CMS METROLOGY
CONTROL MEASUREMENT SYSTEMS

Digital Webster Hardness CDW-20 SERIES

1. Overview

CDW-20 series digital display Webster hardness tester are divided into CDW-20, CDW-20a, CDW-20b three types, they are portable and light, can be hold by one hand, do not need samples when testing, without high skill requirements, can do fast NDT test of workpiece on site. It adopts digital displaycan meet the needs of quality control and qualified rate. It isthe best choice of testing batch products and been widely used in each process of aluminum production test, acceptance inspection and products quality inspection, It is a necessary device in raising qualification rate and saving cost.

1.1 Technical Parameters

- Measurement Range: 0~20HW
- Accuracy: 0.5HW
- Accurate Measurement Range: 5~18HW
- Resolution: 0.1HW
- Hardness Range: 25 110HRE, 58 131HV
- Test material: Aluminum Alloy(1100~7075 Series)

1.2 Features

- CDW-20 series Webster hardness tester are made in accordance with US ANSI/ASTM B647-87standard and China nonferrous metal YS/T420-2000Aluminum Alloy Webster Hardness Tester
- Small size and portable.
- No need sample, can do NDT test.
- No need high skill requirement, can be test on site.
- Can test various shape of aluminum
- Compared with.traditional Webster hardness tester, the digital display is more convenient for reading

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1.3 Function and aplication

FUNCTIONS

- Confirm the workpiece is heat-treated or not,
- Whether the workpiece is made of improper alloy;
- Testing over-long or over-weight workpiece;
- Project acceptance of aluminum factories
- Do project acceptance in companies of windows, door and curtain wall.

APLICATION

Test the hardness of aluminum(1100-7075 series). There are three types, CDW-20, CDW-20a, CDW-20b. CDW-20 is used to test thickness 0.4-6mm, inner diameter>10mm. CDW-20a is used to test thickness 0.4-13mm, inner diameter>10mm, CDW-20b is used to test thickness 0.4-8, inner diameter>6mm. When using the tester it will have anvil effect and cause inaccuracy, the thinner the bigger. For thinner workpiece, put two similar workpieces together, will reduce the inaccuracy.

Item	Model	Test Material	Hardness Range	Specimen Size/mm
1	CDW-20	Aluminum Alloy	25~110 HRE 58~131HV	Thickness 0.4-6 Inner diameter>10
2	CDW-20a			Thickness 0.4-13 Inner diameter>10
3	CDW-20b			Thickness 0.4-8 Inner diameter>6

1.4 Working principle

CDW-20 series Webster hardness tester adopts indentation principle. Under pressure, the indentation is inversely proportional to the material hardness. HW is short for hardness of Webster, when the value is 16, it means the hardness is 16HW. If the sample is out of range, the display will show 20.0 after applying force, if the range is too low, the reading will be 00.0.

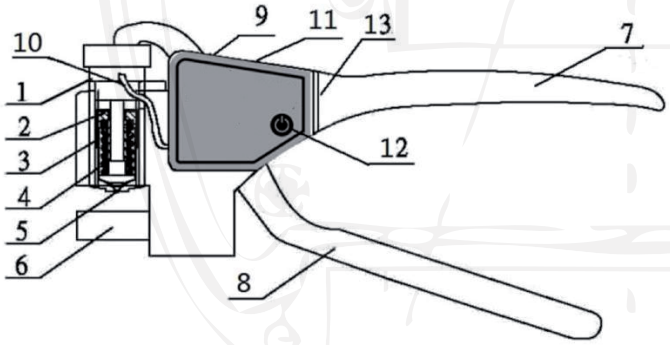
1.5 Configuration

	Item	Part name	QTY	Remarks
Standard Deliver	1	Main Unit	1	
	2	Standard Hardness Block	1	
	3	Special Wrench	1	
	4	AC Adapter	1	
	5	AAA battery	2	
	6	User´s manual	1	
	7	Calibration Certificate	1	
	8	Warranty card	1	
	9	Carry case	1	

1.6 Working Condition

The tester should be used in environment of clean, no vibration and no corrosive medium.

2. Estructure



1. Sensor
2. Adjusting nut
3. Indenter cylinder
4. Load spring
5. Indenter
6. Anvil
7. Up handle
8. Down handle
9. Pivot screw
10. Signal line
11. Digital display device
12. Switch
13. Battery cover

3. Operation

3.1 Measure

Put the workpiece between anvil and indenter, the reading shows the hardness when press the handle. Hold the handle firmly, any twist or movement will cause the inaccuracy. You can also press unit key to change into value of Hba, HR, HV, HB etc.

3.2 Screen

When testing the hardness of batch workpieces, the screen function will improve the efficiency.

3.2.1 Screen

Press the set key on the external display screen, use up/down arrow to set the maximum hardness, press set key again, use up/down key to set the minimum hardness. Waiting for 3 seconds, it will automatically exit.

3.2.1 Start Screen

Press screen key on the external digital display device, enter screen mode. If the hardness is in the prefixed range, the reading will appear, if not the external digital display device will flash and beep.

4. Calibration

There are full scale calibration, test block calibration two calibrations. The base point of full scale calibration is 20.

4.1 Full Scale Calibration

Hold tight the handle directly to the bottom without putting the specimen in the opening of the hardness tester. The indicator should point at 20, release the handle, full scale calibration finished.

4.2 Test Block Calibration

1. Use test block to calibrate, observe whether the reading is in accordance with the test value, the maximum allowable error is ±0.5HW, if they are matched, calibration finished.
2. If the reading is out of requirement, spin the pivot screw, take out the down handle and dial head, use special wrench change the adjusting nut to calibrate the value. Repeat the above steps until the reading meet the requirements.

4.3 Change the indenter

If the needle can't point at 20 by adjusting screw, it is damaged, change a new one.
Screw off the pivot screw take out the lower handle from the main frame, remove the dial head from the indenter cylinder, keep the cylinder in the frame, adjust the screw and take out the intender change a new one. Adjust the pressure of load spring with care to avoid damage, then calibrate the tester as before.

4.4 Calibration Cautions

- Check the full scale value after 1-2 weeks, make sure the indenter isn't damaged. If the reading is wrong, we should make full scale calibration. When full scale can't reach 20, we should change the indenter, if it still not work, it means the tester is damaged, you should deliver it to our company for maintenance.
- Make regular check for test clock, if found errors, we should adjust the load spring to calibrate.
- Full scale calibration has already been set in factory, only in these conditions can do this:
    1. Change new indenter
    2. Indenter abrasion
- Do not change readings of test block by adjusting screw.

5. Maintenance

5.1 Instrument Maintenance

- Prevent contamination, use soft cloth to clean the dust or stain of the tester especially remove the contamination on the dial head or it will cause error.
- Prevent rust, when using pay special attention to its waterproof performance except clean it frequently, many parts will bear rust with water, the rust in the dial head will cause the instrument useless.
- Prevent falling off, the tester is made up of many precision components, falling off will result in permanent damage to some parts.
- Do not dismantle, all the components had already been put together properly in factory except calibration.

5.2 Measure Notes When Testing

- The surface of the specimen should be treated smooth and clean, the dirt especially the tiny sand grains may affect the test accuracy.
- The instrument scale below 4HW and above 17HW, its sensitivity will decline strikingly and the testing accuracy will also be reduced.
- The distance between the testing point and the edge of the test piece should be bigger than 5mm, test close to the edge of the test piece will affect the accuracy.
- During the test, the distance between the to adjacent indentations should be no smaller than 6mm, otherwise the previous indentation will affect the next testing accuracy,
- Although the hard oxide film is thin, it will also influence on the hardness accuracy of the aluminum extrusions. Experiences indicate that the oxide film with hardness of 10μm will increase the hardness value by 0.5~1HW.
- All kinds of coatings will affect severely the testing accuracy, so sand paper or solvent is needed to remove

  the coatings first before carrying on the hardness testing.
- The indenter should be vertical to the surface of workpiece, ensure the bottom close to anvil, otherwise it will cause inaccuracy.
- During the test, enough grip strength should be applied at one time, adding the strength slowly will make the test result incline to the low side.
- The hardness of anvil and the indenter is the same, do not make them connect except full scale calibration.

5.3 Charging

1. Put the batteries in the charger, make sure the positive is right, connect to 220v electrical source, red indicator shows charging
2. When charging finished, the indicator will turn green then take out the batteries.

Appendix

Appendix 1 Hardness Conversion Table

HW	HRF	HRF	HB	934-1	HV
20.0	110		168.7		179.5
19.0	105.7		152	97	161.3
18.0	101.4	98.5	132	91	139.4
17.5	99.2		122	88	129.6
17.0	97.1	95	115.8	86	121.5
16.5	94.9		109.5	84	114.8
16.0	92.8	91	104.2	82	109.1
15.5	96.0		99.4	81	103.7
15.0	88.5	87.2	95.4	79	99.4
14.5	86.3		91.7	77.5	95.4
14.0	84.2	83	88.3	76	91.6
13.5	82		85	74.5	88.1
13.0	79.9	78.8	82.2	73	85
12.5	77.7		79.5	72	82.1
12.0	75.6	74.6	77	71.5	79.3
11.5	73.4		74.4	69	76.5
11.0	71.3	70.3	72.2	68	74
10.5	69.1		70	67	71.7
10.0	67	66.1	68	66	69.5
9.5	64.8		66	64.4	67.3
9.0	62.7	61.8	64.1	63.5	65.2
8.5	60.5		62.3	62.5	63.2-
8.0	58.4	57.6	60.5	61.5	61
7.5	56.2		58.8	60.5	59.3
7.0	54.1	53.3	57.2	59.5	58
6.5	51.9		55.5	58.5	55.8
6.0	49.8	50		57	
5.0	45.5			56	
4.0	41.2			54	
3.0	36.9			52	
2.0	32.6			50	
1.0	28.3				

Notes, the data is from the following files

1)HW-HRE conversion : In accordance with People's Republic of China Metrological Verification Regulation (JJG 944-1999) Webster hardness tester attachment of aluminum alloy HW and HRE conversion;
2)HRE, HRF, HV, HB conversion is in accordance with industrial standard of Ministry of Aviation and Aerospace of China(HB/Z 215-92) appendix of alloy hardness and strength conversion;
3)HW-934-1 conversion is get from Barcol hardness tester user's manual.