

Hardness Conversion Table

(SAE J 417) [for steel]

Yamamoto Scientific Tool Laboratory

Rockwell	Vickers	Brinell HB 10/3000		Rockwell			Rockwell Superficial			Shore ⁽²⁾	Leeb ⁽³⁾		Tensile Strength (Approx.) Mpa	Rockwell
HRC	HV	HBS	HBW	HRA	HRB	HRD	HR15N	HR30N	HR45N	HS	HLD	HLE		HRC
Diamond 150kgf		Steel ball	Carbide ball	Diamond 60kgf	1/16" ball 100kgf	Diamond 100kgf	Diamond				Carbide	Diamond		Diamond 150kgf
							15kgf	30kgf	45kgf					
68	940	-	-	85.6	-	76.9	93.2	84.4	75.4	98.0	878	846	-	68
67	900	-	-	85.0	-	76.1	92.9	83.6	74.2	95.6	869	836	-	67
66	865	-	-	84.5	-	75.4	92.5	82.8	73.3	93.4	860	826	-	66
65	832	-	(739)	83.9	-	74.5	92.2	81.9	72.0	91.2	850	817	-	65
64	800	-	(722)	83.4	-	73.8	91.8	81.1	71.0	89.0	840	806	-	64
63	772	-	(705)	82.8	-	73.0	91.4	80.1	69.9	87.1	830	796	-	63
62	746	-	(688)	82.3	-	72.2	91.1	79.3	68.8	85.2	820	786	-	62
61	720	-	(670)	81.8	-	71.5	90.7	78.4	67.7	83.3	810	776	-	61
60	697	-	(654)	81.2	-	70.7	90.2	77.5	66.6	81.5	800	766	-	60
59	674	-	(634)	80.7	-	69.9	89.8	76.6	65.5	79.7	790	755	-	59
58	653	-	615	80.1	-	69.2	89.3	75.7	64.3	78.1	781	746	-	58
57	633	-	595	79.6	-	68.5	88.9	74.8	63.2	76.4	771	736	-	57
56	613	-	577	79.0	-	67.7	88.3	73.9	62.0	74.8	762	726	-	56
55	595	-	560	78.5	-	66.9	87.9	73.0	60.9	73.2	753	717	2075	55
54	577	-	543	78.0	-	66.1	87.4	72.0	59.8	71.7	744	708	2015	54
53	560	-	525	77.4	-	65.4	86.9	71.2	58.6	70.2	735	699	1950	53
52	544	(500)	512	76.8	-	64.6	86.4	70.2	57.4	68.8	727	691	1880	52
51	528	(487)	496	76.3	-	63.8	85.9	69.4	56.1	67.3	719	683	1820	51
50	513	(475)	481	75.9	-	63.1	85.5	68.5	55.0	65.9	711	675	1760	50
49	498	(464)	469	75.2	-	62.1	85.0	67.6	53.8	64.5	703	667	1695	49
48	484	451	455	74.7	-	61.4	84.5	66.7	52.5	63.1	695	659	1635	48
47	471	442	443	74.1	-	60.8	83.9	65.8	51.4	61.9	688	652	1580	47
46	458	432	432	73.6	-	60.0	83.5	64.8	50.3	60.6	681	645	1530	46
45	446	421	421	73.1	-	59.2	83.0	64.0	49.0	59.4	674	639	1480	45
44	434	409	409	72.5	-	58.5	82.5	63.1	47.8	58.2	668	632	1435	44
43	423	400	400	72.0	-	57.7	82.0	62.2	46.7	57.1	661	626	1385	43
42	412	390	390	71.5	-	56.9	81.5	61.3	45.5	55.9	655	620	1340	42
41	402	381	381	70.9	-	56.2	80.9	60.4	44.3	54.9	649	614	1295	41
40	392	371	371	70.4	-	55.4	80.4	59.5	43.1	53.8	643	608	1250	40
39	382	362	362	69.9	-	54.6	79.9	58.6	41.9	52.7	636	602	1215	39
38	372	353	353	69.4	-	53.8	79.4	57.7	40.8	51.6	630	596	1180	38
37	363	344	344	68.9	-	53.1	78.8	56.8	39.6	50.6	624	591	1160	37
36	354	336	336	68.4	(109.0)	52.3	78.3	55.9	38.4	49.6	618	585	1115	36
35	345	327	327	67.9	(108.5)	51.5	77.7	55.0	37.2	48.6	612	579	1080	35
34	336	319	319	67.4	(108.0)	50.8	77.2	54.2	36.1	47.6	605	573	1055	34
33	327	311	311	66.8	(107.5)	50.0	76.6	53.3	34.9	46.6	599	567	1025	33
32	318	301	301	66.3	(107.0)	49.2	76.1	52.1	33.7	45.5	592	561	1000	32
31	310	294	294	65.8	(106.0)	48.4	75.6	51.3	32.5	44.6	586	555	980	31
30	302	286	286	65.3	(105.5)	47.7	75.0	50.4	31.3	43.6	579	549	950	30
29	294	279	279	64.7	(104.5)	47.0	74.5	49.5	30.1	42.7	572	543	930	29
28	286	271	271	64.3	(104.0)	46.1	73.9	48.6	28.9	41.7	566	537	910	28
27	279	264	264	63.8	(103.0)	45.2	73.3	47.7	27.8	40.9	559	531	880	27
26	272	258	258	63.3	(102.5)	44.6	72.8	46.8	26.7	40.0	553	525	860	26
25	266	253	253	62.8	(101.5)	43.8	72.2	45.9	25.5	39.3	548	520	840	25
24	260	247	247	62.4	(101.0)	43.1	71.6	45.0	24.3	38.5	542	515	825	24
23	254	243	243	62.0	100.0	42.1	71.0	44.0	23.1	37.7	536	509	805	23
22	248	237	237	61.5	99.0	41.6	70.5	43.2	22.0	37.0	530	504	785	22
21	243	231	231	61.0	98.5	40.9	69.9	42.3	20.7	36.4	525	499	770	21
20	238	226	226	60.5	97.8	40.1	69.4	41.5	19.6	35.7	519	494	760	20
(18)	230	219	219	-	96.7	-	-	-	-	34.7	510	486	730	(18)
(16)	222	212	212	-	95.5	-	-	-	-	33.6	501	478	705	(16)
(14)	213	203	203	-	93.9	-	-	-	-	32.4	490	468	675	(14)
(12)	204	194	194	-	92.3	-	-	-	-	31.2	479	458	650	(12)
(10)	196	187	187	-	90.7	-	-	-	-	30.2	469	448	620	(10)
(8)	188	179	179	-	89.5	-	-	-	-	-	-	-	600	(8)
(6)	180	171	171	-	87.1	-	-	-	-	-	-	-	580	(6)
(4)	173	165	165	-	85.5	-	-	-	-	-	-	-	550	(4)
(2)	166	158	158	-	83.5	-	-	-	-	-	-	-	530	(2)
(0)	160	152	152	-	81.7	-	-	-	-	-	-	-	515	(0)

(1) This table is edited fundamentally based on ASTM E 140. Number in the parenthesis is the Value of the range that it isn't usually used.

(2) Shore hardness is based on JIS B 7731-1993(HV-HS Conversion).

(3) HLD and HLE values are based on the 5th degree equation of 2015 revised edition Roll Hardness Committee of MTRAJ (SK5 φ115x133 block, HV-HL conversion)

(4) Approx. tensile strength is referred to the tables of JIS Z 8413 and Z 8438. (These standards were abolished in 1993.)

(5)but a conversion table just indicates approximate values for convenient use, therefore judging product quality by conversion value should be forbidden. The important values such like that should be taken from the test by the test machine of the purpose itself. (Takeo Yoshizawa, "Hardness Test and Applications" p.291, SHOKA-BO)