

MHRS-150-XYZ

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Automatic Rockwell Hardness Tester



Overview

Mitech MHRS-150-XYZ automatic Rockwell hardness tester, based on the mechanical principle of conical diamond or hard alloy indenter pressing into the sample surface to produce indentation, realizing the material hardness measurement by measuring the depth of the indentation. With high automation degree, accurate measurement, equipped with automatic turret and high sensitivity touch screen, it can ensure automatic loading and unloading of electronic, automatic indentation marks, automatic generation of inspection reports and other functions. With easy operation and high detection efficiency, it can meet the needs of workpiece sample hardness control and conformity assessment of hardness testing. It is widely used in metal processing and manufacturing, various metal material's failure analysis and other fields like colleges and research institutions. It is the professional precision testing equipment to improve the work efficiency, product qualification rate and save production costs.

Technical Parameters

Technical specifications	Technical Parameters
Preliminary testing force	98.07N , tolerance±2.0%
Testing force	588.4N , 980.7N , 1471N , tolerance±1.0%
Measuring range	HRA : 20-88、 HRB : 20-100、 HRC : 20-70、 HRD : 40-77、 HRE : 70-100、 HRF : 60-100、 HRG : 30-94、 HRH : 80-100、 HRK : 40-100、 HRL : 50-115、 HRM : 50-115、 HRR : 50-115
Testing force application Mode	Automatic operation (preliminary test force need manual operation)
Indenter specification	Diamond cone Rockwell indenter, Φ1.5875mm steel ball indenter
Display	High sensitivity touch screen
Rockwell scale	HRA、 HRB、 HRC、 HRD、 HRE、 HRF、 HRG、 HRH、 HRK、 HRL、 HRM、 HRP、 HRR、 HRS、 HRV
Conversion scale	HRA、 HRB、 HRC、 HRD、 HR15N、 HR30N、 HR45N、 HR15T、 HR30T、 HR45T、 HV、 HBW、 HK
Duration time	0~99s
Indication error	0.1HR
Maximum height of specimen	300mm
Distance of indenter to outer wall	165mm
Power supply	AC220V/50Hz
Dimension	550*320*750mm
Main unit weight	100kg

Features

- Widely used for high-precision hardness testing for parts with a variety of metal and non-metallic materials;
- High degree of automation, accurate measurement, suitable for large demand or high precision measurement of high-end users;
- Automatic operation with one-button, measuring pressure can be adjusted up and down, instant display material hardness value, and high test efficiency;
- Measurement data files can be set to automatically store, open, store, print, modify, call and other operations, generate word or Excel test report;
- Adopt touch screen display interface, display operation integration, simple and intuitive, no technical requirements for the operator ;
- Option for various specifications of the indenter, support 15 types of Rockwell hardness scales testing;
- Equipped with high-speed thermal printer, quickly print out the test data;
- Support the conversion among various hardness scales such as Brinell, Vickers and etc;
- Equipped with excellent performance of cemented carbide or diamond indenter, high hardness, wear resistance, good toughness, with high temperature, corrosion resistance, to ensure that the instrument test value is accurate, stable and reliable;
- With the function of error value correction, the hardness value of the error can be corrected by key input, easier to meet the test accuracy requirements;
- With the function of threshold overrun automatic alarm, apply to the bulk of finished products or semi-finished pieces of paper-by-piece detection;
- Original ambient temperature real-time display function, to avoid the instrument working in the case of high or low temperature for a long time, resulting in increased test error and reduce the service life;
- Consistent with EN-ISO-6508、 GB/T230.1、 GB/T230.2、 JG112、 ASTM E18 and other relevant standards at home and abroad.

The Scope of Application

Sample thickness: the specimen should have a certain size and thickness to ensure the distance between the adjacent indentation center and the distance from the indentation center to edge of the specimen is greater than 3mm, and the minimum thickness of the specimen should not be less than 8 times the depth of indentation. After the test, the back of the sample shall not have obvious deformation marks, and the minimum thickness of the sample depends on the load size used in its material and hardness test. The following table for the minimum thickness of the sample and different hardness test scale can test the material and hardness range table for reference.

Minimum specimen thickness table

Scale	Rockwell hardness value HR	Minimum thickness(mm)	Scale	Rockwell hardness value HR	Minimum thickness(mm)
HRA	70	0.7	B	80	1.0
	80	0.5		90	0.8
	90	0.4		100	0.7
HRB	25	2.0	C	20	1.5
	30	1.9		30	1.3
	40	1.7		40	1.2
	50	1.5		50	1.0
	60	1.3		60	0.8
	70	1.2		70	0.7

Different hardness test scales can be used to measure the material and hardness range of the sample materials.

Scale	Indenter type	preliminary testing	Testing force	Measuring range	Application
HRA			60kgf(588.4N)	20-88HRA	hard alloy, carbide, surface quenched steel, carburizing steel
HRD	Diamond cone		100kgf(980.7N)	40-77HRD	thin steel sheet, surface quenched steel
HRC			150kgf(1471N)	20-70HRC	quenched steel, tempered steel, chilled cast iron
HRF	Φ1.5875mm		60kgf(588.4N)	60-100HRF	cast iron, aluminum, magnesium alloy, bearing alloy
HRB	(1/16inch)		100kgf(980.7N)	20-100HRB	mild steel, copper alloy, annealed steel
HRG	steel ball	98.07 N	150kgf(1471N)	30-94HRG	phosphorus iron, beryllium bronze, malleable cast iron
HRH	Φ3.175mm	(10kgf)	60kgf(588.4N)	80-100HRH	aluminum, zinc, lead etc.
HRE	(1/8inch)		100kgf(980.7N)	70-100HRE	bearing alloy, tin, hard plastics and other soft materials
HRK	steel ball		150kgf(1471N)	40-100HRK	bearing alloy, tin, hard plastics and other soft materials
HRL	Φ6.35mm(1/4 inch)		60kgf(588.4N)	50-115HRL	Hard plastic ,hard rubber, aluminum, tin, bronze, mild steel, synthetic resin, friction materials and etc.
HRM	inch)steel ball		100kgf(980.7N)	50-115HRL	
HRR	Φ12.7(1/2 inch)steel ball		60kgf(588.4N)	50-115HRL	

Note: A, B, C are the commonly used test scales for Rockwell hardness test.

Applications

- Used for quality control in metal processing manufacturing;
- Used for failure analysis testing of metallic materials;
- Demonstration experiment for education and teaching in Colleges and Universities;
- Hardness testing of materials in scientific research institutions.

Working Conditions

- Operation Temperature : 10 ~ 30°C ;
- Relative Humidity : ≤65% ;
- The surrounding environment should avoid of vibration, strong magnetic field, corrosive medium and heavy dust.

Indication error

Scale	Standard Hardness Range	Allowed Maximum Tolerance
HRA	(20-75)HRA ; (75-88)HRA	±2HRA ; ±1.5HRA
HRB	(20-45)HRB ; (45-80)HRB ; (80-100)HRB	±4HRB ; ±3HRB ; ±2HRB
HRC	(20-70)HRC	±1.5HRC
HRD	(40-70)HRD ; (70-77)HRD	±2HRD ; ±1.5HRD
HRE	(70-90)HRE ; (90-100)HRE	±2.5HRE ; ±2HRE
HRF	(60-90)HRF ; (90-100)HRF	±3HRF ; ±2HRF
HRG	(30-50)HRG ; (50-75)HRG ; (75-94)HRG	±6HRG ; ±4.5HRG ; ±3HRG
HRH	(80-100)HRH	±2HRH
HRK	(40-60)HRK ; (60-80)HRK ; (80-100)HRK	±4HRK ; ±3HRK ; ±2HRK
HRL	(100-120)HRL	±1.2HRL
HRM	(85-110)HRM	±1.5HRM
HRR	(114-125)HRR	±1.2HRR

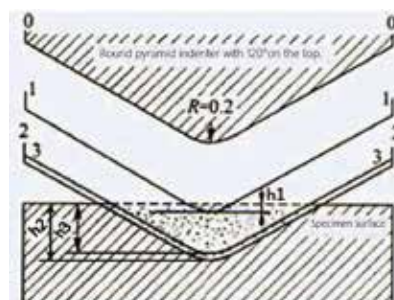
Working Principle

The Rockwell hardness test is taking the diamond cone with 120° apex angle or the hardened steel ball with specified diameter as the indenter to press into sample surface with specific test force, then get the Rockwell hardness of the measured metallic materials according to the sample surface indentation depth.

The Rockwell hardness measurement principle is shown as below figure. 0-0 is the position that the diamond indenter is not yet in contact with the sample. 1-1 figure is the indenter position under the affect of the preliminary test force, the indentation depth is h_1 . The preliminary test is to eliminate the influence to the testing result accuracy caused by the roughness of the sample surface. 2-2 in the figure is the indenter position under the influence of the testing force (the preliminary test force and the main test force). The depth is h_2 . 3-3 in the figure is the indenter position after dismantling the main test force. As the metal elasticity will recovery some degree after deformation, the really indentation depth of the indenter is h_3 . The plastic deformation caused by the main test force make the indenter pressing into the depth is $h = h_3 - h_1$. Rockwell hardness value is determined by the size of h , the greater the depth h , the lower the hardness, otherwise, the higher the hardness. In the traditional concept, usually use a constant C minus h to represent the level of hardness, while the depth of indentation per 0.002mm as a unit of hardness. The hardness value obtained is called the Rockwell hardness value, denoted by the symbol HR.

$$HR = \frac{c - h}{0.002}$$

In the formula, c is a constant (for HRC, HRA, c is 0.2; for HRB, c is 0.26). The Rockwell hardness value HR obtained is an unknown number which is usually read directly on the test machine indicator when testing.



Rockwell hardness tester working principle Figure

It should be noted that the measured hardness values would be different with different indenter and test force. Therefore, the Rockwell hardness testing specifies 15 different hardness test scales according to the different indenter specification and test force sizes. And the HRB, HRC, HRA are the most widely used.

Configurations

	NO.	Name	QTY.	Remarks
	1	Main unit	1	
	2	Hardness test software	1	
	3	Diamond Rockwell indenter	1	
	4	φ1.5875mm 1/16inch steel ball indenter	1	
	5	Thermal printing paper	1	
	6	X-Y testing table	1	
Standard Configuration	7	Rockwell Standard Block	3	
	8	Fuse	2	
	9	Power cable	1	
	10	Plastic dust cover	1	
	11	Attached files	1	
	12	Instrument case	1	
Optional Configuration	1	Φ3.175mm 1/8inch steel ball indenter	1	Mainly used for measuring hard plastic and other non-metallic materials Rockwell hardness.
	2	Φ6.35mm 1/4inch steel ball indenter	1	
	3	Φ12.7mm 1/2inch steel ball indenter	1	
	4	Computer	1	



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