

Fractions to 1" in 64ths, and 1" to 3" in 16ths. Thou = 0.001" = 0.0254 mm. Quick sums: 1/64" = 0.40 mm, 1/32" = 0.79 mm, 1/16" = 1.59 mm, 1/8" = 3.18 mm, 1/4" = 6.35 mm.

Fractions to decimals and mm

Inch	Decimal in	mm
1/64"	0.0156	0.397
1/32"	0.0312	0.794
3/64"	0.0469	1.191
1/16"	0.0625	1.587
5/64"	0.0781	1.984
3/32"	0.0938	2.381
7/64"	0.1094	2.778
1/8"	0.1250	3.175
9/64"	0.1406	3.572
5/32"	0.1562	3.969
11/64"	0.1719	4.366
3/16"	0.1875	4.762
13/64"	0.2031	5.159
7/32"	0.2188	5.556
15/64"	0.2344	5.953
1/4"	0.2500	6.350
17/64"	0.2656	6.747
9/32"	0.2812	7.144
19/64"	0.2969	7.541
5/16"	0.3125	7.938
21/64"	0.3281	8.334
11/32"	0.3438	8.731
23/64"	0.3594	9.128
3/8"	0.3750	9.525
25/64"	0.3906	9.922
13/32"	0.4062	10.319
27/64"	0.4219	10.716
7/16"	0.4375	11.112
29/64"	0.4531	11.509
15/32"	0.4688	11.906
31/64"	0.4844	12.303
1/2"	0.5000	12.700

Inch	Decimal in	mm
33/64"	0.5156	13.097
17/32"	0.5312	13.494
35/64"	0.5469	13.891
9/16"	0.5625	14.287
37/64"	0.5781	14.684
19/32"	0.5938	15.081
39/64"	0.6094	15.478
5/8"	0.6250	15.875
41/64"	0.6406	16.272
21/32"	0.6562	16.669
43/64"	0.6719	17.066
11/16"	0.6875	17.462
45/64"	0.7031	17.859
23/32"	0.7188	18.256
47/64"	0.7344	18.653
3/4"	0.7500	19.050
49/64"	0.7656	19.447
25/32"	0.7812	19.844
51/64"	0.7969	20.241
13/16"	0.8125	20.637
53/64"	0.8281	21.034
27/32"	0.8438	21.431
55/64"	0.8594	21.828
7/8"	0.8750	22.225
57/64"	0.8906	22.622
29/32"	0.9062	23.019
59/64"	0.9219	23.416
15/16"	0.9375	23.812
61/64"	0.9531	24.209
31/32"	0.9688	24.606
63/64"	0.9844	25.003
1"	1.0000	25.400

Inch	Decimal in	mm
1-1/16"	1.0625	26.987
1-1/8"	1.1250	28.575
1-3/16"	1.1875	30.162
1-1/4"	1.2500	31.750
1-5/16"	1.3125	33.337
1-3/8"	1.3750	34.925
1-7/16"	1.4375	36.512
1-1/2"	1.5000	38.100
1-9/16"	1.5625	39.688
1-5/8"	1.6250	41.275
1-11/16"	1.6875	42.862
1-3/4"	1.7500	44.450
1-13/16"	1.8125	46.037
1-7/8"	1.8750	47.625
1-15/16"	1.9375	49.212
2"	2.0000	50.800
2-1/16"	2.0625	52.387
2-1/8"	2.1250	53.975
2-3/16"	2.1875	55.562
2-1/4"	2.2500	57.150
2-5/16"	2.3125	58.737
2-3/8"	2.3750	60.325
2-7/16"	2.4375	61.912
2-1/2"	2.5000	63.500
2-9/16"	2.5625	65.087
2-5/8"	2.6250	66.675
2-11/16"	2.6875	68.263
2-3/4"	2.7500	69.850
2-13/16"	2.8125	71.438
2-7/8"	2.8750	73.025
2-15/16"	2.9375	74.612
3"	3.0000	76.200

Millimetres to inches

mm	inch	mm	inch	mm	inch	mm	inch
1	0.0394	26	1.0236	51	2.0079	76	2.9921
2	0.0787	27	1.0630	52	2.0472	77	3.0315
3	0.1181	28	1.1024	53	2.0866	78	3.0709
4	0.1575	29	1.1417	54	2.1260	79	3.1102
5	0.1969	30	1.1811	55	2.1654	80	3.1496
6	0.2362	31	1.2205	56	2.2047	81	3.1890
7	0.2756	32	1.2598	57	2.2441	82	3.2283
8	0.3150	33	1.2992	58	2.2835	83	3.2677
9	0.3543	34	1.3386	59	2.3228	84	3.3071
10	0.3937	35	1.3780	60	2.3622	85	3.3465
11	0.4331	36	1.4173	61	2.4016	86	3.3858
12	0.4724	37	1.4567	62	2.4409	87	3.4252
13	0.5118	38	1.4961	63	2.4803	88	3.4646
14	0.5512	39	1.5354	64	2.5197	89	3.5039
15	0.5906	40	1.5748	65	2.5591	90	3.5433
16	0.6299	41	1.6142	66	2.5984	91	3.5827
17	0.6693	42	1.6535	67	2.6378	92	3.6220
18	0.7087	43	1.6929	68	2.6772	93	3.6614
19	0.7480	44	1.7323	69	2.7165	94	3.7008
20	0.7874	45	1.7717	70	2.7559	95	3.7402
21	0.8268	46	1.8110	71	2.7953	96	3.7795
22	0.8661	47	1.8504	72	2.8346	97	3.8189
23	0.9055	48	1.8898	73	2.8740	98	3.8583
24	0.9449	49	1.9291	74	2.9134	99	3.8976
25	0.9843	50	1.9685	75	2.9528	100	3.9370

Engineering units

Quantity	From	To	Multiply by	Back: multiply by
Length	inch	mm	25.4	0.03937
	thou (0.001 in)	micron (µm)	25.4	0.03937
	foot	metre	0.3048	3.2808
	mile	km	1.6093	0.6214
Area	sq inch	mm2	645.16	0.00155
	sq foot	m2	0.0929	10.764
Volume	cu inch	cm3 (cc)	16.387	0.06102
	UK gallon	litre	4.5461	0.2200
	US gallon	litre	3.7854	0.2642
Mass	ounce (oz)	gram	28.350	0.03527
	pound (lb)	kg	0.45359	2.2046
	short ton (US)	tonne	0.90718	1.1023
Force	long ton (UK)	tonne	1.0160	0.9842
	kgf	newton (N)	9.8067	0.10197
	lbf	newton (N)	4.4482	0.22481
Pressure	tonne-force	kN	9.8067	0.10197
	bar	psi	14.504	0.06895
	bar	kPa	100	0.01
	kgf/cm2	bar	0.98067	1.0197
Stress	atmosphere	bar	1.01325	0.98692
	N/mm2	MPa	1	1
	ksi	MPa	6.8948	0.14504
	kgf/mm2	MPa	9.8067	0.10197
Torque	ton/in2 (UK)	MPa	15.444	0.06475
	ft-lbf	Nm	1.3558	0.73756
	in-lbf	Nm	0.11298	8.8507
	kgf-m	Nm	9.8067	0.10197
Power	hp (UK / US)	kW	0.7457	1.3410
	PS (metric hp)	kW	0.7355	1.3596
Speed	ft/min (sfm)	m/min	0.3048	3.2808
	inch/rev (ipr)	mm/rev	25.4	0.03937
	mph	km/h	1.6093	0.6214
Flow	US gal/min	litre/min	3.7854	0.2642
	cfm (ft3/min)	litre/min	28.317	0.03531
Energy	BTU	kJ	1.0551	0.9478
	kWh	MJ	3.6	0.2778

mm	inch	thou
0.01	0.0004	0.4
0.02	0.0008	0.8
0.05	0.0020	2.0
0.1	0.0039	3.9
0.2	0.0079	7.9
0.25	0.0098	9.8
0.3	0.0118	11.8
0.4	0.0157	15.7
0.5	0.0197	19.7
0.6	0.0236	23.6
0.7	0.0276	27.6
0.75	0.0295	29.5
0.8	0.0315	31.5
0.9	0.0354	35.4

Engineering Conversion Chart

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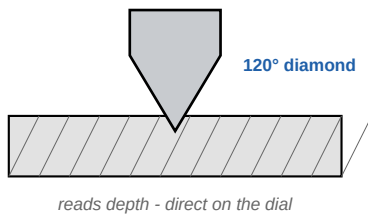
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Hardness scales and conversions for steel, typical material hardness, temperature.

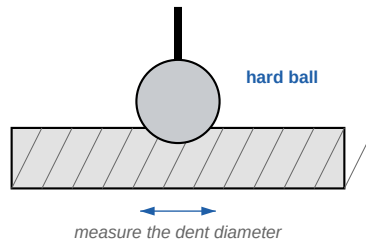
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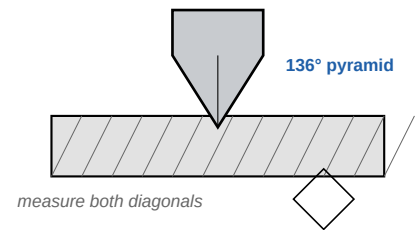
Rockwell C (HRC) / HRA



Brinell (HB) / Rockwell B



Vickers (HV)



Hardness conversion (steel, approximate)

Rockwell	Vickers HV	Brinell HB	Tensile MPa (approx)
68 HRC	940	-	-
66 HRC	865	-	-
64 HRC	800	722	-
62 HRC	746	688	-
60 HRC	697	654	-
58 HRC	653	615	2330
56 HRC	613	577	2160
55 HRC	595	560	2080
54 HRC	577	543	2010
52 HRC	544	512	1880
50 HRC	513	481	1760
48 HRC	484	455	1640
46 HRC	458	432	1520
45 HRC	446	421	1480
44 HRC	434	409	1430
42 HRC	412	390	1340
40 HRC	392	371	1250
38 HRC	372	353	1180
36 HRC	354	336	1110
35 HRC	345	327	1080
34 HRC	336	319	1050

Rockwell	Vickers HV	Brinell HB	Tensile MPa (approx)
32 HRC	318	301	1000
30 HRC	302	286	940
28 HRC	286	271	890
26 HRC	272	258	840
25 HRC	266	253	820
24 HRC	260	247	800
22 HRC	248	237	770
20 HRC	238	226	720
100 HRB	240	240	800
98 HRB	228	228	760
95 HRB	210	210	700
92 HRB	195	195	650
90 HRB	185	185	620
88 HRB	176	176	590
85 HRB	165	163	550
82 HRB	155	153	510
80 HRB	150	146	490
75 HRB	135	133	450
70 HRB	125	121	410
65 HRB	115	111	380
60 HRB	106	105	350

Scale	Indenter and load	Use it for
HRC	120° diamond cone, 150 kgf	Hardened steel and tool steel, 20 - 68 HRC
HRB	1/16" ball, 100 kgf	Soft steel, brass, aluminium, 20 - 100 HRB
HB	10 mm ball, 3000 kgf (500 kgf soft metals)	Castings, forgings, plate - large average reading
HV	136° diamond pyramid, 1 - 100 kgf	Everything, thin sheet and case-hardened skins (low loads)
HRA	120° diamond cone, 60 kgf	Carbide and very hard thin parts

Typical hardness and temperature

Material	Typical hardness
Aluminium alloy 6082-T6	95 - 100 HB
Brass CZ121 (free cutting)	100 - 160 HV
Mild steel (S275, EN1A)	120 - 160 HB
EN8 / 080M40 as rolled	180 - 220 HB
EN19 / 4140 hardened and tempered (T)	270 - 330 HB (28 - 35 HRC)
EN24T / 4340	250 - 300 HB
Hardox 400 / AR400 plate	370 - 430 HB
Grey cast iron	180 - 240 HB
Spring steel, tempered	42 - 50 HRC
Saw blade, chisel, punch	52 - 58 HRC
Tool steel hardened (O1, D2)	58 - 62 HRC
Files	62 - 65 HRC
HSS drills and taps	63 - 66 HRC
Tungsten carbide	1300 - 1800 HV (about 88 - 93 HRA)

°C	°F	°C	°F
-40	-40	350	662
-20	-4	400	752
-10	14	450	842
0	32	500	932
10	50	550	1022
20	68	600	1112
30	86	650	1202
40	104	700	1292
50	122	750	1382
60	140	800	1472
70	158	850	1562
80	176	900	1652
90	194	950	1742
100	212	1000	1832
120	248	1100	2012
150	302	1200	2192
180	356	1300	2372
200	392	1400	2552
250	482	1500	2732
300	572		