uBrin-3000E Brinell Hardness Tester

Instruction Manual



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1. Brief Introduction

1.1 Hardness is one of the important indices of material mechanical performance. And hardness test is the important means to determine metal material or the quality of product parts. Because of the corresponding relation between metal hardness and other mechanical performance, therefore, most metal materials can be measured the hardness to approximately calculate the other mechanical performance, such as strength, fatigue, creep and wear.

1.2 The instrument controlled by single-chip microcomputer□acquire signals by sensor,loading by stepping motor,It's a closed-loop control system. Brinell hardness test is mainly used in hardness measurement for cast iron, steel products, nonferrous metals and soft alloys, etc. Besides it can be also used in hardness measurement for some nonmetal materials, such as rigid plastics, bakelite, etc.

1.3 The instrument uses a new touch screen,with new usage to lead the change of Hardness.

1.4 Performance Standards:GB/T231.1 GB/T231.2

2. Main Technical Specifications

Test Force	62.5kgf(612.9N),100kgf(980.7N),125kgf(1226N),187.5kgf (1839N),250kgf(4903N),500kgf(4903N),750kgf(7355N),1 000kgf(9807N),1500kgf(1471N),3000kgf(29420N)
Hardness Range	8~650 HBW
Enlargement Factor of Reading Microscope	20times
Minimum Division Value of Micrometer Drum Wheel	0.01mm
Maximum Height of Specimen	240mm
Distance from the Indenter Central Point to the Instrument Body	155mm
Time-delayed Control	0~60 seconds, adjustable
Power Source	AC220V±5%/50~60HZ
Overall Dimension (L×W×H)	(550×210×780)mm
Main Body Weight	110kg

2.11 To ensure the correctness of Brinell hardness test, it should meet the requirements in the table as follows:

Table.1

Material	Brinell hardness	F/D2
Steel and Cast iron	< 140	10
	≥140	30
Copper & copper alloy	< 35	5
	35~130	10
	> 130	30
Light metal & its alloy	<35	2.5
	35~80	5,10
	> 80	10
F—test force (kg) ; D—ball diameter (mm)		

2. Main Technical Specifications

2.12 The displayed value's repetition and tolerance of the hardness tester:

Table.2

Standard hardness test block	Tolerance of displayed value%	Repetition of displayed value%
≤125	±3	3
125<HBW≤225	±2.5	2.5
＞225	±2	2

2.13 Correspondent relations among scale, indenter and test force:

Table.3

Hardness symbol	**Diameter of Indentermm**	**F/D2**	**Test ForceN(kg)**
HBW 10/3000	10	30	29420(3000)
HBW 10/1500	10	15	14710(1500)
HBW 10/1000	10	10	9807(1000)
HBW 10/500	10	5	4903(500)
HBW 10/250	10	2.5	2452(250)
HBW 10/125	10	1.25	1226(125)
HBW 10/100	10	1	980.7(100)
HBW 5/750	5	30	7355(750)
HBW 5/250	5	10	2452(250)
HBW 5/125	5	5	1226(125)
HBW 5/62.5	5	2.5	612.9(62.5)
HBW 2.5/187.5	2.5	30	1839(187.5)
HBW 2.5/62.5	2.5	10	612.9(62.5)

3. Installation and Testing

3.1 Operational Conditions

3.1.1 Room temperature within 10~30 ℃;

3.1.2 Relative room humidity inferior to 65%;

3.1.3 In an environment without any shock or vibration;

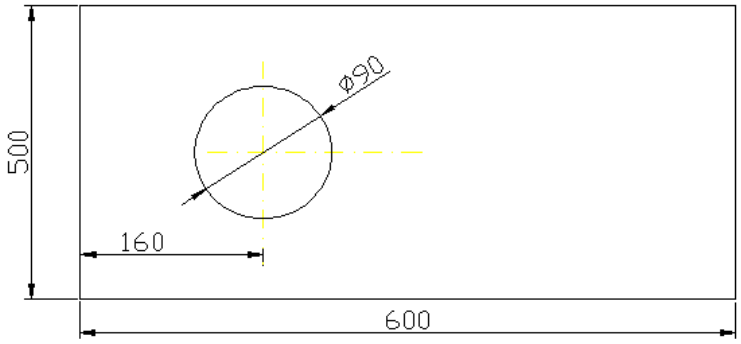
3.1.4 In a surrounding without any corrosive medium.

3.2 Unpacking

3.2.1 Pull out the nails and open the box cover, take out the accessories kit.

3.2.2 Lift the instrument box, screw out the two M10 bolt at the bottom with wrench and separate hardness from bottom plate,then take out the hardness tester (safety first).

3.2.3 Place the instrument on a stable working table and adjust it to the horizontal within 1mm/m. Open a hole at the appropriate position on working table (see Fig.1) in order to make the lifting screw work.

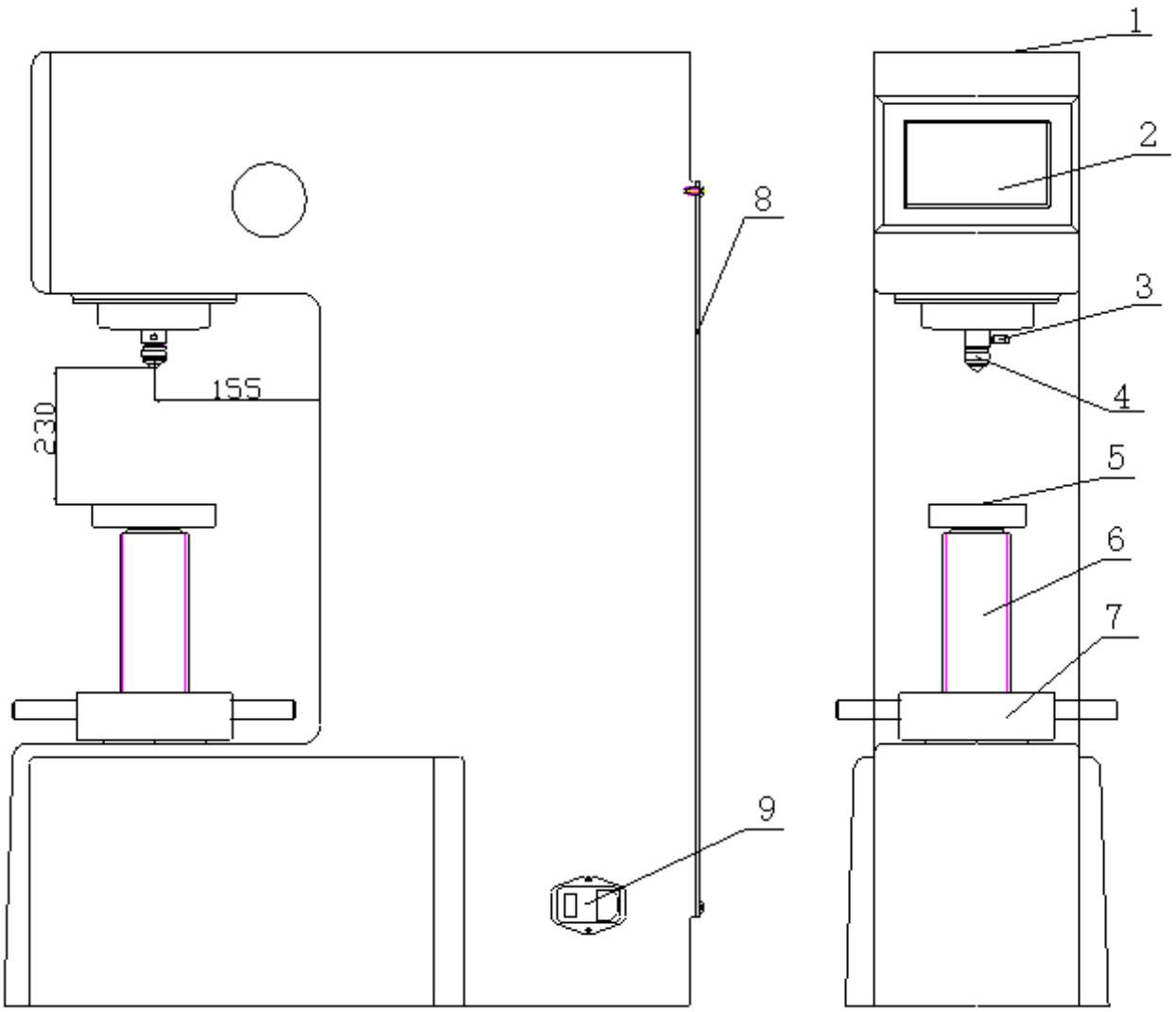


(Fig.1)

3.3 Installation

3.3.1 Remove the cushion block between the lifting screw and ball indenter (see Fig 2).

3. Installation and Testing



(Fig.2)

1.Upper Cover

2.Touch Screen

3.Indenter Screw

4.Indenter

5.Testing Table

6.Lifting Screw

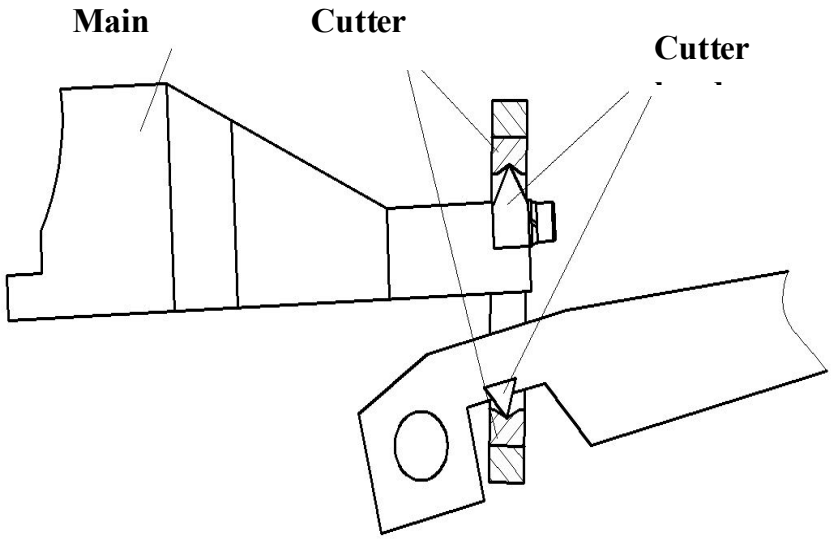
7.Wheel

8. Rear Cover

9.Power Switch

3. Installation and Testing

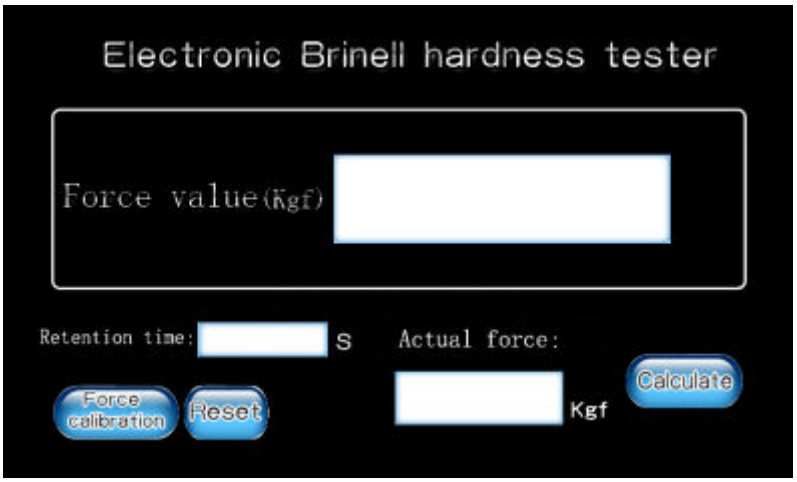
3.3.2 In general, you needn't to open the Up Cover, only open It under abnormal operating conditions. If opened the up cover, observe the cutter head group behind the mask whether the cutter head is falling into the cutter groove. If the cutter head is not in the cutter groove, please press the main lever and suit the cutter groove on the cutter head (see Fig.3). (This generally does not occur; it happens only in the strong vibration).



(Fig.3)

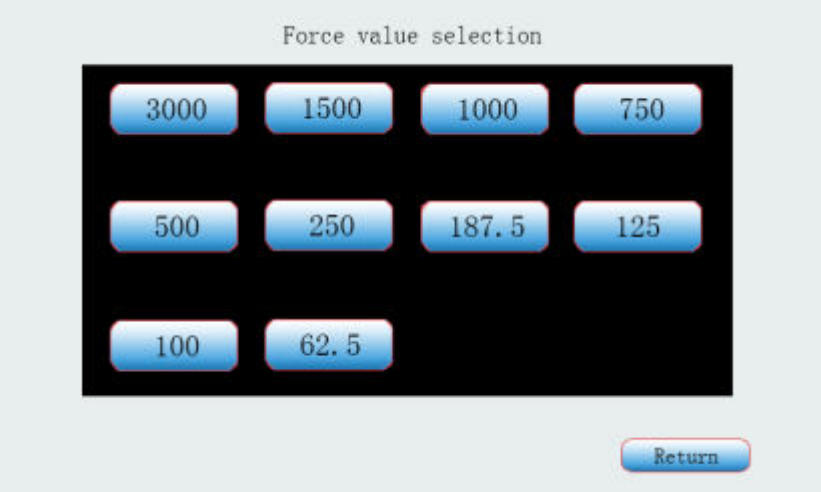
3.4.Introduction to the Panel Board and Its Functions

3.4.1.Open the power switch, pop up operation interface(Fig.4)



(Fig.4)

3.4.2 Click the force value , Fig.5 interface pop up.



(Fig.5)

Select the test force and ball indenter depending on material hardness(Table.1) (Table.3),such as click 3000,then the interface back to fig(4).

3.4.3 click Retention time ,Fig.6 interface pop up.



(Fig.6)

Input 10 seconds,click OK return to interface(fig.4).

3.4.4 calibration of test force

The test force is factory calibrated, generally no longer allowed users to calibrate, if there's special circumstances, please contact our company, Counseling by staff and calibrated, the method is very simple.

3.4.5 Operation of the hardness tester

（1）Install the 10mm indenter into main shaft hole and make it close to the bearing surface. Aim the notch of the indenter to the screw, and then tighten the indenter screw(3) slightly.

（2）The testing table(5) should be place in the hole of the lifting screw(6).

（3）Continue rotating the wheel(7) until the specimen touches the indenter and the actual force value in the bottom of interface is larger than 90, the instrument would make a sound like "Du",then the instrument automatically applies the test force to 3000kgf ,retention for 10 seconds,unloading and back to main screen.

NOTE: 500kg~3000kg test forces be selected, rotate the wheel to make the test force larger than 90kg,the instrument would make a sound like "Du",then the instrument automatically applies the test force.

62.5kg~250kg test forces be selected, rotate the wheel to make the test force about 27~37kg,the instrument would make a sound like "Du",then the instrument automatically applies the test force;If the manual force is larger than 37kg, the instrument issues a "Du, Du, …" constant sound and does not work, please descend the testing table, and retest,do not applies test force larger than 37kg.

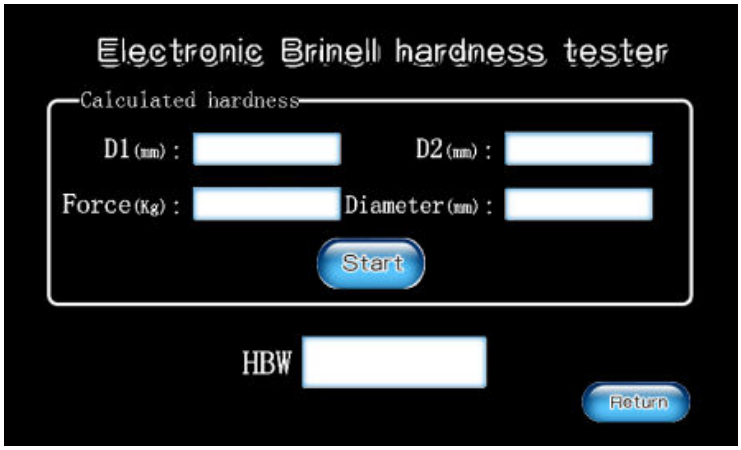
（4）Click the calculate button in the main interface to enter measurement interface(Fig.7).

（5）Fill indenter's diameter blanks with a diameter of 10mm.

（6）Input the actual measured values of D1 and D2 into the corresponding box.

（7）Click on "Calculate" to automatically calculate and display Brinell hardness values, no need to look-up table calculation.

3. Installation and Testing



(Fig.7)

3.5 Preparatory work

3.5.1 The surface of the specimen must be clean. There can't be dirty, oxide skin, pits or significant processing trace,must ensure that the test force is applied perpendicular to the specimen.

3.5.2 The minimum thickness of the specimen shall be more than10 times the depth of the indentation. There can't be visual deformation traces on the back of specimen after testing. Relationship between minimum thickness of specimen and hardness. (see Table.4)

Table.4

Indentation's average diameter	Specimen's minimum thickness			
	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		0.83		
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

3.5.3 Retention time:10~15 seconds for ferrous metal, 30 seconds for non-ferrous metal, 60 seconds for those hardness value is less than 35HBW.

3.5.4 The hardness test should be uniformly distributed on the specimen. The distance between two adjacent indentation's centers should be not less than 3 times the diameter of the indentation; the distance between the indentation center and the edge of the specimen should be not less than 2.5 times the diameter of the indentation. Please test according to what mentioned above, otherwise the indentation will be asymmetric and the hardness value will be incorrect.

3.5.5 The electric of the instrument uses the loop control system; it can dynamically reflect the real changes of the test force. During the whole dwell time, the display window "test force" constantly shows the instantaneous force value, with the indenter gradually pressed into the specimen, force value decreases. And when the value is reduced to a prescribed error range, the instrument will automatically adjust that the test force will always be maintained in the specified range.

4. Maintenance and Precautions

4.1 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, transportation or voltage, it may cause some changes in the instrument data. Generally it can be handled as follows:

4.1.1 Without loading indenter, apply 29420N test force to press several times in each starting of the instrument, so as to eliminate mechanical deformation amount, make electric components in normal operation and decrease test errors.

4.1.2 Loading and unloading signal of each level test force is feed back by the sensor, and the output signal of the sensor is very sensitive. So we equip the anti interference assembly in the circuit. But in order to ensure the instrument normal work and avoid unnecessary damage, the instrument should avoid using around strong current interference source.

4.2 The test force must be perpendicular to the surface of the test piece at the time of loading, so the device can not test the parts with surface of inclined plane .

4.3 The instrument power source should be reliably grounded and have a voltage stabilizing device.

4.4 The instrument will issue some noise in the process of loading and unloading; it is a normal phenomenon that the loading device is automatically adjusting.

4.5 The active surface of such as the lifting screw(5) should be periodically lubricated with grease.

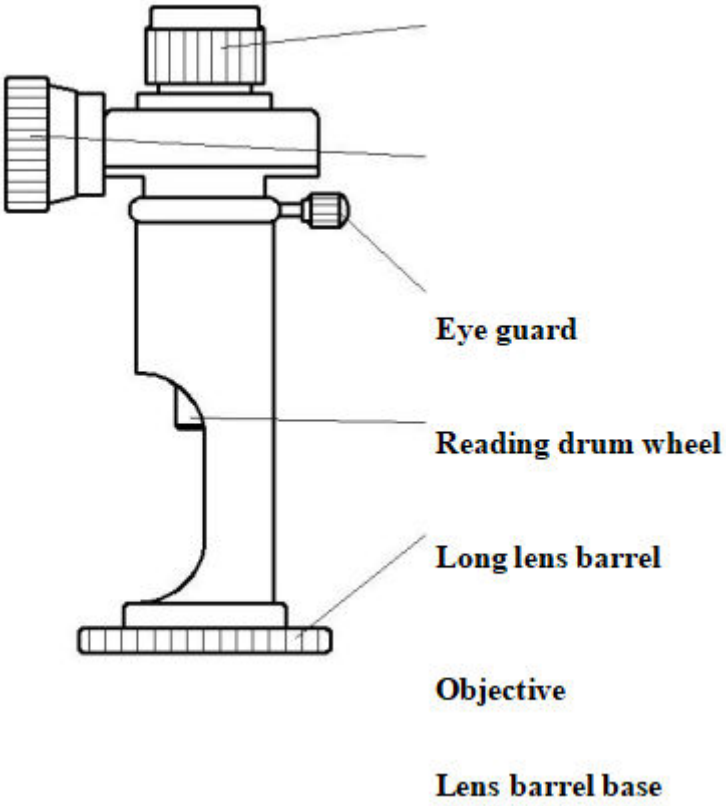
4.6 Turn off the power source after the test is completed.

4.7 The instrument should be kept clean and covered with dust shield after finishing the test. The hardness blocks and the ball indenter should be coated with antirust oil to prevent rusting.

4.8 The instrument should do periodic inspection, at least once a year to ensure the accuracy of the hardness tester.

5. Usage of the Reading Microscope

5.1 Additional reading microscope is mainly used for Brinell hardness indentation measurements; it has the advantages of simple structure and convenient operation. (see Fig.8)



(Fig.8)

5.2 Technical specifications of the reading microscope

5.2.1 Amplification of the reading microscope: 20×

5.2.2 Minimum division value of the drum wheel: 0.01mm

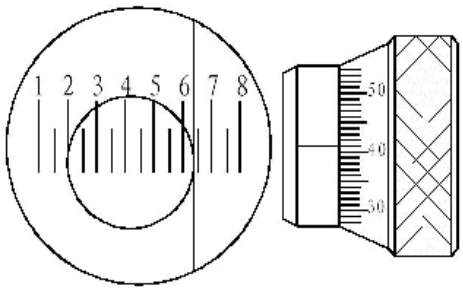
5.2.3 The effective measuring range of the field of view: 6mm

5.3 Usage of the reading microscope

5.3.1 Put the tested hardness block on a stable table and place the reading microscope on the hardness block, with the notch of the long lens barrel faced to natural light or illuminated with light. Rotate the eye guard on the eyepiece and make the indentation edge clear.

5. Usage of the Reading Microscope

5.3.2 Make any digit of the fixed glass of the eyepiece as the starting line (case grid 2) left tangent to the indentation (see Fig.9), stable the reading microscope, rotating the drum wheel, and make the movable glass lines right tangent to the indentation.



(Fig.9)

5.3.3 Read from the eyepiece, the integer value is 6-2 = 4mm, and accumulate the remaining fraction, the method is as follows: read from the drum wheel, it's 41 grids, and each grid for 0.01mm, then 41×0.01mm = 0.41mm, the indentation diameter is 4mm+0.41mm = 4.41mm. Check the "Brinell hardness control table"P21: 186HBW10 / 3000

5.4 Maintenance of the reading microscope

5.4.1 The precision of the reading microscope has been adjusted before ex-factory. Don't disassembly and assembly voluntarily.

5.4.2 The reading microscope should avoid the environment of dust, damp and corrosive gases when stored and used.

5.4.3 If the surface of the reading microscope lens is dirty, it can be wiped by soft cotton and lens paper; if it is oil polluted, it can be wiped by the cotton dipped in a little mixed liquid of alcohol and ether.

6. Accessories (The Packing List)

1	20×reading microscope	1
2	φ2.5mm ball indenter	1
3	φ5mm ball indenter	1
4	φ10mm ball indenter	1
5	Small plane testing table	1
6	Big plane testing table	1
7	V-shaped testing table	1
	Standard hardness test block:	
8	HBW/3000/10 (175~250)	1
9	HBW/1000/10(75~125)	1
10	HBW/187.5/2.5(150~250)	1
11	Spare fuse (2A)	2
12	Power cord	1
13	Dust-proof plastic bag	1
14	Usage instruction manual	1

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