Preferred Sizes in Metric

The idea for developing metric standards worldwide comes from a preferred numbering system. Its first known application was in the 1870's by Charles Renard, a French army captain who reduced the different diameters of rope for military balloons from 425 to 17.

Nominal metric sizes are identical where the metric systems have been in use for several years. These reflect preferred sizes for components such as threaded fasteners, steel plates, sheets, and bars used throughout the world. The accompanying table, *Selecting a Preferred Size* shows how the general system works.

For example, if a designer was choosing a hydraulic cylinder, bolt, or plate thickness, the sizes in the First-choice column would be preferred. Second- and Third-choice columns are self-explanatory. The table extends to smaller and larger sizes. For instance, 60-mm sizes would be a preferred choice as would 2.5-mm devices.

The three columns to the far right are the originating Renard numbers. In the First-choice column, each succeeding number is 1.6 times the previous, with some rounding. These three columns provide the basis for the values on the left side of the table. The inch values show close corresponding English units.

The form of the first table carries through to other tables in the standard. The number series shown are recommended to reduce the number of standard sizes for items such as screw threads, steel plates, steel sheets, round steel bars, lifting capacities, and hydraulic cylinder diameters.

Preferred Sizes (mm)			Customary Sizes			Preferred Numbers		
First Choice	Second Choice	Third Choice	mm	in. Fractions	in. Decimals	First Choice	Second Choice	Third Choice
4			3.97	5/32	0.156	4		
		4.5	4.37	11/64	0.172			4.5
	5		4.76	3/16	0.188		5	
		5.5	5.56	7/32	0.219			5.6
6			6.35	1/4	0.25	6.3		
		7	7.14	9/32	0.281			7.1
	8		7.94	5/16	0.313		8	
		9	8.73	11/32	0.344			9
10			9.53	3/8	0.375	10		
		11	11.11	7/16	0.438			11.2
	12		12.7	1/2	0.5		12.5	
		14	14.29	9/16	0.563			14
16			15.88	5/8	0.625	16		
		18	17.46	11/16	0.688			18
	20		19.05	3/4	0.75		20	
		22	22.23	7/8	0.875			22.4
25			25.4	1	—	25		
		28	28.58	1-1/8	1.125			28
	30		30.16	1-3/16	1.188		31.5	
		35	34.93	1-3/8	1.375			35.5
40			39.69	1-9/16	1.563	40		

The values in the first three columns of the table may be extended to cover smaller or larger sizes by multiplying or dividing sizes by 10.

Reprinted from Kverneland, K.O., "How ISO Standards Cut Manufacturing Costs," *Machine Design*, pp 126-130, November 5, 1998.

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Preferred Tolerances in Metric

A FEW WORLD STANDARDS FOR ROUND COLD-FINISHED STEEL BARS*

Country	National Standard	ISO Product Tolerance				Other ISO Shaft Tolerance
Global	ISO 1829	h11	h9	h7	h6	h5, h8 (second choice)
USA	ANSI B4.2	h11	h9	h7	h6	
Japan	JIS G3 123	h11	h9	h7	h6	h13, h12, h10, h8
Germany	DIN 668 59360.1	h11	h9	h7	h6	
France	NF A47-411	h11	h9			h10
U.K.	BS 4500	h11	h9	h7	h6	
Italy	UNI 468, 469 UNI 5953	h11	h9	h7		
Australia	AS 1654	h11	h9	h7	h6	

ISO 1829, ANSI B4.2, BS 4500 and AS 1654 are preferred tolerance standards.

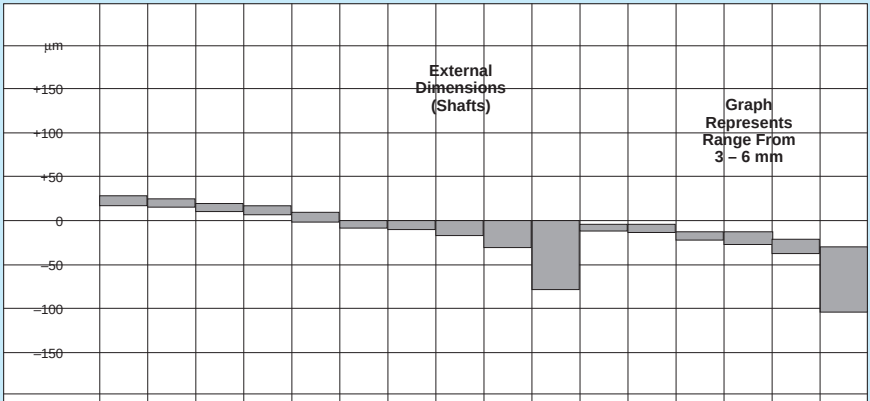
PREFERRED FITS FOR SHAFTS AND HOLES*

Hole Basis	Shaft Basis	Description
H11/c11	C11/h11	Loose running fits are for wide commercial tolerances or allowances on external members
H9/d9	D9/h9	Free running fits are good for large temperature variations,high running speeds, or heavy journal pressure, but not where accuracy is essential.
H8/f7	F8/h7	Close running fits are for running on accurate machines and for accurate locations at moderate speeds.
H7/g6	G7/h6	Sliding fits are not intended to run freely, but to move and turn freely and locate accurately.
H7/h6	H7/h6	Location clearance provides snug fits for locating stationary parts, but can be freely assembled and disassembled.
H7/k6	K7/h6	Location transition fits are for accurate locations, a compromise between clearance and interference.
H7/n6	N7/h6	Location transition fits are for more accurate locations where greater interference is permissible.
H7/p6	P7/h6	Location interference fits are for parts requiring rigidity and alignment with prime accuracy of location but without special bore-pressure requirements.
H7/s6	S7/h6	Medium drive fits are for ordinary steel parts or shrink fits on light sections. these provide the tightest usable fit with cast iron.
H7/u6	U7/h6	Force fits are suitable for parts which can be highly stressed or for shrink fits where the heavy pressing forces required are impractical.

* Reprinted from Kverneland, K.O., "How ISO Standards Cut Manufacturing Costs," *Machine Design*, pp 126-130, November 5, 1998.

FOR EXTERNAL MEASUREMENTS (SHAFTS)*

Measurements in µm (1µm = 0.001mm)

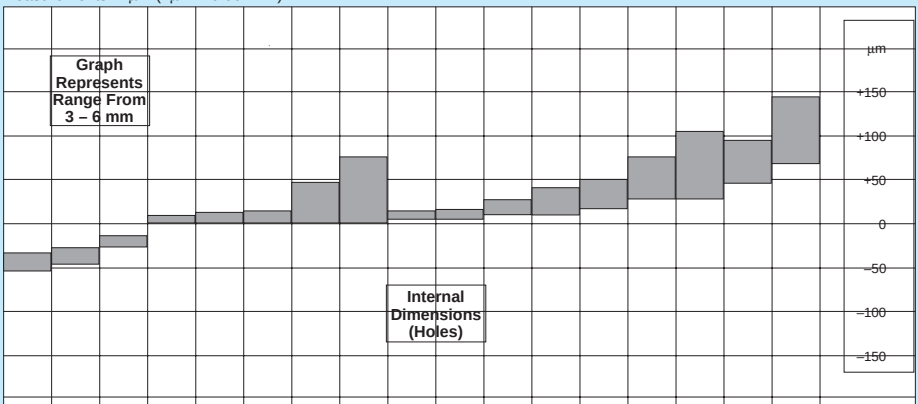


Nominal Range in mm	s6	r6	n6	m6	j6	h5	h6	h8	h9	h11	g5	g6	f7	f8	e8	d11
from > 1 to ≤ 3	+20 +14	+16 +10	+10 +4	+8 +2	+4 –2	0 –4	0 –6	0 –14	0 –25	0 –60	–2 –6	–2 –8	–6 –16	–6 –20	–14 –28	–20 –80
from > 3 to ≤ 6	+27 +19	+23 +15	+16 +8	+12 +4	+6 –2	0 –5	0 –8	0 –18	0 –30	0 –75	–4 –9	–4 –12	–10 –22	–10 –28	–20 –38	–30 –105
from > 6 to ≤ 10	+32 +23	+28 +19	+19 +10	+15 +6	+7 –2	0 –6	0 –9	0 –22	0 –36	0 –90	–5 –11	–5 –14	–13 –28	–13 –35	–25 –47	–40 –130
from > 10 to ≤ 14	+39 +28	+34 +23	+23 +12	+18 +7	+8 –3	0 –8	0 –11	0 –27	0 –43	0 –110	–6 –14	–6 –17	–16 –34	–16 –43	–32 –59	–50 –160
from > 14 to ≤ 18																
from > 18 to ≤ 24	+48 +35	+41 +28	+28 +15	+21 +8	+9 –4	0 –9	0 –13	0 –33	0 –52	0 –130	–7 –16	–7 –20	–20 –41	–20 –53	–40 –73	–65 –195
from > 24 to ≤ 30																
from > 30 to ≤ 40	+59 +43	+50 +34	+33 +17	+25 +9	+11 –5	0 –11	0 –16	0 –39	0 –62	0 –160	–9 –20	–9 –25	–25 –50	–25 –64	–50 –89	–80 –240
from > 40 to ≤ 50																
from > 50 to ≤ 65	+72 +53	+60 +41	+39 +20	+30 +11	+12 –7	0 –13	0 –19	0 –46	0 –74	0 –190	–10 –23	–10 –29	–30 –60	–30 –76	–60 –106	–100 –290
from > 65 to ≤ 80	+78 +59	+62 +43														
from > 80 to ≤100	+93 +71	+73 +51	+45 +23	+35 +13	+13 –9	0 –15	0 –22	0 –54	0 –87	0 –220	–12 –27	–12 –34	–36 –71	–36 –90	–72 –126	–120 –340
from >100 to ≤120	+101 +79	+76 +54														
from >120 to ≤140	+117 +92	+88 +63	+52 +27	+40 +15	+14 –11	0 –18	0 –25	0 –63	0 –100	0 –250	–14 –32	–14 –39	–43 –83	–43 –106	–85 –148	–145 –395
from >140 to ≤160	+125 +100	+90 +65														
from >160 to ≤180	+133 +108	+93 +68														

*Per DIN 58700 sheet 1 p. 2.

FOR INTERNAL MEASUREMENTS (HOLES)*

Measurements in µm (1µm = 0.001mm)



Z8	X8	S7	H6	H7	H8	H10	H11	G6	G7	F8	F9	E9	D10	D11	CD10	C11	Designation
–26 –40	–20 –34	–14 –24	+6 0	+10 0	+14 0	+40 0	+60 0	+8 +2	+12 +2	+20 +6	+31 +6	+39 +14	+60 +20	+80 +20	+74 +34	+120 +60	from > 1 to ≤ 3
–35 –53	–28 –46	–15 –27	+8 0	+12 0	+18 0	+48 0	+75 0	+12 +4	+16 +4	+28 +10	+40 +10	+50 +20	+78 +30	+105 +30	+94 +46	+145 +70	from > 3 to ≤ 6
–42 –64	–34 –56	–17 –32	+9 0	+15 0	+22 0	+58 0	+90 0	+14 +5	+20 +5	+35 +13	+49 +13	+61 +25	+98 +40	+130 +40	+114 +56	+170 +80	from > 6 to ≤ 10
–50 –77	–40 –67	–21 –39	+11 0	+18 0	+27 0	+70 0	+110 0	+17 +6	+24 +6	+43 +16	+59 +16	+75 +32	+120 +50	+160 +50	—	+205 +95	from > 10 to ≤ 14
–60 –87	–45 –72																from > 14 to ≤ 18
–73 –106	–54 –87	–27 –48	+13 0	+21 0	+33 0	+84 0	+130 0	+20 +7	+28 +7	+53 +20	+72 +20	+92 +40	+149 +65	+195 +65	—	+240 +110	from > 18 to ≤ 24
–88 –121	–64 –97																from > 24 to ≤ 30
–112 –151	–80 –119	–34 –59	+16 0	+25 0	+39 0	+100 0	+160 0	+25 +9	+34 +9	+64 +25	+87 +25	+112 +50	+180 +80	+240 +80	—	+280 +120	from > 30 to ≤ 40
–136 –175	–97 –136															+290 +130	from > 40 to ≤ 50
–172 –218	–122 –168	–42 –72	+19 0	+30 0	+46 0	+120 0	+190 0	+29 +10	+40 +10	+76 +30	+104 +30	+134 +60	+220 +100	+290 +100	—	+330 +140	from > 50 to ≤ 65
–210 –256	–146 –192	–48 –78														+340 +150	from > 65 to ≤ 80
–258 –312	–178 –232	–58 –93	+22 0	+35 0	+54 0	+140 0	+220 0	+34 +12	+47 +12	+90 +36	+123 +36	+159 +72	+260 +120	+340 +120	—	+390 +170	from > 80 to ≤100
–310 –364	–210 –264	–66 –101														+400 +180	from >100 to ≤120
–365 –428	–248 –311	–77 –117	+25 0	+40 0	+63 0	+160 0	+250 0	+39 +14	+54 +14	+106 +43	+143 +43	+185 +85	+305 +145	+395 +145	—	+450 +200	from >120 to ≤140
–415 –478	–280 –343	–85 –125														+460 +210	from >140 to ≤160
—	–310 –373	–93 –133														+480 +230	from >160 to ≤180

Nominal Range in mm

*Per DIN 58700 sheet 1 p. 3.

ISO-Metric Primary Fits

Expressed in thousandths of a millimeter

RUNNING & SLIDING FITS	d, e — LOOSE CLEARANCE	f — AVERAGE RUNNING
LOCATIONAL FITS	g — LOCATIONAL CLEARANCE	h — LOCATIONAL TRANSITION
FORCE FITS	k — LIGHT DRIVE	p, s — MEDIUM DRIVE

DIA.		NOMINAL SIZE RANGE IN INCHES & MILLIMETERS								
		> .039 to .118 in.	.118 to .236 in.	.236 to .394 in.	.394 to .709 in.	.709 to 1.181 in.	1.181 to 1.969 in.	1.969 to 3.150 in.	3.150 to 4.724 in.	4.724 to 7.087 in.
		≤ .118 in.	.236 in.	.394 in.	.709 in.	1.181 in.	1.969 in.	3.150 in.	4.724 in.	7.087 in.
		> 1 to 3mm	3 to 6mm	6 to 10mm	10 to 18mm	18 to 30mm	30 to 50mm	50 to 80mm	80 to 120mm	120 to 180mm
	FITS	VALUES (From / To) IN THOUSANDTHS OF A mm								
Hole	H6	+6 0	+8 0	+9 0	+11 0	+13 0	+16 0	+19 0	+22 0	+25 0
Shaft	g5	–2 –6	–4 –9	–5 –11	–6 –14	–7 –16	–9 –20	–10 –23	–12 –27	–14 –32
	h5	0 –4	0 –5	0 –6	0 –8	0 –9	0 –11	0 –13	0 –15	0 –18
	k5	+4 0	+6 +1	+7 +1	+9 +1	+11 +2	+13 +2	+15 +2	+18 +3	+21 +3
	p5	+10 +6	+17 +12	+21 +15	+26 +18	+31 +22	+37 +26	+45 +32	+52 +37	+61 +43
Hole	H7	+10 0	+12 0	+15 0	+18 0	+21 0	+25 0	+30 0	+35 0	+40 0
Shaft	f6	–6 –12	–10 –18	–13 –22	–16 –27	–20 –33	–25 –41	–30 –49	–36 –58	–43 –68
	g6	–2 –8	–4 –12	–5 –14	–6 –17	–7 –20	–9 –25	–10 –29	–12 –34	–14 –39
	h6	0 –6	0 –8	0 –9	0 –11	0 –13	0 –16	0 –19	0 –22	0 –25
	k6	+6 0	+9 +1	+10 +1	+12 +1	+15 +2	+18 +2	+21 +2	+25 +3	+28 +3
	p6	+12 +6	+20 +12	+24 +15	+29 +18	+35 +22	+42 +26	+51 +32	+59 +37	+68 +43
Hole	H8	+14 0	+18 0	+22 0	+27 0	+33 0	+39 0	+46 0	+54 0	+63 0
Shaft	e8	–14 –28	–20 –38	–25 –47	–32 –59	–40 –73	–50 –89	–60 –106	–72 –126	–85 –148
	f8	–6 –20	–10 –28	–13 –35	–16 –43	–20 –53	–25 –64	–30 –76	–36 –90	–43 –106
	h8	0 –14	0 –18	0 –22	0 –27	0 –33	0 –39	0 –46	0 –54	0 –63
	s8	+29 +15	+37 +19	+45 +23	+55 +28	+68 +35	+82 +43	+99 +53	+125 +71	+155 +92
Hole	H9	+25 0	+30 0	+36 0	+43 0	+52 0	+62 0	+74 0	+87 0	+100 0
Shaft	e9	–14 –39	–20 –50	–25 –61	–32 –75	–40 –92	–50 –112	–60 –134	–72 –159	–85 –185
	h9	0 –25	0 –30	0 –36	0 –43	0 –52	0 –62	0 –74	0 –87	0 –100
Hole	H11	+60 0	+75 0	+90 0	+110 0	+130 0	+160 0	+190 0	+220 0	+250 0
Shaft	d11	–20 –80	–30 –105	–40 –130	–50 –160	–65 –195	–80 –240	–100 –290	–120 –340	–145 –395
	h11	0 –60	0 –75	0 –90	0 –110	0 –130	0 –160	0 –190	0 –220	0 –250

ISO-Metric Primary Fits

Expressed in inches

RUNNING & SLIDING FITS	d, e — LOOSE CLEARANCE	f — AVERAGE RUNNING
LOCATIONAL FITS	g — LOCATIONAL CLEARANCE	h — LOCATIONAL TRANSITION
FORCE FITS	k — LIGHT DRIVE	p, s — MEDIUM DRIVE

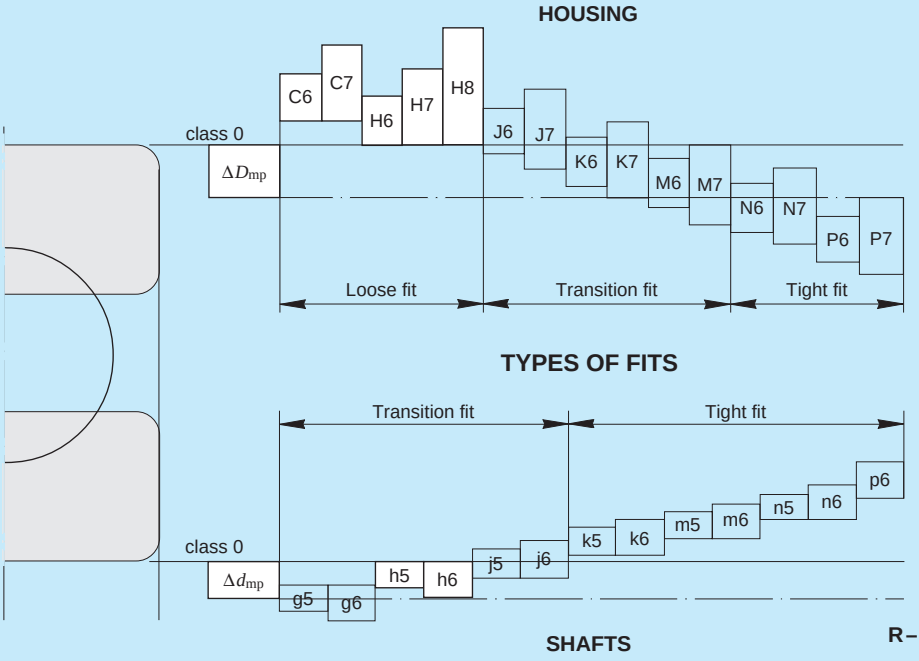
DIA.		NOMINAL SIZE RANGE IN INCHES & MILLIMETERS								
		> .039 to .118 in.	.118 to .236 in.	.236 to .394 in.	.394 to .709 in.	.709 to 1.181 in.	1.181 to 1.969 in.	1.969 to 3.150 in.	3.150 to 4.724 in.	4.724 to 7.087 in.
		≤								
		> 1 to 3mm	3 to 6mm	6 to 10mm	10 to 18mm	18 to 30mm	30 to 50mm	50 to 80mm	80 to 120mm	120 to 180mm
	FITS	VALUES (From / To) IN INCHES								
Hole	H6	+.00024 .00000	+.00031 .00000	+.00035 .00000	+.00043 .00000	+.00051 .00000	+.00063 .00000	+.00075 .00000	+.00087 .00000	+.00098 .00000
Shaft	g5	–.00008 –.00024	–.00016 –.00035	–.00020 –.00043	–.00024 –.00055	–.00028 –.00063	–.00035 –.00079	–.00039 –.00091	–.00047 –.00106	–.00055 –.00126
	h5	.00000 –.00016	.00000 –.00020	.00000 –.00024	.00000 –.00031	.00000 –.00035	.00000 –.00043	.00000 –.00051	.00000 –.00059	.00000 –.00071
	k5	+.00016 .00000	+.00024 +.00004	+.00028 +.00008	+.00035 +.00008	+.00043 +.00008	+.00051 +.00008	+.00059 +.00012	+.00071 +.00012	+.00083 +.00016
	p5	+.00039 +.00024	+.00067 +.00047	+.00083 +.00059	+.00102 +.00071	+.00122 +.00087	+.00146 +.00102	+.00177 +.00126	+.00205 +.00146	+.00240 +.00169
Hole	H7	+.00039 .00000	+.00047 .00000	+.00059 .00000	+.00071 .00000	+.00083 .00000	+.00098 .00000	+.00118 .00000	+.00138 .00000	+.00157 .00000
Shaft	f6	–.00024 –.00047	–.00039 –.00071	–.00051 –.00087	–.00063 –.00106	–.00079 –.00130	–.00098 –.00161	–.00118 –.00193	–.00142 –.00228	–.00169 –.00268
	g6	–.00008 –.00031	–.00016 –.00047	–.00020 –.00055	–.00024 –.00067	–.00028 –.00079	–.00035 –.00098	–.00039 –.00114	–.00047 –.00134	–.00055 –.00154
	h6	.00000 –.00028	.00000 –.00031	.00000 –.00035	.00000 –.00043	.00000 –.00051	.00000 –.00063	.00000 –.00075	.00000 –.00087	.00000 –.00098
	k6	+.00024 +.00000	+.00035 +.00004	+.00039 +.00004	+.00047 +.00004	+.00059 +.00008	+.00071 +.00008	+.00083 +.00008	+.00098 +.00012	+.00110 +.00012
	p6	+.00047 +.00024	+.00079 +.00047	+.00094 +.00059	+.00114 +.00071	+.00138 +.00087	+.00165 +.00102	+.00201 +.00126	+.00232 +.00146	+.00268 +.00169
Hole	H8	+.00055 .00000	+.00071 .00000	+.00087 .00000	+.00106 .00000	+.00130 .00000	+.00154 .00000	+.00181 .00000	+.00213 .00000	+.00248 .00000
Shaft	e8	–.00055 –.00110	–.00079 –.00150	–.00098 –.00185	–.00126 –.00232	–.00157 –.00287	–.00197 –.00350	–.00236 –.00417	–.00283 –.00496	–.00335 –.00583
	f8	–.00024 –.00079	–.00039 –.00110	–.00051 –.00138	–.00063 –.00169	–.00079 –.00209	–.00098 –.00252	–.00118 –.00299	–.00142 –.00354	–.00169 –.00417
	h8	.00000 –.00055	.00000 –.00071	.00000 –.00087	.00000 –.00106	.00000 –.00130	.00000 –.00154	.00000 –.00181	.00000 –.00213	.00000 –.00248
	s8	+.00114 +.00059	+.00146 +.00075	+.00177 +.00091	+.00217 +.00110	+.00268 +.00138	+.00323 +.00169	+.00390 +.00209	+.00492 +.00280	+.00610 +.00362
Hole	H9	+.00098 .00000	+.00118 .00000	+.00142 .00000	+.00169 .00000	+.00205 .00000	+.00244 .00000	+.00291 .00000	+.00343 .00000	+.00394 .00000
Shaft	e9	–.00055 –.00154	–.00079 –.00197	–.00098 –.00240	–.00126 –.00295	–.00157 –.00362	–.00197 –.00441	–.00236 –.00528	–.00283 –.00626	–.00335 –.00728
	h9	.00000 –.00098	.00000 –.00118	.00000 –.00142	.00000 –.00169	.00000 –.00205	.00000 –.00244	.00000 –.00291	.00000 –.00343	.00000 –.00394
Hole	H11	+.00236 .00000	+.00295 .00000	+.00354 .00000	+.00433 .00000	+.00512 .00000	+.00630 .00000	+.00748 .00000	+.00866 .00000	+.00984 .00000
Shaft	d11	–.00079 –.00315	–.00118 –.00413	–.00157 –.00512	–.00197 –.00630	–.00256 –.00768	–.00315 –.00945	–.00394 –.01142	–.00472 –.01339	–.00571 –.01555
	h11	.00000 –.00236	.00000 –.00295	.00000 –.00354	.00000 –.00433	.00000 –.00512	.00000 –.00630	.00000 –.00748	.00000 –.00866	.00000 –.00984

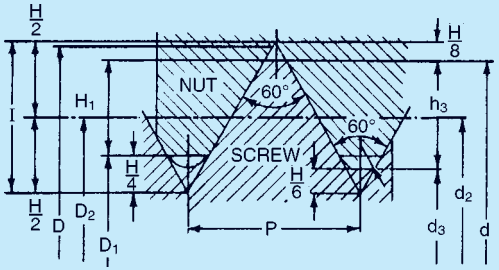
Comparison of Tolerance Classifications of Various National Standards

Standard		Tolerance Class				
International Organization for Standardization	**ISO 492**	Normal class Class 6X	Class 6	Class 5	Class 4	Class 2
American National Standards Institute (ANSI)	**ANSI/AFBMA Std.20***	ABEC-1 RBEC-1	ABEC-3 RBEC-3	ABEC-5 RBEC-5	ABEC-7	ABEC-9
Deutsches Institut fur Normung	**DIN 620**	P0	P6	P5	P4	P2
Japanese Industrial Standard	**JIS B 1514**	Class 0 Class 6X	Class 6	Class 5	Class 4	Class 2

* "ABEC" is applied for ball bearings and "RBEC" for roller bearings.

NOTES: 1. ISO 492 and 199, DIN 620 and JIS B 1514 have the same specification level.
2. The tolerance and allowance of JIS B 1514 are a little different from those of AFBMA standards.





$H = 0.86603P$

$h_3 = 0.61343P$

$H_1 = 0.54127P$

$r = \frac{H}{6} = 0.14434P$

$d_2 = d - 0.64953P$ (Effective-Pitch-Diameter)

$D_1 = d - 2H_1$ (Minor Diameter – Internal)

$d_3 = d - 2h_3$ (Minor Diameter – External)

D = (Major Diameter)

d Basic Thread Designation	Pitch mm	Threads Per Inch	Tap Drill mm	Basic Pitch Diameter $d_2 = D_2$	Minor Diameter Limits			
					d_3 – External		D_1 – Internal	
					Min.	Max.	Min.	Max.
M1	0.25	101.6	0.75	0.83762	0.622	0.693	0.729	0.785
M1.6	0.35	72.6	1.25	1.37267	1.063	1.151	1.221	1.321
M2	0.4	63.5	1.6	1.74019	1.394	1.430	1.567	1.679
M2.5	0.45	56.5	2.05	2.20772	1.825	1.928	2.013	2.138
M3	0.5	50.8	2.5	2.67524	2.256	2.367	2.453	2.599
M3.5	0.6	42.3	2.9	3.11029	2.615	2.743	2.850	3.010
M4	0.7	36.3	3.3	3.54534	2.979	3.119	3.242	3.422
M5	0.8	31.8	4.2	4.01286	3.842	3.995	4.134	4.334
M6	1	25.4	5	5.35048	4.563	4.747	4.917	5.153
M8	1.25	20.3	6.75	7.18810	6.230	6.438	6.647	6.912
M10	1.5	16.9	8.5	9.02572	7.888	8.128	8.376	8.676

NOTE: Above limits are based on DIN 13 Sheet 13 for medium tolerance class.

For external threads:	For internal threads:
M1 – Tolerance 6h	M1 – Tolerance 5H
M1.6 and up – Tolerance 6g	M1.6 and up – Tolerance 6H

APPROXIMATE EQUIVALENCE OF GEAR PRECISION CLASSES

International ISO	Germany DIN	Japan JIS	U.S.A. AGMA
4	4	0	13
5	5	1	12
6	6	2	11
7	7	3	10
8	8	4	9
9	9	5	8

PREFERRED STANDARD SIZES OF METRIC GEARS

Small Module	Medium Module	Large Module
0.1	1	8
0.2	1.25	10
0.3	1.5	12
0.4	2	16
0.5	2.5	20
0.6	3	25
0.8	4	32
	5	40
	6	50

Diametral Pitch to Metric Gear Equivalence

Diametral Pitch P	Module m	Circular Pitch		Circular Tooth Thickness		Addendum	
		inches	millimeters	inches	millimeters	inches	millimeters
0.5000	50.8	6.2832	159.593	3.1416	79.796	2.0000	50.800
0.5080	**50**	6.1842	157.080	3.0921	78.540	1.9685	50.000
0.5644	45	5.5658	141.372	2.7829	70.686	1.7717	45.000
0.6048	42	5.1948	131.947	2.5974	65.973	1.6535	42.000
0.6350	**40**	4.9474	125.664	2.4737	62.832	1.5748	40.000
0.6513	39	4.8237	122.522	2.4119	61.261	1.5354	39.000
0.7056	36	4.4527	113.097	2.2263	56.549	1.4173	36.000
0.7500	33.8667	4.1888	106.395	2.0944	53.198	1.3333	33.867
0.7697	33	4.0816	103.673	2.0408	51.836	1.2992	33.000
0.7938	**32**	3.9579	100.531	1.9790	50.265	1.2598	32.000
0.8467	30	3.7105	94.248	1.8553	47.124	1.1811	30.000
0.9071	28	3.4632	87.965	1.7316	43.982	1.1024	28.000
0.9407	27	3.3395	84.823	1.6697	42.412	1.0630	27.000
1	25.4000	3.1416	79.796	1.5708	39.898	1.0000	25.400
1.0160	**25**	3.0921	78.540	1.5461	39.270	0.9843	25.000
1.0583	24	2.9684	75.398	1.4842	37.699	0.9449	24.000
1.1545	22	2.7211	69.115	1.3605	34.558	0.8661	22.000
1.2700	**20**	2.4737	62.832	1.2368	31.416	0.7874	20.000
1.4111	18	2.2263	56.549	1.1132	28.274	0.7087	18.000
1.5000	16.9333	2.0944	53.198	1.0472	26.599	0.6667	16.933
1.5875	**16**	1.9790	50.265	0.9895	25.133	0.6299	16.000
1.8143	14	1.7316	43.982	0.8658	21.991	0.5512	14.000
2	12.7000	1.5708	39.898	0.7854	19.949	0.5000	12.700
2.1167	**12**	1.4842	37.699	0.7421	18.850	0.4724	12.000
2.3091	11	1.3605	34.558	0.6803	17.279	0.4331	11.000
2.5000	10.1600	1.2566	31.919	0.6283	15.959	0.4000	10.160
2.5400	**10**	1.2368	31.416	0.6184	15.708	0.3937	10.000
2.8222	9	1.1132	28.274	0.5566	14.137	0.3543	9.000
3	8.4667	1.0472	26.599	0.5236	13.299	0.3333	8.467
3.1416	8.0851	1.0000	25.400	0.5000	12.700	0.3183	8.085
3.1750	**8**	0.9895	25.133	0.4947	12.566	0.3150	8.000
3.5000	7.2571	0.8976	22.799	0.4488	11.399	0.2857	7.257
3.6286	7	0.8658	21.991	0.4329	10.996	0.2756	7.000
3.9077	6.5000	0.8040	20.420	0.4020	10.210	0.2559	6.500
4	6.3500	0.7854	19.949	0.3927	9.975	0.2500	6.350
4.2333	**6**	0.7421	18.850	0.3711	9.425	0.2362	6.000
4.6182	5.5000	0.6803	17.279	0.3401	8.639	0.2165	5.500
5	5.08	0.6283	15.959	0.3142	7.980	0.2000	5.080
5.0800	**5**	0.6184	15.708	0.3092	7.854	0.1969	5.000
5.3474	4.75	0.5875	14.923	0.2938	7.461	0.1870	4.750
5.6444	4.5	0.5566	14.137	0.2783	7.069	0.1772	4.500
6	4.2333	0.5236	13.299	0.2618	6.650	0.1667	4.233
6.3500	**4**	0.4947	12.566	0.2474	6.283	0.1575	4.000
6.7733	3.75	0.4638	11.781	0.2319	5.890	0.1476	3.750
7	3.6286	0.4488	11.399	0.2244	5.700	0.1429	3.629
7.2571	3.5	0.4329	10.996	0.2164	5.498	0.1378	3.500
7.8154	3.25	0.4020	10.210	0.2010	5.105	0.1280	3.250
8	3.1750	0.3927	9.975	0.1963	4.987	0.1250	3.175
8.4667	**3**	0.3711	9.425	0.1855	4.712	0.1181	3.000
9	2.8222	0.3491	8.866	0.1745	4.433	0.1111	2.822
9.2364	2.75	0.3401	8.639	0.1701	4.320	0.1083	2.750

NOTE: Bold face diametrical pitches and modules designate preferred values.

Continued on the next page

Diametral Pitch to Metric Gear Equivalence

Diametral Pitch P	Module m	Circular Pitch		Circular Tooth Thickness		Addendum	
		inches	millimeters	inches	millimeters	inches	millimeters
10	2.5400	0.3142	7.980	0.1571	3.990	0.1000	2.540
10.1600	**2.50**	0.3092	7.854	0.1546	3.927	0.0984	2.500
11	2.3091	0.2856	7.254	0.1428	3.627	0.0909	2.309
11.2889	2.25	0.2783	7.069	0.1391	3.534	0.0886	2.250
12	2.1167	0.2618	6.650	0.1309	3.325	0.0833	2.117
12.7000	**2**	0.2474	6.283	0.1237	3.142	0.0787	2.000
13	1.9538	0.2417	6.138	0.1208	3.069	0.0769	1.954
14	1.8143	0.2244	5.700	0.1122	2.850	0.0714	1.814
14.5143	1.75	0.2164	5.498	0.1082	2.749	0.0689	1.750
15	1.6933	0.2094	5.320	0.1047	2.660	0.0667	1.693
16	1.5875	0.1963	4.987	0.0982	2.494	0.0625	1.588
16.9333	**1.5**	0.1855	4.712	0.0928	2.356	0.0591	1.500
18	1.4111	0.1745	4.433	0.0873	2.217	0.0556	1.411
20	1.2700	0.1571	3.990	0.0785	1.995	0.0500	1.270
20.3200	**1.25**	0.1546	3.927	0.0773	1.963	0.0492	1.250
22	1.1545	0.1428	3.627	0.0714	1.814	0.0455	1.155
24	1.05833	0.1309	3.325	0.0654	1.662	0.0417	1.058
25.4000	**1**	0.1237	3.142	0.0618	1.571	0.0394	1.000
28	0.90714	0.1122	2.850	0.0561	1.425	0.0357	0.907
28.2222	0.9	0.1113	2.827	0.0557	1.414	0.0354	0.900
30	0.84667	0.1047	2.660	0.0524	1.330	0.0333	0.847
31.7500	**0.8**	0.0989	2.513	0.0495	1.257	0.0315	0.800
32	0.79375	0.0982	2.494	0.0491	1.247	0.0313	0.794
33.8667	0.75	0.0928	2.356	0.0464	1.178	0.0295	0.750
36	0.70556	0.0873	2.217	0.0436	1.108	0.0278	0.706
36.2857	**0.7**	0.0866	2.199	0.0433	1.100	0.0276	0.700
40	0.63500	0.0785	1.995	0.0393	0.997	0.0250	0.635
42.333	**0.6**	0.0742	1.885	0.0371	0.942	0.0236	0.600
44	0.57727	0.0714	1.814	0.0357	0.907	0.0227	0.577
48	0.52917	0.0654	1.662	0.0327	0.831	0.0208	0.529
50	0.5080	0.0628	1.596	0.0314	0.798	0.0200	0.508
50.800	**0.5**	0.0618	1.571	0.0309	0.785	0.0197	0.500
63.500	**0.4**	0.0495	1.257	0.0247	0.628	0.0157	0.400
64	0.39688	0.0491	1.247	0.0245	0.623	0.0156	0.397
67.733	0.375	0.0464	1.178	0.0232	0.589	0.0148	0.375
72	0.35278	0.0436	1.108	0.0218	0.554	0.0139	0.353
72.5714	0.35	0.0433	1.100	0.0216	0.550	0.0138	0.350
78.1538	0.325	0.0402	1.021	0.0201	0.511	0.0128	0.325
80	0.31750	0.0393	0.997	0.0196	0.499	0.0125	0.318
84.6667	**0.3**	0.0371	0.942	0.0186	0.471	0.0118	0.300
92.3636	0.275	0.0340	0.864	0.0170	0.432	0.0108	0.275
96	0.26458	0.0327	0.831	0.0164	0.416	0.0104	0.265
101.600	**0.25**	0.0309	0.785	0.0155	0.393	0.0098	0.250
120	0.21167	0.0262	0.665	0.0131	0.332	0.0083	0.212
125	0.20320	0.0251	0.638	0.0126	0.319	0.0080	0.203
127.000	**0.2**	0.0247	0.628	0.0124	0.314	0.0079	0.200
150	0.16933	0.0209	0.532	0.0105	0.266	0.0067	0.169
169.333	0.15	0.0186	0.471	0.0093	0.236	0.0059	0.150
180	0.14111	0.0175	0.443	0.0087	0.222	0.0056	0.141
200	0.12700	0.0157	0.399	0.0079	0.199	0.0050	0.127
203.200	0.125	0.0155	0.393	0.0077	0.196	0.0049	0.125

NOTE: Bold face diametrical pitches and modules designate preferred values.

Configuration of Different Timing Belts

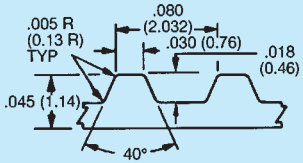


Fig. 1 0.080 Pitch MXL

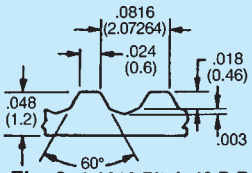


Fig. 2 0.0816 Pitch 40 D.P.

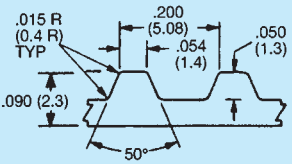


Fig. 3 0.200 Pitch XL

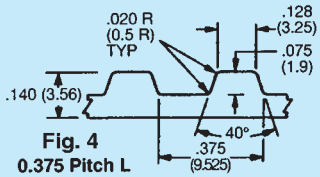


Fig. 4
0.375 Pitch L

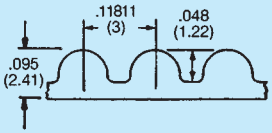


Fig. 5 3 mm Pitch HTD

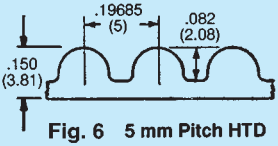


Fig. 6 5 mm Pitch HTD

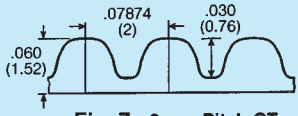


Fig. 7 2 mm Pitch GT

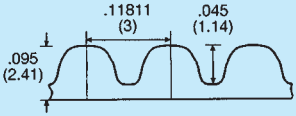


Fig. 8 3 mm Pitch GT

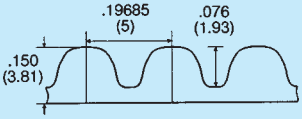


Fig. 9 5 mm Pitch GT

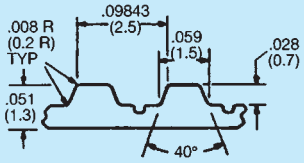


Fig. 10 T2.5 mm Pitch

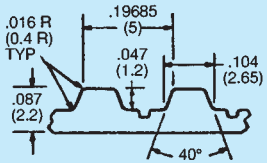


Fig. 11 T5 mm Pitch

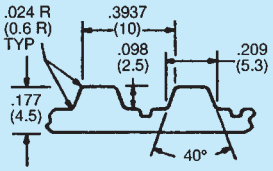


Fig. 12 T10 mm Pitch

ALLOWABLE WORKING TENSION OF DIFFERENT BELT CONSTRUCTIONS

Figure	Belt Type	Pitch		Allowable Working Tension per 1 Inch of Belt Width	
		Inch	mm	lbs.	N
1	MXL	0.080	2.032	32	142
2	40DP	0.0816	2.07	21.4	95
3	XL	0.200	5.08	41	182
4	L	0.375	9.525	55	244
—	H	0.500	12.7	140	622
5	HTD	0.118	3	64	285
6		0.197	5	102	454
—		0.315	8	138	614
7	GT	0.079	2	25	111
8		0.118	3	114	507
9		0.197	5	160	712
10	T	—	2.5	32	142
11		—	5	41	182
12		—	10	55	244

Characteristics of Belt Tension Member Materials*

E = Excellent G = Good F = Fair P = Poor

Belt Requirements	Cord Material								
	Nylon	Polyester Cont. Fil. Yarn	Polyester Spun Yarn	Kevlar-Polyester Mix	Kevlar Cont. Fil. Yarn	Kevlar Spun Yarn	Glass	Stainless Steel	Polyester Film Reinforce.
Operate Over Small Pulley	E	G	E	F	P	F	P	P	G
High Pulley Speed	E	E	E	F	P	F	P	P	G
High Intermittent Shock Loading	F	G	G	E	E	E	P	G	F
Vibration Absorbtion	E	G	E	G	F	F	P	P	F
High Torque Low Speed	P	P	P	F	G	F	E	E	F
Low Belt Stretch	P	P	P	P	G	F	E	E	G
Dimensional Stability	P	P	P	F	G	G	E	E	G
High Temperature 200°F	P	P	P	P	E	E	E	E	F
Low Temperature	F	G	G	G	G	E	E	E	G
Good Belt Tracking	E	G	E	G	F	G	F	P	E
Rapid Start Stop Operation	F	G	E	G	P	G	P	E	G
Close Center-Distance Tolerance	P	P	P	P	G	F	E	E	G
Elasticity Required in Belt	E	G	E	G	P	P	P	P	P

*Courtesy of Chemiflex Inc.

ALLOWABLE WORKING TENSION FOR DIFFERENT BELT WIDTHS

(in kg, not corrected for centrifugal force loss)

Belt Type		MXL	40 D.P.	XL	L	H	True Metric® GT®			True Metric® HTD®		True Metric® "T" Series		
Inch Pitch		.080	.0816	.200	.375	.500								
Metric Pitch		2.032	2.073	5.08	9.525	12.7	2	3	5	3	5	2.5	5	10
Belt Width	3mm (1/8")	1.13	0.77				1.10							
	4mm (.157)											1.59		
	4.5mm (3/16")	2.04	1.36	2.27										
	5mm (.197)									3.63				
	6mm (.236)						2.19	10.01				2.95	3.4	
	6mm (1/4")	3.18	2.13	3.63						5.44				
	8mm (5/16")	3.9	2.63	4.54										
	9 mm (.354")						3.61	16.48	23.15					
	9.5mm (3/8")	4.63	3.08	5.44	7.26					7.94	14.74			
	10mm (.394)									8.62	15.42	4.94	5.94	
	11mm (7/16")	5.49	3.67	6.8	9.07									
	12.5mm (1/2")	6.67	4.45	8.16	10.89	26.76				11.79	21.09			
	14mm (9/16")	7.8	5.22	9.53	12.7	31.75								
	15mm (.591)								42.86	14.06	24.95			
	16mm (5/8")	8.57		10.89	14.06	36.29								
	16mm (.630)												9.98	12.93
	19mm (3/4")	10.16	6.8	13.15	17.7	44.91				19.5	32.66			
	20mm (.787)									20.4	34.47			
	22mm (7/8")	12.47	8.26	15.88	21.32	54.43				23.13	39.01			
	25mm (.984)									26.76	44.45			24.95
	25mm (1")	14.52	9.71	18.6	24.95	63.5				27.22	45.36			
	32mm (1.26)													32.66

Dimensions in ( ) are for reference

MINIMUM PULLEY DIAMETERS

Belt Type	Pitch		rpm	Suggested Minimum*		
				No. of Grooves	Pitch Diameter	
	mm	inch			mm	inch
MXL	2.03	0.080	10000	14	9.1	.357
			7500	12	7.8	.306
			5000	11	7.1	.280
			3500	10	6.5	.255
XL	5.08	0.200	3500	12	19.4	.764
			1750	11	17.8	.700
			1160	10	16.2	.637
L	9.5	0.375	3500	16	48.5	1.910
			1750	14	42.4	1.671
			1160	12	36.4	1.432
H	12.7	0.500	3500	20	81	3.182
			1750	18	73	2.865
			1160	16	65	2.546
True Metric® GT®	2	0.079	14000	16	10.18	0.401
			7500	14	8.91	0.351
			5000	12	7.64	0.301
	3	0.118	5000	20	19.10	0.752
			2800	18	17.19	0.677
			1600	16	15.28	0.601
	5	0.197	2000	22	35.01	1.378
			1400	20	31.83	1.253
			1000	18	28.64	1.128
True Metric® HTD®	3	0.118	3500	20	19.1	.752
			1750	18	17.2	.677
			1160	17	16.2	.639
	5	0.197	3500	30	47.7	1.880
			1750	26	41.4	1.629
			1160	22	35	1.379
	8	0.315	3500	32	81.5	3.208
			1750	28	71.3	2.807
			1160	24	61.1	2.406
True Metric® "T" Series	2.5	—	3600 1800 1200	14	11.2	.441
			up to 1200	16	12.8	.504
	5	—	3600 1800 1200	14	22.5	.886
			up to 1200	16	25.6	1.008
	10	—	3600 1800 1200	16	51.1	2.012
			up to 1200	18	57.5	2.264

* Smaller pulleys than shown under "Suggested Minimum" may be used if a corresponding reduction in belt life is satisfactory. Use of pulleys smaller than those shown will be at customers' own responsibility for performance and belt life.

Fractional and Decimal Inch & Metric Equivalents

INCH		METRIC
Fractional	Decimal	mm
	.00394	.1
	.00787	.2
	.01181	.3
1/64	.015625	.3969
	.01575	.4
	.01969	.5
	.02362	.6
	.02756	.7
1/32	.03125	.7938
	.0315	.8
	.03543	.9
	.03937	1.00
3/64	.046875	1.1906
1/16	.0625	1.5875
5/64	.078125	1.9844
	.07874	2.00
3/32	.09375	2.3813
7/64	.109375	2.7781
	.11811	3.00
1/8	.125	3.175
9/64	.140625	3.5719
5/32	.15625	3.9688
	.15748	4.00
11/64	.171875	4.3656
3/16	.1875	4.7625
	.19685	5.00
13/64	.203125	5.1594
7/32	.21875	5.5563
15/64	.234375	5.9531
	.23622	6.00
1/4	.2500	6.35
17/64	.265625	6.7469
	.27559	7.00
9/32	.28125	7.1438
19/64	.296875	7.5406
5/16	.3125	7.9375
	.31496	8.00
21/64	.328125	8.3344
11/32	.34375	8.7313
	.35433	9.00
23/64	.359375	9.1281
3/8	.375	9.525
25/64	.390625	9.9219
	.3937	10.00
13/32	.40625	10.3188
27/64	.421875	10.7156
	.43307	11.00
7/16	.4375	11.1125
29/64	.453125	11.5094

INCH		METRIC
Fractional	Decimal	mm
15/32	.46875	11.9063
	.47244	12.00
31/64	.484374	12.3031
1/2	.5000	12.70
	.51181	13.00
33/64	.515625	13.0969
17/32	.53125	13.4938
35/64	.546875	13.8907
	.55118	14.00
9/16	.5625	14.2875
37/64	.578125	14.6844
	.59055	15.00
19/32	.59375	15.0813
39/64	.609375	15.4782
5/8	.625	15.875
	.62992	16.00
41/64	.640625	16.2719
21/32	.65625	16.6688
	.66929	17.00
43/64	.671875	17.0657
11/16	.6875	17.4625
45/64	.703125	17.8594
	.70866	18.00
23/32	.71875	18.2563
47/64	.734375	18.6532
	.74803	19.00
3/4	.7500	19.05
49/64	.765625	19.4469
25/32	.78125	19.8438
	.7874	20.00
51/64	.796875	20.2407
13/16	.8125	20.6375
	.82677	21.00
53/64	.828125	21.0344
27/32	.84375	21.4313
55/64	.859375	21.8282
	.86614	22.00
7/8	.875	22.225
57/64	.890625	22.6219
	.90551	23.00
29/32	.90625	23.0188
59/64	.921875	23.4157
15/16	.9375	23.8125
	.94488	24.00
61/64	.953125	24.2094
31/32	.96875	24.6063
	.98425	25.00
63/64	.984375	25.0032
1	1.0000	25.4001

Conversion of Small mm to Inch

mm	inches
0.01	0.00039
0.02	0.00079
0.03	0.00118
0.04	0.00157
0.05	0.00197
0.06	0.00236
0.07	0.00276
0.08	0.00315
0.09	0.00354

mm	inches
0.1	0.00394
0.2	0.00787
0.3	0.01181
0.4	0.01575
0.5	0.01969
0.6	0.02362
0.7	0.02756
0.8	0.03150
0.9	0.03543

mm	inches
1	0.03937
2	0.07874
3	0.11811
4	0.15748
5	0.19685
6	0.23622
7	0.27559
8	0.31496
9	0.35433

mm	millimeters (mm)									
	0	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
	inches									
0	.00000	.00004	.00008	.00012	.00016	.00020	.00024	.00028	.00031	.00035
0.010	.00039	.00043	.00047	.00051	.00055	.00059	.00063	.00067	.00071	.00075
0.020	.00079	.00083	.00087	.00091	.00094	.00098	.00102	.00106	.00110	.00144
0.030	.00118	.00122	.00126	.00130	.00134	.00138	.00142	.00146	.00150	.00154
0.040	.00157	.00161	.00165	.00169	.00173	.00177	.00181	.00185	.00189	.00193
0.050	.00197	.00201	.00205	.00209	.00213	.00217	.00220	.00224	.00228	.00232
0.060	.00236	.00240	.00244	.00248	.00252	.00256	.00260	.00264	.00268	.00272
0.070	.00276	.00280	.00283	.00287	.00291	.00295	.00299	.00303	.00307	.00311
0.080	.00315	.00319	.00323	.00327	.00331	.00335	.00339	.00343	.00346	.00350
0.090	.00354	.00358	.00362	.00366	.00370	.00374	.00378	.00382	.00386	.00390
0.100	.00394	.00398	.00402	.00406	.00409	.00413	.00417	.00421	.00425	.00429
0.110	.00433	.00437	.00441	.00445	.00449	.00453	.00457	.00461	.00465	.00469
0.120	.00472	.00476	.00480	.00484	.00488	.00492	.00496	.00500	.00504	.00508
0.130	.00512	.00516	.00520	.00524	.00528	.00531	.00535	.00539	.00543	.00547
0.140	.00551	.00555	.00559	.00563	.00567	.00571	.00575	.00579	.00583	.00587
0.150	.00591	.00594	.00598	.00602	.00606	.00610	.00614	.00618	.00622	.00626
0.160	.00630	.00634	.00638	.00642	.00646	.00650	.00654	.00657	.00661	.00665
0.170	.00669	.00673	.00677	.00681	.00685	.00689	.00693	.00697	.00701	.00705
0.180	.00709	.00713	.00717	.00720	.00724	.00728	.00732	.00736	.00740	.00744
0.190	.00748	.00752	.00756	.00760	.00764	.00768	.00772	.00776	.00780	.00783
0.200	.00787	.00791	.00795	.00799	.00803	.00807	.00811	.00815	.00819	.00823

Conversion of Small Inch to mm

inches	mm
0.001	0.0254
0.002	0.0508
0.003	0.0762
0.004	0.1016
0.005	0.1270
0.006	0.1524
0.007	0.1778
0.008	0.2032
0.009	0.2286

inches	mm
0.01	0.254
0.02	0.508
0.03	0.762
0.04	1.016
0.05	1.270
0.06	1.524
0.07	1.778
0.08	2.032
0.09	2.286

inches	mm
0.1	2.54
0.2	5.08
0.3	7.62
0.4	10.16
0.5	12.70
0.6	15.24
0.7	17.78
0.8	20.32
0.9	22.86

inches	inches									
	0	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009
	millimeters (mm)									
0	.00000	.00254	.00508	.00762	.01016	.01270	.01524	.01778	.02032	.02286
0.001	.02540	.02794	.03048	.03302	.03556	.03810	.04064	.04318	.04572	.04826
0.002	.05080	.05334	.05588	.05842	.06096	.06350	.06604	.06858	.07112	.07366
0.003	.07620	.07874	.08128	.08382	.08636	.08890	.09144	.09398	.09652	.09906
0.004	.10160	.10414	.10668	.10922	.11176	.11430	.11684	.11938	.12192	.12446
0.005	.12700	.12954	.13208	.13462	.13716	.13970	.14224	.14478	.14732	.14986
0.006	.15240	.15494	.15748	.16002	.16256	.16510	.16764	.17018	.17272	.17526
0.007	.17780	.18034	.18288	.18542	.18796	.19050	.19304	.19558	.19812	.20066
0.008	.20320	.20574	.20828	.21082	.21336	.21590	.21844	.22098	.22352	.22606
0.009	.22860	.23114	.23368	.23622	.23876	.24130	.24384	.24638	.24892	.25146
0.010	.25400	.25654	.25908	.26162	.26416	.26670	.26924	.27178	.27432	.27686
0.011	.27940	.28194	.28448	.28702	.28956	.29210	.29464	.29718	.29972	.30226
0.012	.30480	.30734	.30988	.31242	.31496	.31750	.32004	.32258	.32512	.32766
0.013	.33020	.33274	.33528	.33782	.34036	34290	.34544	.34798	.35052	.35306
0.014	.35560	.35814	.36068	.36322	.36576	.36830	.37084	.37338	.37592	.37846
0.015	.38100	.38354	.38608	.38862	.39116	.39370	.39624	.39878	.40132	.40386
0.016	.40640	.40894	.41148	.41402	.41656	.41910	.42164	.42418	.42672	.42926
0.017	.43180	.43434	.43688	.43942	.44196	.44450	.44704	.44958	.45212	.45466
0.018	.45720	.45974	.46228	.46482	.46736	.46990	.47244	.47498	.47752	.48006
0.019	.48260	.48514	.48768	.49022	.49276	.49530	.49784	.50038	.50292	.50546
0.020	.50800	.51054	.51308	.51562	.51816	.52070	.52324	.52578	.52832	.53086

Miscellaneous Conversion Factors

Quantity	Conventional		SI Unit	Conversion Factors
	Inch Unit	Metric Unit		
Length	Inch inch	Meter m	Metre m	1 inch = 25.4 mm 1 mm = 0.03937 inch 1 m = 3.2808 ft 1 ft = 0.3048 m
Area	Square Inch $inch^2$	Square Centimeter cm^2	Square Metre m^2	1 $inch^2$ = 6.4516 cm^2 1 cm^2 = 0.155 $inch^2$ 1 m^2 = 10.764 ft^2 1 ft^2 = 0.092903 m^2
Mass	Pound Mass lb	Kilogram Mass kg	Kilogram Mass kg	1 lb = 0.45359237 kg 1 kg = 2.2046 lb
Force	Pound Force lbf	Kilogram Force kgf	Newton N	1 lbf = 0.45359237 kgf 1 lbf = 4.44822 N 1 kgf = 2.2046 lbf 1 kgf = 9.80665 N 1 N = 0.1019716 kgf 1 N = 0.224809 lbf
Stress Pressure	Pounds Per Square Inch $lbf/inch^2$	Kilogram Per Square Centimeter kgf/cm^2	Pascal N/m^2 (Pa)	1 MPa (megapascal) = 10^6 N/m^2 = N/mm^2 1 kPa (kilopascal) = 10^3 N/m^2 1 $lbf/inch^2$ = 0.070307 kgf/cm^2 1 $lbf/inch^2$ = 7.0307 • 10^{-4} kgf/mm^2 1 $lbf/inch^2$ = 6.8947 • 10^{-3} N/mm^2 (MPa) 1 kgf/cm^2 = 14.2233 $lbf/inch^2$ 1 kgf/cm^2 = 9.80665 • 10^{-2} N/mm^2 (MPa)
Torque Work	Inch • Pounds lbf • inch	Kilogram-Meters kgf • m	Newton-Metres N • m	1 lbf • inch = 1.1521 kgf • cm 1 kgf • cm = 0.8679 lbf • inch 1 lbf • inch = 0.1129848 N • m 1 kgf • m = 9.80665 N • m 1 kgf • cm = 9.80665 • 10^{-2} N • M 1 N • m = 8.85 lbf • inch 1 N • m = 10.19716 kgf • cm
Power	lbf • ft/min	kgf • m/s	N • m/s	1 kW = 1000 N • m/s 1 kW = 60,000 N • m/min 1 kW = 44,220 lbf • ft/min 1 kW = 1.34 hp 1 hp = 75 kgf • m/s 1 hp = 44,741 N • m/min 1 hp = 33,000 lbf • ft/min 1 hp = 0.7457 kW
Velocity	Feet Per Second ft/sec	Meters Per Second m/sec	Metres Per Second m/s	1 ft/sec = 0.3048 m/sec 1 inch/sec = 2.54 cm/sec 1 ft/min = 0.00508 m/sec 1 mile/hr = 0.44704 m/sec 1 km/hr = 0.27777 m/sec 1 mile/hr = 1.609344 km/hr
Acceleration	Feet Per Second Square ft/sec^2	Meter Per Second Square m/sec^2	Metre Per Second Square m/sec^2	1 ft/sec^2 = 0.3048 m/sec^2

Linear	1 inch	25.400 millimeters (mm)	1 millimeter	0.03937 inches (in.)
	1 inch	2.54 centimeters (cm)	1 centimeter	0.3937 inches (in.)
	1 foot	12 inches (in.)	1 inch	0.08333 feet (ft.)
	1 foot	0.333 yards (yd.)	1 yard	3 feet (ft.)
	1 foot	0.30481 meters (m)	1 meter	3.2809 feet (ft.)
	1 yard	36 inches (in.)	1 inch	0.02778 yards (yd.)
	1 yard	3 feet (ft.)	1 foot	0.333 yards (yd.)
	1 yard	91.44 centimeters (cm)	1 centimeter	0.01094 yards (yd.)
	1 yard	0.9144 meters (m)	1 meter	1.0936 yards (yd.)
	1 statute mile	5280 feet (ft.)	1 kilometer	3281 feet (ft.)
	1 statute mile	1760 yards (yd.)	1 kilometer	1094 yards (yd.)
	1 statute mile	1.6093 kilometers (km)	1 kilometer	0.6214 statute mile
Area	1 sq. inch	6.4516 sq. centimeters	1 sq. centimeter	0.15500 sq. feet
	1 sq. foot	144 sq. inches	1 sq. inch	0.00694 sq. feet
	1 sq. foot	929.03 sq. centimeters	1 sq. centimeter	0.00108 sq. feet
	1 sq. foot	0.092903 sq. meters	1 sq. meter	10.764 sq. feet
	1 sq. yard	9 sq. feet	1 sq. foot	0.1111 sq. yards
	1 sq. yard	0.83612 sq. meters	1 sq. meter	1.196 sq. yards
Volume	1 cu. inch	0.0005787 cu. feet	1 cu. foot	1728 cu. inches
	1 cu. inch	0.004329 gallons (gal.)	1 gallon	231 cu. inches
	1 cu. inch	16.39 cu. centimeters	1 cu. centimeter	0.06102 cu. inches
	1 cu. inch	0.00001639 cu. meters	1 cu. meter	61023 cu. inches
	1 cu. inch	0.0164 liters (l)	1 liter	61.017 cu. inches
	1 cu. foot	1728 cu. inches	1 cu. inch	0.0005787 cu. feet
	1 cu. foot	7.481 gallons (gal.)	1 gallon	0.1337 cu. feet
	1 cu. foot	0.0283 cu. meters	1 cu. meter	35.31 cu. feet
	1 cu. foot	28.32 liters (l)	1 liter	0.03531 cu. feet
	1 cu. yard	27 cu. feet	1 cu. foot	0.0370 cu. yards
	1 cu. yard	0.76410 cu. meters	1 cu. meter	1.30873 cu. yards
	1 pint	0.4732 liters (l)	1 liter	2.11327 pints (pt.)
	1 quart	2 pints (pt.)	1 pint	0.50 quarts (qt.)
	1 quart	0.25 gallons (gal.)	1 gallon	4 quarts (qt.)
	1 quart	57.75 cu. inches	1 cu. inch	0.017316 quarts (qt.)
	1 quart	0.03342 cu. feet	1 cu. foot	29.9222 quarts (qt.)
	1 quart	0.9464 liters (l)	1 liter	1.057 quarts (qt.)
	1 gallon	231 cu. inches	1 cu. inch	0.004329 gallons (gal.)
	1 gallon	0.1337 cu. feet	1 cu. foot	7.481 gallons (gal.)
	1 gallon	3.785 liters (l)	1 liter	0.2642 gallons (gal.)
Weight	1 ounce	28.35 grams (g)	1 gram	0.03537 ounces (oz.)
	1 ounce	0.02835 kilograms (kg)	1 kilogram	35.274 ounces (oz.)
	1 pound	16 ounces (oz.)	1 ounce	0.0625 pounds (lb.)
	1 pound	453.6 grams (g)	1 gram	0.002205 pounds (lb.)
	1 pound	0.4536 kilograms (kg)	1 kilogram	2.2046 pounds (lb.)
Pressure	1 pound/ sq. inch	0.070307 kg's/sq. cm	1 kilogram/sq. cm	14.223 pounds/sq. in.
	1 pound/sq. foot	4.8824 kilograms/sq. m	1 kilogram/sq. meter	0.2048 pounds/sq. ft.
	1 pound/sq. yard	0.54249 kilograms/sq. m	1 kilogram/sq. meter	1.8433 pounds/sq. yd.
	1 ounce/cu. inch	1.7300 grams/cu. cm	1 gram/cu. cm	0.57803 ounce/cu. in.
	1 pound/cu. foot	16.019 kilograms/cu. m	1 kilogram/cu. meter	0.062428 pounds/cu. ft.

Miscellaneous Conversion Factors (Cont.)

To Convert	Into	Multiply By
Amperes/sq. cm	Amperes/sq. in.	6.452
Amperes/sq. in.	Amperes/sq. cm	0.1550
Ampere-hours	Coulombs	3600
Ampere-turns	Gilberts	1.257
Ampere-turns/cm	Ampere-turns/in.	2.540
Ampere-turns/cm	Gilberts/cm	1.257
Ampere-turns/in.	Ampere-turns/cm	0.3937
Ampere-turns/in.	Gilberts/cm	0.4950
Angstrom unit	Inches	3937×10^{-9}
Angstrom unit	Microns (mus)	1×10^{-4}
Atmospheres	Cms of mercury	76
Atmospheres	Ft. of water (4°C)	33.90
Atmospheres	In. of mercury (0°C)	29.92
Atmospheres	Pounds/sq. in.	14.70
Bars	Atmospheres	0.9869
Bars	Dynes/sq. cm	10^{6}
Bars	Pounds/sq. in.	14.50
Btu	Ergs	1.0550×10^{10}
Btu	Foot-pounds	778.3
Btu	Gram-calories	252
Btu	Horsepower-hrs.	3.931×10^{-4}
Btu	Joules	1054.8
Btu	Kilowatt-hrs.	2.928×10^{-4}
Btu/hr.	Foot-pounds/sec.	0.2162
Btu/hr.	Gram-cal./sec.	0.0700
Btu/hr.	Horsepower-hrs.	3.929×10^{-4}
Btu/hr.	Watts	0.2931
Btu/min.	Foot-pounds/sec.	12.96
Btu/min.	Horsepower	0.02356
Btu/min.	Kilowatts	0.01757
Btu/min.	Watts	17.57
Calories, gram (mean)	Btu (mean)	3.9685×10^{-3}
Candle/ sq. in.	Lamberts	.4870
Centigrade	Fahrenheit	(°C x 9/5) + 32°
Centiliters	Liters	0.01
Centimeters	Feet	3.281×10^{-2}
Centimeters	Meters	0.01
Centimeters	Inches	0.3937
Centimeters	Millimeters	10
Centimeter-dynes	Centimeter-grams	1.020×10^{-3}
Centimeter-dynes	Pound-feet	7.376×10^{-8}
Centimeters/sec.	Feet/sec.	0.03281
Centimeters/sec.^{2}	Feet/sec.^{2}	0.03281
Circular mils	Sq. centimeters	5.067×10^{-6}
Circular mils	Sq. mils	0.7854
Circular mils	Sq. inches	7.854×10^{-7}
Circumference	Radians	6.283
Coulombs	Faradays	1.036×10^{-5}
Coulombs/ sq. cm	Coulombs/ sq. in.	64.52
Coulombs/ sq. in.	Coulombs/ sq. cm	0.1550
Cubic centimeters	Cu. inches	0.06102
Cubic centimeters	Gallons (U.S. liquid)	2.642×10^{-4}
Cubic centimeters	Liters	0.001
Cubic centimeters	Quarts (U.S liq.)	1.057×10^{-3}
Cubic feet	Cu. Inches	1728

To Convert	Into	Multiply By
Cubic feet	Cu. meters	0.02832
Cubic feet	Cu. yards	0.03704
Cubic feet	Gallons (U.S. liq.)	7.48052
Cubic feet	Liters	28.32
Cubic feet/ min.	Cu. cms/sec.	472
Cubic inches	Cu. centimeters	16.39
Cubic inches	Cu. feet	5.787×10^{-4}
Cubic inches	Gallons (U.S. liq.)	4.329×10^{-3}
Cubic inches	Liters	0.01639
Cubic inches	Quarts (U.S. liq.)	0.01732
Cubic meters	Gallons (U.S. liq.)	264.2
Cubic meters	Liters	1000
Cubic meters	Pints (U.S. liq.)	2113
Days	Seconds	86400
Degrees/sec.	Radians/sec.	0.01745
Degress/sec.	Revolutions/min.	0.1667
Degrees/sec.	Revolutions/sec.	2.778×10^{-3}
Degrees (angle)	Quadrants	0.01111
Degrees (angle)	Radians	0.01745
Degrees (angle)	Seconds	3600
Dyne/cm	Erg/sq. millimeter	0.01
Dyne/ sq. cm	Atmospheres	9.869×10^{-7}
Dyne/ sq. cm	In. of mercury (0°C)	2.953×10^{-5}
Dynes	Grams	1.020×10^{-3}
Dynes	Joules/cm	10^{-7}
Dynes	Joules/m (Newtons)	10^{-5}
Dynes	Pounds	2.248×10^{-6}
Dynes/ sq. cm	Bars	10^{-6}
Erg/sec.	Dyne-cm/sec.	1.0
Ergs	Btu	9.480×10^{-11}
Ergs	Dyne-centimeters	1.0
Ergs	Foot-pounds	7.367×10^{-8}
Ergs	Grams-calories	0.2389×10^{-7}
Ergs	Grams-cms	1.020×10^{-3}
Ergs	Joules	10^{-7}
Ergs	Watt-hours	0.2778×10^{-10}
Ergs/sec.	Btu/min.	5.688×10^{-9}
Ergs/sec.	Foot-pounds/sec.	7.3756×10^{-8}
Ergs/sec.	Horsepower	1.341×10^{-10}
Ergs/sec.	Kilowatts	10^{-10}
Farads	Microfarads	10^{6}
Faradays	Ampere-hours	26.80
Faradays	Coulombs	9.649×10^{4}
Feet	Centimeters	30.48
Feet	Meters	0.3048
Feet	Millimeters	304.8
Feet of water	Atmospheres	0.02950
Feet of water	Inches of mercury	0.8826
Feet of water	Kilograms/sq. cm	0.03048
Feet of water	Pounds/sq. in.	0.4335
Feet/min.	Centimeters/sec.	0.5080
Feet/min.	Miles/hr.	0.01136
Feet/sec.	Centimeters/sec.	30.48
Feet/sec.^{2}	Meters/sec.^{2}	0.3048
Feet/sec.^{2}	Miles/h•s	0.6818

Miscellaneous Conversion Factors (Cont.)

To Convert	Into	Multiply By
Foot-candles	Lumens/sq. meter	10.764
Foot-pounds	Btu	1.286×10^{-3}
Foot-pounds	Ergs	1.356×10^{-7}
Foot-pounds	Gram-calories	0.3238
Foot-pounds	Joules	1.356
Foot-pounds/min.	Btu/min.	1.286×10^{-3}
Foot-pounds/min.	Foot-pounds/sec.	0.01667
Foot-pounds/min.	Horsepower	3.030×10^{-5}
Foot-pounds/min.	Kg-calories/min.	3.24×10^{-4}
Foot-pounds/min.	Kilowatts	2.260×10^{-5}
Foot-pounds/sec.	Btu/min.	0.07717
Foot-pounds/sec.	Horsepower	1.818×10^{-3}
Foot-pounds/sec.	Kilowatts	1.356×10^{-3}
Gallons	Cu. feet	0.1337
Gallons	Cu. inches	231
Gallons	Liters	3.785
Gallons of water	Pounds of water	8.3453
Gausses	Lines/sq. in.	6.452
Gausses	Webers/sq. cm	10^{-8}
Gausses	Webers/sq. in.	6.452×10^{-8}
Gilberts	Ampere-turns	0.7958
Gilberts/cm	Ampere-turns/cm	0.7958
Gilberts/cm	Ampere-turns/in.	2.021
Grams	Dynes	980.7
Grams	Joules/cm	9.807×10^{-5}
Grams	Kilograms	0.001
Grams	Milligrams	1000
Grams	Ounces (avdp)	0.03527
Grams	Pounds	2.205×10^{-3}
Grams/cu. cm	Pounds/cu. ft.	62.43
Grams/cu. cm	Pounds/cu. in.	0.03613
Gram-calories	Btu	3.9683×10^{-3}
Gram-calories	Ergs	4.1868×10^{7}
Gram-calories	Foot-pounds	3.0880
Gram-calories	Horsepower-hrs.	1.5596×10^{-6}
Gram-calories	Watt-hrs.	1.1630×10^{-3}
Gram-calories/sec.	Btu-hr.	14.286
Gram-centimeters	Btu	9.297×10^{-8}
Gram-centimeters	Ergs	980.7
Gram-centimeters	Joules	9.807×10^{-5}
Henries	Millihenries	1000
Horsepower	Btu/min.	42.44
Horsepower	Foot-pounds/min.	33000
Horsepower	Foot-pounds/sec.	550
Horsepower	Kg-calories/min.	10.68
Horsepower	Watts	745.7
Horsepower-hrs.	Btu	2547
Horsepower-hrs.	Ergs	2.6845×10^{13}
Horsepower-hrs.	Foot-pounds	1.98×10^{6}
Horsepower-hrs.	Gram-calories	641190
Horsepower-hrs.	Joules	2.684×10^{6}
Horsepower-hrs.	Kilowatt-hrs.	0.7457
Hours	Weeks	5.952×10^{-3}
Inches	Centimeters	2.540
Inches	Millimeters	25.40
Inches	Mils	1000
Inches of mercury	Atmospheres	0.03342
Inches of mercury	Feet of water	1.133

To Convert	Into	Multiply By
Inches of mercury	pounds/sq. in.	0.4912
Joules	Btu	9480×10^{-4}
Joules	Ergs	10^{7}
Joules	Foot-pounds	0.7376
Joules	Kilogram-calories	2.389×10^{-4}
Joules	Watt-hrs.	2.778×10^{-4}
Kilograms	Grams	1000
Kilograms	Pounds	2.205
Kilograms	Tons (short)	1.102×10^{-3}
Kilograms/sq. cm	Pounds/sq. in.	14.22
Kilogram-calories	Btu	3.968
Kilogram-calories	Foot-pounds	3088
Kilogram-calories	Joules	4186
Kilogram-calories	Kilowatt-hrs.	1.163×10^{-3}
Kilolines	Maxwells	1000
Kilometers	Meters	1000
Kilometers	Miles	0.6214
Kilometers/hr.	Feet/sec.	0.9113
Kilometers/hr.	Miles/hr.	0.6214
Kilometers/hr.^{2}	Centimeters/sec.^{2}	27.78
Kilometers/hr.^{2}	Feet/sec.^{2}	0.9113
Kilometers/hr.^{2}	Miles/hr.^{2}	0.6214
Kilowatts	Btu/min.	56.92
Kilowatts	Foot-pounds/sec.	737.6
Kilowatts	Horsepower	1.341
Kilowatts	Kg-calories/min.	14.34
Kilowatts	Watts	1000
Kilowatt-hrs.	Btu	3413
Kilowatt-hrs.	Foot-pounds	2.655×10^{6}
Kilowatt-hrs.	Gram-calories	859850
Kilowatt-hrs.	Horsepower-hrs.	1.341
Kilowatt-hrs.	Joules	3.6×10^{6}
Lines/sq. cm	Gausses	1.0
Lines/sq. in.	Gausses	0.1550
Lines/sq. in.	Webers/sq. in.	10^{-8}
Liters	Cu. centimers	1000
Liters	Cu. feet	0.03531
Liters	Cu. inches	61.02
Liters	Gallons (U.S. liq.)	0. 2642
Lumens	Spher. candle power	0.07958
Lumens	Watts	0.001496
Lumens/sq. ft.	Foot-candles	1.0
Lumens/sq. ft.	Lumens/sq. meter	10.76
Maxwells	Kilolines	0.001
Maxwells	Webers	10^{-8}
Megohms	Ohms	10^{6}
Meters	Centimeters	100
Meters	Feet	3.281
Meters	Inches	39.37
Meters	Kilometers	0.001
Meters	Yards	1.094
Meters/min.	Feet/sec.	0.05468
Meters/sec.	Feet/sec.	3.281
Meters/sec.	Kilometers/hr.	3.6
Meters/sec.	Miles/hr.	2.237
Meters/sec.^{2}	Feet/sec./sec.	3.281
Meters/sec.^{2}	Kilometers/hr.^{2}	3.6
Meters/sec.^{2}	Miles/hr.^{2}	2.237

Miscellaneous Conversion Factors (Cont.)

To Convert	Into	Multiply By
Microfarads	Farads	10^{-6}
Microhms	Megohms	10^{-12}
Microhms	Ohms	10^{-6}
Microns	Meters	1×10^{-6}
Miles (statute)	Centimeters	1.609×10^{5}
Miles (statute)	Feet	5280
Miles (statute)	Inches	6.336×10^{4}
Miles (statute)	Kilometers	1.609
Miles/hr.	Feet/min.	88
Miles/hr.	Feet/sec.	1.467
Miles/hr.	Meters/min.	26.82
Miles/h • s	Centimeters/sec.^{2}	44.70
Miles/h • s	Feet/sec.^{2}	1.467
Miles/h • s	Kilometers/h • s	1.609
Millimicrons	Meters	1×10^{-9}
Milligrams	Grams	0.001
Millihenries	Henries	0.001
Milliliters	Liters	0.001
Millimeters	Centimeters	0.1
Millimeters	Inches	0.03937
Millimeters	Mils	39.37
Mils	Centimeters	2.540×10^{-3}
Mils	Inches	0.001
Minutes (angles)	Degrees	0.01667
Minutes (angles)	Radians	2.909×10^{-4}
Ohms	Megohms	10^{-6}
Ounces	Grams	28.349527
Ounces	Pounds	0.0625
Ounces (fluid)	Cu. inches	1.805
Ounces (fluid)	Liters	0.02957
Pints (liquid)	Cu. centimeters	473.2
Pints (liquid)	Cu. feet	0.01671
Pints (liquid)	Cu. inches	28.87
Pints (liquid)	Gallons	0.125
Pints (liquid)	Liters	0.4732
Pints (liquid)	Quarts (liquid)	0.5
Poise	Grams/cm. sec.	1.00
Pounds	Dynes	44.4823×10^{4}
Pounds	Grams	453.5924
Pounds	Kilograms	0.4536
Pounds	Ounces	16
Pounds of water	Cu. feet	0.01602
Pounds of water	Cu. inches	27.68
Pounds of water	Gallons	0.1198
Pound-feet	Centimeter-dynes	1.356×10^{7}
Pound-feet	Centimeter-grams	13825
Pound-feet	Meter-kilograms	0.1383
Pounds/cu. in.	Grams/cu. cm	27.68
Pounds/cu. in.	Pounds/cu. ft.	1728
Pounds/sq. in.	Atmospheres	0.06804
Pounds/sq. in.	Feet of water	2.307
Pounds/sq. in.	Inches of mercury	2.036
Pounds/sq. in.	Pounds/sq. ft.	144
Quarts (liquid)	Gallons	0.25
Quarts (liquid)	Liters	0.9463
Radians	Degrees	57.30
Radians/sec.	Degrees/sec.	57.30
Radians/sec./sec.	Revs./sec./sec.	0.1592
Revolutions	Degrees	360

To Convert	Into	Multiply By
Revolutions	Radians	6.283
Revolutions/min.	Degrees/sec.	6
Revolutions/min.	Radians/sec.	0.1047
Revolutions/min.^{2}	Radians/sec.^{2}	1.745×10^{-3}
Revolutions/min.^{2}	Revolutions/sec.^{2}	2.778×10^{-4}
Revolutions/sec.	Degrees/sec.	360
Revolutions/sec.	Radians/sec.	6.283
Revolutions/sec.^{2}	Radians/sec.^{2}	6.283
Seconds (angles)	Degrees	2.778×10^{-4}
Seconds (angles)	Minutes	0.01667
Slugs	Pounds	32.17
Square centimeters	Circular mils	1.973×10^{5}
Square centimeters	Sq. inches	0.1550
Square centimeters	Sq. meters	0.0001
Square centimeters	Sq. millimeters	100
Square feet	Circular mils	1.833×10^{8}
Square feet	Sq. centimeters	929
Square feet	Sq. inches	144
Square inches	Circular mils	1.273×10^{6}
Square inches	Sq. centimeters	6.452
Square inches	Sq. millimeters	645.2
Square inches	Sq. mils	10^{6}
Square meters	Sq. centimeters	10^{4}
Square meters	Sq. feet	10.76
Square meters	Sq. inches	1550
Square meters	Sq. millimeters	10^{6}
Square millimeters	Circular mils	1973
Square millimeters	Sq. centimeters	0.01
Square millimeters	Sq. inches	1.550×10^{-3}
Square mils	Circular mils	1.273
Square mils	Sq. centimeters	6.452×10^{-6}
Square mils	Sq. inches	10^{-6}
Temp. (°C) + 273°	Absolute temp. (°C)	1.0
Temp. (°C) + 17.78°	Temperature (°F)	1.8
Temp. (°F) + 460°	Absolute temp. (°F)	1.0
Temp. (°F) - 32°	Temperature (°C)	5/9
Tons (short)	Ounces	32000
Tons (short)	Pounds	2000
Volts/inch	Volts/cm	0.39370
Watts	Btu/hr.	3.4129
Watts	Btu/min.	0.05688
Watts	Ergs/sec.	107
Watts	Foot-pounds/sec.	0.7378
Watts	Horsepower	1.341×10^{-3}
Watts	Kg-calories/min.	0.01433
Watts	Kilowatts	0.001
Watt-hours	Btu	3.413
Watt-hours	Ergs	3.60×10^{10}
Watt-hours	Foot-pounds	2656
Watt-hours	Gram-calories	859.85
Watt-hours	Horsepower-hrs.	1.341×10^{-3}
Watt-hours	Kilogram-calories	0.8605
Watt-hours	Kilowatt-hrs.	0.001
Webers	Maxwells	10^{8}
Webers	Kilolines	10^{5}
Webers/sq. in.	Gausses	1.550×10^{7}
Webers/sq. in.	Lines/sq. in.	10^{8}
Webers/sq. in.	Webers/sq. cm	0.1550
Yards	Meters	0.9144

Multiples and Submultiples of Metric Units

Length			Area		
Unit	**Symbol**	**Value in meters**	**Unit**	**Symbol**	**Value in sq. meters**
Micrometer	μm	0.000001			
Millimeter	mm	0.001	Sq. millimeter	mm^2	0.000001
Centimeter	cm	0.01	Sq. centimeter	cm^2	0.0001
Decimeter	dm	0.1	Sq. decimeter	dm^2	0.01
Meter (unit)	m	1.0	Sq. meter (unit)	m^2	1.0
Dekameter	dkm	10.0	Sq. dekameter (are)	a	100.0
Hectometer	hm	100.0	Hectare	ha	10000.0
Kilometer	km	1000.0	Sq. kilometer	km^2	1000000.0
Myriameter	Mm	10000.0			
Megameter		1000000.0			

Volume					
Unit	**Symbol**	**Value in liters**	**Unit**	**Symbol**	**Value in cubic meters**
Milliliter	ml	0.001	Cubic micron	μm^3	10^{-18}
Centiliter	cl	0.01	Cubic millimeter	mm^3	10^{-9}
Deciliter	dl	0.1	Cubic centimeter	cm^3	10^{-6}
Liter (unit)	l	1.0	Cubic decimeter	dm^3	10^{-3}
Dekaliter	dkl	10.0	Cubic meter	m^3	1
Hectoliter	hl	100.0	Cubic dekameter	dkm^3	10^3
Kiloliter	kl	1000.0	Cubic hectometer	hm^3	10^6
			Cubic kilometer	km^3	10^9

Mass					
Unit	**Symbol**	**Value in grams**	**Unit**	**Symbol**	**Value in grams**
Microgram	γ	0.000001	Dekagram	dkg	10.0
Milligram	mg	0.001	Hectogram	hg	100.0
Centigram	cg	0.01	Kilogram	kg	1000.0
Decigram	dg	0.1	Myriagram	Mg	10000.0
Gram (unit)	g	1.0	Quintal	q	100000.0
			Ton	t	1000000.0

The prefixes used to designate multiples and submultiples of metric units have also been used in recent years in connection with other units. Examples are microinch and kilowatt. Other prefixes besides those originally used with the metric units have come into use. In the case of the prefixes for 10^{12} and 10^9 caution should be used, as these have been interchanged in some instances from those given in the following list:

Tera	10^{12}	Deci	10^{-1}
Giga	10^9	Centi	10^{-2}
Mega	10^6	Milli	10^{-3}
Myria	10^4	Micro	10^{-6}
Kilo	10^3	Nano	10^{-9}
Hecto	10^2	Pico	10^{-12}
Deca	10		

Multipliers for SI Units

TORQUE

Multiply By							To Obtain
dy • cm	**g • cm**	**N • m x 10^{-4}**	**N • m**	**oz • in**	**lb • in**	**lb • ft**	
1	980.7	1000	10^{7}	7.062 x 10^{4}	1.130 x 10^{8}	1.356 x 10^{7}	**dy • cm**
1.020 x 10^{-3}	1	1.020	1.020 x 10^{4}	72.01	1.152 x 10^{3}	1.383 x 10^{4}	**g • cm**
10^{-3}	9.807 x 10^{-1}	1	10^{4}	70.62	1.130 x 10^{3}	1.356 x 10^{4}	**N • m x 10^{-4}**
10^{-7}	9.807 x 10^{-5}	10^{-4}	1	7.062 x 10^{-3}	0.1130	1.356	**N • m**
1.416 x 10^{-5}	1.389 x 10^{-2}	1.416 x 10^{-2}	141.6	1	16	192	**oz • in**
8.850 x 10^{-7}	8.681 x 10^{-4}	8.850 x 10^{-4}	8.850	6.250 x 10^{-2}	1	12	**lb • in**
7.375 x 10^{-8}	7.234 x 10^{-5}	7.375 x 10^{-5}	0.7375	5.208 x 10^{-3}	8.333 x 10^{-2}	1	**lb • ft**

PREFIXES FOR SI UNITS

Multiple and Submultiple	Prefix	Symbol
1,000,000,000,000 = 10^{12}	tera	T
1,000,000,000 = 10^{9}	giga	G
1,000,000 = 10^{6}	mega	M
1,000 = 10^{3}	kilo	k
100 = 10^{2}	hecto	h
10 = 10	deka	da
0.1 = 10^{-1}	deci	d
0.01 = 10^{-2}	centi	c
0.001 = 10^{-3}	milli	m
0.000 001 = 10^{-6}	micro	μ
0.000 000 001 = 10^{-9}	nano	n
0.000 000 000 001 = 10^{-12}	pico	p
0.000 000 000 000 001 = 10^{-15}	femto	f
0.000 000 000 000 000 001 = 10^{-18}	atto	a

POWER

Multiply By			To Obtain
oz • in • rpm	**watts**	**hp**	
1	1352	1.008 x 10^{6}	**oz • in • rpm**
7.345 x 10^{-4}	1	745.7	**watts**
9.917 x 10^{-7}	1.341 x 10^{-3}	1	**hp**

INERTIA

Multiply By				To Obtain
g • cm^2	**kg • m^2**	**oz • in • s^2**	**oz • in^2**	
1	10^{7}	7.062 x 10^{4}	182.9	**g • cm^2**
10^{-7}	1	7.062 x 10^{-3}	1.829 x 10^{-5}	**kg • m^2**
1.416 x 10^{-5}	141.6	1	2.590 x 10^{-3}	**oz • in • s^2**
5.467 x 10^{-3}	5.467 x 10^{4}	386.09	1	**oz • in^2**

GREEK ALPHABET

Α	α	Alpha
Β	β	Beta
Γ	γ	Gamma
Δ	δ	Delta
Ε	ε	Epsilon
Ζ	ζ	Zeta
Η	η	Eta
Θ	θ	Theta
Ι	ι	Iota
Κ	κ	Kappa
Λ	λ	Lambda
Μ	μ	Mu
Ν	ν	Nu
Ξ	ξ	Xi
Ο	ο	Omicron
Π	π	Pi
Ρ	ρ	Rho
Σ	ς	Sigma
Τ	τ	Tau
Υ	υ	Upsilon
Φ	φ	Phi
Χ	χ	Chi
Ψ	ψ	Psi
Ω	ω	Omega