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Approximate conversion values against Rockwell C hardness of steel materials¹⁾

Rockwell C scale hardness ²⁾	Pickers hardness (DPH)	Brinell hardness 100 mm ball, load 3000 kgf			Rockwell hardness ²⁾			Rockwell special hardness special brake indenter			Shore hardness	Tensile strength kgf/mm ² Approx. value	Rockwell C scale hardness ²⁾
		Standard ball	Hultgren ball	Tungsten carbide ball	A scale Load 60kgf brale indenter	B scale Load 100 kgf dia. 1/16in. ball	D-scale Load 100 kgf brale indenter	15-N scale Load 15 kgfkgf	30-N scale Load 30 kgf	45-N scale load 45 kgf			
68	940	—	—	—	85.6	—	76.9	93.2	84.4	75.4	97	—	68
67	900	—	—	—	85.0	—	76.1	92.9	83.6	74.2	95	—	67
66	865	—	—	—	84.5	—	75.4	92.5	82.8	73.3	92	—	66
65	832	—	—	739	83.9	—	74.5	92.2	81.9	72.0	91	—	65
64	800	—	—	722	83.4	—	73.8	91.8	81.1	71.0	88	—	64
63	772	—	—	705	82.8	—	73.0	91.4	80.1	69.9	87	—	63
62	746	—	—	688	82.3	—	72.2	91.1	79.3	68.8	85	—	62
61	720	—	—	670	81.8	—	71.5	90.7	78.4	67.7	83	—	61
60	697	—	613	654	81.2	—	70.7	90.2	77.5	66.6	81	—	60
59	674	—	599	634	80.7	—	69.9	89.8	76.6	65.5	80	—	59
58	653	—	587	615	80.1	—	69.2	89.3	75.7	64.3	78	—	58
57	633	—	575	595	79.6	—	68.5	88.9	74.8	63.2	76	—	57
56	613	—	561	577	79.0	—	67.7	88.3	73.9	62.0	75	—	56
55	595	—	546	560	78.5	—	66.9	87.9	73.0	60.9	74	212	55
54	577	—	534	543	78.0	—	66.1	87.4	72.0	59.8	72	205	54
53	560	—	519	525	77.4	—	65.4	86.9	71.2	58.6	71	199	53
52	544	500	508	512	76.8	—	64.6	86.4	70.2	57.4	69	192	52
51	528	487	494	496	76.3	—	63.8	85.9	69.4	56.1	68	186	51
50	513	475	481	481	75.9	—	63.1	85.5	68.5	55.0	67	179	50
49	498	464	469	469	75.2	—	62.1	85.0	67.6	53.8	66	172	49
48	484	451	455	455	74.7	—	61.4	84.5	66.7	52.5	64	167	48
47	471	442	443	443	74.1	—	60.8	83.9	65.8	51.4	63	161	47
46	458	432	432	432	73.6	—	60.0	83.5	64.8	50.3	62	156	46
45	446	421	421	421	73.1	—	59.2	83.0	64.0	49.0	60	151	45
44	434	409	409	409	72.5	—	58.5	82.5	63.1	47.8	58	146	44
43	423	400	400	400	72.0	—	57.7	82.0	62.2	46.7	57	141	43
42	412	390	390	390	71.5	—	56.9	81.5	61.3	45.5	56	136	42
41	402	381	381	381	70.9	—	56.2	80.9	60.4	44.3	55	132	41
40	392	371	371	371	70.4	—	55.4	80.4	59.5	43.1	54	127	40
39	382	362	362	362	69.9	—	54.6	79.9	58.6	41.9	52	124	39
38	372	353	353	353	69.4	—	53.8	79.4	57.7	40.8	51	120	38
37	363	344	344	344	68.9	—	53.1	78.8	56.8	39.6	50	118	37
36	354	336	336	336	68.4	(109.0)	52.3	78.3	55.9	38.4	49	114	36
35	345	327	327	327	67.9	(108.5)	51.5	77.7	55.0	37.2	48	110	35
34	336	319	319	319	67.4	(108.0)	50.8	77.2	54.2	36.1	47	108	34
33	327	311	311	311	66.8	(107.5)	50.0	76.6	53.3	34.9	46	105	33
32	318	301	301	301	66.3	(107.0)	49.2	76.1	52.1	33.7	44	102	32
31	310	294	294	294	65.8	(106.0)	48.4	75.6	51.3	32.5	43	100	31
30	302	286	286	286	65.3	(105.5)	47.7	75.0	50.4	31.3	42	97	30
29	294	279	279	279	64.7	(104.5)	47.0	74.5	49.5	30.1	41	95	29
28	286	271	271	271	64.3	(104.0)	46.1	73.9	48.6	28.9	41	93	28
27	279	264	264	264	63.8	(103.0)	45.2	73.3	47.7	27.8	40	90	27
26	272	258	258	258	63.3	(102.5)	44.6	72.8	46.8	26.7	38	88	26
25	266	253	253	253	62.8	(101.5)	43.8	72.2	45.9	25.5	38	86	25
24	260	247	247	247	62.4	(101.0)	43.1	71.6	45.0	24.3	37	84	24
23	254	243	243	243	62.0	100.0	42.1	71.0	44.0	23.1	36	82	23
22	248	237	237	237	61.5	99.0	41.6	70.5	43.2	22.0	35	80	22
21	243	231	231	231	61.0	98.5	40.9	69.9	42.3	20.7	35	79	21
20	238	226	226	226	60.5	97.8	40.1	69.4	41.5	19.6	34	77	20
(18)	230	219	219	219	—	96.7	—	—	—	—	33	75	(18)
(16)	222	212	212	212	—	95.5	—	—	—	—	32	72	(16)
(14)	213	203	203	203	—	93.9	—	—	—	—	31	69	(14)
(12)	204	194	194	194	—	92.3	—	—	—	—	29	66	(12)
(10)	196	187	187	187	—	90.7	—	—	—	—	28	63	(10)
(8)	188	179	179	179	—	89.5	—	—	—	—	27	61	(8)
(6)	180	171	171	171	—	87.1	—	—	—	—	26	59	(6)
(4)	173	165	165	165	—	85.5	—	—	—	—	25	56	(4)
(2)	166	158	158	158	—	83.5	—	—	—	—	24	54	(2)
(0)	160	152	152	152	—	81.7	—	—	—	—	24	53	(0)

Note 1) Approximate values were determined from SAE J 417.

2) Some of the parenthesized values in the above table are not used so frequently.

°C-°F temperature conversion table

°C		F	°C		F	°C		F	°C		F
-73	-100	-148	-1.6	29	84.2	17.7	64	147.2	37.1	99	210.2
-62	- 80	-112	-1.1	30	86.0	18.2	65	149.0	37.7	100	212
-51	- 60	- 76	-0.6	31	87.8	18.8	66	150.8	40.6	105	221
-40	- 40	- 40	0	32	89.6	19.3	67	152.6	43	110	230
-29	- 20	- 4	0.5	33	91.4	19.9	68	154.4	49	120	248
-23.3	- 10	14	1.1	34	93.2	20.4	69	156.2	54	130	266
-17.7	0	32	1.6	35	95.0	21.0	70	158.0	60	140	284
-17.2	1	33.8	2.2	36	96.8	21.5	71	159.8	65	150	302
-16.6	2	35.6	2.7	37	98.6	22.2	72	161.6	71	160	320
-16.1	3	37.4	3.3	38	100.4	22.7	73	163.4	76	170	338
-15.5	4	39.2	3.8	39	102.2	23.3	74	165.2	83	180	356
-15.0	5	41.0	4.4	40	104.0	23.8	75	167.0	88	190	374
-14.4	6	42.8	4.9	41	105.8	24.4	76	168.8	93	200	392
-13.9	7	44.6	5.4	42	107.6	25.0	77	170.6	121	250	482
-13.3	8	46.4	6.0	43	109.4	25.5	78	172.4	149	300	572
-12.7	9	48.2	6.6	44	111.2	26.2	79	174.2	177	350	662
-12.2	10	50.0	7.1	45	113.0	26.8	80	176.0	204	400	752
-11.6	11	51.8	7.7	46	114.8	27.3	81	177.8	232	450	842
-11.1	12	53.6	8.2	47	116.6	27.7	82	179.6	260	500	932
-10.5	13	55.4	8.8	48	118.4	28.2	83	181.4	288	550	1 022
-10.0	14	57.2	9.3	49	120.2	28.8	84	183.2	315	600	1 112
- 9.4	15	59.0	9.9	50	122.0	29.3	85	185.0	343	650	1 202
- 8.8	16	61.8	10.4	51	123.8	29.9	86	186.8	371	700	1 292
- 8.3	17	63.6	11.1	52	125.6	30.4	87	188.6	399	750	1 382
- 7.7	18	65.4	11.5	53	127.4	31.0	88	190.4	426	800	1 472
- 7.2	19	67.2	12.1	54	129.2	31.5	89	192.2	454	850	1 562
- 6.6	20	68.0	12.6	55	131.0	32.1	90	194.0	482	900	1 652
- 6.1	21	69.8	13.2	56	132.8	32.6	91	195.8	510	950	1 742
- 5.5	22	71.6	13.7	57	134.6	33.3	92	197.6	538	1 000	1 832
- 5.0	23	73.4	14.3	58	136.4	33.8	93	199.4	593	1 100	2 012
- 4.4	24	75.2	14.8	59	138.2	34.4	94	201.2	648	1 200	2 192
- 3.9	25	77.0	15.6	60	140.0	34.9	95	203.0	704	1 300	2 372
- 3.3	26	78.8	16.1	61	141.8	35.5	96	204.8	760	1 400	2 552
- 2.8	27	80.6	16.6	62	143.6	36.1	97	206.6	815	1 500	2 732
- 2.2	28	82.4	17.1	63	145.4	36.6	98	208.4	871	1 600	2 937

(How to read this table)

For example, for conversion from 38°C to °F read 38 in 4th row box (10th line from the top) and then read the right-side °F box. 38°C is equivalent to 100.4°F upon reading. Furthermore, for conversion from 38°F to °C read the left-side °C box.

°F38 is equivalent to 3.3°C upon reading.

$$C = 5/9(F - 32)$$

$$F = 9/5C + 32$$

Approximate conversion values against Vickers hardness of steel materials¹⁾

Vickers hardness (DPH)	Brinell hardness 10 mm ball, load 3000 kgf			Rockwell hardness ²⁾				Rockwell special hardness special brake indenter			Shore hardness	Tensile strength kgf/mm ² Approx. value	Vickers hardness Load 50kgf
	Standard ball	Hultgren ball	Tungsten carbide ball	A scale Load 60 kgf brale indenter	B scale Load 100 kgf dia. 1/16in. ball	C-scale Load 150 kgf brale indenter	D-scale Load 100 kgf brale indenter	15-N scale Load 15 kgf	30-N scale Load 30 kgf	45-N scale load 45 kgf			
940	—	—	—	85.6	—	68.0	76.9	93.2	84.4	75.4	97	—	940
920	—	—	—	85.3	—	67.5	76.5	93.0	84.0	74.8	96	—	920
900	—	—	—	85.0	—	67.0	76.1	92.9	83.6	74.2	95	—	900
880	—	—	767	84.7	—	66.4	75.7	92.7	83.1	73.6	93	—	880
860	—	—	757	84.4	—	65.9	75.3	92.5	82.7	73.1	92	—	860
840	—	—	745	84.1	—	65.3	74.8	92.3	82.2	72.2	91	—	840
820	—	—	733	83.8	—	64.7	74.3	92.1	81.7	71.8	90	—	820
800	—	—	722	83.4	—	64.0	73.8	91.8	81.1	71.0	88	—	800
780	—	—	710	83.0	—	63.3	73.3	91.5	80.4	70.2	87	—	780
760	—	—	698	82.6	—	62.5	72.6	91.2	79.7	69.4	86	—	760
740	—	—	684	82.2	—	61.8	72.1	91.0	79.1	68.6	84	—	740
720	—	—	670	81.8	—	61.0	71.5	90.7	78.4	67.7	83	—	720
700	—	615	656	81.3	—	60.1	70.8	90.3	77.6	66.7	81	—	700
690	—	610	647	81.1	—	59.7	70.5	90.1	77.2	66.2	—	—	690
680	—	603	638	80.8	—	59.2	70.1	89.8	76.8	65.7	80	—	680
670	—	597	630	80.5	—	58.8	69.8	89.7	76.4	65.3	—	—	670
660	—	590	620	80.3	—	58.3	69.4	89.5	75.9	64.7	79	—	660
650	—	585	611	80.0	—	57.8	69.0	89.2	75.5	64.1	—	—	650
640	—	578	601	79.8	—	57.3	68.7	89.0	75.1	63.5	77	—	640
630	—	571	591	79.5	—	56.8	68.3	88.8	74.6	63.0	—	—	630
620	—	564	582	79.2	—	56.3	67.9	88.5	74.2	62.4	75	—	620
610	—	557	573	78.9	—	55.7	67.5	88.2	73.6	61.7	—	—	610
600	—	550	564	78.6	—	55.2	67.0	88.0	73.2	61.2	74	—	600
590	—	542	554	78.4	—	54.7	66.7	87.8	72.7	60.5	—	210	590
580	—	535	545	78.0	—	54.1	66.2	87.5	72.1	59.9	72	206	580
570	—	527	535	77.8	—	53.6	65.8	87.2	71.7	59.3	—	202	570
560	—	519	525	77.4	—	53.0	65.4	86.9	71.2	58.6	71	199	560
550	505	512	517	77.0	—	52.3	64.8	86.6	70.5	57.8	—	195	550
540	496	503	507	76.7	—	51.7	64.4	86.3	70.0	57.0	69	190	540
530	488	495	497	76.4	—	51.1	63.9	86.0	69.5	56.2	—	186	530
520	480	487	488	76.1	—	50.5	63.5	85.7	69.0	55.6	67	183	520
510	473	479	479	75.7	—	49.8	62.9	85.4	68.3	54.7	—	179	510
500	465	471	471	75.3	—	49.1	62.2	85.0	67.7	53.9	66	174	500
490	456	460	460	74.9	—	48.4	61.6	84.7	67.1	53.1	—	169	490
480	448	452	452	74.5	—	47.7	61.3	84.3	66.4	52.2	64	165	480
470	441	442	442	74.1	—	46.9	60.7	83.9	65.7	51.3	—	160	470
460	433	433	433	73.6	—	46.1	60.1	83.6	64.9	50.4	62	156	460
450	425	425	425	73.3	—	45.3	59.4	83.2	64.3	49.4	—	153	450
440	415	415	415	72.8	—	44.5	58.8	82.8	63.5	48.4	59	149	440
430	405	405	405	72.3	—	43.6	58.2	82.3	62.7	47.4	—	144	430
420	397	397	397	71.8	—	42.7	57.5	81.8	61.9	46.4	57	140	420
410	388	388	388	71.4	—	41.8	56.8	81.4	61.1	45.3	—	136	410
400	379	379	379	70.8	—	40.8	56.0	81.0	60.2	44.1	55	131	400
390	369	369	369	70.3	—	39.8	55.2	80.3	59.3	42.9	—	127	390
380	360	360	360	69.8	(110.0)	38.8	54.4	79.8	58.4	41.7	52	123	380

continued

Vickers hardness (DPH)	Brinell hardness 10 mm ball, load 3000 kgf			Rockwell hardness ²⁾				Rockwell special hardness special brake indenter			Shore hardness	Tensile strength kgf/mm ² Approx. value	Vickers hardness Load 50kgf
	Standard ball	Hultgren ball	Tungsten carbide ball	A scale Load 60 kgf brale indenter	B scale Load 100 kgf dia. 1/16in. ball	C-scale Load 150 kgf brale indenter	D-scale Load 100 kgf brale indenter	15-N scale Load 15 kgf	30-N scale Load 30 kgf	45-N scale load 45 kgf			
370	350	350	350	69.2	—	37.7	53.6	79.2	57.4	40.4	—	120	370
360	341	341	341	68.7	(109.0)	36.6	52.8	78.6	56.4	39.1	50	115	360
350	331	331	331	68.1	—	35.5	51.9	78.0	55.4	37.8	—	112	350
340	322	322	322	67.6	(108.0)	34.4	51.1	77.4	54.4	36.5	47	109	340
330	313	313	313	67.0	—	33.3	50.2	76.8	53.6	35.2	—	105	330
320	303	303	303	66.4	(107.0)	32.2	49.4	76.2	52.3	33.9	45	103	320
310	294	294	294	65.8	—	31.0	48.4	75.6	51.3	32.5	—	100	310
300	284	284	284	65.2	(105.5)	29.8	47.5	74.9	50.2	31.1	42	97	300
295	280	280	280	64.8	—	29.2	47.1	74.6	49.7	30.4	—	96	295
290	275	275	275	64.5	(104.5)	28.5	46.5	74.2	49.0	29.5	41	94	290
285	270	270	270	64.2	—	27.8	46.0	73.8	48.4	28.7	—	92	285
280	265	265	265	63.8	(103.5)	27.1	45.3	73.4	47.8	27.9	40	91	280
275	261	261	261	63.5	—	26.4	44.9	73.0	47.2	27.1	—	89	275
270	256	256	256	63.1	(102.0)	25.6	44.3	72.6	46.4	26.2	38	87	270
265	252	252	252	62.7	—	24.8	43.7	72.1	45.7	25.2	—	86	265
260	247	247	247	62.4	(101.0)	24.0	43.1	71.6	45.0	24.3	37	84	260
255	243	243	243	62.0	—	23.1	42.2	71.1	44.2	23.2	—	82	255
250	238	238	238	61.6	99.5	22.2	41.7	70.6	43.4	22.2	36	81	250
245	233	233	233	61.2	—	21.3	41.1	70.1	42.5	21.1	—	79	245
240	228	228	228	60.7	98.1	20.3	40.3	69.6	41.7	19.9	34	78	240
230	219	219	219	—	96.7	(18.0)	—	—	—	—	33	75	230
220	209	209	209	—	95.0	(15.7)	—	—	—	—	32	71	220
210	200	200	200	—	93.4	(13.4)	—	—	—	—	30	68	210
200	190	190	190	—	91.5	(11.0)	—	—	—	—	29	65	200
190	181	181	181	—	89.5	(8.5)	—	—	—	—	28	62	190
180	171	171	171	—	87.1	(6.0)	—	—	—	—	26	59	180
170	162	162	162	—	85.0	(3.0)	—	—	—	—	25	56	170
160	152	152	152	—	81.7	(0.0)	—	—	—	—	24	53	160
150	143	143	143	—	78.7	—	—	—	—	—	22	50	150
140	133	133	133	—	75.0	—	—	—	—	—	21	46	140
130	124	124	124	—	71.2	—	—	—	—	—	20	44	130
120	114	114	114	—	66.7	—	—	—	—	—	—	40	120
110	105	105	105	—	62.3	—	—	—	—	—	—	—	110
100	95	95	95	—	56.2	—	—	—	—	—	—	—	100
95	90	90	90	—	52.0	—	—	—	—	—	—	—	95
90	86	86	86	—	48.0	—	—	—	—	—	—	—	90
85	81	81	81	—	41.0	—	—	—	—	—	—	—	85

Note 1) Approximate values were determined from **SAE J 417**.

2) Some of the parenthesized values in the above table are not used so frequently.

Contrast table of SI and CGS system units, gravitation system units

Unit system	Length <i>L</i>	Mass <i>M</i>	Time <i>T</i>	Acceleration	Force	Stress	Pressure	Energy
SI	m	kg	s	m/s ²	N	Pa	Pa	J
CGS system	cm	g	s	Gal	dyn	dyn/cm ²	dyn/cm ²	erg
Gravitation system	m	kgf · s ² /m	s	m/s ²	kgf	kgf/m ²	kgf/m ²	kgf · m

Conversion to SI unit

Quantity	Unit designation	Symbol	Conversion rate to SI	SI unit designation	Symbol
Angle	Degree	°	$\pi/180$	Radian	rad
	Minute	'	$\pi/10\ 800$		
	Second	" (sec)	$\pi/648\ 000$		
Length	Meter	m	1	Meter	m
	Micron	μ	10^{-6}		
	Angstrom	Å	10^{-10}		
Area	Square meter	m ²	1	Square meter	m ²
	Are	a	10^2		
	Hector	ha	10^4		
Volume	Cubic meter	m ³	1	Cubic meter	m ³
	Liter	R.L	10^{-3}		
Mass	kilogram	kg	1	Kilogram	kg
	Ton	t	10^3		
	Weight kilogram.square second per meter	kgf · s ² /m	9.806 65		
Time	Second	s	1	Second	s
	Minute	min	60		
	Hour	h	3 600		
	Day	d	86 400		
Speed	Meter per second	m/s	1	Meter per second	m/s
	Knot	kn	1 852/3 600		
Frequency and vibration	Cycle	s ⁻¹ (pps)	1	Hertz	Hz
Revolutions (rotational speed)	Revolutions per minute per second	rpm (r/min)	1/60	Per second	s ⁻¹
Angular speed	Radian per second	rad/s	1	Radian per second	rad/s
Acceleration	Meter per second per second	m/s ²	1	Meter per second per second	m/s ²
	G	G	9.806 65		
Force	Weight kilogram	kgf	9.806 65	Newton	N
	Weight ton	tf	9 806.65		
	Dyne	dyn	10^{-5}		
Force moment	Weight kilogram meter	kgf · m	9.806 65	Newton meter	N · m
Inertia moment	Weight kilogram per square meter	kgf · m · s ²	9.806 65	kilogram square meter	kg · m ²
Stress	Weight kilogram per square meter	kgf/m ²	9.806 65	Pascal or Newton per square meter	Pa or N/m ²
Pressure	Weight kilogram per square meter	kgf/m ²	9.806 65	Pascal	Pa
	Water column meter	mH ₂ O	9 806.65		
	Mercury column meter	mHg	101 325/0.76		
	Torr	Torr	101 325/760		
	Atmospheric pressure	atm	101 325		
	Bar	bar	10^5		
Energy	Erg	erg	10^{-7}	Joule	J
	IT calorie	cal _{IT}	4.186 8		
	Weight kilogram meter	kgf · m	9.806 65		
	Kilowatt per hour	kW · h	3.600×10^6		
	Horse power per hour	PS · h	$2.647\ 79 \times 10^6$		
Power rate and power	Watt	W	1	Watt	W
	Horse power	PS	735.5		
	Weight kilogram meter per second	kgf · m/s	9.806 65		

Unit system	Quantity	Power rate	Temperature	Viscosity	Dynamic viscosity	Magnetic flux	Flux density	Magnetic field strength
SI		W	K	Pa · s	m ² /s	Wb	T	A/m
CGS system		erg/s	°C	P	St	Mx	Gs	Oe
Gravitation system		kgf · m/s	°C	kgf · s/m ²	m ² /s	—	—	—

Conversion to SI unit

Quantity	Unit designation	Symbol	Conversion rate to SI	SI unit designation	Symbol
Viscosity	Poise	P	10 ⁻¹	Pascal second	Pa · s
	Centi poise	cP	10 ⁻³		
	Weight kilogram second per square meter	kgf · s/m ²	9.806 65		
Dynamic viscosity	Stokes	St	10 ⁻⁴	Square meter per second	m ² /s
	Centistokes	cSt	10 ⁻⁶		
Temperature	Degree	°C	+273.15	Kelvin	K
Radioactive Dosage	Curie	Ci	3.7 × 10 ¹⁰	Becquere	Bq
	Roentgen	R	2.58 × 10 ⁻⁴	Coulomb per kilogram	C/kg
Absorption dosage	Rad	rad	10 ⁻²	Gray	Gy
Dosage equivalent	Rem	rem	10 ⁻²	Sivert	Sv
Magnetic flux	Maxwell	Mx	10 ⁻⁸	Weber	Wb
Flux density	Gamma	γ	10 ⁻⁹	Tesler	T
	Gauss	Gs	10 ⁻⁴		
Magnetic field strength	Oersted	Oe	10 ³ /4 π	Ampere per meter	A/m
Quantity of electricity	Coulomb	C	1	Coulomb	C
Potential difference	Volt	V	1	Volt	V
Electric resistance	Ohm	Ω	1	Ohm	Ω
Current	Ampere	A	1	Ampere	A

Integer multiplication of SI unit 10

Unit × multiple	Initial letter	
	Name	Symbol
10 ¹⁸	Exa	E
10 ¹⁵	Peta	P
10 ¹²	Tera	T
10 ⁹	Giga	G
10 ⁶	Mega	M
10 ³	Kilo	k
10 ²	Hect	h
10	Deca	da
10 ⁻¹	Deci	d
10 ⁻²	Centi	c
10 ⁻³	Mili	m
10 ⁻⁶	Micro	μ
10 ⁻⁹	Nano	n
10 ⁻¹²	Pico	p
10 ⁻¹⁵	Femt	f
10 ⁻¹⁸	Atto	a

kgf-N conversion table

kgf		N	kgf		N	kgf		N
0.1020	1	9.8066	3.4670	34	333.43	6.8321	67	657.04
0.2039	2	19.613	3.5690	35	343.23	6.9341	68	666.85
0.3059	3	29.420	3.6710	36	353.04	7.0361	69	676.66
0.4079	4	39.227	3.7730	37	362.85	7.1380	70	686.46
0.5099	5	49.033	3.8749	38	372.65	7.2400	71	696.27
0.6118	6	58.840	3.9769	39	382.46	7.3420	72	706.08
0.7138	7	68.646	4.0789	40	392.27	7.4440	73	715.88
0.8158	8	78.453	4.1808	41	402.07	7.5459	74	725.69
0.9177	9	88.260	4.2828	42	411.88	7.6479	75	735.50
1.0197	10	98.066	4.3848	43	421.68	7.7499	76	745.30
1.1217	11	107.87	4.4868	44	431.49	7.8518	77	755.11
1.2237	12	117.68	4.5887	45	441.30	7.9538	78	764.92
1.3256	13	127.49	4.6907	46	451.10	8.0558	79	774.72
1.4276	14	137.29	4.7927	47	460.91	8.1578	80	784.53
1.5296	15	147.10	4.8946	48	470.72	8.2597	81	794.34
1.6316	16	156.91	4.9966	49	480.52	8.3617	82	804.14
1.7335	17	166.71	5.0986	50	490.33	8.4637	83	813.95
1.8355	18	176.52	5.2006	51	500.14	8.5656	84	823.76
1.9375	19	186.33	5.3025	52	509.94	8.6676	85	833.56
2.0394	20	196.13	5.4045	53	519.75	8.7696	86	843.37
2.1414	21	205.94	5.5065	54	529.56	8.8716	87	853.18
2.2434	22	215.75	5.6085	55	539.36	8.9735	88	862.98
2.3454	23	225.55	5.7104	56	549.17	9.0755	89	872.79
2.4473	24	235.36	5.8124	57	558.98	9.1775	90	882.60
2.5493	25	245.17	5.9144	58	568.78	9.2794	91	892.40
2.6513	26	254.97	6.0163	59	578.59	9.3814	92	902.21
2.7532	27	264.78	6.1183	60	588.40	9.4834	93	912.02
2.8552	28	274.59	6.2203	61	598.20	9.5854	94	921.82
2.9572	29	284.39	6.3223	62	608.01	9.6873	95	931.63
3.0592	30	294.20	6.4242	63	617.82	9.7893	96	941.44
3.1611	31	304.01	6.5262	64	627.62	9.8913	97	951.24
3.2631	32	313.81	6.6282	65	637.43	9.9932	98	961.05
3.3651	33	323.62	6.7302	66	647.24	10.0952	99	970.86

[How to read the table]

For example, for conversion from 10kgf to N read 10 on center stage of 1st row box and then read the right-side N. 10kgf is equivalent to 98.066 upon reading. Furthermore, for conversion from 10N to kgf read the right side kgf box. 10N is equivalent to 1.0197kg upon reading.

1kgf=9.80665N
1N=0.101972kgf

Viscosity conversion table

Dynamic viscosity mm ² /s	Saybolt SUS (sec)	Redwood R" (sec)	Engler E (deg.)
2.7	35	32.2	1.18
4.3	40	36.2	1.32
5.9	45	40.6	1.46
7.4	50	44.9	1.60
8.9	55	49.1	1.75
10.4	60	53.5	1.88
11.8	65	57.9	2.02
13.1	70	62.3	2.15
14.5	75	67.6	2.31
15.8	80	71.0	2.42
17.0	85	75.1	2.55
18.2	90	79.6	2.68
19.4	95	84.2	2.81
20.6	100	88.4	2.95
23.0	110	97.1	3.21
25.0	120	105.9	3.49
27.5	130	114.8	3.77
29.8	140	123.6	4.04
32.1	150	132.4	4.32
34.3	160	141.1	4.59
36.5	170	150.0	4.88
38.8	180	158.8	5.15
41.0	190	167.5	5.44
43.2	200	176.4	5.72
47.5	220	194.0	6.28
51.9	240	212	6.85
56.5	260	229	7.38
60.5	280	247	7.95
64.9	300	265	8.51
70.3	325	287	9.24
75.8	350	309	9.95
81.2	375	331	10.7
86.8	400	353	11.4
92.0	425	375	12.1
97.4	450	397	12.8

Dynamic viscosity mm ² /s	Saybolt SUS (sec)	Redwood R" (sec)	Engler E (deg.)
103	475	419	13.5
108	500	441	14.2
119	550	485	15.6
130	600	529	17.0
141	650	573	18.5
152	700	617	19.9
163	750	661	21.3
173	800	705	22.7
184	850	749	24.2
195	900	793	25.6
206	950	837	27.0
217	1 000	882	28.4
260	1 200	1 058	34.1
302	1 400	1 234	39.8
347	1 600	1 411	45.5
390	1 800	1 587	51
433	2 000	1 763	57
542	2 500	2 204	71
650	3 000	2 646	85
758	3 500	3 087	99
867	4 000	3 526	114
974	4 500	3 967	128
1 082	5 000	4 408	142
1 150	5 500	4 849	156
1 300	6 000	5 290	170
1 400	6 500	5 730	185
1 510	7 000	6 171	199
1 630	7 500	6 612	213
1 740	8 000	7 053	227
1 850	8 500	7 494	242
1 960	9 000	7 934	256
2 070	9 500	8 375	270
2 200	10 000	8 816	284

Ordinary tolerance for cutting dimensions

JIS B 0405

Ordinary tolerance is applied to cutting dimensions for which special accuracy is not required functionally and, therefore, applicable tolerances are indicated in batch, without individual indication of them, in relevant specification, drawings, etc.

Ordinary tolerances shall be indicated by either one of the following methods (1) and (2).

- (1) Numerical value table for each dimensional division
 - (2) Applicable Standard No. and tolerance class
- Ex. Ordinary tolerance shall conform to the "Medium Class" specified in JIS B 0405.

Unit : mm

Dimensional division	Class		
	Fine class	Medium class	Coarse class
0.5 and over 3 incl. Over 3 6 incl.	±0.05	±0.1	—
			±0.2
Over 6 30 incl. Over 30 120 incl. Over 120 315 incl.	±0.1 ±0.15 ±0.2	±0.2 ±0.3 ±0.5	±0.5 ±0.8 ±1.2
Over 315 1000 incl. Over 1000 2000 incl.	±0.3 ±0.5	±0.8 ±1.2	±2 ±3

Reference: The numerical values given above every each of "Fine Class", "Medium class" and "Coarse Class" match "Fine series, Medium series", and "Coarse series" specified in ISO 2768 (Permissible Machining Variations in Dimensions without Tolerance Indication).

Ordinary tolerances for castings

JIS B 0403

This Standard specifies the ordinary tolerances for the as-casted length and wall thickness dimensions (hereinafter referred to as "ordinary tolerance") of gray castings and spherical graphite

castings molded using sand molds (excluding precision mold and other equivalent).

The ordinary tolerance shall be indicated by either one of the following methods (1) and (2).

- (1) Numerical value table for each dimensional division
 - (2) Applicable Standard No. and tolerance class
- Ex. JIS B 0403, Coarse class

Ordinary tolerance for length

Unit : mm

Dimensional division	Material Class		Spherical graphite castings	
	Gray castings Fine class	Coarse class	Fine class	Coarse class
120 incl.	±1	± 1.5	±1.5	± 2
Over 120 250 incl.	±1.5	± 2	±2	± 2.5
Over 250 400 incl.	±2	± 3	±2.5	± 3.5
Over 400 800 incl.	±3	± 4	±4	± 5
Over 800 1600 incl.	±4	± 6	±5	± 7
Over 1600 3150 incl.	—	±10	—	±10

Ordinary tolerance for wall thickness

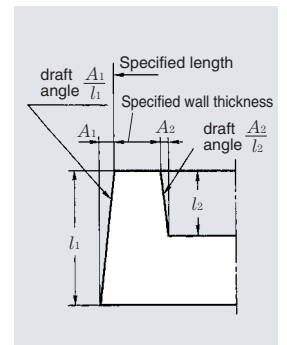
Unit : mm

Dimensional division	Material Class		Spherical graphite castings	
	Gray castings Fine class	Coarse class	Fine class	Coarse class
10 incl.	±1	±1.5	±1.2	±2
Over 10 18 incl.	±1.5	±2	±1.5	±2.5
Over 18 30 incl.	±2	±3	±2	±3
Over 30 50 incl.	±2	±3.5	±2.5	±4

Dimension-A for draft angle

Unit : mm

Dimensional division	Dimension A (max)
18 incl.	1
Over 18 30 incl.	1.5
Over 30 50 incl.	2
Over 50 120 incl.	2.5
Over 120 315 incl.	3.5
Over 315 630 incl.	6
Over 630 1000 incl.	9



Remarks : l means l_1 and l_2 in the above sketch.
A means A_1, A_2 in the above sketch.

Ordinary tolerances for press-formed metal parts

JIS B 0408

This Standard specifies the ordinary tolerances for the punching, bending and drawing dimensions, bending angle of press-formed metal parts (hereinafter referred to as "ordinary tolerance").

Ordinary tolerance is applied to the dimensions for which special accuracy is not required functionally and, therefore, applicable tolerances are indicated in batch, without individual indication of them, in relevant specification, drawings, etc.

Ordinary tolerance shall be indicated by either one of the following methods (1) and (2).

- (1) Numerical value table for each dimensional division
 - (2) Applicable Standard No. and tolerance class
- Ex. JIS B0408, Class-A

Ordinary tolerance for punching

Unit : mm

Dimensional division	Class		
	Class-A	Class-B	Class-C
6 incl.	±0.05	±0.1	±0.3
Over 6 30 incl.	±0.1	±0.2	±0.5
Over 30 120 incl.	±0.15	±0.3	±0.8
Over 120 400 incl.	±0.2	±0.5	±1.2
Over 400 1000 incl.	±0.3	±0.8	±2
Over 1000 2000 incl.	±0.5	±1.2	±3

Ordinary tolerance for bending angle

Unit : mm

Dimensional division	Class		
	Class-A	Class-B	Class-C
6 incl.	±0.1	±0.3	±0.5
Over 6 30 incl.	±0.2	±0.5	±1
Over 30 120 incl.	±0.3	±0.8	±1.5
Over 120 400 incl.	±0.5	±1.2	±2.5
Over 400 1000 incl.	±0.8	±2	±4
Over 1000 2000 incl.	±1.2	±3	±6

Ordinary tolerances for sheared metal plates

JIS B 0410

This Standard specifies the ordinary tolerances for the shearing width and ordinary tolerances for the straightness and perpendicularity (hereinafter generically referred to as "ordinary tolerance") of metal plates of 12mm and less in thickness which were sheared by direct shearing machines such as gear pusher, square shear, etc.

The ordinary tolerance shall be indicated by either one of the following methods (1) and (2).

- (1) Numerical value table for each dimensional division
- (2) Applicable standard No. and tolerance class

Ex. 1. JIS B 0410, Class-B

- 2. Cutting width, straightness: JIS B 0410, Class-B
- Perpendicularity: JIS B 0410, Class-A

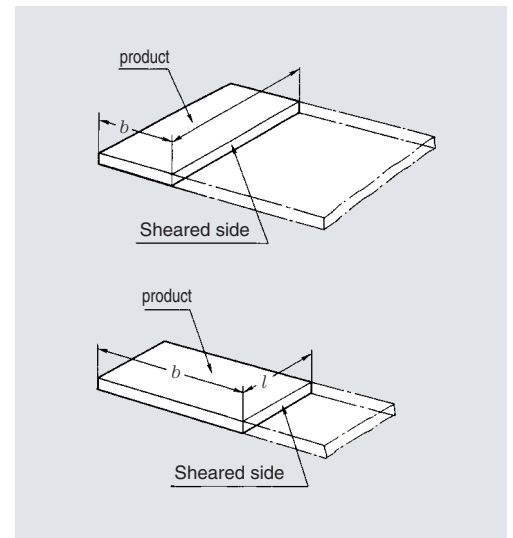
Definition of the terms: The terms used in this Standard are as defined in JIS B 0111 (Terminology relating to press machines) and, in addition, defined as follows.

- (1) Cutting width: Distance from one side sheared by shear cutter to opposite side, as illustrated in Fig. *b*
- (2) Cutting length: length of one side sheared by shear cutter, as illustrated in Fig. *l*.

Ordinary tolerance for shearing width

Unit : mm

Cutting width division <i>b</i>	Classification by plate thickness (<i>t</i>)							
	$t \leq 1.6$		$1.6 < t \leq 3$		$3 < t \leq 6$		$6 < t \leq 12$	
	Class							
	Class-A	Class-B	Class-A	Class-B	Class-A	Class-B	Class-A	Class-B
30 and less	±0.1	±0.3	—	—	—	—	—	—
Over 30 120 incl.	±0.2	±0.5	±0.3	±0.5	±0.8	±1.2	—	±1.5
Over 120 400 incl.	±0.3	±0.8	±0.4	±0.8	±1	±1.5	—	±2
Over 400 1000 incl.	±0.5	±1	±0.5	±1.2	±1.5	±2	—	±2.5
Over 1000 2000 incl.	±0.8	±1.5	±0.8	±2	±2	±3	—	±3
Over 2000 4000 incl.	±1.2	±2	±1.2	±2.5	±3	±4	—	±4



Ordinary tolerance for straightness

Unit : mm

Cutting length division	Classification by plate thickness (<i>t</i>)							
	$t \leq 1.6$		$1.6 < t \leq 3$		$3 < t \leq 6$		$6 < t \leq 12$	
	Class							
	Class-A	Class-B	Class-A	Class-B	Class-A	Class-B	Class-A	Class-B
30 and less	0.1	0.2	—	—	—	—	—	—
Over 30 120 incl.	0.2	0.3	0.2	0.3	0.5	0.8	—	1.5
Over 120 400 incl.	0.3	0.5	0.3	0.5	0.8	1.5	—	2
Over 400 1000 incl.	0.5	0.8	0.5	1	1.5	2	—	3
Over 1000 2000 incl.	0.8	1.2	0.8	1.5	2	3	—	4
Over 2000 4000 incl.	1.2	2	1.2	2.5	3	5	—	6

Ordinary tolerance for squareness

Unit : mm

Narrow side length division	Classification by plate thickness (<i>t</i>)					
	$t \leq 3$		$3 < t \leq 6$		$6 < t \leq 12$	
	Class					
	Class-A	Class-B	Class-A	Class-B	Class-A	Class-B
30 and less	—	—	—	—	—	—
Over 30 120 incl.	0.3	0.5	0.5	0.8	—	1.5
Over 120 400 incl.	0.8	1.2	1	1.5	—	2
Over 400 1000 incl.	1.5	3	2	3	—	3
Over 1000 2000 incl.	3	6	4	6	—	6
Over 2000 4000 incl.	6	10	6	10	—	10

Ordinary tolerance for sintered metal parts

JIS B 0411

This Standard specifies the ordinary tolerance which is applied to the machining dimensions of sintered mechanical parts and sintered oil-contained bearing, of sintered metal parts, but excluding machining methods other (e.g. cutting, etc.) than the machining method specific for sintered metal parts.

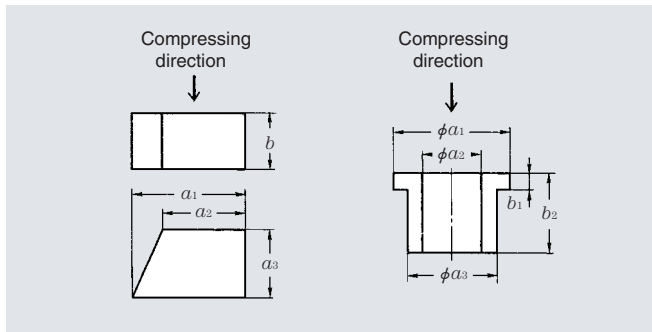
Ordinary tolerance is applied to the dimensions for which special accuracy is not required functionally and, therefore, applicable tolerances are indicated in batch, without individual indication of them, in relevant specification, drawings, etc.

Ordinary tolerance shall be indicated by either one of the following methods (1) and (2).

- (1) Numerical value table for each dimensional division
- (2) Applicable Standard No. and tolerance class
Ex. JIS B0411, Fine Class

Definition of terms: The terms used in this Standard are as defined below.

- (1) Width: Perpendicular dimension against compressing direction in compressive molding of powders, as illustrated in Fig. *a*.
- (2) Height: Dimension parallel to compressing direction in molding of powders, as illustrated in Fig. *b*.



Class: The ordinary tolerance class shall be three classes of "Fine Class", "Medium Class" and "Coarse class".

Reference: The numerical values every each class of "Fine Class", "Medium Class" and "Coarse class" match "Fine Series", "Medium Series" and "Coarse Series" specified in ISO 2768 (Permissible machining variations in dimensions without tolerance indication)

Ordinary tolerance for width

Unit : mm

Dimensional division \ class	class		
	Fine class	Medium class	Coarse class
6 and less	±0.05	±0.1	±0.2
Over 6 - 30 incl.	±0.1	±0.2	±0.5
Over 30 - 120 incl.	±0.15	±0.3	±0.8
Over 120 - 315 incl.	±0.2	±0.5	±1.2

Ordinary tolerance for height

Unit : mm

Dimensional division \ class	class		
	Fine class	Medium class	Coarse class
6 and less	±0.1	±0.2	±0.6
Over 6 - 30 incl.	±0.2	±0.5	±1
Over 30 - 120 incl.	±0.3	±0.8	±1.8

Dimensional tolerance for shaft (JIS B 0401-2)

Diameter division mm		a13		c12		d6		e6		e13		f5		f6		g5		g6	
Over	incl.	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
3	6	-270	-450	-70	-190	-30	-38	-20	-28	-20	-200	-10	-15	-10	-18	-4	-9	-4	-12
6	10	-280	-500	-80	-230	-40	-49	-25	-34	-25	-245	-13	-19	-13	-22	-5	-11	-5	-14
10	18	-290	-560	-95	-275	-50	-61	-32	-43	-32	-302	-16	-24	-16	-27	-6	-14	-6	-17
18	30	-300	-630	-110	-320	-65	-78	-40	-53	-40	-370	-20	-29	-20	-33	-7	-16	-7	-20
30	40	-310	-700	-120	-370	-80	-96	-50	-66	-50	-440	-25	-36	-25	-41	-9	-20	-9	-25
40	50	-320	-710	-130	-380	-100	-119	-60	-79	-60	-520	-30	-43	-30	-49	-10	-23	-10	-29
50	65	-340	-800	-140	-440	-120	-142	-72	-94	-72	-612	-36	-51	-36	-58	-12	-27	-12	-34
65	80	-360	-820	-150	-450	-145	-170	-85	-110	-85	-715	-43	-61	-43	-68	-14	-32	-14	-39
80	100	-380	-920	-170	-520	-170	-199	-100	-129	-100	-820	-50	-70	-50	-79	-15	-35	-15	-44
100	120	-410	-950	-180	-530	-190	-222	-110	-142	-110	-920	-56	-79	-56	-88	-17	-40	-17	-49
120	140	-460	-1 090	-200	-600	-210	-246	-125	-161	-125	-1 015	-62	-87	-62	-98	-18	-43	-18	-54
140	160	-520	-1 150	-210	-610	-230	-270	-135	-175	-135	-1 105	-68	-95	-68	-108	-20	-47	-20	-60
160	180	-580	-1 210	-240	-700	-260	-720	-145	-189	-145	-1 189	-76	-120	-76	-130	-22	-54	-22	-66
180	200	-660	-1 380	-240	-700	-290	-340	-160	-210	-160	-210	-80	-130	-80	-130	-24	-74	-24	-74
200	225	-740	-1 460	-260	-720	-170	-226	-170	-226	-170	-226	-86	-142	-86	-142	-26	-82	-26	-82
225	250	-820	-1 540	-280	-740	-190	-222	-110	-142	-110	-920	-56	-79	-56	-88	-17	-40	-17	-49
250	280	-920	-1 730	-300	-820	-210	-246	-125	-161	-125	-1 015	-62	-87	-62	-98	-18	-43	-18	-54
280	315	-1 050	-1 860	-330	-850	-230	-270	-135	-175	-135	-1 105	-68	-95	-68	-108	-20	-47	-20	-60
315	355	-1 200	-2 090	-360	-930	-260	-720	-145	-189	-145	-1 189	-76	-120	-76	-130	-22	-54	-22	-66
355	400	-1 350	-2 240	-400	-970	-290	-340	-160	-210	-160	-210	-80	-130	-80	-130	-24	-74	-24	-74
400	450	-1 500	-2 470	-440	-1 070	-230	-270	-135	-175	-135	-1 105	-68	-95	-68	-108	-20	-47	-20	-60
450	500	-1 650	-2 620	-480	-1 110	-260	-304	-145	-189	-145	-1 189	-76	-120	-76	-120	-22	-66	-22	-66
500	560	-	-	-	-	-260	-304	-145	-189	-	-	-	-	-76	-120	-	-	-22	-66
560	630	-	-	-	-	-290	-340	-160	-210	-	-	-	-	-80	-130	-	-	-24	-74
630	710	-	-	-	-	-290	-340	-160	-210	-	-	-	-	-80	-130	-	-	-24	-74
710	800	-	-	-	-	-320	-376	-170	-226	-	-	-	-	-86	-142	-	-	-26	-82
800	900	-	-	-	-	-320	-376	-170	-226	-	-	-	-	-86	-142	-	-	-26	-82
900	1 000	-	-	-	-	-350	-416	-195	-261	-	-	-	-	-98	-164	-	-	-28	-94
1 000	1 120	-	-	-	-	-350	-416	-195	-261	-	-	-	-	-98	-164	-	-	-28	-94
1 120	1 250	-	-	-	-	-390	-468	-220	-298	-	-	-	-	-110	-188	-	-	-30	-108
1 250	1 400	-	-	-	-	-390	-468	-220	-298	-	-	-	-	-110	-188	-	-	-30	-108
1 400	1 600	-	-	-	-	-390	-468	-220	-298	-	-	-	-	-110	-188	-	-	-30	-108

Diameter division mm		j5		js5		j6		js6		j7		k4		k5		k6		m5	
Over	incl.	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
3	6	+3	-2	+2.5	-2.5	+6	-2	+4	-4	+8	-4	+5	+1	+6	+1	+9	+1	+9	+4
6	10	+4	-2	+3	-3	+7	-2	+4.5	-4.5	+10	-5	+5	+1	+7	+1	+10	+1	+12	+6
10	18	+5	-3	+4	-4	+8	-3	+5.5	-5.5	+12	-6	+6	+1	+9	+1	+12	+1	+15	+7
18	30	+5	-4	+4.5	-4.5	+9	-4	+6.5	-6.5	+13	-8	+8	+2	+11	+2	+15	+2	+17	+8
30	40	+6	-5	+5.5	-5.5	+11	-5	+8	-8	+15	-10	+9	+2	+13	+2	+18	+2	+20	+9
40	50	+6	-5	+5.5	-5.5	+11	-5	+8	-8	+15	-10	+9	+2	+13	+2	+18	+2	+20	+9
50	65	+6	-7	+6.5	-6.5	+12	-7	+9.5	-9.5	+18	-12	+10	+2	+15	+2	+21	+2	+24	+11
65	80	+6	-7	+6.5	-6.5	+12	-7	+9.5	-9.5	+18	-12	+10	+2	+15	+2	+21	+2	+24	+11
80	100	+6	-9	+7.5	-7.5	+13	-9	+11	-11	+20	-15	+13	+3	+18	+3	+25	+3	+28	+13
100	120	+6	-9	+7.5	-7.5	+13	-9	+11	-11	+20	-15	+13	+3	+18	+3	+25	+3	+28	+13
120	140	+7	-11	+9	-9	+14	-11	+12.5	-12.5	+22	-18	+15	+3	+21	+3	+28	+3	+33	+15
140	160	+7	-11	+9	-9	+14	-11	+12.5	-12.5	+22	-18	+15	+3	+21	+3	+28	+3	+33	+15
160	180	+7	-11	+9	-9	+14	-11	+12.5	-12.5	+22	-18	+15	+3	+21	+3	+28	+3	+33	+15
180	200	+7	-13	+10	-10	+16	-13	+14.5	-14.5	+25	-21	+18	+4	+24	+4	+33	+4	+37	+17
200	225	+7	-13	+10	-10	+16	-13	+14.5	-14.5	+25	-21	+18	+4	+24	+4	+33	+4	+37	+17
225	250	+7	-13	+10	-10	+16	-13	+14.5	-14.5	+25	-21	+18	+4	+24	+4	+33	+4	+37	+17
250	280	+7	-16	+11.5	-11.5	+16	-16	+16	-16	+26	-26	+20	+4	+27	+4	+36	+4	+43	+20
280	315	+7	-16	+11.5	-11.5	+16	-16	+16	-16	+26	-26	+20	+4	+27	+4	+36	+4	+43	+20
315	355	+7	-18	+12.5	-12.5	+18	-18	+18	-18	+29	-28	+22	+4	+29	+4	+40	+4	+46	+21
355	400	+7	-18	+12.5	-12.5	+18	-18	+18	-18	+29	-28	+22	+4	+29	+4	+40	+4	+46	+21
400	450	+7	-20	+13.5	-13.5	+20	-20	+20	-20	+31	-32	+25	+5	+32	+5	+45	+5	+50	+23
450	500	+7	-20	+13.5	-13.5	+20	-20	+20	-20	+31	-32	+25	+5	+32	+5	+45	+5	+50	+23
500	560	-	-	-	-	-	-	+22	-22	-	-	-	-	-	-	+44	0	-	-
560	630	-	-	-	-	-	-	+22	-22	-	-	-	-	-	-	+44	0	-	-
630	710	-	-	-	-	-	-	+25	-25	-	-	-	-	-	-	+50	0	-	-
710	800	-	-	-	-	-	-	+25	-25	-	-	-	-	-	-	+50	0	-	-
800	900	-	-	-	-	-	-	+28	-28	-	-	-	-	-	-	+56	0	-	-
900	1 000	-	-	-	-	-	-	+28	-28	-	-	-	-	-	-	+56	0	-	-
1 000	1 120	-	-	-	-	-	-	+33	-33	-	-	-	-	-	-	+66	0	-	-
1 120	1 250	-	-	-	-	-	-	+33	-33	-	-	-	-	-	-	+66	0	-	-
1 250	1 400	-	-	-	-	-	-	+39	-39	-	-	-	-	-	-	+78	0	-	-
1 400	1 600	-	-	-	-	-	-	+39	-39	-	-	-	-	-	-	+78	0	-	-

Unit : μm

h4		h5		h6		h7		h8		h9		h10		h11		h13		js4		Diameter division mm	
High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	Over	incl.
0	-4	0	-5	0	-8	0	-12	0	-18	0	-30	0	-48	0	-75	0	-180	+2	-2	3	6
0	-4	0	-6	0	-9	0	-15	0	-22	0	-36	0	-58	0	-90	0	-220	+2	-2	6	10
0	-5	0	-8	0	-11	0	-18	0	-27	0	-43	0	-70	0	-110	0	-270	+2.5	-2.5	10	18
0	-6	0	-9	0	-13	0	-21	0	-33	0	-52	0	-84	0	-130	0	-330	+3	-3	18	30
0	-7	0	-11	0	-16	0	-25	0	-39	0	-62	0	-100	0	-160	0	-390	+3.5	-3.5	30	40
																				40	50
0	-8	0	-13	0	-19	0	-30	0	-46	0	-74	0	-120	0	-190	0	-460	+4	-4	50	65
																				65	80
0	-10	0	-15	0	-22	0	-35	0	-54	0	-87	0	-140	0	-220	0	-540	+5	-5	80	100
																				100	120
0	-12	0	-18	0	-25	0	-40	0	-63	0	-100	0	-160	0	-250	0	-630	+6	-6	120	140
																				140	160
																				160	180
0	-14	0	-20	0	-29	0	-46	0	-72	0	-115	0	-185	0	-290	0	-720	+7	-7	180	200
																				200	225
																				225	250
0	-16	0	-23	0	-32	0	-52	0	-81	0	-130	0	-210	0	-320	0	-810	+8	-8	250	280
																				280	315
0	-18	0	-25	0	-36	0	-57	0	-89	0	-140	0	-230	0	-360	0	-890	+9	-9	315	355
																				355	400
0	-20	0	-27	0	-40	0	-63	0	-97	0	-155	0	-250	0	-400	0	-970	+10	-10	400	450
																				450	500
-	-	-	-	0	-44	0	-70	0	-110	0	-175	0	-280	0	-440	0	-	-	-	500	560
																				560	630
-	-	-	-	0	-50	0	-80	0	-125	0	-200	0	-320	0	-500	0	-	-	-	630	710
																				710	800
-	-	-	-	0	-56	0	-90	0	-140	0	-230	0	-360	0	-560	0	-	-	-	800	900
																				900	1 000
-	-	-	-	0	-66	0	-105	0	-165	0	-260	0	-420	0	-660	0	-	-	-	1 000	1 120
																				1 120	1 250
-	-	-	-	0	-78	0	-125	0	-195	0	-310	0	-500	0	-780	0	-	-	-	1 250	1 400
																				1 400	1 600

Unit : μm

m6		n5		n6		p5		p6		r6		r7		Basic tolerance				Diameter division mm	
High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	IT2	IT3	IT5	IT7	Over	incl.
+12	+4	+13	+8	+16	+8	+17	+12	+20	+12	+23	+15	+27	+15	1.5	2.5	5	12	3	6
+15	+6	+16	+10	+19	+10	+21	+15	+24	+15	+28	+19	+34	+19	1.5	2.5	6	15	6	10
+18	+7	+20	+12	+23	+12	+26	+18	+29	+18	+34	+23	+41	+23	2	3	8	18	10	18
+21	+8	+24	+15	+28	+15	+31	+22	+35	+22	+41	+28	+49	+28	2.5	4	9	21	18	30
+25	+9	+28	+17	+33	+17	+37	+26	+42	+26	+50	+34	+59	+34	2.5	4	11	25	30	40
																		40	50
+30	+11	+33	+20	+39	+20	+45	+32	+51	+32	+60	+41	+71	+41	3	5	13	30	50	65
																		65	80
+35	+13	+38	+23	+45	+23	+52	+37	+59	+37	+73	+51	+86	+51	4	6	15	35	80	100
																		100	120
+40	+15	+45	+27	+52	+27	+61	+43	+68	+43	+88	+63	+103	+63	5	8	18	40	120	140
																		140	160
																		160	180
+46	+17	+51	+31	+60	+31	+70	+50	+79	+50	+106	+77	+123	+77	7	10	20	46	180	200
																		200	225
																		225	250
+52	+20	+57	+34	+66	+34	+79	+56	+88	+56	+126	+94	+146	+94	8	12	23	52	250	280
																		280	315
+57	+21	+62	+37	+73	+37	+87	+62	+98	+62	+144	+108	+165	+108	9	13	25	57	315	355
																		355	400
+63	+23	+67	+40	+80	+40	+95	+68	+108	+68	+166	+126	+189	+126	10	15	27	63	400	450
																		450	500
+70	+26	-	-	+88	+44	-	-	+122	+78	+194	+150	+220	+150	-	-	-	70	500	560
																		560	630
+80	+30	-	-	+100	+50	-	-	+138	+88	+225	+175	+255	+175	-	-	-	80	630	710
																		710	800
+90	+34	-	-	+112	+56	-	-	+156	+100	+235	+185	+265	+185	-	-	-	90	800	900
																		900	1 000
+106	+40	-	-	+132	+66	-	-	+186	+120	+266	+210	+300	+210	-	-	-	105	1 000	1 120
																		1 120	1 250
+126	+48	-	-	+156	+78	-	-	+218	+140	+316	+250	+355	+250	-	-	-	125	1 250	1 400
																		1 400	1 600

Dimensional tolerance for housing bore (JIS B 0401-2)

Diameter division mm		E7		E10		E11		E12		F6		F7		F8		G6		G7		H6	
Over	incl.	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
3	6	+32	+20	+68	+20	+95	+20	+140	+20	+18	+10	+22	+10	+28	+10	+12	+4	+16	+4	+8	0
6	10	+40	+25	+83	+25	+115	+25	+175	+25	+22	+13	+28	+13	+35	+13	+14	+5	+20	+5	+9	0
10	18	+50	+32	+102	+32	+142	+32	+212	+32	+27	+16	+34	+16	+43	+16	+17	+6	+24	+6	+11	0
18	30	+61	+40	+124	+40	+170	+40	+250	+40	+33	+20	+41	+20	+53	+20	+20	+7	+28	+7	+13	0
30	40	+75	+50	+150	+50	+210	+50	+300	+50	+41	+25	+50	+25	+64	+25	+25	+9	+34	+9	+16	0
40	50																				
50	65	+90	+60	+180	+60	+250	+60	+360	+60	+49	+30	+60	+30	+76	+30	+29	+10	+40	+10	+19	0
65	80																				
80	100	+107	+72	+212	+72	+292	+72	+422	+72	+58	+36	+71	+36	+90	+36	+34	+12	+47	+12	+22	0
100	120																				
120	140	+125	+85	+245	+85	+335	+85	+485	+85	+68	+43	+83	+43	+106	+43	+39	+14	+54	+14	+25	0
140	160																				
160	180																				
180	200	+146	+100	+285	+100	+390	+100	+560	+100	+79	+50	+96	+50	+122	+50	+44	+15	+61	+15	+29	0
200	225																				
225	250																				
250	280	+162	+110	+320	+110	+430	+110	+630	+110	+88	+56	+108	+56	+137	+56	+49	+17	+69	+17	+32	0
280	315																				
315	355	+182	+125	+355	+125	+485	+125	+695	+125	+98	+62	+119	+62	+151	+62	+54	+18	+75	+18	+36	0
355	400																				
400	450	+198	+135	+385	+135	+535	+135	+765	+135	+108	+68	+131	+68	+165	+68	+60	+20	+83	+20	+40	0
450	500																				
500	560	+215	+145	-	-	-	-	-	-	+120	+76	+146	+76	+186	+76	+66	+22	+92	+22	+44	0
560	630																				
630	710	+240	+160	-	-	-	-	-	-	+130	+80	+160	+80	+205	+80	+74	+24	+104	+24	+50	0
710	800																				
800	900	+260	+170	-	-	-	-	-	-	+142	+86	+176	+86	+226	+86	+82	+26	+116	+26	+56	0
900	1000																				
1000	1120	+300	+195	-	-	-	-	-	-	+164	+98	+203	+98	+263	+98	+94	+28	+133	+28	+66	0
1120	1250																				
1250	1400	+345	+220	-	-	-	-	-	-	+188	+110	+235	+110	+305	+110	+108	+30	+155	+30	+78	0
1400	1600																				
1600	1800	+390	+240	-	-	-	-	-	-	+212	+120	+270	+120	+350	+120	+124	+32	+182	+32	+92	0
1800	2000																				

Unit: μm

Diameter division mm		K6		K7		M6		M7		N6		N7		P6		P7		R6		R7	
Over	incl.	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
3	6	+2	-6	+3	-9	-1	-9	0	-12	-5	-13	-4	-16	-9	-17	-8	-20	-12	-20	-11	-23
6	10	+2	-7	+5	-10	-3	-12	0	-15	-7	-16	-4	-19	-12	-21	-9	-24	-16	-25	-13	-28
10	18	+2	-9	+6	-12	-4	-15	0	-18	-9	-20	-5	-23	-15	-26	-11	-29	-20	-31	-16	-34
18	30	+2	-11	+6	-15	-4	-17	0	-21	-11	-24	-7	-28	-18	-31	-14	-35	-24	-37	-20	-41
30	40	+3	-13	+7	-18	-4	-20	0	-25	-12	-28	-8	-33	-21	-37	-17	-42	-29	-42	-25	-50
40	50																				
50	65	+4	-15	+9	-21	-5	-24	0	-30	-14	-33	-9	-39	-26	-45	-21	-51	-35	-54	-30	-60
65	80																	-37	-56	-32	-62
80	100	+4	-18	+10	-25	-6	-28	0	-35	-16	-38	-10	-45	-30	-52	-24	-59	-44	-66	-38	-73
100	120																	-47	-69	-41	-76
120	140	+4	-21	+12	-28	-8	-33	0	-40	-20	-45	-12	-52	-36	-61	-28	-68	-56	-81	-48	-88
140	160																	-58	-83	-50	-90
160	180																	-61	-86	-53	-93
180	200	+5	-24	+13	-33	-8	-37	0	-46	-22	-51	-14	-60	-41	-70	-33	-79	-68	-97	-60	-106
200	225																	-71	-100	-63	-109
225	250																	-75	-104	-67	-113
250	280	+5	-27	+16	-36	-9	-41	0	-52	-25	-57	-14	-66	-47	-79	-36	-88	-85	-117	-74	-126
280	315																	-89	-121	-78	-130
315	355	+7	-29	+17	-40	-10	-46	0	-57	-26	-62	-16	-73	-51	-87	-41	-98	-97	-133	-87	-144
355	400																	-103	-139	-93	-150
400	450	+8	-32	+18	-45	-10	-50	0	-63	-27	-67	-17	-80	-55	-95	-45	-108	-113	-153	-103	-166
450	500																	-119	-159	-109	-172
500	560	0	-44	0	-70	-26	-70	-26	-96	-44	-88	-44	-114	-78	-122	-78	-148	-150	-194	-150	-220
560	630																	-155	-199	-155	-225
630	710	0	-50	0	-80	-30	-80	-30	-100	-50	-100	-50	-130	-88	-138	-88	-168	-175	-225	-175	-225
710	800																	-185	-235	-185	-265
800	900	0	-56	0	-90	-34	-90	-34	-124	-56	-112	-56	-146	-100	-156	-100	-190	-210	-266	-210	-300
900	1000																	-220	-276	-220	-310
1000	1120	0	-66	0	-105	-40	-106	-40	-145	-66	-132	-66	-171	-120	-186	-120	-225	-250	-316	-250	-355
1120	1250																	-260	-326	-260	-365
1250	1400	0	-78	0	-125	-48	-126	-48	-173	-78	-156	-78	-203	-140	-218	-140	-265	-300	-378	-300	-425
1400	1600																	-330	-408	-330	-455
1600	1800	0	-92	0	-150	-58	-150	-58	-208	-92	-184	-92	-242	-170	-262	-170	-320	-370	-462	-370	-520
1800	2000																	-400	-492	-400	-550

Unit : μm

H7	H8	H9	H10	H11	H13	J6	Js6		J7	Js7		K5	Diameter division mm	
							High	Low		High	Low		Over	incl.
+ 12 0	+ 18 0	+ 30 0	+ 48 0	+ 75 0	+180 0	+ 5 -3	+ 4 - 4	+ 6 - 6	+ 6 - 6	+ 6 - 6	0 - 5	3	6	
+ 15 0	+ 22 0	+ 36 0	+ 58 0	+ 90 0	+220 0	+ 5 -4	+ 4.5 - 4.5	+ 8 - 7	+ 7.5 - 7.5	+ 1 - 5	+1 - 5	6	10	
+ 18 0	+ 27 0	+ 43 0	+ 70 0	+110 0	+270 0	+ 6 -5	+ 5.5 - 5.5	+10 - 8	+ 9 - 9	+2 - 6	+2 - 6	10	18	
+ 21 0	+ 33 0	+ 52 0	+ 84 0	+130 0	+330 0	+ 8 -5	+ 6.5 - 6.5	+12 - 9	+10.5 -10.5	+1 - 8	+1 - 8	18	30	
+ 25 0	+ 39 0	+ 62 0	+100 0	+160 0	+390 0	+10 -6	+ 8 - 8	+14 -11	+12.5 -12.5	+2 - 9	+2 - 9	30	40	
												40	50	
+ 30 0	+ 46 0	+ 74 0	+120 0	+190 0	+460 0	+13 -6	+ 9.5 - 9.5	+18 -12	+15 -15	+3 -10	+3 -10	50	65	
												65	80	
+ 35 0	+ 54 0	+ 87 0	+140 0	+220 0	+540 0	+16 -6	+11 -11	+22 -13	+17.5 -17.5	+2 -13	+2 -13	80	100	
												100	120	
+ 40 0	+ 63 0	+100 0	+160 0	+250 0	+630 0	+18 -7	+12.5 -12.5	+26 -14	+20 -20	+3 -15	+3 -15	120	140	
												140	160	
												160	180	
+ 46 0	+ 72 0	+115 0	+185 0	+290 0	+720 0	+22 -7	+14.5 -14.5	+30 -16	+23 -23	+2 -18	+2 -18	180	200	
												200	225	
												225	250	
+ 52 0	+ 81 0	+130 0	+210 0	+320 0	+810 0	+25 -7	+16 -16	+36 -16	+26 -26	+3 -20	+3 -20	250	280	
												280	315	
+ 57 0	+ 89 0	+140 0	+230 0	+360 0	+890 0	+29 -7	+18 -18	+39 -18	+28.5 -28.5	+3 -22	+3 -22	315	355	
												355	400	
+ 63 0	+ 97 0	+155 0	+250 0	+400 0	+970 0	+33 -7	+20 -20	+43 -20	+31.5 -31.5	+2 -25	+2 -25	400	450	
												450	500	
+ 70 0	+110 0	+175 0	+280 0	+440 0	- 0	- -	+22 -22	- -	+35 -35	- -	- -	500	560	
												560	630	
+ 80 0	+125 0	+200 0	+320 0	+500 0	- 0	- -	+25 -25	- -	+40 -40	- -	- -	630	710	
												710	800	
+ 90 0	+140 0	+230 0	+360 0	+560 0	- 0	- -	+28 -28	- -	+45 -45	- -	- -	800	900	
												900	1 000	
+105 0	+165 0	+260 0	+420 0	+660 0	- 0	- -	+33 -33	- -	+52.5 -52.5	- -	- -	1 000	1 120	
												1 120	1 250	
+125 0	+195 0	+310 0	+500 0	+780 0	- 0	- -	+39 -39	- -	+62.5 -62.5	- -	- -	1 250	1 400	
												1 400	1 600	
+150 0	+230 0	+370 0	+600 0	+920 0	- 0	- -	+46 -46	- -	+75 -75	- -	- -	1 600	1 800	
												1 800	2 000	

Inch - Millimeter conversion table

1in.=25.4mm

Inch		0"	1"	2"	3"	4"	5"	6"	7"	8"	9"
Fraction	Decimals										
1/64	0.015625	0.397	25.400	50.800	76.200	101.600	127.000	152.400	177.800	203.200	228.600
1/32	0.031250	0.794	25.797	51.197	76.597	101.997	127.397	152.797	178.197	203.597	228.997
3/64	0.046875	1.191	26.194	51.594	76.994	102.394	127.794	153.194	178.594	203.994	229.394
1/16	0.062500	1.588	26.591	51.991	77.391	102.791	128.191	153.591	178.991	204.391	229.791
5/64	0.078125	1.984	26.988	52.388	77.788	103.188	128.588	153.988	179.388	204.788	230.188
3/32	0.093750	2.381	27.384	52.784	78.184	103.584	128.984	154.384	179.784	205.184	230.584
7/64	0.109375	2.778	27.781	53.181	78.581	103.981	129.381	154.781	180.181	205.581	230.981
1/ 8	0.125000	3.175	28.178	53.578	78.978	104.378	129.778	155.178	180.578	205.978	231.378
9/64	0.140625	3.572	28.575	53.975	79.375	104.775	130.175	155.575	180.975	206.375	231.775
5/32	0.156250	3.969	28.972	54.372	79.772	105.172	130.572	155.972	181.372	206.772	232.172
11/64	0.171875	4.366	29.369	54.769	80.169	105.569	130.969	156.369	181.769	207.169	232.569
3/16	0.187500	4.762	29.766	55.166	80.566	105.966	131.366	156.766	182.166	207.566	232.966
13/64	0.203125	5.159	30.162	55.562	80.962	106.362	131.762	157.162	182.562	207.962	233.362
7/32	0.218750	5.556	30.559	55.959	81.359	106.759	132.159	157.559	182.959	208.359	233.759
15/64	0.234375	5.953	30.956	56.356	81.756	107.156	132.556	157.956	183.356	208.756	234.156
1/ 4	0.250000	6.350	31.353	56.753	82.153	107.553	132.953	158.353	183.753	209.153	234.553
17/64	0.265625	6.747	31.750	57.150	82.550	107.950	133.350	158.750	184.150	209.550	234.950
9/32	0.281250	7.144	31.750	57.547	82.947	108.347	133.747	159.147	184.547	209.947	235.347
19/64	0.296875	7.541	32.147	57.944	83.344	108.744	134.144	159.544	184.944	210.344	235.744
5/16	0.312500	7.938	32.544	58.341	83.741	109.141	134.541	159.941	185.341	210.741	236.141
21/64	0.328125	8.334	32.941	58.738	84.138	109.538	134.938	160.338	185.738	211.138	236.538
11/32	0.343750	8.731	33.338	59.134	84.534	109.934	135.334	160.734	186.134	211.534	236.934
23/64	0.359375	9.128	33.734	59.531	84.931	110.331	135.731	161.131	186.531	211.931	237.331
3/ 8	0.375000	9.525	34.131	59.928	85.328	110.728	136.128	161.528	186.928	212.328	237.728
25/64	0.390625	9.922	34.528	60.325	85.725	111.125	136.525	161.925	187.325	212.725	238.125
13/32	0.406250	10.319	34.925	60.722	86.122	111.522	136.922	162.322	187.722	213.122	238.522
27/64	0.421875	10.716	35.322	61.119	86.519	111.919	137.319	162.719	188.119	213.519	238.919
7/16	0.437500	11.112	35.719	61.516	86.916	112.316	137.716	163.116	188.516	213.916	239.316
29/64	0.453125	11.509	36.116	61.912	87.312	112.712	138.112	163.512	188.912	214.312	239.712
15/32	0.468750	11.906	36.512	62.309	87.709	113.109	138.509	163.909	189.309	214.709	240.109
31/64	0.484375	12.303	36.909	62.706	88.106	113.506	138.906	164.306	189.706	215.106	240.506
1/ 2	0.500000	12.700	37.306	63.103	88.503	113.903	139.303	164.703	190.103	215.503	240.903
33/64	0.515625	13.097	37.703	63.500	88.900	114.300	139.700	165.100	190.500	215.900	241.300
17/32	0.531250	13.494	38.100	63.897	89.297	114.697	140.097	165.497	190.897	216.297	241.697
35/64	0.546875	13.891	38.497	64.294	89.694	115.094	140.494	165.894	191.294	216.694	242.094
9/16	0.562500	14.288	38.894	64.691	90.091	115.491	140.891	166.291	191.691	217.091	242.491
37/64	0.578125	14.684	39.291	65.088	90.488	115.888	141.283	166.688	192.088	217.488	242.888
19/32	0.593750	15.081	39.688	65.484	90.884	116.284	141.684	167.084	192.484	217.884	243.284
39/64	0.609375	15.478	40.084	65.881	91.281	116.681	142.081	167.481	192.881	218.281	243.681
5/ 8	0.625000	15.875	40.481	66.278	91.678	117.078	142.478	167.878	193.278	218.678	244.078
41/64	0.640625	16.272	40.878	66.675	92.075	117.475	142.875	168.275	193.675	219.075	244.475
21/32	0.656250	16.669	41.275	67.072	92.472	117.872	143.272	168.672	194.072	219.472	244.872
43/64	0.671875	17.066	41.672	67.469	92.869	118.269	143.669	169.069	194.469	219.869	245.269
11/16	0.687500	17.462	42.069	67.866	93.266	118.666	144.066	169.466	194.866	220.266	245.666
45/64	0.703125	17.859	42.462	68.262	93.662	119.062	144.462	169.862	195.262	220.662	246.062
23/32	0.718750	18.256	42.862	68.659	94.059	119.459	144.859	170.259	195.659	221.056	246.459
47/64	0.734375	18.653	43.259	69.056	94.456	119.856	145.256	170.656	196.056	221.456	246.856
3/ 4	0.750000	19.050	43.656	69.453	94.853	120.253	145.653	171.053	196.453	221.853	247.253
49/64	0.765625	19.447	44.053	69.850	95.250	120.650	146.050	171.450	196.850	222.250	247.650
25/32	0.781250	19.844	44.450	70.247	95.647	121.047	146.447	171.847	197.247	222.647	248.047
51/64	0.796875	20.241	70.644	70.644	96.044	121.444	146.844	172.244	197.644	223.044	248.444
13/16	0.812500	20.638	71.041	71.041	96.441	121.841	147.241	172.641	198.041	223.441	248.841
53/64	0.828125	21.034	71.438	71.438	96.838	122.238	147.638	173.038	198.438	223.838	249.238
27/32	0.843750	21.431	71.834	71.834	97.234	122.634	148.034	173.434	198.834	224.234	249.634
55/64	0.859375	21.828	72.231	72.231	97.631	123.031	148.431	173.831	199.231	224.631	250.031
7/ 8	0.875000	22.225	72.628	72.628	98.028	123.428	148.828	174.228	199.628	225.028	250.428
57/64	0.890625	22.622	73.025	73.025	98.425	123.825	149.225	174.625	200.025	225.425	250.825
39/32	0.906250	23.019	73.422	73.422	98.822	124.222	149.622	175.022	200.422	225.822	251.222
59/64	0.921875	23.416	73.819	73.819	99.219	124.619	150.019	175.419	200.819	226.219	251.619
15/16	0.937500	23.812	74.216	74.216	99.616	125.016	150.416	175.816	201.216	226.616	252.016
61/64	0.953125	24.209	74.612	74.612	100.012	125.412	150.812	176.212	201.612	227.012	252.412
31/32	0.968750	24.606	75.009	75.009	100.409	125.809	151.209	176.609	202.009	227.409	252.809
63/64	0.984375	25.003	75.406	75.406	100.806	126.206	151.606	177.006	202.406	227.806	253.206
		25.003	50.403	75.803	101.203	126.603	152.003	177.403	202.803	228.203	253.603