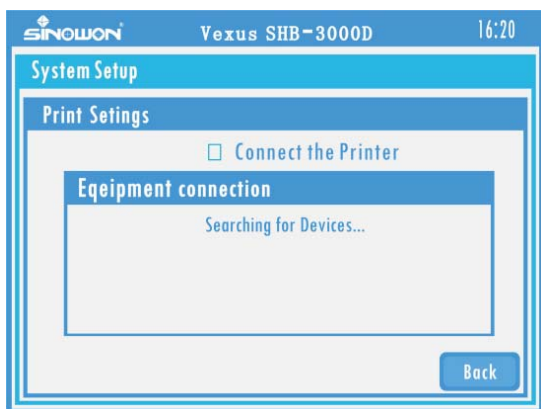


Fig. 6-10

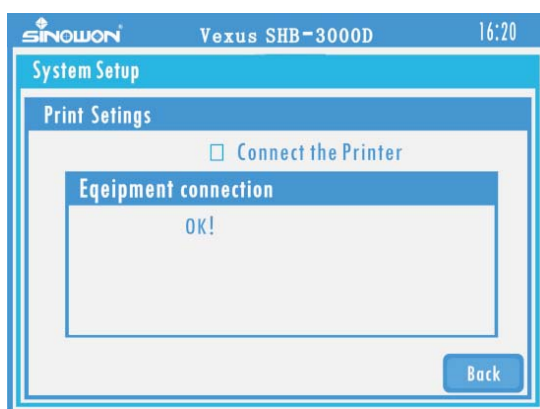


Fig. 6-11

6.8 【 Print Setup 】

available for wireless print by connecting bluetooth print device (optional), or connect the upper bluetooth module (optional) with a computer. Connection steps are as follows:

- 1) When connect with a bluetooth print device: turn on the print device, wait for its stand-by state;
When connect with a computer: insert the upper bluetooth module (optional) into the computer USB.
- 2) Click the small box in front of the [connect the printer], start signal search function shown as Fig 6-10.
- 3) It will finish signal search after seconds, at this time click Connect as representation, when it shows Connect OK, we have connected bluetooth device successfully with PC. Detailed introduction about PC setup, please see [wireless data transmission setup].
- 4) Click back to the [viewing data] to execute data printing operation. (connect with PC, data transmit to PC). Detailed introduction, please see [about data printing].



1. Make sure blue tooth is power on before connect with hardness tester.
2. Blue tooth sensor range is 1-3 meter.
3. Connect one time is OK.
4. If hardness tester is powered off, then reconnect Blue tooth once restart hardness tester
5. If connect failure, then reconnect again.

6.9 【Wireless data transmission setup】

Connect successfully with PC, setup as follows:

- 1) XP system: click start-program-accessory-communication-hyperterminal one by one, it will pop out a new connection window (Figure ①)-edit connection name-click OK.
- 2) Above Win7 system: for those systems have not hyperterminal, extra installation is needed. Users can download from the internet. Double-click the function icon after extraction, it will show a new connection window (Figure ①) -edit connection name-click OK.
It will pop out region setup when it is firstly used, users should set up as needed.
- 3) Choose the using com port (as the following Fig, port is COM3) baudrate [B/S] set up as 9600 (Figure ②,③), others do not change, click OK after every setup.
- 4) All the above finished, executive print operation, data will transmit to PC.



6.10 【 Others Setup 】

Following sub-menu in this setup, see Fig.6-12

- 6.10.1Click sound, switch on system sound.
- 6.10.2Click enable default name, then will display name edit dialog box, then input name and click Enter to confirm. Name consist set name and number, see Fig 6-13, the saved name is sinowon01. If not click, default name is 16 digits 0 and increases.
- 6.10.3[auto sleep] click on screen to set sleep time, minimal is 1 min, max is 60 min, default is 5 min, enable auto sleep will shut off screen, to save electricity, click any part of screen will back to working status.

6.11 【 Product information 】

To check the serial number, model, edition, etc.

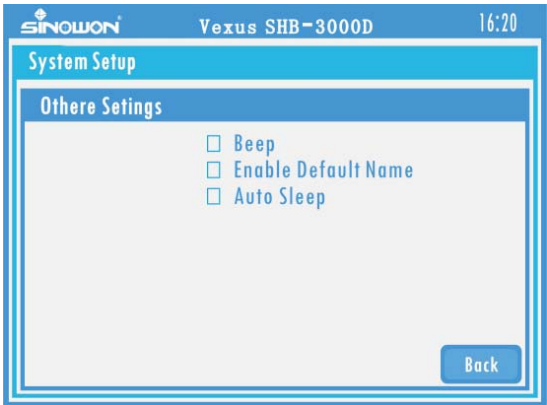


Fig. 6-12

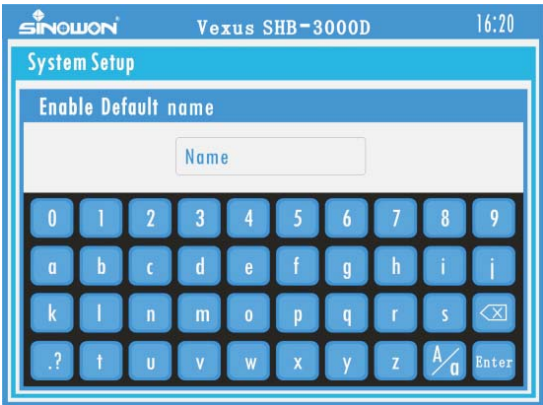



Fig. 6-13

6.12 [Viewing Data]

Click view data enter to see the result details, see Fig.6-14, conversion scale can be modified and show different value.

- 1) **List**: Each page shows 5 test results, the latest one is on top, see Fig6-14.
- 2) **Details**: To show the detail information of each test result, like test time, test scale, hardness conversion. Fig6-15.
- 3) **Graph**: operator can click less than 10 results, then click graph, system will show graph of selected results, max and min value are red.
- AVE: Average value;
- S: Standard deviation; if shows“Err”, means exceeds permitted error;
- %S: Percentage of deviation; if shows“Err”, means exceeds permitted error;
- %RE: Repeatability. The value is small, means hardness is stable
- 4) **About print**:
 - Print single result: Click Print on the page of list or details can print single result, see Fig.6-17.
 - Group Print: Click  on graph page, the print show Fig6-18.

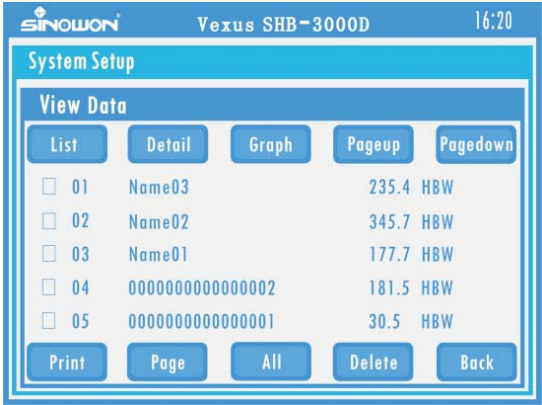


Fig.6-14

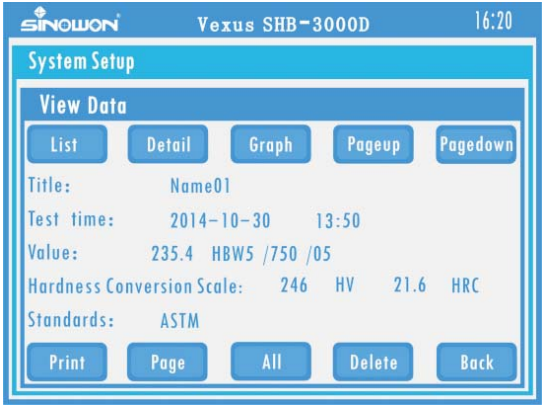


Fig.6-15

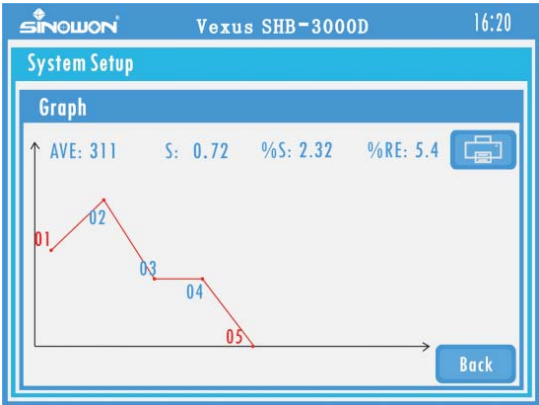


Fig.6-16

Title:	00000000000000000007
Test Time:	2015-01-01 16:00
Value:	235.4 HBW5 /750 /05
Standards:	ASTM
Handness Conversion:	21.6 HRC 243 HV

Fig.6-17

Value:	
(01) 235.4 HBW	(02) 345.7 HBW
(03) 177.7 HBW	(04) 181.5 HBW
(05) 30.5 HBW	
Max:345.7	Min:30.5
AVE:194.4	
S:Err	S%:Err
%RE:16.2	

Fig.6-18

6.13 [Default Setup]

- 6.13.1Default setup will delete test setup, system setup and test results, if no special case, please do not use this function. Password 88888888.
- 6.13.2Steps: Enter system setup, select default setup, then enter password, click Enter on lower right corner, then system starts default setup, a moment later system will back to system setup. Fig6-20.

6.14 【 Working Mode 】

- No measurement:

When set this mode, instrument will execute loading, dwell, unloading, then back to main page after indentation, but do not measure indentation. Customer can continuously get indentations, then use software (optional) to measure indentation and save results in computer.

- Measurement:

When set this mode, each indentation will be measured one by one, and get results to save in hardness tester.

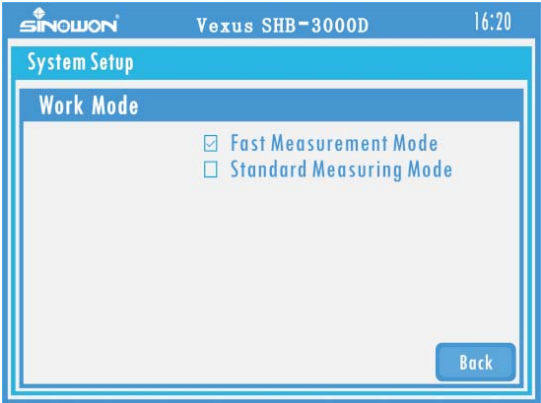


Fig. 6-19

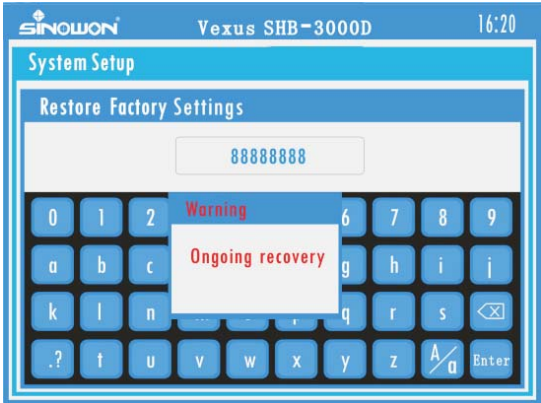


Fig. 6-20

7、Operation Description

7.1Preparation:

7.1.1Test Method:

- 1) Make sure brinell hardness tester and indenter conform to ASTM_E10
- 2) Room temperature between 10~35℃, for high accuracy request, it should be between 23 ± 5) ℃
- 3) Test force and indenter should be conform below table, table7-1.

Table 7-1 Table of test force and indenter

Hardness scale	Ball diameter D/mm	$0.102F/D^2$	Force F/N
HBW10/3000	10	30	29420
HBW10/1500	10	15	14710
HBW10/1000	10	10	9807
HBW10/500	10	5	4903
HBW10/250	10	2.5	2452
HBW10/100	10	1	980.7
HBW5/750	5	30	7355
HBW5/250	5	10	2452
HBW5/125	5	5	1226
HBW5/62.5	5	2.5	612.9
HBW5/25	5	1	245.2
HBW2.5/187.5	2.5	30	1839
HBW2.5/62.5	2.5	10	612.9
HBW2.5/31.25	2.5	5	306.5
HBW2.5/15.625	2.5	2.5	153.2
HBW2.5/6.25	2.5	1	61.29
HBW1/30	1	30	294.2
HBW1/10	1	10	98.07
HBW1/5	1	5	49.03
HBW1/2.5	1	2.5	24.52
HBW1/1	1	1	9.807

4) Apply the test force within 1 to 8 s. Faster force application times are permitted if it is demonstrated that test results are not affected. Maintain the fully applied test force for 10 s to 15 s, with the following exception.

In the case of materials exhibiting excessive plastic flow after application of the test force, special considerations may be necessary since the indenter will continue to penetrate into the material.

Testing of these materials may require the use of a longer applied force dwell time than stated above, which should be specified in the product specification. When an extended applied force dwell time is used, the dwell time shall be recorded and reported with the test results.

5) The distance between the centers of two adjacent indentations shall be at least three times the diameter of the mean indentation.

The distance from the center of any indentation to an edge of the test piece shall be at least two and a half times the diameter of the mean indentation.

6) Indentation should be between $0.24D \sim 0.6D$.

7) To measure diameter of indentation by 2 cross perpendicular line.

8) If specimen surface is cylinder, there is correction value.

9) Brinell hardness values shall not be designated by a number alone because it is necessary to indicate which indenter and which force has been employed in making the test. Brinell hardness numbers shall be followed by the symbol HBW.

a) For example: 350 HBW 5/750 = Brinell hardness of 350 determined with a ball of 5 mm diameter and with a test force of 7.355 kN (750 kgf) applied for 10 s to 15 s.

7.1.2 Specimen Surface:

1) The surface of the specimen must be clean, as the grease or the dirt on the surface would make the edge of the image of the indentation vague, thus affecting the precision of the measurement. Please clean the specimen with alcohol or ether, $RA < 1.6 \mu m$.

2) The thickness of the specimen tested shall be such that no bulge or other marking showing the effect of the test force appears on the side of the piece opposite the indentation. The thickness of the material under test should be at least ten times the depth of the indentation. The thickness of the material can also be used as a guideline for the minimum depth of a layer of a material, such as a coating.

Minimum Specimen Thickness Based on Ten-Times the Indentation Depth table 7-2

Diameter Indentation d/mm	Thickness /mm			
	Ball diameter /mm			
	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			
0.7				
0.8				
0.9				
1				
1.1				
1.2				
1.3				
1.4				
1.5				
1.6				
1.7				
1.8				
1.9		0.29	0.58	
2		0.40.53	0.69	
2.2		0.67	0.8	
2.4		0.83	0.92	1.17
2.6		1.02	1.05	1.38
2.8		1.23	1.19	1.6
3		1.46	1.34	1.84
3.2		1.72	1.5	2.1
3.4		2	1.67	2.38
3.6			2.04	2.68
3.8			2.47	3
4			2.92	3.34
4.2			3.43	3.7
4.4			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

7.1.3 About "K":

"k" IS a number calculated as the ratio of the test force in kgf to the square of the indenter ball diameter in mm.

The test force shall be chosen so that the diameter of the indentation d lies between the values $0,24 D$ and $0,6 D$.

Table 7-3 indicates recommended force-diameter ratios ($0,102 \cdot F/D^2$) that are appropriate for use when testing certain materials and hardness levels.

In order to test the largest representative area of the test piece, the diameter of the testing ball shall be chosen to be as large as possible.

When the thickness of the test piece permits, a 10 mm diameter ball is preferred.

Table 7-3 — Ratio $0,102 \cdot F/D^2$ for different metallic materials

Material	Brinell hardness HBW	Force-diameter ratio $0,102 \cdot F/D^2$ N/mm ²
Steel, nickel alloys, titanium alloys	-	30
Cast iron ^①	< 140	10
	≥ 140	30
Copper and copper alloys	< 35	5
	35~200	10
	> 200	30
Light metals and their alloys	< 35	2.5
	35~80	5
		10
		15
	> 80	10
Lead, tin	-	1

▲ Remark: 1. For the testing of cast iron, the nominal diameter of the ball shall be 2,5 mm, 5 mm or 10 mm.

7.1.4 Permitted Error and Repeatability

The indirect verification procedure is designed to verify that for all of the Brinell hardness scales to be used, each test force is being accurately applied, each indenter-ball size is correct, and the measuring device is calibrated correctly for the range of indentation sizes that these scales produce.

This is accomplished by making Brinell hardness tests on test blocks that have been calibrated for appropriate Brinell hardness scales that employ each of the corresponding test forces and indenter ball sizes. It needs at least 2 standard blocks from below ranges:

$d \leq 200\text{HBW}$

$300\text{HBW} \sim 400\text{HBW}$

$\geq 500\text{HBW}$

Test five indentation and list accordingly by indentation diameter: d_1 、 d_2 、 d_3 、 d_4 、 d_5 。

The repeatability is:

$d_5 - d_1$

Permitted Error is:

$\bar{H} - H$

In the format \bar{H} is average of five measurement:

$$\bar{H} = \frac{H_1 + H_2 + H_3 + H_4 + H_5}{5}$$

In the format H_1 、 H_2 、 H_3 、 H_4 、 H_5 ----- d_1 、 d_2 、 d_3 、 d_4 、 d_5 corresponding hardness value;

H -----Standard hardness block value。

Repeatability and Error of brinell hardness tester, Table 7-4

Standard hardness block value HBW	Maximum Permissible Repeatability/mm	Maximum Permissible Error/%
≤ 125	$0.030\bar{d}$	± 3
$125 < \text{HBW} \leq 225$	$0.025\bar{d}$	± 2.5
> 225	$0.020\bar{d}$	± 2

7.2 Operation Steps:

7.2.1 Power On

7.2.2 Prefer use 10mm indenter to do test if specimen available.

7.2.3 Set test parameter, working mode, dwell time, force and indenter.

7.2.4 Put specimen on test anvil, then click zero clearance, until specimen touches indenter.



1. the surface on which the indentation is to be made should be filed, ground, machined or polished flat with abrasive material so that the edge of the indentation can be clearly.
 2. defined to permit the measurement of the diameter to the specified accuracy.
- Preparation shall be carried out in such a way that any alteration of the surface hardness of the test surface.

7.2.5 Note the color of loading slot, when goes to green line, and hear sound “Di--” means loading is finished, stop rotate lifting system, then to dwell time.

7.2.6 See Fig6-1, once the process finished, means a measurement is done.



Please do not make the loading slot exceeds red line, otherwise will damage the machine.

▲ Note: This machine apply close loop control system, it can reflect the real force changing, during dwell time, the force is always shadow, this is normal.

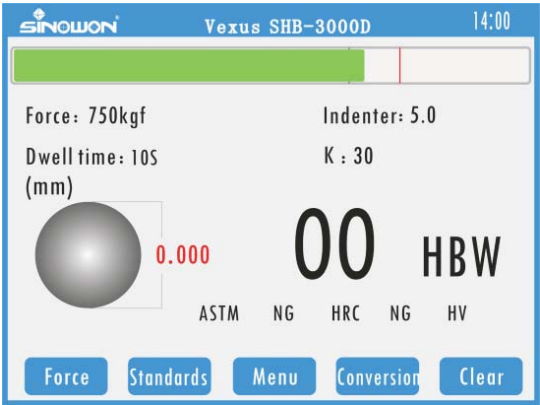


Fig.7-1

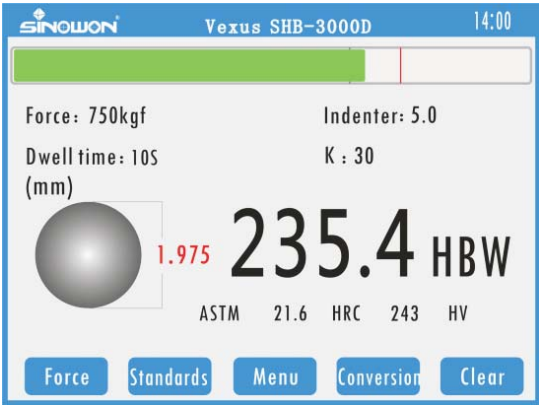


Fig.7-2

7.2.7 Then take off specimen and measure the diameter by microscope.

7.2.8 Microscope Zero Clearance

- 1) If the 2 lines are not clear, adjust patch to make them clear.
- 2) Rotate the right Drum Wheel and Right Drum Wheel to enable inner side edges of two graduated lines move closely without limit between them, the light slot between graduated lines become smaller and smaller till reaching critical state with no light slot. Press CLR-D key to set Zero.



When change operator, need to readjust patch to see the clear indentation and measurement line

- 3) Long time press eyepiece button about 3 seconds, then it will a warning dialog box. Then click Yes to finish zero clearance.
- 4) If already zero clearance once power on the machine, then just neglect above steps and measure dialog line.

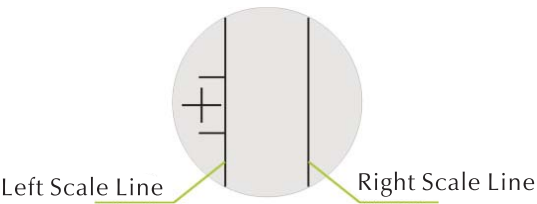


Fig.4

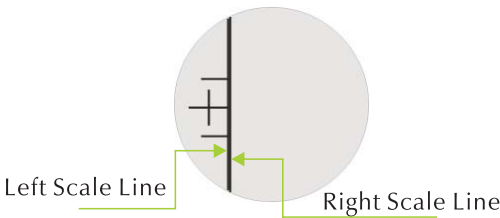


Fig.5

▲Note: 1) Left drum wheel can move 2 lines at the same time, while right drum wheel can move right line only.

2) The instrument has memory for setting the zero. It is necessary to reset the zero only when the instrument is re-started after it is closed. When new operator comes, please set the zero, so as to keep the accuracy for the measurement.

7.2.9 Measure the Indentation line length of indentation:

- 1) Rotate the Left Drum Wheel to enable the inner side of left graduated line tangent to the left tip of the diagonal line of the indentation, Fig6.
- 2) Rotate the Right Drum Wheel to enable the inner side of right graduated line tangent to the right tip of the diagonal line of the indentation, Fig7.

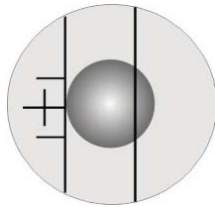


Fig.6

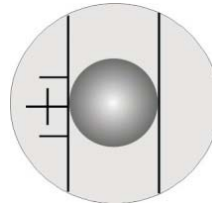


Fig.7

- 3) Press button on microscope (15) ,auto calculate brinell value (HBW) ,See Fig.7-2.

▲If operator find the value exceeds permitted error, then repeat the measurement again.



1. The distance between the centers of two adjacent indentations shall be at least three times the diameter of the mean indentation. The distance from the center of any indentation to an edge of the test piece shall be at least two and a half times the diameter of the mean indentation.

2. The diameter of the indentation shall be between 24 and 60 % of the ball diameter.

7.2.10 After measured, press [ESC] quit and save result, it can be seen again from view data.

8、 Special attention(b)

Before ex-factory this instrument is up to the state standards through overall test for delivery , but due to the causes of assembly and disassembly or transportation , it is able to bring about the variation in test value of hardness meter. Generally it can be handled as follows:

- Apply 29400N test force to press several times in each starting of the machine, so that mechanical deformation amount eliminates, electric components are in normal operation and test error decreases.
- Each level test force and positive and negative signal of the instrument can be obtained from the feedback of the sensor . Output signal of the sensor is quite feeble , therefore anti-interferencemodule has been installed in the circuit , but to ensure the normal operation of the instrument and avoid the possible occurrence of unnecessary damage , when the instrument is in use , it should avoid heavy current interference source in its surrounding . It should be Fig 4 closed after the test is complete.
- ground wire is necessary.
- During loading, dwell, there is noise, but normal.
- After tested, remember power off.
- Brinell hardness tests should be carried out at an ambient temperature within the limits of 10 to 35°C.
- The diameter, when measured at not less than three positions, shall not differ from the nominal diameter by more than the tolerances given in.

TABLE A3.2 Diameter Tolerances for Indenter Balls

Ball Diameter, mm	mm
10	± 0.005
5	± 0.004
2.5	± 0.003
1	± 0.003

9、Maintenance

- Periodically test the force is correct or not according to national standard.
- Power off for any adjustment.
- Turn the hand-wheel in counter direction to take the stock away from light source. Apply a thin coat of oil on the stock surface and cover it with a antirust paper to protect the stock from rust and also prevent the oil vapor bringing adverse effect on the lens and light source.
- When the tester is not in use, wrap the microscopic ocular lens with a lens tissue and cover the tester with a cloth to prevent dust from entering the tester. If the tester will not be used for a long period, desiccant shall be place in the optical part of the tester to protect the lens.
- If the tester has not been used for a long period, several minutes of warm up shall be allowed after turn on the power to ensure the apparatus accuracy.
- Every time after switching on, use the test load of 29400N(3000kgf) to make several trial tests, to eliminate gaps between different parts, ensure proper function of electronic components and reduce test error.
- When measure the ball dent, a light cycle may be observed in the dent. This is a normal physical phenomenon and will not impact the measurement accuracy.
- The two graduation lines in ocular lens shall be calibrated in the first measurement after start up. During the sequential tests no more calibration will be needed even if the test load or indenter is changed. This is a memory program designed in software package to facilitate the test operation which can keep only the current data, and the data will volatilize once power is cut off and shall be re-calibrated after next start up.
- If problem can not be solved, please contact local sales person.

10、Trouble Shooting

PHENOMENON	REASONS	TROUBLESHOOTING
TOUCH SCREEN FAILURE	Still on testing	Unloading, then use touch screen
NO LCD	1 Power on failure 2 fuse broken	1 Check power cable 2 replace fuse
PANEL FAILURE	Hardness tester is not working	Restart then back to work.
BLOCKED LIFTING SYSTEM	Dust or small lint enter into lifting system	Take off cover than clean the screws then pull it
POWER ON, BUT HARDNESS TESTER NO ACTION, NOISE	MECHANICAL MALFUNCTION	Check power is normal, socket and cable are in good condition.

▲ Note: If still can not solve the problem, please contact our sales.

11、 After Sales Service

- Two years warranty for main unit only for quality problem, the others accessories are not under warranty. Refer packing list of ultrasonic hardness tester.
- please show invoice and warranty card in case need repair.
- we ask for charges for accessories not under warranty.

12、 Shipping Notice

- Storage should be far away from the vibration, corrosion, moisture, dust, also should be stored at a normal temperature and humidity. Please put in the original packing box before transportation to avoid any damage.
- ▲ Note: Operation manual will be updated without further notice, latest edition will be sent to customers by email timely.



ISO 9001:2015 Certified Company



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