KASPERCALC

HARDNESS CONVERSION CHART

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

ASTM E140-02, Tables 1 to 9
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.

Austenitic Stainless Steel Sheet, Rockwell C Range · ASTM E140 Table 6

HRC Diamond (Brale), 150 kg	HRA Diamond (Brale), 60 kg	HR15N Diamond (N Brale), 15 kg	HR30N Diamond (N Brale), 30 kg	HR45N Diamond (N Brale), 45 kg
48	74.4	84.1	66.2	52.1
47	73.9	83.6	65.3	50.9
46	73.4	83.1	64.5	49.8
45	72.9	82.6	63.6	48.7
44	72.4	82.1	62.7	47.5
43	71.9	81.6	61.8	46.4
42	71.4	81.0	61.0	45.2
41	70.9	80.5	60.1	44.1
40	70.4	80.0	59.2	43.0
39	69.9	79.5	58.4	41.8
38	69.3	79.0	57.5	40.7
37	68.8	78.5	56.6	39.6
36	68.3	78.0	55.7	38.4
35	67.8	77.5	54.9	37.3
34	67.3	77.0	54.0	36.1
33	66.8	76.5	53.1	35.0
32	66.3	75.9	52.3	33.9
31	65.8	75.4	51.4	32.7
30	65.3	74.9	50.5	31.6
29	64.8	74.4	49.6	30.4
28	64.3	73.9	48.8	29.3
27	63.8	73.4	47.9	28.2
26	63.3	72.9	47.0	27.0
25	62.8	72.4	46.2	25.9
24	62.3	71.9	45.3	24.8
23	61.8	71.3	44.4	23.6
22	61.3	70.8	43.5	22.5
21	60.8	70.3	42.7	21.3
20	60.3	69.8	41.8	20.2

From interlaboratory tests on Types 201, 202, 301, 302, 304, 304L, 305, 316, 316L, 321 and 347, annealed to extra hard (Type 301); sheet about 0.1 to 0.050 in thick.

Copper, No. 102 to 142 · ASTM E140 Table 7

HV1 136° diamond pyramid, 1 kg	HV0.1 136° diamond pyramid, 100 g	HK1 Knoop diamond, 1 kg	HK0.5 Knoop diamond, 500 g	HR15T 1/16 in ball, 15 kg	HR15T 1/16 in ball, 15 kg	HR30T 1/16 in ball, 30 kg	HRB 1/16 in ball, 100 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	HB 10 mm ball, 500 kg	HBS 2/20 2 mm ball, 20 kg
130	127	138.7	133.8	–	85.0	–	67	99.0	–	69.5	49.0	–	119
128	125.2	136.8	132.1	83.0	84.5	–	66	98.0	87.0	68.5	48.0	–	117.5
126	123.6	134.9	130.4	–	84.0	–	65	97.0	–	67.5	46.5	120	115
124	121.9	133	128.7	82.5	83.5	–	64	96.0	86.0	66.5	45.0	117.5	113
122	121.1	131	127	–	83.0	–	62.5	95.5	85.5	66.0	44.0	115	111
120	118.5	129	125.2	82.0	82.5	–	61	95.0	–	65.0	42.5	112	109
118	116.8	127.1	123.5	81.5	–	–	59.5	94.0	85.0	64.0	41.0	110	107.5
116	115	125.1	121.7	–	82.0	–	58.5	93.0	–	63.0	40.0	107	105.5
114	113.5	123.2	119.9	81.0	81.5	–	57	92.5	84.5	62.0	38.5	105	103.5
112	111.8	121.4	118.1	80.5	81.0	–	55	91.5	–	61.0	37.0	102	102
110	109.9	119.5	116.3	80.0	–	–	53.5	91.0	84.0	60.0	36.0	99.5	100
108	108.3	117.5	114.5	–	80.5	–	52	90.5	83.5	59.0	34.5	97	98
106	106.6	115.6	112.6	79.5	80.0	–	50	89.5	–	58.0	33.0	94.5	96
104	104.9	113.5	110.1	79.0	79.5	–	48	88.5	83.0	57.0	32.0	92	94
102	103.2	111.5	108	78.5	79.0	–	46.5	87.5	82.5	56.0	30.0	89.5	92
100	101.5	109.4	106	78.0	78.0	–	44.5	87.0	82.0	55.0	28.5	87	90
98	99.8	107.3	104	77.5	77.5	–	42	85.5	81.0	53.5	26.5	84.5	88
96	98	105.3	102.1	77.0	77.0	–	40	84.5	80.5	52.0	25.5	82	86.5
94	96.4	103.2	100	76.5	76.5	–	38	83.0	80.0	51.0	23.0	79.5	85
92	94.7	101	98	76.0	75.5	–	35.5	82.0	79.0	49.0	21.0	77	83
90	93	98.9	96	75.5	75.0	–	33	81.0	78.0	47.5	19.0	74.5	81
88	91.2	96.9	94	75.0	74.5	–	30.5	79.5	77.0	46.0	16.5	–	79
86	89.7	95.5	92	74.5	73.5	–	28	78.0	76.0	44.0	14.0	–	77
84	87.9	92.3	90	74.0	73.0	–	25.5	76.5	75.0	43.0	12.0	–	75
82	86.1	90.1	87.9	73.5	72.0	–	23	74.5	74.5	41.0	9.5	–	73
80	84.5	87.9	86	72.5	71.0	–	20	73.0	73.5	39.5	7.0	–	71.5
78	82.8	85.7	84	72.0	70.0	–	17	71.0	72.5	37.5	5.0	–	69.5
76	81	83.5	81.9	71.5	69.5	–	14.5	69.0	71.5	36.0	2.0	–	67.5
74	79.2	81.1	79.9	71.0	68.5	–	11.5	67.5	70.0	34.0	–	–	66
72	77.6	78.9	78.7	70.0	67.5	–	8.5	66.0	69.0	32.0	–	–	64
70	75.8	76.8	76.6	69.5	66.5	–	5	64.0	67.5	30.0	–	–	62
68	74.3	74.1	74.4	69.0	65.5	–	2	62.0	66.0	28.0	–	–	60.5
66	72.6	71.9	71.9	68.0	64.5	–	–	60.0	64.5	25.5	–	–	58.5
64	70.9	69.5	70	67.5	63.5	–	–	58.0	63.5	23.5	–	–	57
62	69.1	67	67.9	66.5	62.0	–	–	56.0	61.0	21.0	–	–	55
60	67.5	64.6	65.9	66.0	61.0	–	–	54.0	59.0	18.0	–	–	53
58	65.8	62	63.8	65.0	60.0	–	–	51.5	57.0	15.5	–	–	51.5
56	64	59.8	61.8	64.5	58.5	–	–	49.0	55.0	13.0	–	–	49.5
54	62.3	57.4	59.5	63.5	57.5	–	–	47.0	53.0	10.0	–	–	48
52	60.7	55	57.2	63.0	56.0	–	–	44.0	51.5	7.5	–	–	46.5
50	58.9	52.8	55	62.0	55.0	–	–	41.5	49.5	4.5	–	–	44.5
48	57.3	50.3	52.7	61.0	53.5	–	–	39.0	47.5	1.5	–	–	42
46	55.8	48	50.2	60.5	52.0	–	–	36.0	45.0	–	–	–	41
44	53.9	45.9	47.8	59.5	51.0	–	–	33.5	43.0	–	–	–	–
42	52.2	43.7	45.2	58.5	49.5	–	–	30.5	41.0	–	–	–	–
40	51.3	40.2	42.8	57.5	48.0	–	–	28.0	38.5	–	–	–	–

Superficial T scales on 0.010 in (0.25 mm) and 0.020 in (0.51 mm) strip where marked; B, F and the other T scales on 0.040 in (1.02 mm) strip and greater. Brinell 10 mm/500 kgf on 0.080 in (2.03 mm) strip, 2 mm/20 kgf on 0.040 in strip.

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.

Austenitic Stainless Steel Sheet, Rockwell B Range · ASTM E140 Table 6

HRB 1/16 in ball, 100 kg	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	61.5	(113.9)	91.5	80.4	70.2
99	60.9	(113.2)	91.2	79.7	69.2
98	60.3	(112.5)	90.8	79.0	68.2
97	59.7	(111.8)	90.4	78.3	67.2
96	59.1	(111.1)	90.1	77.7	66.1
95	58.5	(110.5)	89.7	77.0	65.1
94	58.0	(109.8)	89.3	76.3	64.1
93	57.4	(109.1)	88.9	75.6	63.1
92	56.8	(108.4)	88.6	74.9	62.1
91	56.2	(107.8)	88.2	74.2	61.1
90	55.6	(107.1)	87.8	73.5	60.1
89	55.0	(106.4)	87.5	72.8	59.0
88	54.5	(105.7)	87.1	72.1	58.0
87	53.9	(105.0)	86.7	71.4	57.0
86	53.3	(104.4)	86.4	70.7	56.0
85	52.7	(103.7)	86.0	70.0	55.0
84	52.1	(103.0)	85.6	69.3	54.0
83	51.5	(102.3)	85.2	68.6	52.9
82	50.9	(101.7)	84.9	67.9	51.9
81	50.4	(101.0)	84.5	67.2	50.9
80	49.8	(100.3)	84.1	66.5	49.9
79	49.2	99.6	83.8	65.8	48.9
78	48.6	99.0	83.4	65.1	47.9
77	48.0	98.3	83.0	64.4	46.8
76	47.4	97.6	82.6	63.7	45.8
75	46.9	96.9	82.3	63.0	44.8
74	46.3	96.2	81.9	62.4	43.8
73	45.7	95.6	81.5	61.7	42.8
72	45.1	94.9	81.2	61.0	41.8
71	44.5	94.2	80.8	60.3	40.7
70	43.9	93.5	80.4	59.6	39.7
69	43.3	92.8	80.1	58.9	38.7
68	42.8	92.2	79.7	58.2	37.7
67	42.2	91.5	79.3	57.5	36.7
66	41.6	90.8	78.9	56.8	35.7
65	41.0	90.1	78.6	56.1	34.7
64	40.4	89.5	78.2	55.4	33.6
63	39.8	88.8	77.8	54.7	32.6
62	39.3	88.1	77.5	54.0	31.6
61	38.7	87.4	77.1	53.3	30.6
60	38.1	86.8	76.7	52.6	29.6

Same test program as the C range. F scale values in parentheses are outside the recommended range.

Wrought Aluminum Products · ASTM E140 Table 9

HB 10 mm ball, 500 kg	HV15 136° diamond pyramid, 15 kg	HRB 1/16 in ball, 100 kg	HRE 1/8 in ball, 100 kg	HRH 1/8 in ball, 60 kg	HR15T 1/16 in ball, 15 kg	HR30T 1/16 in ball, 30 kg	HR15W 1/8 in ball, 15 kg
160	189	91	–	–	89.0	77.0	95.0
155	183	90	–	–	89.0	76.0	95.0
150	177	89	–	–	89.0	75.0	94.0
145	171	87	–	–	88.0	74.0	94.0
140	165	86	–	–	88.0	73.0	94.0
135	159	84	–	–	87.0	71.0	93.0
130	153	81	–	–	87.0	70.0	93.0
125	147	79	–	–	86.0	68.0	92.0
120	141	76	–	–	86.0	67.0	92.0
115	135	72	101.0	–	86.0	65.0	91.0
110	129	69	100.0	–	85.0	63.0	91.0
105	123	65	99.0	–	84.0	61.0	91.0
100	117	60	98.0	–	83.0	59.0	90.0
95	111	56	96.0	–	82.0	57.0	90.0
90	105	51	94.0	108.0	81.0	54.0	89.0
85	98	46	91.0	107.0	80.0	52.0	89.0
80	92	40	88.0	106.0	78.0	50.0	88.0
75	86	34	84.0	104.0	76.0	47.0	87.0
70	80	28	80.0	102.0	74.0	44.0	86.0
65	74	–	75.0	100.0	72.0	–	85.0
60	68	–	70.0	97.0	70.0	–	83.0
55	62	–	65.0	94.0	67.0	–	82.0
50	56	–	59.0	91.0	64.0	–	80.0
45	50	–	53.0	87.0	62.0	–	79.0
40	44	–	46.0	83.0	59.0	–	77.0

Brinell: 10 mm ball, 500 kgf. Vickers 15 kgf.

Nickel and High-Nickel Alloys · ASTM E140 Table 3

HV 136° diamond pyramid	HBS 10 mm standard ball, 3000 kg	HRA Diamond (Brale), 60 kg	HRB 1/16 in ball, 100 kg	HRC Diamond (Brale), 150 kg	HRD Diamond (Brale), 100 kg	HRE 1/8 in ball, 100 kg	HRF 1/16 in ball, 60 kg	HRG 1/16 in ball, 150 kg	HRK 1/8 in ball, 150 kg	HR15N Diamond (N Brale), 15 kg	HR30N Diamond (N Brale), 30 kg	HR45N Diamond (N Brale), 45 kg	HR15T 1/16 in ball, 15 kg	HR30T 1/16 in ball, 30 kg	HR45T 1/16 in ball, 45 kg
513	(479)	75.5	–	50	63.0	–	–	–	–	85.5	68.0	54.5	–	–	–
481	450	74.5	–	48	61.5	–	–	–	–	84.5	66.5	52.5	–	–	–
452	425	73.5	–	46	60.0	–	–	–	–	83.5	64.5	50.0	–	–	–
427	403	72.5	–	44	58.5	–	–	–	–	82.5	63.0	47.5	–	–	–
404	382	71.5	–	42	57.0	–	–	–	–	81.5	61.0	45.5	–	–	–
382	363	70.5	–	40	55.5	–	–	–	–	80.5	59.5	43.0	–	–	–
362	346	69.5	–	38	54.0	–	–	–	–	79.5	58.0	41.0	–	–	–
344	329	68.5	–	36	52.5	–	–	–	–	78.5	56.0	38.5	–	–	–
326	313	67.5	–	34	50.5	–	–	–	–	77.5	54.5	36.0	–	–	–
309	298	66.5	(106)	32	49.5	–	(116.5)	94.0	–	76.5	52.5	34.0	94.5	85.5	77.0
285	275	64.5	(104)	28.5	46.5	–	(115.5)	91.0	–	75.0	49.5	30.0	94.0	84.5	75.0
266	258	63.0	(102)	25.5	44.5	–	(114.5)	87.5	–	73.5	47.0	26.5	93.0	83.0	73.0
248	241	61.5	100	22.5	42.0	–	(113.0)	84.5	–	72.0	44.5	23.0	92.5	81.5	71.0
234	228	60.5	98	20	40.0	–	(112.0)	81.5	–	70.5	42.0	20.0	92.0	80.5	69.0
220	215	59.0	96	(17)	38.0	–	(111.0)	78.5	100.0	69.0	39.5	17.0	91.0	79.0	67.0
209	204	57.5	94	(14.5)	36.0	–	(110.0)	75.5	98.0	68.0	37.5	14.0	90.5	77.5	65.0
198	194	56.5	92	(12)	34.0	–	(108.5)	72.0	96.5	66.5	35.5	11.0	89.5	76.0	63.0
188	184	55.0	90	(9)	32.0	(108.5)	(107.5)	69.0	94.5	65.0	32.5	7.5	89.0	75.0	61.0
179	176	53.5	88	(6.5)	30.0	(107.0)	(106.5)	65.5	93.0	64.0	30.5	5.0	88.0	73.5	59.5
171	168	52.5	86	(4)	28.0	(106.0)	(105.0)	62.5	91.0	62.5	28.5	2.0	87.5	72.0	57.5
164	161	51.5	84	(2)	26.5	(104.5)	(104.0)	59.5	89.0	61.5	26.5	–	87.0	70.5	55.5
157	155	50.0	82	–	24.5	(103.0)	(103.0)	56.5	87.5	–	–	–	86.0	69.5	53.5
151	149	49.0	80	–	22.5	(102.0)	(101.5)	53.0	85.5	–	–	–	85.5	68.0	51.5
145	144	47.5	78	–	21.0	(100.5)	(100.5)	50.0	83.5	–	–	–	84.5	66.5	49.5
140	139	46.5	76	–	(19.0)	99.5	99.5	47.0	82.0	–	–	–	84.0	65.5	47.5
135	134	45.5	74	–	(17.5)	98.0	98.5	43.5	80.0	–	–	–	83.0	64.0	45.5
130	129	44.0	72	–	(16.0)	97.0	97.0	40.5	78.0	–	–	–	82.5	62.5	43.5
126	125	43.0	70	–	(14.5)	95.5	96.0	37.5	76.5	–	–	–	82.0	61.0	41.5
122	121	42.0	68	–	(13.0)	94.5	95.0	34.5	74.5	–	–	–	81.0	60.0	39.5
119	118	41.0	66	–	(11.5)	93.0	93.5	31.0	72.5	–	–	–	80.5	58.5	37.5
115	114	40.0	64	–	(10.0)	91.5	92.5	–	71.0	–	–	–	79.5	57.0	35.5
112	111	39.0	62	–	(8.0)	90.5	91.5	–	69.0	–	–	–	79.0	56.0	33.5
108	108	–	60	–	–	89.0	90.0	–	67.5	–	–	–	78.5	54.5	31.5
106	106	–	58	–	–	88.0	89.0	–	65.5	–	–	–	77.5	53.0	29.5
103	103	–	56	–	–	86.5	88.0	–	63.5	–	–	–	77.0	51.5	27.5
100	100	–	54	–	–	85.5	87.0	–	62.0	–	–	–	76.0	50.5	25.5
98	98	–	52	–	–	84.0	85.5	–	60.0	–	–	–	75.5	49.0	23.5
95	95	–	50	–	–	83.0	84.5	–	58.0	–	–	–	74.5	47.5	21.5
93	93	–	48	–	–	81.5	83.5	–	56.5	–	–	–	74.0	46.5	19.5
91	91	–	46	–	–	80.5	82.0	–	54.5	–	–	–	73.5	45.0	17.0
89	89	–	44	–	–	79.0	81.0	–	52.5	–	–	–	72.5	43.5	14.5
87	87	–	42	–	–	78.0	80.0	–	51.0	–	–	–	72.0	42.0	12.5
85	85	–	40	–	–	76.5	79.0	–	49.0	–	–	–	71.0	41.0	10.0
83	83	–	38	–	–	75.0	77.5	–	47.0	–	–	–	70.5	39.5	7.5
81	81	–	36	–	–	74.0	76.5	–	45.5	–	–	–	70.0	38.0	5.5
79	79	–	34	–	–	72.5	75.5	–	43.5	–	–	–	69.0	36.5	3.0
78	78	–	32	–	–	71.5	74.0	–	42.0	–	–	–	68.5	35.5	1.0
77	77	–	30	–	–	70.0	73.0	–	40.0	–	–	–	67.5	34.0	–

Nickel content over 50 %, annealed to heavily cold-worked or age-hardened. Values in parentheses are beyond the ranges recommended for accuracy and are for comparison only. Vickers at 1, 5, 10 or 30 kgf.

Austenitic Stainless Steel Plate, Annealed · ASTM E140 Table 5

HRB 1/16 in ball, 100 kg	HBS 10 mm standard ball, 3000 kg
100	256
99	248
98	240
97	233
96	226
95	219
94	213
93	207
92	202
91	197
90	192
89	187
88	183
87	178
86	174
85	170
84	167
83	163
82	160
81	156
80	153
79	150
78	147
77	144
76	142
75	139
74	137
73	135
72	132
71	130
70	128
69	126
68	124
67	122
66	120
65	118
64	116
63	114
62	113
61	111
60	110

Brinell: 10 mm ball, 3000 kgf.

Alloyed White Irons · ASTM E140 Table 8

HV50 136° diamond pyramid, 50 kg	HBW 10 mm tungsten carbide ball, 3000 kg	HRC Diamond (Brale), 150 kg
1000	(903)	70
980	(886)	69
960	(868)	68
940	(850)	68
920	(833)	67
900	(815)	66
880	(798)	66
860	(780)	65
840	(762)	64
820	(745)	63
800	(727)	62
780	(710)	62
760	(692)	61
740	(674)	60
720	(657)	59
700	(639)	58
680	621	57
660	604	56
640	586	55
620	569	54
600	551	53
580	533	52
560	516	51
540	498	50
520	481	48
500	463	47
480	445	45
460	428	44
440	410	42
420	393	40
400	375	38
380	357	35

Brinell: 10 mm tungsten carbide ball. Values in parentheses are above the maximum hardness recommended by E10 and are for information only.

Nickel and High-Nickel Alloys, Vickers and Knoop · ASTM E140 Table 3 (continued)

HV 136° diamond pyramid	HK Knoop diamond, 500 g and over
382	436
362	413
344	392
326	372
309	352
285	325
266	304
248	283
234	267
220	251
209	239
198	226
188	215
171	195
164	187
157	179
151	173
145	166
140	160
135	154
130	149
126	144
122	140
119	136

Vickers at 1, 5, 10 or 30 kgf; Knoop at 500 and 1000 gf.

Cartridge Brass (70 % Copper, 30 % Zinc) · ASTM E140 Table 4

HV 136° diamond pyramid	HRB 1/16 in ball, 100 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	HB 10 mm ball, 500 kg
196	93.5	110.0	90.0	77.5	66.0	169
194	–	109.5	–	–	65.5	167
192	93	–	–	77.0	65.0	166
190	92.5	109.0	–	76.5	64.5	164
188	92	–	89.5	–	64.0	162
186	91.5	108.5	–	76.0	63.5	161
184	91	–	–	75.5	63.0	159
182	90.5	108.0	89.0	–	62.5	157
180	90	107.5	–	75.0	62.0	156
178	89	–	–	74.5	61.5	154
176	88.5	107.0	–	–	61.0	152
174	88	–	88.5	74.0	60.5	150
172	87.5	106.5	–	73.5	60.0	149
170	87	–	–	–	59.5	147
168	86	106.0	88.0	73.0	59.0	146
166	85.5	–	–	72.5	58.5	144
164	85	105.5	–	72.0	58.0	142
162	84	105.0	87.5	–	57.5	141
160	83.5	–	–	71.5	56.5	139
158	83	104.5	–	71.0	56.0	138
156	82	104.0	87.0	70.5	55.5	136
154	81.5	103.5	–	70.0	54.5	135
152	80.5	103.0	–	–	54.0	133
150	80	–	86.5	69.5	53.5	131
148	79	102.5	–	69.0	53.0	129
146	78	102.0	–	68.5	52.5	128
144	77.5	101.5	86.0	68.0	51.5	126
142	77	101.0	–	67.5	51.0	124
140	76	100.5	85.5	67.0	50.0	122
138	75	100.0	–	66.5	49.0	121
136	74.5	99.5	85.0	66.0	48.0	120
134	73.5	99.0	–	65.5	47.5	118
132	73	98.5	84.5	65.0	46.5	116
130	72	98.0	84.0	64.5	45.5	114
128	71	97.5	–	63.5	45.0	113
126	70	97.0	83.5	63.0	44.0	112
124	69	96.5	–	62.5	43.0	110
122	68	96.0	83.0	62.0	42.0	108
120	67	95.5	–	61.0	41.0	106
118	66	95.0	82.5	60.5	40.0	105
116	65	94.5	82.0	60.0	39.0	103
114	64	94.0	81.5	59.5	38.0	101
112	63	93.0	81.0	58.5	37.0	99
110	62	92.6	80.5	58.0	35.5	97
108	61	92.0	–	57.0	34.5	95
106	59.5	91.2	80.0	56.0	33.0	94
104	58	90.5	79.5	55.0	32.0	92
102	57	89.8	79.0	54.5	30.5	90
100	56	89.0	78.5	53.5	29.5	88
98	54	88.0	78.0	52.5	28.0	86
96	53	87.2	77.5	51.5	26.5	85
94	51	86.3	77.0	50.5	24.5	83
92	49.5	85.4	76.5	49.0	23.0	82
90	47.5	84.4	75.5	48.0	21.0	80
88	46	83.5	75.0	47.0	19.0	79
86	44	82.3	74.5	45.5	17.0	77
84	42	81.2	73.5	44.0	14.5	76
82	40	80.0	73.0	43.0	12.5	74
80	37.5	78.6	72.0	41.0	10.0	72
78	35	77.4	71.5	39.5	7.5	70
76	32.5	76.0	70.5	38.0	4.5	68
74	30	74.8	70.0	36.0	1.0	66
72	27.5	73.2	69.0	34.0	–	64
70	24.5	71.8	68.0	32.0	–	63
68	21.5	70.0	67.0	30.0	–	62
66	18.5	68.5	66.0	28.0	–	61
64	15.5	66.8	65.0	25.5	–	59
62	12.5	65.0	63.5	23.0	–	57
60	10	62.5	62.5	–	–	55
58	–	61.0	61.0	18.0	–	53
56	–	58.8	60.0	15.0	–	52
54	–	56.5	58.5	12.0	–	50
52	–	53.5	57.0	–	–	48
50	–	50.5	55.5	–	–	47
49	–	49.0	54.5	–	–	46
48	–	47.0	53.5	–	–	45
47	–	45.0	–	–	–	44
46	–	43.0	–	–	–	43
45	–	40.0	–	–	–	42

Brinell: 10 mm ball, 500 kgf.

Non-Austenitic Steels, Leeb (Type D) · ASTM E140-12b Table 10

HLD Type D impact device, rebound	HRC Diamond (Brale), 150 kg	HV 136° diamond pyramid	HBS 10 mm standard ball, 3000 kg
828	62	762	(721)
819	61	737	(699)
809	60	711	(675)
800	59	688	(654)
791	58	667	634
782	57	645	614
773	56	625	595
764	55	605	577
755	54	586	559
746	53	568	542
737	52	550	526
729	51	534	511
720	50	517	496
712	49	503	482
703	48	487	467
695	47	473	455
687	46	460	442
679	45	447	430
671	44	434	416
663	43	422	407
655	42	410	395
647	41	398	385
640	40	388	375
632	39	377	365
625	38	368	356
618	37	358	347
611	36	349	338
603	35	339	328
596	34	330	320
590	33	323	313
583	32	314	305
576	31	306	297
570	30	299	291
563	29	291	283
557	28	284	276
551	27	277	270
545	26	271	264
539	25	264	258
533	24	258	252
527	23	251	246
521	22	245	240
516	21	240	235
510	20	234	229

Leeb hardness with a type D impact device, Rockwell C 62 to 20. Table 10 carries its own Vickers and Brinell values, which differ slightly from Table 1. Brinell (10 mm steel ball, 3000 kgf) values in parentheses are outside the recommended range. Transcribed from a reproduction that cites E140-12b, and checked against the ASTM E140 block of the Proceq steel conversion chart.