BARCOL IMPRESSOR
HM-934-1

This Barcol Impressor is small in size, light in weight, easy to carry. Although complex and advanced, it is convenient to use and operate. Its ruggedness will allow many years of use if proper operating techniques are followed. Please read the following instructions carefully and always keep this manual within easy reach.

1. FEATURES

HM-934-1, a digital indentation hardness tester, is the latest design and development of our company. It is characterized in that provided with a balance positioning, a digital display of hardness value, and a non disassembly calibration and adjusting. It is with good stability, convenient calibration, and high accuracy of detection. It is mainly used in aluminum processing industry, testing pure aluminum, soft aluminum, thick aluminum alloy, aluminum strip, aluminum rod, aluminum castings, aluminum forgings and aluminum alloy products. Also, it can be used for glass steel industry. The relevant standard is ASTM B648-10(2015), ASTM D2583-13, and GB / T 3854-2005.

* Small in size, portable. Single hand operation, easy to use. Can be used in any occasion as long as the hand can reach.
* Wide test range, can test from very soft pure aluminum to a particularly hard aluminum alloy. effective test range equivalent to the Brinell Hardness of 25~150HB.
* No need to be supported. Just test on one side of the sample with the hardness tester, no need to be supported. It is suitable for the test of large and extra thick workpiece.
* With the maximum hold function, recording the maximum hardness value during measurements.

CONTENT

1. FEATURES.....1
2. PRINCIPLE AND STRUCTURE.....2
3. SPECIFICATIONS.....4
4. OPERATING PROCEDURE.....4
5. CALIBRATION OF THE TESTER.....6
6. PIN.....8
7. STANDARD BLOCKS.....9
8. MEASUREMENT NUMBER.....9
9. THE TYPICAL BARCOL HARDNESS OF ALUMINIUM ALLOY.....11
10. NOTE.....12

2. PRINCIPLE AND STRUCTURE

HM-934-1 is a kind of indentation hardness tester. It presses a specific shape of the pressure pin into the sample surface with the standard spring pressure, the hardness is characterized by the indentation depth.

The Barcol Hardness can be calculated according to the following formula.

$$HBa=100-h/0.0076$$

In the formula,

HBa, Barcol Hardness Value

h, Indentation Depth (mm)

0.0076, The indentation depth characterizing a single Barcol Unit

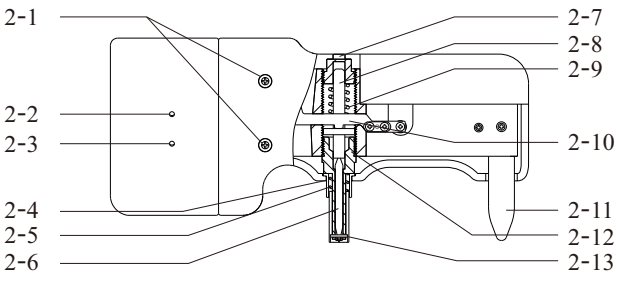


Fig 1.1 Structure

Barcol HM-934-1	Brinell 10mm 500kg	Vickers 5kg	Webster W-20	Rockwell			
				B	E	F	H
67	57	62	10.6		69	68	93
68	60	65	11.0		71	70	94
69	62	67	11.4		73	72	95
70	64	70	11.8	17	75	74	97
71	67	72	12.2	23	76	75	98
72	69	75	12.6	28	78	77	99
73	72	78	12.9	33	80	79	100
74	75	81	13.3	38	81	80	101
75	78	85	13.7	42	83	82	102
76	80	88	14.0	47	84	83	103
77	84	92	14.3	51	86	85	104
78	87	95	14.7	55	87	86	105
79	90	99	15.0	59	89	88	106
80	94	103	15.3	63	90	89	106
81	97	108	15.6	66	91	90	107
82	101	112	15.9	70	92	91	108
83	105	117	16.2	73	94	92	109
84	109	121	16.4	76	95	93	109
85	113	126	16.7	79	96	94	110
86	117	131	16.9	81	97	95	111
87	121	137	17.2	84	98	96	111
88	126	142	17.4	86	99	97	112
89	130		17.6	88	100	98	112
90	135		17.8	90	101	98	113
91	140		18.0		102	99	114
92	145		18.2		103	100	
93			18.4		103	100	
94			18.6		104	101	
95			18.7		105	102	
96			18.9		106	102	
97			19.0		106	103	
98			19.2		107		
99			19.3		107		
100			19.4				

determine the hardness of the conversion relationship for each material by the experiment.

Barcol HM-934-1	Brinell 10mm 500kg	Vickers 5kg	Webster W-20	Rockwell			
				B	E	F	H
35		21					32
36		22					35
37		23					37
38		24					40
39		25					42
40	25	26					45
41	25	27					47
42	26	28					49
43	27	29					51
44	27	30					54
45	28	30					56
46	29	31					58
47	30	32			23		60
48	30	33	0.7		26		62
49	31	34	1.3		28		64
50	32	35	1.9		31		66
51	33	36	2.5		34		68
52	34	38	3.1		36		70
53	35	39	3.6		39	30	72
54	37	40	4.2		41	34	73
55	38	41	4.7		44	37	75
56	39	43	5.3		46	40	77
57	40	44	5.8		48	43	78
58	42	45	6.3		50	46	80
59	43	47	6.8		53	48	82
60	45	49	7.3		55	51	83
61	46	50	7.8		57	54	85
62	48	52	8.3		59	56	86
63	50	54	8.8		61	59	88
64	51	56	9.2		63	61	89
65	53	58	9.7		65	63	90
66	55	60	10.1		67	66	92

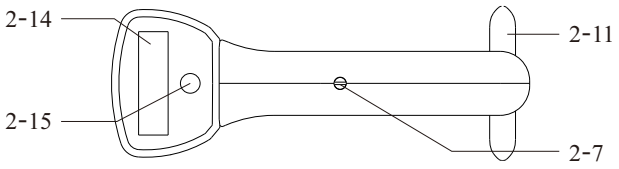


Fig 1.2 Structure

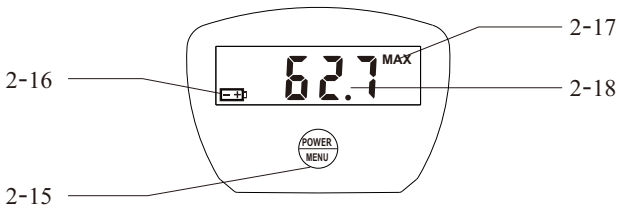


Fig 2 Pannel

2-1 Screw of Case
2-2 High End Calibration Button
2-3 Low End Calibration Button
2-4 Spring Tube
2-5 The Lower Spindle Spring
2-6 Pin
2-7 Main Spindle Adjusting Screw
2-8 The Upper Spindle
2-9 The Upper Spindle Spring
2-10 Lever
2-11 Supporting Feet
2-12 The Lower Spindle Connecting Screw
2-13 Shield Ring
2-14 Display

aluminum and aluminum alloy materials as shown in table 3.

Table 3 Typical Barcol Hardness Value of Aluminum Alloy

Alloy and heat treatment	1100-0	3003-0	3003H14	2024-0
Barcol Hardness	35	42	56	60
Alloy and heat treatment	5052-0	5052H14	6061T6	2024T3
Barcol Hardness	62	62	80	85

10. NOTE

When the tester is used for a period of time, especially after the measurement of the soft aluminum alloy material, the material is stuck on the pin, which may result in the enlarge of measurement value. To eliminate this error, be sure to clean up the debris stuck on the top of the measuring pin before measurement.

4. OPERATING PROCEDURE

4.1 Power On/Off The Tester

To power on the tester, just press the Power/Menu Key. There are 2 methods to power off the tester, Automatic power off and manual power off. In the boot state, press and hold the Power/Menu Key for about 3 seconds to power off. After 10 minutes no operation, the tester power off automatically.

4.2 Check The Tester

Place the configured hardness blocks on a hard, flat surface, measure the hardness blocks. The measurement reading should be in the indicated range of two hardness blocks. If it is out of the range, calibration according to part 5 is needed.

4.3 Sample Requirement

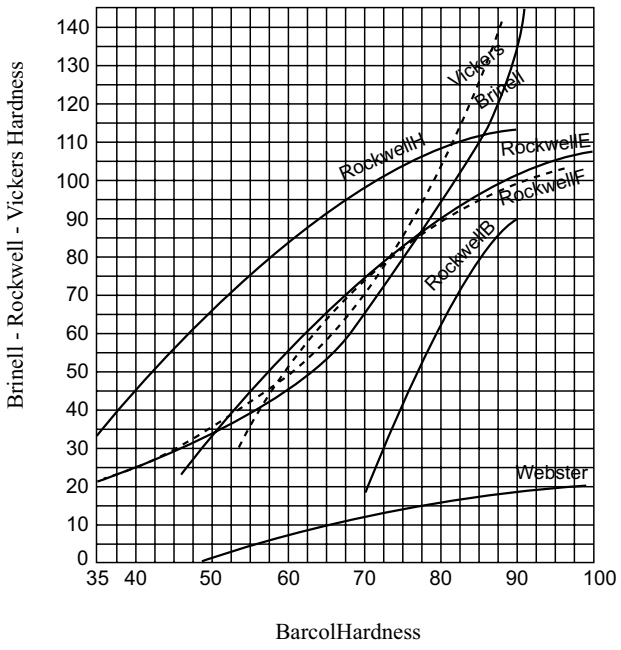
* The sample surface should be smooth, clean and without mechanical damage. The sample surface can be slightly polished to eliminate scratches or coatings.
* The specimen thickness should be not less than 1.5mm, and there should not be obvious deformation trace on the supporting surface after testing. Sample size should ensure that the minimum distance between the pin tip to any edge is not less than 3mm.
* Ensure that there are no previous test indentation left around 3mm of the current test point.
* In order to ensure the accuracy of the test, the pin must be perpendicular to the surface of the sample.

2-15 Power/Menu Key
2-16 Battery Indicator
2-17 Maximum Indicator
2-18 Measurement Reading

3. SPECIFICATIONS

Measurement Range: 0~100 HBa, equivalent to the Brinell hardness of 25~150HB
Resolution: 0.1 HBa
Indication Error: 81~88 HBa±1 HBa
42~48 Hba±2 HBa
Repeatability Error: 81~88 HBa±1.5 HBa
42~48 HBa±2.5 Hba
Operating Condition: Temperature: 0~50°C
Humidity: <80%RH
Power Supply: 2 x 1.5 V AAA (UM-4) Battery
Dimensions: 170x63x82 mm
Weight: 390g (Not Including Batteries)
Standard Accessories:
Main Unit
2 Pins
2 Standard Blocks
Cross Screw Driver
Slotted Screw Driver
Small Screw Driver
Spanner
Carrying Case
Operation Manual
Optional Accessories:
Bluetooth Data Adapter with Software

ATTACHED LIST 1
APPROXIMATE CONVERSION CURVE



ATTACHED LIST 2 HARDNESS CONVERSION

NOTE: Due to the property of soft metal materials, different hardness measurement system can not establish a unified relationship. So the conversion table is for reference only, it is recommended to

* Test samples should be placed stably. Small sample should be placed on a solid backing. (e.g., steel, glass, etc.)
* The sample should not be tilted, samples should not have any slide or elastic deformation in the process of testing.

4.4 Measuring Procedure

Hold the tester, place the test on the sample, placidly and rapidly push the tester with enough pressure. Read the displayed reading, this reading is the hardness value.

4.5 Maximum Value Hold Function

Press the Maximum/Plus Key, the Maximum indicator 'MAX' is shown on upper right corner of the display. The Maximum reading during the measurement is shown and hold on the display. To quit, just press the Power/Menu Key, the 'MAX' disappear.

4.6 Battery Replacement

When the Battery Indicator is displayed, it is necessary to replace the batteries. Open the battery cover and take off the batteries. Install the batteries correctly according to the pattern in the battery box.

5. CALIBRATION OF THE TESTER

The calibration of this tester includes Low End Calibration, High End Calibration, and Display Value Calibration. Before out of the factory, the tester is calibrated. If the reading is out of the indicated range on the test block when checking

Table 2 The Measurement Number of Glass Steel and Hard Plastic (According to GB/T3854-2005)

Non-reinforced Plastic (Hard Plastic)	Min. Measurement Number	Reinforced Plastic (Glass Steel)	Min. Measurement Number
20	9	30	29
30	8	40	22
40	7	50	16
50	6	60	10
60	5	70	5
70	4		
80	3		

9. THE TYPICAL BARCOL HARDNESS OF ALUMINIUM ALLOY

HM-934-1 Barcol Hardness Tester adopts standard load spring and standard pressure pin, is the most widely used Barcol hardness meter currently, can be used in the testing of aluminum, aluminum alloy, copper, copper alloy, fiber reinforced plastics (Glass Steel), other reinforced plastics, non-reinforced hard plastic, and other materials, hardness test range quite in 25-135HBW (500kg, 10mm). Typical Barcol Hardness Value of a variety of different grades, different state of

range of 3mm. Or there will be deviation.

8. MEASUREMENT NUMBER

Use the method of calculating the average of several measurements to figure out the measurement value. The softer the sample is, the more numbers of measurements should be included.

The suggested corresponding number of measurement to different hardness value on uniform material and non-uniform material are as stated as table 1 and table 2.

Table 1 The Measurement Number of Aluminium Alloy (According to ASTM B648-2000)

Barcol Hardness Value	Min. Measurement Number
50	6
60	5
70	4
80	3

the tester, or after the replacement of pin, calibrate the tester.

NOTE: IT IS NECESSARY TO LOOSEN THE MAIN SPINDLE ADJUSTING SCREW BEFORE ZERO CALIBRATION AND FULL SCALE CALIBRATION.

5.1 Low End Calibration

Press and hold the Power/Menu Key for about 9 seconds, ‘ CAL’ is shown on the display. Release the key, a digit appears on the display. Press the High End Calibration Button or the Low End Calibration Button to adjust the digit till it equals to the indicated value on the Pin Length Calibration Block. Press the Power/Menu Key to quit.

Use a small screw driver to loosen the Main Spindle Adjusting Screw in counter-clockwise direction till the end. Put the Pin Tube into the hole of the Pin Length Calibration Block, push the tester so that the pin draws back completely into the Pin Tube, the reading value should equals to the thickness value indicated on the Pin Length Calibration Block. If it is exceeded, press the Low End Calibration Button, the standard value will be displayed. Release the Low End Calibration Button, the Low End Calibration is completed.

5.2 High End Calibration

Use a small screw driver to loosen the Main Spindle Adjusting Screw in counter-clockwise direction till the end. Place the tester on a solid

flat surface, such as glass plate. Push the tester so that the pin draws back completely into the Pin Tube, 100.0 should be shown on the display. If it is exceeded, press the High End Calibration Button, 100.0 will be displayed. Release the High End Calibration Button, the High End Calibration is completed.

5.3 Display Value Calibration

Use a small screw driver to adjust the Main Spindle Adjusting Screw, the display value decreases when turning it clockwise direction, while increases when turning it counter-clockwise. Adjust the screw till the measured value is in the indicated range of the 2 Standard Blocks.

6. PIN

With the frequent use of the tester, the pressure pin will be wore slightly. At this time the measurement value will deviate, so it is necessary to check the wear of the pressure pin regularly. When calibrating the display value of the tester, if it is not able to get 2 measurement value within the standard range, it means that the pin is wore, the pin length is less than the allowable range. It is time to replace the pin. It is necessary to calibrate the tester after pin replacement.

Pin Replacement

Loosen the screws on both sides of the handle with a small screwdriver (a total of 12). Take off the case, take out the Spring Tube. Loosen the Lower

Spindle Connecting Screw with a spanner, take off the Lower Spindle. Take off the used pin and replace it with a new one, then reinstall the Lower Spindle and lock it with spanner. Put on the Spring Tube, remount the case, lock it with the screws. See the following Fig.3 for reference. The replacement of Pin is completed, calibrate the tester according to Part 5.

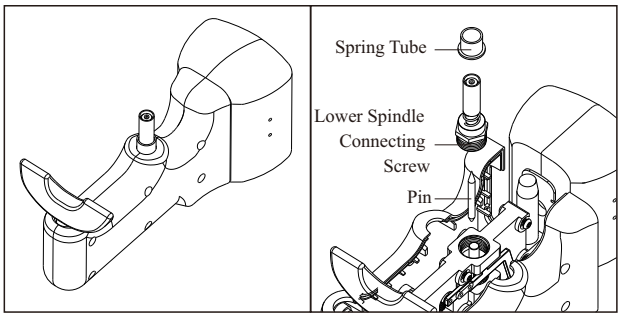


Fig 3 Disassembly Graph

7. STANDARD BLOCKS

There are 2 Standard Block for this tester, a high valued block and a low valued block.

Only the side with indicated value is available, if the block is tested on both sides, there will be deviation.

When testing the blocks, it is necessary to ensure that the distance from testing point to the edge is more than 3mm, and there is no indentation in the