



HSM Wire International, Inc

Ph: 330-244-8501 Fax: 330-244-8561

www.hsmwire.com

Common Applications and Nomenclature for Hardness Test

Test	Symbol	Indenter	Test Force (kg)	Indentation depth (mm)*	Application
Rockwell A	HRA	Diamond	60	(100 - HRA value) / 500	Very hard materials, cemented carbides
Rockwell B	HRB	1/16" ball	100	(130 - HRB value) / 500	Low strength steel, copper alloys, alum alloys, malleable iron
Rockwell C	HRC	Diamond	150	(100 - HRC value) / 500	High Strength Steel, titanium, pearlitic malleable iron
Rockwell D	HRD	Diamond	100	(100 - HRD value) / 500	High Strength steel, thin steel
Rockwell E	HRE	1/8 " ball	100	(130 - HRE value) / 500	Cast iron, alum and magnesium alloys
Rockwell F	HRF	1/16 " ball	60	(130 - HRF value) / 500	Annealed copper alloys, thin soft metals
Rockwell G	HRG	1/16 " ball	150	(130 - HRG value) / 500	Phosphor bronze, beryllium copper. Malleable irons **
Rockwell H	HRH	1/8 " ball	60	(130 - HRH value) / 500	Aluminum, zinc, lead
Rockwell K	HRK	1/8 " ball	150	(130 - HRK value) / 500	Bearing metals and other very soft or thin materials, including plastics. Use smallest ball and heaviest load that do not give anvil effect.
Rockwell L	HRL	1/4 " ball	60	(130 - HRL value) / 500	
Rockwell M	HRM	1/4 " ball	100	(130 - HRM value) / 500	
Rockwell P	HRP	1/4 " ball	150	(130 - HRP value) / 500	
Rockwell R	HRR	1/2 " ball	60	(130 - HRR value) / 500	
Rockwell S	HRS	1/2 " ball	100	(130 - HRS value) / 500	
Rockwell V	HRV	1/2 " ball	150	(130 - HRV value) / 500	

**To be used as a guideline only



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Superficial Rockwell N	HR15N	Diamond	15	$(100 - \text{HR15N value}) / 1000$	Cemented Carbides, thin steel and case hardened steel, hard cast irons, titanium, and other materials harder than 100 HRB
Superficial Rockwell N	HR30N	Diamond	30	$(100 - \text{HR30N value}) / 1000$	
Superficial Rockwell N	HR45N	Diamond	45	$(100 - \text{HR45N value}) / 1000$	
Superficial Rockwell T	HR15T	1/16 " ball	15	$(100 - \text{HR15T value}) / 1000$	Copper alloys, phosphor bronze, soft steels, aluminum alloys, malleable iron, thin soft sheet metals
Superficial Rockwell T	HR30T	1/16 " ball	30	$(100 - \text{HR30T value}) / 1000$	
Superficial Rockwell T	HR45T	1/16 " ball	45	$(100 - \text{HR45T value}) / 1000$	
Superficial Rockwell W	HR15W	1/8 " ball	15	$(100 - \text{HR15W value}) / 1000$	Cast Iron, Aluminum and Magnesium alloys, bearing metals, zinc, lead
Superficial Rockwell W	HR30W	1/8 " ball	30	$(100 - \text{HR30W value}) / 1000$	
Superficial Rockwell W	HR45W	1/8 " ball	45	$(100 - \text{HR45W value}) / 1000$	



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Superficial Rockwell X	HR15X	¼ " ball	15	(100 - HR15X value) / 1000	Cast Iron, Alluminum and Magnesium alloys, bearing metals, zinc, lead
Superficial Rockwell X	HR30X	¼ " ball	30	(100 - HR30X value) / 1000	
Superficial Rockwell X	HR45X	¼ " ball	45	(100 - HR45X value) / 1000	
Superficial Rockwell Y	HR15Y	½ " ball	15	(100 - HR15Y value) / 1000	
Superficial Rockwell Y	HR30Y	½ " ball	30	(100 - HR30Y value) / 1000	
Superficial Rockwell Y	HR45Y	½ " ball	45	(100 - HR45Y value) / 1000	
Vickers - "Macro"	HV	Diamond	1-100	Diagonal length in mm / 7	A wide range of materials
Vickers - "Micro"	HV	Diamond	0.005 to 1	Diagonal length in mm / 7	A wide range of materials
Knoop	HK	Diamond	0.005 to 1	Diagonal length in mm / 30	A wide range of materials, case depth determination

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* It is possible to determine the minimum recommended thickness of the test piece using the indentation depth. Rule of thumb is that the thickness should exceed 10 times the depth of the indentation with a diamond indenter and 15 times the depth of the indentation with a ball indenter. EXAMPLE: a Hardness reading of HRB 43 is observed:

$$t = (130 - HRB) / 500$$

$$t = (130 - 43) / 500$$

$$t = 0.174 \text{ mm or } 0.0071 \text{ in}$$

Test piece thickness should be 15 x t or 2.61 mm (0.1in)

** Upper limit is 92 HRG to avoid possible flattening of the ball