When you purchase the Barcol Impressor, it marks a step forward in the field of precision measurement. Before using it, please read this manual carefully and keep it in an accessible place.

934-1S

DIGITAL BARCOL IMPRESSOR

OPERATING MANUAL

Catalogue

1. Overview and Features

The 934-1S digital Barcol impressor is a new indentation hardness tester designed and developed by our company. It is characterized by a balanced positioning device and a hardness value digital display device. It's also characterized by good stability, convenient calibration and high detection accuracy. It's mainly used in the aluminum processing industry for testing pure aluminum, soft aluminum alloy, thicker aluminum alloy, aluminum strip, aluminum profile, aluminum bar, aluminum casting, aluminum forging and aluminum alloy products; It can also be used in the fiberglass industry. The relevant standards are ASTM B648-00 "Test Method for Measuring Hardness of Aluminum Alloy with Barker Hardness Tester", ASTM HD2583-07 "Test Method for Measuring Hardness of Hard Plastic Indentation with Barker Hardness Tester" and GB/T 3854-2005 "Barker hardnessTest Method for Hardness of Reinforced Plastic ".

- Small and light, one - hand operation, only need press, no experience needed, can be used in any situation.
- Wide range of tests. From very soft pure aluminum to very hard aluminum, the effective test range is equivalent to brinell hardness 25~130HBW.
- No support required. The Barcol impressor is only tested on one side of the sample without support and is suitable for testing very large and thick workpieces.
- With the function of maximum holding, it can record the maximum hardness value during measurement.
- Besides the Barcol hardness, the Brinell hardness number (HB), Vickers hardness number (HV), Webster's hardness number (HW) and Rockwell hardness number (HRB/HRE/HRF/HRH) of the material all can be measured.\
- It has the function of calculating the average value of 29 groups of data at most.

2.Principle and Structure

The 934-1S digital Barcol impressor is an indentation hardness tester. Under the standard spring pressure, It is pressed into the surface of the sample with a specific shaped intender , and the depth of the pressure represents the hardness of the sample. The Barcol hardness can be calculated by the following formula:

HBa=100-h/0.0076

Where HBa is the Barcol hardness symbol

H is indentation depth (mm)

0.0076 is the indentation depth (mm) represented by a Barcol hardness value.

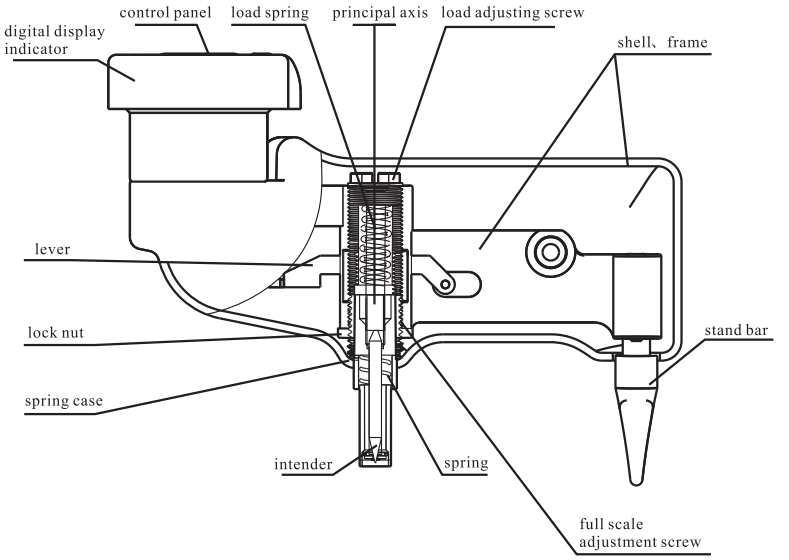

FIG. 1.1 Digital Barcol Impressor Structure diagram

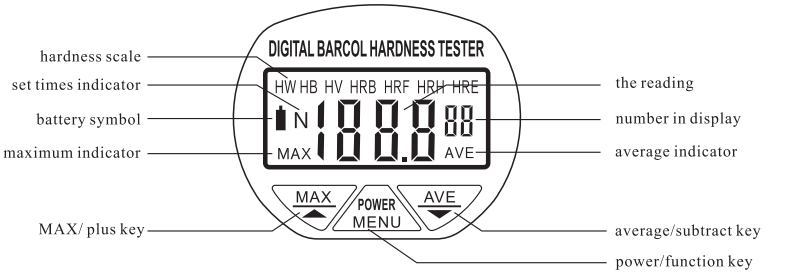

FIG. 2 control panel

3.Technical Parameters.

Measurable parameters: Barcol hardness number (HBa), Brinell hardness number (HB), Vickers hardness number (HV), Webster's hardness number (HW) and Rockwell hardness number (HRB/HRE/HRF/HRH) .
Measurement range: 0~100 HBa, equivalent to 25~135 HBW
Resolution: 0.5 HBa
Indication error: 81~88 HBa ± 1 HBa
42~48 HBa ± 2 HBa
Repeatability error: 81~88HBa ± 1.5HBa
42~48 HBa ± 2.5 HBa

Working environment: Temperature 0~40℃
Humidity ≤ 80%RH
Power supply: 3V (CR2030)
Size: 150 * 110 * 60 mm
Weight: 550 g
Standard configuration: Mainframe
Supporting foot
Spare indenters (2 pieces)
Hardness block (2 pieces)
Correction wrench
Portable case

Optional accessories: High value hardness block
Low value hardness block
Spare indenter

4.Application Method

4.1 Turn the instrument on and off

To start the instrument, press the power/function button lightly. There are two shutdown modes of the instrument, automatic shutdown and manual shutdown. In the power-on state, press and hold the power/function key for about 3 seconds to enter the function selection interface, and switch to " OFF" function by short pressing the average/subtract key and MAX/ Plus keyboard. Press the power/function key to confirm and then the instrument will shut down. Automatic shutdown after stop operation for 5 minutes.

4.2 Inspection instrument

Place the attached hardness blocks on a hard flat surface to test them. The measured value shall be within the range of the two hardness blocks. If it is out of tolerance, the indicated value shall be corrected according to article 5.

4.3 Sample Requirements

*Sample surface should be smooth, clean and no mechanical damage. The sample surface can be lightly polished to remove scratches or layers.

*The thickness of the sample shall not be greater than 1.5mm, and there shall be no obvious deformation on the supporting surface of the sample after the test. The sample size shall ensure that the minimum distance between the tip of the indenter and any edge is not less than 3mm.

*Ensure that there is no old indentation left by previous tests within 3mm around the presser at the current test point.

*To ensure the accuracy of the test, the indenter must be perpendicular to the surface of the sample.

*Samples should be placed smoothly, small pieces should be placed on hard and firm backing (such as steel, plate, glass plate, etc.).

*The sample shall not be upturned and shall not be moved or be deform during the test.

4.4 Test operation

Hold the instrument, place the instrument on the sample, apply enough pressure smoothly and quickly to read the display value, which is the Barcol hardness value. When unit conversion is required, HW, HB, HV, HRB, HRE, HRF and HRH units can be converted by short pressing the power/function key before measurement. After setting the unit, the value displayed during measurement is the value of the selected hardness scale.

4.5 Maximum retention function.

Press the MAX/Add button lightly, and "MAX" will appear in the lower left corner of the monitor. At this time, the measurement result will be displayed as the maximum value in the measurement process. To cancel this function, just press the MAX/Add button again and "MAX" will disappear

4.6 Replacement of battery

When the symbol of battery appears on the display, the battery needs to be replaced. Open the battery cover and remove the battery. Install the battery properly as shown on the label on the battery case. If the instrument is not used for a long time, remove the battery to prevent it from rotting and damaging the instrument.

5.Instrument Adjustment

5.1 Zero correction

The zero point of the instrument is relatively stable and generally does not change. Zero correction shall be completed under the guidance of the manufacturer.

5.2 Calibration at full scale

Loosen the housing screw, open the housing and take out the main frame. Loosen the lock nut and turn the full scale adjustment screw with a special wrench attached. The indicating value decreases when loosening and increases when tightening. After adjustment, screw the lock nut and test it on the glass plate again, the indicated value should be 100±1. If there is any deviation, repeat the operation until the indicator indicates 100±1.

5.3 Indicated value correction

Screw the load adjusting screw with cross groove, the indicated value decreases when tightening and increases when loosening. Adjust repeatedly until the indicated value is within the range marked on the hardness block.

Test another piece of durometer. The value should be indicated within the hardness range marked by the hardness block. If there is any deviation, it can be fine-tuned. The calibrated instrument shall be tested on the "hard" and "soft" hardness blocks. The reading shall be within the range indicated by the hardness block. If it cannot be done, the pressure needle shall be replaced with a new one.

6. 压针

6.1 Protection of indenter

The indenter of this impressor is a precision part made of hard steel. The tip of the indenter is accurately machined to a very small size. Special care should be taken to prevent damage. When the indenter is in contact with the measured object, the instrument should be carefully and steadily pressed down to avoid sliding or abrasions. Lateral sliding on a hard object, especially a rough one, can damage the indenter. This indenter does not have any warranty, please use it carefully. If the indenter is damaged, it should be replaced in time.Each new instrument is equipped with 2 spare indenters. The other spare indenters are available in our company.

Warning!!

Do not attempt to polish the damaged indenter and reuse it.

6.2 Abrasion of indenter

With the frequent use of the instrument, the indenter will undergo slight abrasion. At this point, the measured value will be deviated, so you should regularly check the abrasion degree of the indenter.

Place the instrument on the glass plate and press down the instrument. The indicator shall point to the full scale of 100±1. If it is not 100±1, the pressure needle has been worn.Place a hardness block on the same surface and test the block. If the reading on the indicator is not within the range indicated by the block, it may also be evidence of abrasion on the indenter.

If the needle is worn out, the instrument should be calibrated. If the readings of the two hardness blocks is not within the range marked by the hardness block at the same time after the calibration, it indicates that the indenter has undergone great abrasion, and the length of the indenter is less than the allowed range, then the needle should be replaced. Re-calibrate the instrument after replacing the needle.

6.3 Replacement of indenter

The replacement steps are as follows:

6.3.1 Remove the fastening screw on the side of the casing.

6.3.2 Hold the spring cylinder to ensure that it does not fall down, and take out the instrument frame from the top of the casing.

6.3.3 Loosen the load adjusting screw until the cross groove of the screw protruded from the upper part of the frame.

6.3.4 Invert the instrument, pay attention to prevent the spring and spindle from falling off, loosen the lock nut and remove the full scale adjustment screw.

6.3.5 Take out the old indenter, install the new one, and re-screw in the full scale adjustment screw to expose 5mm from the lower part of the frame.

6.3.6 Test on the glass plate and read the maximum reading, taking care not to over -apply pressure to avoid excessive deflection of the pointer, which will damage the indicator if the pointer exceeds 110 .Adjust the full scale adjusting screw until a reading of 100±1 is obtained.

6.3.7 Screw the lock nut and re-check the full value.

6.3.8 Check and correct the indicated value.

6.3.9 Reinstall the instrument and check the full value and indicated value.

7. Hardness blocks

The instrument is equipped with two hardness blocks , which are high value and low value.Only one side with numerical value can be used. If two sides are used, the reading error will be caused.

When testing the hardness block, avoid testing within 3mm from the edge or old indentation, otherwise it will cause reading error.

8.Average Calculation

Press the average/subtract key to display the setting times indicator "N" and the maximum indicator "MAX". After each test, it stabilized for about 1S, the hardness value of this test and the number of tests are displayed simultaneously. When the set number of tests is reached, the hardness value of this test is displayed first, followed by the average value, and the average symbol "AVE" is displayed at the same time.

Setting of measurement times:

Press the power/Function button for about 3 seconds to enter the function selection interface. Press the average/subtract and MAX/ Add keys to switch to "No" function. Press the power/function keys to confirm and then press the average/subtract and MAX/ Add keys to set the measurement times. The number of measurements can be set from 1 to 29. After setting, press the power/function key to retum to the measuring condition.

9. Number of Measurements

Use multiple tests to get an average.The softer the sample, the more times it should be tested.For composites, more tests should be performed.

The recommended measurement times of different hardness values for homogeneous and heterogeneous materials are shown in Table 1 and Table 2.

Table 1 Number of measurements on aluminum alloy materials
(According to ASTM B648-2000)

Barcol hardness value	Minimum number of measurements
50	6
60	5
70	4
80	3

Table 2 Number of measurements on FRP and hard plastics
(According to GB/T3854-2005)

Unreinforced plastics (hard plastics)		Reinforced plastics (fiberglass reinforced plastics)	
Barcol hardness value	Minimum number of measurements	Barcol hardness value	Minimum number of measurements
20	9	30	29
30	8	40	22
40	7	50	16
50	6	60	10
60	5	70	5
70	4		
80	3		

10.Typical Barcol Hardness values of Aluminum Alloys

The 944-1S Barcol impressor adopts standard load spring and standard indenter. It is the most widely used Barcol hardness tester at present. It can be used to test aluminum and aluminum alloy, copper and copper alloy, fiber reinforced plastics (FRP) and other reinforced plastics, non-reinforced hard plastics and other materials. The hardness test range is equivalent to 25-130HBW (500kg,10mm).Typical Barcol hardness values of aluminum and aluminum alloy of different grades and states are shown in Table 3:

Table 3: Typical Barcol Hardness values of Aluminum Alloys

Alloys and Heat treatment	1100−0	3003−0	3003H14	2024−0
Barcol hardness value	35	42	56	60
Alloys and Heat treatment	5052−0	5052H14	6061T6	2024T3
Barcol hardness value	62	75	80	85

11.Matters Need Attention

When the instrument is used for a period of time, especially after many times of measuring soft aluminum alloy material, the reading may be too large because the produced debris of materials sticks to the indenter during the measurement.To eliminate this error, the debris on the indenter endpoint should be cleaned before measurement.

Table 1 Rough conversion curve

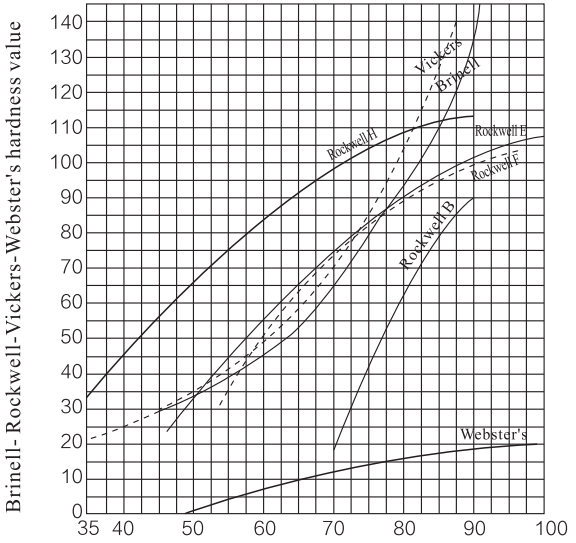

Table 1 Rough conversion curve
Table 2 Hardness Conversion Table (see next page)
Note: Due to the nature of soft metal materials, it is not possible to establish a unified correlation between different hardness measurement systems. Therefore, the conversion table is for reference only. It is suggested to determine the conversion relation of Barcol hardness by test for each material.

Barcol 934−1S	Brinell 10mm 500kg	Vickers 5kg	Webster's 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
67	57	62	10.6		69	68	93
68	60	65	11.0		71	70	94
69	62	67	11.4		73	72	95

Barcol 934−1S	Brinell 10mm 500kg	Vickers 5kg	Webster's W-20	Rockwell			
				B	E	F	H
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		108		