

## Hardness Conversion Charts

C	A	D	15-N	30-N	45-N	HV	HK	HB	G	KSI
150 kg Diamond 1/16" ball	60 kg Diamond 1/16" ball	100 kg Diamond 1/16" ball	15 kg N Diamond	30 kg N Diamond	45 kg N Diamond	Vickers 10 kg	500 gm & over	3000 kg 10mm ball	150 kg 1/16" ball	1000 kg lbs/sq. in.
80	92.0	86.5	•	92.0	87.0	1865	•	NA	NA	NA
79	91.5	85.5	•	91.4	86.5	1787	•	NA	NA	NA
78	91.0	84.5	•	91.0	85.5	1710	•	NA	NA	NA
77	90.5	84.0	•	90.5	84.5	1633	•	NA	NA	NA
76	90.0	83.0	•	90.0	83.5	1556	•	NA	NA	NA
75	89.5	82.5	•	89.0	82.5	1478	•	NA	NA	NA
74	89.0	81.5	•	88.5	81.5	1400	•	NA	NA	NA
73	88.5	81.0	•	88.0	80.5	1323	•	NA	NA	NA
72	88.0	80.0	•	87.0	79.5	1245	•	NA	NA	NA
71	87.0	79.5	•	86.5	78.5	1160	•	NA	NA	NA
70	86.5	78.5	•	86.0	77.5	1076	•	NA	NA	NA
69	86.0	78.0	•	85.0	76.5	1004	•	NA	NA	NA
68	85.6	76.9	93.2	84.4	75.4	940	920	NA	NA	NA
67	85.0	76.1	92.9	83.6	74.2	900	895	NA	NA	NA
66	84.5	75.4	92.5	82.8	73.3	865	870	NA	NA	NA
65	83.9	74.5	92.2	81.9	72.0	832	846	739	NA	NA
64	83.4	73.8	91.8	81.1	71.0	800	822	722	NA	NA
63	82.8	73.0	91.4	80.1	69.9	772	799	706	NA	NA
62	82.3	72.2	91.1	79.3	68.8	746	776	688	NA	NA
61	81.8	71.5	90.7	78.4	67.7	720	754	670	NA	NA
60	81.2	70.7	90.2	77.5	66.6	697	732	654	NA	NA
59	80.7	69.9	89.8	76.6	65.5	674	710	634	NA	351
58	80.1	69.2	89.3	75.7	64.3	653	690	615	NA	338
57	79.6	68.5	88.9	74.8	63.2	633	670	595	NA	325
56	79.0	67.7	88.3	73.9	62.0	613	650	577	NA	313
55	78.5	66.9	87.9	73.0	60.9	595	630	560	NA	301
54	78.0	66.1	87.4	72.0	59.8	577	612	543	NA	292
53	77.4	65.4	86.9	71.2	58.6	560	594	525	NA	283
52	76.8	64.6	86.4	70.2	57.4	544	576	512	NA	273
51	76.3	63.8	85.9	69.4	56.1	528	558	496	NA	264
50	75.9	63.1	85.5	68.5	55.0	513	542	481	NA	255
49	75.2	62.1	85.0	67.6	53.8	498	526	469	NA	246
48	74.7	61.4	84.5	66.7	52.5	484	510	455	NA	238
47	74.1	60.8	83.9	65.8	51.4	471	495	443	NA	229
46	73.6	60.0	83.5	64.8	50.3	458	480	432	NA	221
45	73.1	59.2	83.0	64.0	49.0	446	466	421	NA	215
44	72.5	58.5	82.5	63.1	47.8	434	452	409	NA	208
43	72.0	57.7	82.0	62.2	46.7	423	438	400	NA	201
42	71.5	56.9	81.5	61.3	45.5	412	426	390	NA	194
41	70.9	56.2	80.9	60.4	44.3	402	414	381	NA	188
40	70.4	55.4	80.4	59.5	43.1	392	402	371	NA	182
39	69.9	54.6	79.9	58.6	41.9	382	391	362	NA	177
38	69.4	53.8	79.4	57.7	40.8	372	380	353	NA	171
37	68.9	53.1	78.8	56.8	39.6	363	370	344	NA	166
36	68.4	52.3	78.3	55.9	38.4	354	360	336	NA	161
35	67.9	51.5	77.7	55.0	37.2	345	351	327	NA	156
34	67.4	50.8	77.2	54.2	36.1	336	342	319	NA	152
33	66.8	50.0	76.6	53.3	34.9	327	334	311	NA	149
32	66.3	49.2	76.1	52.1	33.7	318	326	301	NA	146
31	65.8	48.4	75.6	51.3	32.5	310	318	294	NA	141
30	65.3	47.7	75.0	50.4	31.3	302	311	286	92.0	138
29	64.6	47.0	74.5	49.5	30.1	294	304	279	91.0	135
28	64.3	46.1	73.9	48.6	28.9	286	297	271	90.0	131
27	63.8	45.2	73.3	47.7	27.8	279	290	264	89.0	128
26	63.3	44.6	72.8	46.8	26.7	272	284	258	88.0	125
25	62.8	43.8	72.2	45.9	25.5	266	278	253	87.0	123
24	62.4	43.1	71.6	45.0	24.3	260	272	247	86.0	119
23	62.0	42.1	71.0	44.0	23.1	254	266	243	84.5	117
22	61.5	41.6	70.5	43.2	22.0	248	261	237	83.5	115
21	61.0	40.9	69.9	42.3	20.7	243	256	231	82.5	112
20	60.5	40.1	69.4	41.5	19.6	238	251	226	81.0	110

The conversion values are approximate values only. They have been independently developed and appear to be consistent with ASTM E-140 and A-370.

**Mitutoyo**

B	F	G	15-T	30-T	45-T	E	H	K	A	HK	HB	HB HV	KSI
100 kg 1/16" ball	60 kg 1/16" ball	150 kg 1/16" ball	15 kg 1/16" ball	30 kg 1/16" ball	45 kg 1/16" ball	100 kg 1/8" ball	60 kg 1/8" ball	150 kg 1/8" ball	60 kg Diamond	500 gm & over	500 kg 10 mm ball	3000 kg 10 kg	1000 kg lbs/sq. in.
100	NA	82.5	93.1	83.1	72.9	NA	NA	NA	61.5	251	201	240	116
99	NA	81.0	92.8	82.5	71.9	NA	NA	NA	60.9	246	195	234	114
98	NA	79.0	92.5	81.8	70.9	NA	NA	NA	60.2	241	189	228	109
97	NA	77.5	92.1	81.1	69.9	NA	NA	NA	59.5	236	184	222	104
96	NA	76.0	91.8	80.4	68.9	NA	NA	NA	58.9	231	179	216	102
95	NA	74.0	91.5	79.8	67.9	NA	NA	NA	58.3	226	175	210	100
94	NA	72.5	91.2	79.1	66.9	NA	NA	NA	57.6	221	171	205	98
93	NA	71.0	90.8	78.4	65.9	NA	NA	NA	57.0	216	167	200	94
92	NA	69.0	90.5	77.8	64.8	NA	NA	NA	56.4	211	163	195	92
91	NA	67.5	90.2	77.1	63.8	NA	NA	NA	55.8	206	160	190	90
90	NA	66.0	89.9	76.4	62.8	NA	NA	NA	55.2	201	157	185	89
89	NA	64.0	89.5	75.8	61.8	NA	NA	NA	54.6	196	154	180	88
88	NA	62.5	89.2	75.1	60.8	NA	NA	NA	54.0	192	151	176	86
87	NA	61.0	88.9	74.4	59.8	NA	NA	NA	53.4	188	148	172	84
86	NA	59.0	88.6	73.8	58.8	NA	NA	NA	52.8	184	145	169	83
85	NA	57.5	88.2	73.1	57.8	NA	NA	NA	52.3	180	142	165	82
84	NA	56.0	87.9	72.4	56.8	NA	NA	NA	51.7	176	140	162	81
83	NA	54.0	87.6	71.8	55.8	NA	NA	NA	51.1	173	137	159	80
82	NA	52.5	87.3	71.1	54.8	NA	NA	NA	50.6	170	135	156	77
81	NA	51.0	86.9	70.4	53.8	NA	NA	NA	50.0	167	133	153	73
80	NA	49.0	86.6	69.7	52.8	NA	NA	NA	49.5	164	130	150	72
79	NA	47.5	86.3	69.1	51.8	NA	NA	NA	48.9	161	128	147	70
78	NA	46.0	86.0	68.4	50.8	NA	NA	NA	48.4	158	126	144	69
77	NA	44.0	85.6	67.7	49.8	NA	NA	NA	47.9	155	124	141	68
76	NA	42.5	85.3	67.1	48.8	NA	NA	NA	47.3	152	122	139	67
75	99.6	41.0	85.0	66.4	47.8	NA	NA	NA	46.8	150	120	137	66
74	99.1	39.0	84.7	65.7	46.8	NA	NA	NA	46.3	147	118	135	65
73	98.5	37.5	84.3	65.1	45.8	NA	NA	NA	45.8	145	116	132	64
72	98.0	36.0	84.0	64.4	44.8	NA	NA	NA	45.3	143	114	130	63
71	97.4	34.5	83.7	63.7	43.8	NA	NA	NA	44.8	141	112	127	62
70	96.8	32.5	83.4	63.1	42.8	99.5	NA	81.5	44.3	139	110	125	61
69	96.2	31.0	83.0	62.4	41.8	99.0	NA	81.0	43.8	137	109	123	60
68	95.6	29.5	82.7	61.7	40.8	98.0	NA	80.0	43.3	135	107	121	59
67	95.1	28.0	82.4	61.0	39.8	97.5	NA	79.0	42.8	133	106	119	58
66	94.5	26.5	82.1	60.4	38.7	97.0	NA	78.0	42.3	131	104	117	57
65	93.9	25.0	81.8	59.7	37.7	96.0	NA	77.5	41.8	129	102	116	56
64	93.4	23.5	81.4	59.0	36.7	95.5	NA	76.5	41.4	127	101	114	NA
63	92.8	22.0	81.1	58.4	35.7	95.0	NA	75.5	40.9	125	99	112	NA
62	92.2	20.5	80.8	57.7	34.7	94.5	NA	74.5	40.4	124	98	110	NA
61	91.7	19.0	80.5	57.0	33.7	93.5	NA	74.0	40.0	122	96	108	NA
60	91.1	17.5	80.1	56.4	32.7	93.0	NA	73.0	39.5	120	95	107	NA
59	90.5	16.0	79.8	55.7	31.7	92.5	NA	72.0	39.0	118	94	106	NA
58	90.0	14.5	79.5	55.0	30.7	92.0	NA	71.0	38.6	117	92	104	NA
57	89.4	13.0	79.2	54.4	29.7	91.0	NA	70.5	38.1	115	91	103	NA
56	88.8	11.5	78.8	53.7	28.7	90.5	NA	69.5	37.7	114	90	101	NA
55	88.2	10.0	78.5	53.0	27.7	90.0	NA	68.5	37.2	112	89	100	NA
54	87.7	8.5	78.2	52.4	26.7	89.5	NA	68.0	36.8	111	87	NA	NA
53	87.1	7.0	77.9	51.7	25.7	89.0	NA	67.0	36.3	110	86	NA	NA
52	86.5	5.5	77.5	51.0	24.7	88.0	NA	66.0	35.9	109	85	NA	NA
51	86.0	4.0	77.2	50.3	23.7	87.5	NA	65.0					

### Minimum Thickness Chart

Thicker or harder material can be tested.	Rockwell Superficial Hardness Scales			Rockwell Regular Hardness Scales		
Thickness inches (mm)	15N	30N	45N	A	D	C
.006 (0.15)	92	•	•	•	•	•
.008 (0.20)	90	•	•	•	•	•
.010 (0.25)	88	•	•	•	•	•
.012 (0.30)	83	82	77	•	•	•
.014 (0.36)	76	78.5	74	•	•	•
.016 (0.41)	68	74	72	86	•	•
.018 (0.46)	✓	66	68	84	0	9
.020 (0.51)	✓	57	63	82	77	0
.022 (0.56)	✓	47	58	79	75	69
.024 (0.61)	✓	✓	51	76	72	67
.026 (0.66)	✓	✓	37	71	68	65
.028 (0.71)	✓	✓	20	67	63	62
.030 (0.76)	✓	✓	✓	60	58	57
.032 (0.81)	✓	✓	✓	✓	51	52
.034 (0.86)	✓	✓	✓	✓	43	45
.036 (0.91)	✓	✓	✓	✓	✓	37
.038 (0.96)	✓	✓	✓	✓	✓	28
.040 (1.02)	✓	✓	✓	✓	✓	20

  

Thicker or harder material can be tested.	Rockwell Superficial Hardness Scales			Rockwell Regular Hardness Scales		
Thickness inches (mm)	15T	30T	45T	F	B	G
.010 (0.25)	91	•	•	•	•	•
.012 (0.30)	86	•	•	•	•	•
.014 (0.36)	81	80	•	•	•	•
.016 (0.41)	75	72	71	•	•	•
.018 (0.46)	68	64	62	•	•	•
.020 (0.51)	✓	55	53	•	•	•
.022 (0.56)	✓	45	43	•	•	•
.024 (0.61)	✓	34	31	98	94	94
.026 (0.66)	✓	✓	18	91	87	87
.028 (0.71)	✓	✓	4	85	80	76
.030 (0.76)	✓	✓	✓	77	71	68
.032 (0.81)	✓	✓	✓	69	62	59
.034 (0.86)	✓	✓	✓	✓	52	50
.036 (0.91)	✓	✓	✓	✓	40	42
.038 (0.96)	✓	✓	✓	✓	28	31
.040 (1.02)	✓	✓	✓	✓	✓	22

✓ - Can be tested - no minimum hardness.

### A complete line of Rockwell Hardness Testing Machines to suit practically every application



60, 100 and 150 kgf. Test Force				
15, 30, 45, 60, 100 and 150 kgf. Test force	X	X		X
Rockwell Scales (Letter Scales HRA, HRB ....)		X		
Rockwell and Superficial Scales (Letter and HR15-30-45 N or TW)	X		X	X
Rockwell Diamond		X		
Rockwell/Superficial Diamond	X		X	X
1/16" Carbide Ball Indenter	X	X	X	X
Dead Weight	X	X	X	
Individual Hanging Weights	X			
Dial A Weight System		X	X	
Automatic Brake-Start		X	X	X
Closed Loop Electronic Force				X
Digital Display	X	X	X	X
Scale Conversions	X	X	X	X
Cylindrical Corrections				X
Adjustable Timing functions	X	X	X	X
Offset Function	X	X	X	X
Data Output	X	X	X	X
Statistics				X
Meets ASTM E18	X	X	X	X
7.1" Max Sample Height	X	X	X	
8.1" Max Sample Height				X
15.5" Max Sample Height				HR521 L / HR523 L
6.5" Max Sample Depth	X	X	X	
5.9" Max Sample Depth				X
2 HRC Test Blocks	X	X	X	X
1 HRBW Test Block	X	X	X	X
1 HR30TW Test Block	X		X	X
1 HR30N Test Block	X		X	X
64mm Flat and 40mm Vee Anvil	X	X	X	X
OPTIONAL Light Force (Baby) Brinell kit	X	X	X	HR523 Only

### Rockwell hardness scales Preliminary test force: 98.07N (10kgf)

Scale	Indenter	Test force	Applications
A	Diamond	588.4N(60kgf)	Cemented carbide, thin steel plates case hardened steel
D		980.7N(150kgf)	
C		1471N(150kgf)	
F	1/16" diameter carbide ball	588.4N(60kgf)	Bearing metal, copper, annealed steel, brass, hard-drawn aluminum alloys beryllium copper, phosphor bronze
B		980.7N(100kgf)	
G		1471N(150kgf)	
H	1/8" diameter carbide ball	588.4N(60kgf)	Bearing metal
E		980.7N(100kgf)	
K		1471N(150kgf)	
L	1/4" diameter carbide ball	588.4N(60kgf)	Plastics, lead
M		980.7N(100kgf)	
P		1471N(150kgf)	
R	1/2" diameter carbide ball	588.4N(60kgf)	Plastics
S		980.7N(100kgf)	
V		1471N(150kgf)	

### Rockwell Superficial hardness scales Preliminary test force: 29.42N (3kgf)

Scale	Indenter	Test force	Applications
15N	Diamond	147.1N(15kgf)	Carburized layer, sintered
30N		294.2N(30kgf)	
45N		441.3N(45kgf)	
15T	1/16" diameter carbide ball	147.1N(15kgf)	Thin copper plates (brass, bronze), mild steel
30T		294.2N(30kgf)	
45T		441.3N(45kgf)	
15W	1/8" diameter carbide ball	147.1N(15kgf)	Plastics, zinc, bearing alloys
30W		294.2N(30kgf)	
45W		441.3N(45kgf)	
15X	1/4" diameter carbide ball	147.1N(15kgf)	Plastics, zinc, bearing alloys
30X		294.2N(30kgf)	
45X		441.3N(45kgf)	
15Y	1/2" diameter carbide ball	147.1N(15kgf)	Plastics, zinc, bearing alloys
30Y		294.2N(30kgf)	
45Y		441.3N(45kgf)	