KASPERCALC

HARDNESS CONVERSION CHART

Rockwell · superficial Rockwell · Vickers · Knoop · Brinell · Shore · approximate tensile strength

ASTM E140-02, Tables 1 to 9
TO 1-1A-9 / NAVAIR 01-1A-9 (17 Oct 2025), Ch. 8
2026-11-06

Read across a row to compare scales. Shaded column: the chart's key scale. – = not printed for that hardness ( ) = outside the recommended range of that test Conversions are approximate and only for the material named: test with the scale the drawing specifies.

Non-Austenitic Steels, Rockwell C Range · ASTM E140 Table 1

HRC Diamond (Brale), 150 kg	HV 136° diamond pyramid	HBS 10 mm standard ball, 3000 kg	HBW 10 mm tungsten carbide ball, 3000 kg	HK Knoop diamond, 500 g and over	HRA Diamond (Brale), 60 kg	HRD Diamond (Brale), 100 kg	HR15N Diamond (N Brale), 15 kg	HR30N Diamond (N Brale), 30 kg	HR45N Diamond (N Brale), 45 kg	HSc Diamond-tipped hammer, rebound
68	940	–	–	920	85.6	76.9	93.2	84.4	75.4	97.3
67	900	–	–	895	85.0	76.1	92.9	83.6	74.2	95.0
66	865	–	–	870	84.5	75.4	92.5	82.8	73.3	92.7
65	832	–	(739)	846	83.9	74.5	92.2	81.9	72.0	90.6
64	800	–	(722)	822	83.4	73.8	91.8	81.1	71.0	88.5
63	772	–	(705)	799	82.8	73.0	91.4	80.1	69.9	86.5
62	746	–	(688)	776	82.3	72.2	91.1	79.3	68.8	84.5
61	720	–	(670)	754	81.8	71.5	90.7	78.4	67.7	82.6
60	697	–	(654)	732	81.2	70.7	90.2	77.5	66.6	80.8
59	674	–	634	710	80.7	69.9	89.8	76.6	65.5	79.0
58	653	–	615	690	80.1	69.2	89.3	75.7	64.3	77.3
57	633	–	595	670	79.6	68.5	88.9	74.8	63.2	75.6
56	613	–	577	650	79.0	67.7	88.3	73.9	62.0	74.0
55	595	–	560	630	78.5	66.9	87.9	73.0	60.9	72.4
54	577	–	543	612	78.0	66.1	87.4	72.0	59.8	70.9
53	560	–	525	594	77.4	65.4	86.9	71.2	58.6	69.4
52	544	(500)	512	576	76.8	64.6	86.4	70.2	57.4	67.9
51	528	(487)	496	558	76.3	63.8	85.9	69.4	56.1	66.5
50	513	(475)	481	542	75.9	63.1	85.5	68.5	55.0	65.1
49	498	(464)	469	526	75.2	62.1	85.0	67.6	53.8	63.7
48	484	451	455	510	74.7	61.4	84.5	66.7	52.5	62.4
47	471	442	443	495	74.1	60.8	83.9	65.8	51.4	61.1
46	458	432	432	480	73.6	60.0	83.5	64.8	50.3	59.8
45	446	421	421	466	73.1	59.2	83.0	64.0	49.0	58.5
44	434	409	409	452	72.5	58.5	82.5	63.1	47.8	57.3
43	423	400	400	438	72.0	57.7	82.0	62.2	46.7	56.1
42	412	390	390	426	71.5	56.9	81.5	61.3	45.5	54.9
41	402	381	381	414	70.9	56.2	80.9	60.4	44.3	53.7
40	392	371	371	402	70.4	55.4	80.4	59.5	43.1	52.6
39	382	362	362	391	69.9	54.6	79.9	58.6	41.9	51.5
38	372	353	353	380	69.4	53.8	79.4	57.7	40.8	50.4
37	363	344	344	370	68.9	53.1	78.8	56.8	39.6	49.3
36	354	336	336	360	68.4	52.3	78.3	55.9	38.4	48.2
35	345	327	327	351	67.9	51.5	77.7	55.0	37.2	47.1
34	336	319	319	342	67.4	50.8	77.2	54.2	36.1	46.1
33	327	311	311	334	66.8	50.0	76.6	53.3	34.9	45.1
32	318	301	301	326	66.3	49.2	76.1	52.1	33.7	44.1
31	310	294	294	318	65.8	48.4	75.6	51.3	32.5	43.1
30	302	286	286	311	65.3	47.7	75.0	50.4	31.3	42.2
29	294	279	279	304	64.8	47.0	74.5	49.5	30.1	41.3
28	286	271	271	297	64.3	46.1	73.9	48.6	28.9	40.4
27	279	264	264	290	63.8	45.2	73.3	47.7	27.8	39.5
26	272	258	258	284	63.3	44.6	72.8	46.8	26.7	38.7
25	266	253	253	278	62.8	43.8	72.2	45.9	25.5	37.8
24	260	247	247	272	62.4	43.1	71.6	45.0	24.3	37.0
23	254	243	243	266	62.0	42.1	71.0	44.0	23.1	36.3
22	248	237	237	261	61.5	41.6	70.5	43.2	22.0	35.5
21	243	231	231	256	61.0	40.9	69.9	42.3	20.7	34.8
20	238	226	226	251	60.5	40.1	69.4	41.5	19.6	34.2

Carbon, alloy and tool steels, as-forged, annealed, normalized or quenched and tempered, provided they are homogeneous. Brinell numbers in parentheses are outside the range recommended for Brinell testing (E10). Scleroscope values are based on Vickers-Scleroscope relationships from NBS reference blocks.

Non-Austenitic Steels, Rockwell B Range · ASTM E140 Table 2

HRB 1/16 in ball, 100 kg	HV 136° diamond pyramid	HBS 10 mm standard ball, 3000 kg	HK Knoop diamond, 500 g and over	HRA Diamond (Brale), 60 kg	HRF 1/16 in ball, 60 kg	HR15T 1/16 in ball, 15 kg	HR30T 1/16 in ball, 30 kg	HR45T 1/16 in ball, 45 kg
100	240	240	251	61.5	–	93.1	83.1	72.9
99	234	234	246	60.9	–	92.8	82.5	71.9
98	228	228	241	60.2	–	92.5	81.8	70.9
97	222	222	236	59.5	–	92.1	81.1	69.9
96	216	216	231	58.9	–	91.8	80.4	68.9
95	210	210	226	58.3	–	91.5	79.8	67.9
94	205	205	221	57.6	–	91.2	79.1	66.9
93	200	200	216	57.0	–	90.8	78.4	65.9
92	195	195	211	56.4	–	90.5	77.8	64.8
91	190	190	206	55.8	–	90.2	77.1	63.8
90	185	185	201	55.2	–	89.9	76.4	62.8
89	180	180	196	54.6	–	89.5	75.8	61.8
88	176	176	192	54.0	–	89.2	75.1	60.8
87	172	172	188	53.4	–	88.9	74.4	59.8
86	169	169	184	52.8	–	88.6	73.8	58.8
85	165	165	180	52.3	–	88.2	73.1	57.8
84	162	162	176	51.7	–	87.9	72.4	56.8
83	159	159	173	51.1	–	87.6	71.8	55.8
82	156	156	170	50.6	–	87.3	71.1	54.8
81	153	153	167	50.0	–	86.9	70.4	53.8
80	150	150	164	49.5	–	86.6	69.7	52.8
79	147	147	161	48.9	–	86.3	69.1	51.8
78	144	144	158	48.4	–	86.0	68.4	50.8
77	141	141	155	47.9	–	85.6	67.7	49.8
76	139	139	152	47.3	–	85.3	67.1	48.8
75	137	137	150	46.8	99.6	85.0	66.4	47.8
74	135	135	147	46.3	99.1	84.7	65.7	46.8
73	132	132	145	45.8	98.5	84.3	65.1	45.8
72	130	130	143	45.3	98.0	84.0	64.4	44.8
71	127	127	141	44.8	97.4	83.7	63.7	43.8
70	125	125	139	44.3	96.8	83.4	63.1	42.8
69	123	123	137	43.8	96.2	83.0	62.4	41.8
68	121	121	135	43.3	95.6	82.7	61.7	40.8
67	119	119	133	42.8	95.1	82.4	61.0	39.8
66	117	117	131	42.3	94.5	82.1	60.4	38.7
65	116	116	129	41.8	93.9	81.8	59.7	37.7
64	114	114	127	41.4	93.4	81.4	59.0	36.7
63	112	112	125	40.9	92.8	81.1	58.4	35.7
62	110	110	124	40.4	92.2	80.8	57.7	34.7
61	108	108	122	40.0	91.7	80.5	57.0	33.7
60	107	107	120	39.5	91.1	80.1	56.4	32.7
59	106	106	118	39.0	90.5	79.8	55.7	31.7
58	104	104	117	38.6	90.0	79.5	55.0	30.7
57	103	103	115	38.1	89.4	79.2	54.4	29.7
56	101	101	114	37.7	88.8	78.8	53.7	28.7
55	100	100	112	37.2	88.2	78.5	53.0	27.7
54	–	–	111	36.8	87.7	78.2	52.4	26.7
53	–	–	110	36.3	87.1	77.9	51.7	25.7
52	–	–	109	35.9	86.5	77.5	51.0	24.7
51	–	–	108	35.5	86.0	77.2	50.3	23.7
50	–	–	107	35.0	85.4	76.9	49.7	22.7
49	–	–	106	34.6	84.8	76.6	49.0	21.7
48	–	–	105	34.1	84.3	76.2	48.3	20.7
47	–	–	104	33.7	83.7	75.9	47.7	19.7
46	–	–	103	33.3	83.1	75.6	47.0	18.7
45	–	–	102	32.9	82.6	75.3	46.3	17.7
44	–	–	101	32.4	82.0	74.9	45.7	16.7
43	–	–	100	32.0	81.4	74.6	45.0	15.7
42	–	–	99	31.6	80.8	74.3	44.3	14.7
41	–	–	98	31.2	80.3	74.0	43.7	13.6
40	–	–	97	30.7	79.7	73.6	43.0	12.6
39	–	–	96	30.3	79.1	73.3	42.3	11.6
38	–	–	95	29.9	78.6	73.0	41.6	10.6
37	–	–	94	29.5	78.0	72.7	41.0	9.6
36	–	–	93	29.1	77.4	72.3	40.3	8.6
35	–	–	92	28.7	76.9	72.0	39.6	7.6
34	–	–	91	28.2	76.3	71.7	39.0	6.6
33	–	–	90	27.8	75.7	71.4	38.3	5.6
32	–	–	89	27.4	75.2	71.0	37.6	4.6
31	–	–	88	27.0	74.6	70.7	37.0	3.6
30	–	–	87	26.6	74.0	70.4	36.3	2.6

Carbon, alloy and tool steels, as-forged, annealed, normalized or quenched and tempered, provided they are homogeneous.

Approximate Tensile Strength of Carbon and Low Alloy Steels · TO 1-1A-9 Table 8-5

HRC Diamond (Brale), 150 kg	HRB 1/16 in ball, 100 kg	HV50 136° diamond pyramid, 50 kg	HBW 10 mm tungsten carbide ball, printed as 300 kg	HBS 10 mm steel ball, printed as 300 kg	Tensile ksi (1000 psi)
67	–	918	820	717	–
66	–	884	796	701	–
65	–	852	774	686	–
64	–	822	753	671	–
63	–	793	732	656	–
62	–	765	711	642	–
61	–	740	693	628	–
60	–	717	675	613	–
59	–	694	657	600	–
58	–	672	639	584	–
57	–	650	621	574	–
56	121.3	630	604	561	–
55	120.8	611	588	548	–
54	120.2	592	571	536	–
53	119.6	573	554	524	283
52	119.1	556	538	512	273
51	118.5	539	523	500	264
50	117.9	523	508	488	256
49	117.4	508	494	476	246
48	116.8	493	479	464	237
47	116.2	479	465	453	231
46	115.6	465	452	442	221
45	115	452	440	430	215
44	114.4	440	427	419	208
43	113.8	428	415	408	201
42	113.3	417	405	398	194
41	112.7	406	394	387	188
40	112.1	396	385	377	181
39	111.5	386	375	367	176
38	110.9	376	365	357	170
37	110.4	367	356	347	165
36	109.7	357	346	337	160
35	109.1	348	337	327	155
34	108.5	339	329	318	150
33	107.8	330	319	309	147
32	107.1	321	310	301	142
31	106.4	312	302	294	139
30	105.7	304	293	286	136
29	105	296	286	279	132
28	104.3	288	278	272	129
27	130.7*	281	271	265	126
26	102.9	274	264	259	123
25	102.2	267	258	253	120
24	101.5	261	252	247	118
23	100.8	255	246	241	115
22	100.2	250	241	235	112
21	99.5	245	236	230	110
20	98.9	240	231	225	107
19	98.1	235	226	220	104
18	97.5	231	222	215	103
17	96.9	227	218	210	102
16	96.2	223	214	206	100
15	95.5	219	210	201	99
14	94.9	215	206	197	97
13	94.1	211	202	193	95
12	93.4	207	199	190	93
11	92.6	203	195	186	91
10	91.8	199	191	183	90
9	91.2	196	187	180	89
8	90.3	192	184	177	88
7	89.7	189	180	174	87
6	89	186	177	171	85
5	88.3	183	174	168	84
4	87.5	179	171	165	83
3	87	177	169	162	82
2	86	173	165	160	81
1	85.5	171	163	158	80
0	84.5	167	159	154	78
–	83.2	162	153	150	76
–	82	157	148	145	74
–	80.5	153	144	140	72
–	79	149	140	136	70
–	77.5	143	134	131	68
–	76	139	130	127	66
–	74	135	126	122	64
–	72	129	120	117	62
–	70	125	116	113	60
–	68	120	111	108	58
–	66	116	107	104	56
–	64	112	104	100	54
–	61	108	100	96	52
–	58	104	95	92	50
–	55	99	91	87	48
–	51	95	86	83	46
–	47	91	83	79	44
–	44	88	80	76	42
–	39	84	76	72	40
–	35	80	72	68	38
–	30	76	67	64	36
–	24	72	64	60	34
–	20	69	61	57	32
–	11	65	57	53	30
–	0	62	54	50	28

For plain carbon and low alloy steels only. The Brinell heading is printed "300 Kilogram Load - 10 Millimeter Ball" with a footnote mark (3) that has no footnote text in the TO. * Printed as shown in TO 1-1A-9; evidently a misprint.