

# MHRS-150T

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## Cantilever Rockwell Hardness Tester



### Overview

Mitech MHRS-150T Cantilever Rockwell Hardness Tester, also known as convex nose dual Rockwell hardness, 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 novel appearance, stable performance, touch screen operation easy and real-time monitoring test environment temperature, it can solve the problem of ring, tube, groove type workpiece surface, convex workpiece surface while other general Rockwell hardness tester can not measure the workpiece Rockwell hardness testing requirements. it is widely used in metal processing and manufacturing, various metal material's failure analysis and other fields like colleges and research institutions, and it is the precise and high-tech equipment to test the metal materials Rockwell hardness.

## Technical Parameters

Technical specifications	Technical Parameters
Preliminary testing force	29.4N、98.07N , tolerance±2.0%
Testing force	147.1N , 294.2N , 441.3N , 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 : 100-120、 HRM : 85-110、 HRR : 114-125
Testing force application Mode	Automatic operation (preliminary test force needs manual operation)
Indenter specification	Diamond cone Rockwell indenter, Φ1.5875mm steel ball indenter
Display	LCD
Rockwell scale	HRA、HRB、HRC、HRD、HRE、HRF、HRG、HRH、HRK、HRL、HRM、HRP、HRR、HRS、HRV
Conversion scale	HV、HBW、HK
Indication error	0.01HR
Duration time	1~30s
Maximum height of specimen	200mm
Distance of indenter to outer wall	150mm
Power supply	AC220V/50Hz
Dimension	700*250*600mm
Main unit weight	100kg

## Features

- Widely used in the ring, tube, groove type workpiece surface, it can test the convex parts of the workpiece and the workpiece Rockwell hardness and surface Rockwell hardness that other general Rockwell hardness tester can not measure;
- Adopt large-screen LCD, easy to operate, visually display the test results;
- 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 automatically modified by key input, easier to meet the test accuracy requirements;
- Support the conversion among various hardness scales such as Brinell, Vickers and etc;
- With the function of threshold overrun automatic alarm, which applies to the bulk of finished products or semi-finished pieces of paper-by-piece detection;
- Option for various specifications of the indenter, support 15 types of Rockwell hardness scales testing;
- The function of original ambient temperature real-time display can avoid the instrument working in the case of high or low temperature for a long time , resulting in increased test error and reducing the service life;
- Equipped with high-speed thermal printer, real-time print test results;
- 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

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

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

scale	Indenter type	Initial test force	Total test force	The scope of application
HR15N	Diamond cone	3kfg ( 29.42N )	15kgf ( 147.1N )	Surface carburizing layer, surface nitriding layer, surface hardened steel plate etc.
HR30N			30kgf ( 294.2 )	
HR45N			45kgf ( 441.3N )	
HR15T	Φ1.5875mm		15kgf ( 147.1N )	The cast iron, magnesium alloy, bearing alloy, mild steel, copper alloy, annealed steel, phosphor bronze, beryllium bronze, malleable cast iron and other thin specimens.
HR30T	( 1/16inch )		30kgf ( 294.2 )	
HR45T	steel ball		45kgf ( 441.3N )	
HR15W	Φ3.175mm		15kgf ( 147.1N )	The aluminum, zinc, lead, tin, hard plastic and other thin specimens.
HR30W	( 1/8inch )		30kgf ( 294.2 )	
HR45W	steel ball		45kgf ( 441.3N )	
HR15X	Φ6.35mm		15kgf ( 147.1N )	The hard rubber, copper, synthetic resin and friction materials such as thin specimens.
HR30X	(1/4inch)		30kgf ( 294.2 )	
HR45X	steel ball		45kgf ( 441.3N )	
HR15Y	Φ12.7mm		15kgf ( 147.1N )	
HR30Y	(1/2inch)		30kgf ( 294.2 )	
HR45Y	steel ball		45kgf ( 441.3N )	

Note: The surface Rockwell hardness test commonly use the N and T two scales.

## 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
N	—	±2HRN
T	—	±3HRT

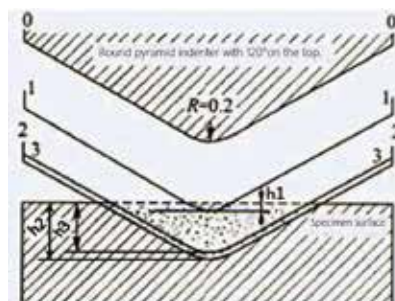
## Working Principle

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 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 dismounting 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
Standard Configuration	1	Main unit	1	
	2	Diamond Rockwell indenter	1	
	3	φ1.5875mm 1/16 inch steel ball indenter	1	
	4	Thermal printing paper	1	
	5	Small testing table	1	
	6	Large testing table	1	
	7	V-shape testing table	1	
	8	Rockwell Standard Block	3	
	9	Fuse	2	
	10	Power cable	1	
	11	Plastic dust cover	1	
	12	Attached files	1	
	13	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	



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