

Imperial—Metric—SI Conversion Tables

Length

SI units: mm, m, km.

Imperial units: in, ft, mile.

	mm	m	km	in	ft	mile
mm	1	10 ^{−3}	10 ^{−6}	0.039 3701	3.281 × 10 ^{−3}	—
m	1000	1	10 ^{−3}	39.3701	3.280 84	6.214 × 10 ^{−4}
km	10 ⁶	10 ³	1	39 370.1	3280.84	0.621 371
in	25.4	0.0254	—	1	0.083 333	—
ft	304.8	0.3048	3.048 × 10 ^{−4}	12	1	1.894 × 10 ^{−4}
mile	—	1609.34	1.609 34	63 360	5280	1

Area

SI units: mm², m², km².

Imperial units: in², ft², mile².

	mm ²	m ²	km ²	in ²	ft ²	mile ²
mm ²	1	10 ^{−6}	—	1.550 × 10 ^{−3}	1.076 × 10 ^{−5}	—
m ²	10 ⁶	1	10 ^{−6}	1550	10.764	—
km ²	—	10 ⁶	1	—	1076 × 10 ⁷	0.3861
in ²	645.16	6.452 × 10 ^{−4}	—	1	6.944 × 10 ^{−3}	—
ft ²	92 903	0.092 90	—	144	1	—
mile ²	—	2.590 × 10 ⁶	2.590	—	2.788 × 10 ⁷	1

Second Moment of AreaSI units: mm^4 , m^4 .Imperial units: in^4 , ft^4 .

	mm^4	m^4	in^4	ft^4
mm^4	1	10^{-12}	2.4025×10^{-6}	1.159×10^{-10}
m^4	10^{12}	1	2.4025×10^6	115.86
in^4	416 231	4.1623×10^{-7}	1	4.8225×10^{-5}
ft^4	8.631×10^9	8.631×10^{-3}	20 736	1

VolumeSI units: mm^3 , m^3 .

Metric units: ml, l.

Imperial units: in^3 , ft^3 , UK gallon.

	mm^3	ml	l	m^3	in^3	ft^3	UK Gallon
mm^3	1	10^{-3}	10^{-6}	10^{-9}	6.10×10^{-5}	—	—
ml	10^3	1	10^{-3}	10^{-6}	0.061 024	3.53×10^{-5}	2.2×10^{-4}
l	10^6	10^3	1	10^{-3}	61.024	0.035 32	0.22
m^3	10^9	10^6	10^3	1	61 024	35.31	220
in^3	16 387	16.39	0.0164	1.64×10^{-5}	1	5.79×10^{-4}	3.61×10^{-3}
ft^3	—	2.83×10^4	28.32	0.028 32	1728	1	6.229
UK gallon	—	4546	4.546	4.55×10^{-3}	277.4	0.1605	1

Additional unit: 1 US gallon = 0.8327 UK gallon.

DensitySI unit: kg/m^3 .Metric unit: g/cm^3 .Imperial units: lb/ft^3 , lb/in^3 .

	kg/m^3	g/cm^3	lb/ft^3	lb/in^3
kg/m^3	1	10^{-3}	0.062 428	3.605×10^{-5}
g/cm^3	1000	1	62.428	0.036 127
lb/ft^3	16.019	0.016 019	1	5.787×10^{-4}
lb/in^3	27 680	27.680	1728	1

Mass

SI units: g, kg, t.

Imperial units: lb, cwt, ton.

	g	kg	t	lb	cwt	ton
g	1	10^{-3}	10^{-6}	2.205×10^{-3}	1.968×10^{-5}	9.842×10^{-7}
kg	10^3	1	10^{-3}	2.204 62	0.019 684	9.842×10^{-4}
t	10^6	10^3	1	2204.62	19.6841	0.984 207
lb	453.592	0.453 59	4.536×10^{-4}	1	8.929×10^{-3}	4.464×10^{-4}
cwt	50 802.3	50.8023	0.050 802	112	1	0.05
ton	1.016×10^6	1016.05	1.01605	2240	20	1

Force

SI units: N, kN.

Metric unit: kg_f.

Imperial units: pdl (poundal), lb_f, UK ton_f.

	N	kg_f	kN	pd	lb_f	UK ton_f
N	1	0.1020	10^{-3}	7.233	0.2248	1.004×10^{-4}
kg _f	9.807	1	9.807×10^{-3}	70.93	2.2046	9.842×10^{-4}
kN	1000	102.0	1	7233	224.8	0.1004
pd	0.1383	0.0141	1.383×10^{-4}	1	0.0311	1.388×10^{-5}
lb _f	4.448	0.4536	4.448×10^{-3}	32.174	1	4.464×10^{-4}
UK ton _f	9964	1016	9.964	72 070	2240	1

Additional unit: 1 dyne = 10^{-5} N = 7.233×10^{-5} pdl.

Torque (Moment of Force)

SI unit: N m.

Metric unit: kg_f m.

Imperial units: pdl ft, lb_f ft.

	N m	kg_f m	pd	lb_f ft
N m	1	0.1020	23.73	0.7376
kg _f m	9.807	1	232.7	7.233
pd	0.042 14	4.297×10^{-3}	1	0.031 08
lb _f ft	1.356	0.1383	32.17	1

Inertia

SI unit: N m^2 .

Imperial unit: $\text{lb}_f \text{ft}^2$.

$$1 \text{ lb}_f \text{ft}^2 = 0.4132 \text{ N m}^2$$

$$1 \text{ N m}^2 = 2.420 \text{ lb}_f \text{ft}^2$$

Pressure

SI units: mbar, bar, N/m^2 (pascal).

Imperial units: lb/in^2 , in Hg, atm.

	mbar	bar	N/m^2	lb/in^2	in Hg	atm
mbar	1	10^{-3}	100	0.014 50	0.029 53	9.869×10^{-4}
bar	1000	1	10^5	14.50	29.53	0.9869
N/m^2	0.01	10^{-5}	1	1.450×10^{-4}	2.953×10^{-4}	9.869×10^{-6}
lb/in^2	68.95	0.068 95	6895	1	2.036	0.068 05
in Hg	33.86	0.033 86	3386	0.4912	1	0.033 42
atm	1013	1.013	1.013×10^5	14.70	29.92	1

Additional Conversion Factors

$$1 \text{ inch water} = 0.073 56 \text{ in Hg} = 2.491 \text{ mbar.}$$

$$1 \text{ torr} = 1.333 \text{ mbar.}$$

$$1 \text{ Pa} = 1 \text{ N/m}^2.$$

Energy, Work, Heat

SI unit: J.

Metric units: $\text{kg}_f \text{m}$, kW h.

Imperial units: ft lb_f , cal, Btu.

	J	$\text{kg}_f \text{m}$	kW h	ft lb_f	cal	Btu
J	1	0.1020	2.778×10^{-7}	0.7376	0.2388	9.478×10^{-4}
$\text{kg}_f \text{m}$	9.8066	1	2.724×10^{-6}	7.233	2.342	9.294×10^{-3}
kW h	3.600×10^6	367 098	1	2.655×10^6	859 845	3412.1
ft lb_f	1.3558	0.1383	3.766×10^{-7}	1	0.3238	1.285×10^{-3}
cal	4.1868	0.4270	1.163×10^{-6}	3.0880	1	3.968×10^{-3}
Btu	1055.1	107.59	2.931×10^{-4}	778.17	252.00	1

Additional Conversion Factors

$$1 \text{ therm} = 10^5 \text{ Btu} = 1.0551 \times 10^8 \text{ J.}$$

$$1 \text{ thermie} = 4.186 \times 10^6 \text{ J.}$$

$$1 \text{ hp h} = 0.7457 \text{ kW h} = 2.6845 \times 10^6 \text{ J.}$$

$$1 \text{ ft pdl} = 0.042 14 \text{ J.}$$

$$1 \text{ erg} = 10^{-7} \text{ J.}$$

Power

SI units: W, kW.

Imperial units: HP, ft lb_f/s.

	W	kW	HP	ft lb_f/s
W	1	10^{-3}	1.341×10^{-3}	0.735 64
kW	10^3	1	1.341 02	735.64
HP	745.7	0.7457	1	548.57
ft lb _f /s	1.359 35	1.359×10^{-3}	1.823×10^{-3}	1

Velocity

SI units: mm/s, m/s.

Metric unit: km/h.

Imperial units: ft/s, mile/h.

	mm/s	m/s	km/h	ft/s	mile/h
mm/s	1	10^{-3}	3.6×10^{-3}	3.281×10^{-3}	2.237×10^{-3}
m/s	1000	1	3.6	3.280 84	2.236 94
km/h	277.778	0.277 778	1	0.911 344	0.621 371
ft/s	304.8	0.3048	1.097 28	1	0.681 818
mile/h	447.04	0.447 04	1.609 344	1.466 67	1

AccelerationSI unit: m/s^2 .Other metric unit: cm/s^2 .Imperial unit: ft/s^2 .Other unit: g .

	m/s^2	cm/s^2	ft/s^2	g
m/s^2	1	100	3.281	0.102
cm/s^2	0.01	1	0.0328	0.001 02
ft/s^2	0.3048	30.48	1	1
g	9.81	981	32.2	1

Mass Flow RateSI unit: g/s .Metric units: kg/h , tonne/d .Imperial units: lb/s , lb/h , ton/d .

	g/s	kg/h	tonne/d	lb/s	lb/h	ton/d
g/s	1	3.6	0.086 40	2.205×10^{-3}	7.937	0.085 03
kg/h	0.2778	1	0.024 00	6.124×10^{-4}	2.205	0.023 62
tonne/d	11.57	41.67	1	0.025 51	91.86	0.9842
lb/s	453.6	1633	39.19	1	3600	38.57
lb/h	0.1260	0.4536	0.010 89	2.788×10^{-4}	1	0.010 71
ton/d	11.76	42.34	1.016	0.025 93	93.33	1

Volume Flow RateSI unit: m^3/s .Metric units: l/h , ml/s .Imperial units: gal/h , ft^3/s , ft^3/h .

	l/h	ml/s	m^3/s	gal/h	ft^3/s	ft^3/h
l/h	1	0.2778	2.778×10^{-7}	0.2200	9.810×10^{-6}	0.035 316
ml/s	3.6	1	10^{-6}	0.7919	3.532×10^{-5}	0.127 14
m^3/s	3.6×10^6	10^6	1	7.919×10^5	35.31	1.271×10^5
gal/h	4.546	1.263	1.263×10^{-6}	1	4.460×10^{-5}	0.160 56
ft^3/s	1.019×10^5	2.832×10^4	0.028 32	2.242×10^4	1	3600
ft^3/h	28.316	7.8653	7.865×10^{-6}	6.2282	2.778×10^{-4}	1

Specific Energy (Heat per Unit Volume)

SI units: J/m³, kJ/m³, MJ/m³.

Imperial units: kcal/m³, Btu/ft³, therm/UK gal.

	J/m ³	kJ/m ³	MJ/m ³	kcal/m ³	Btu/ft ³	therm/UK gal
J/m ³	1	10 ⁻³	10 ⁻⁶	1.388 × 10 ⁻⁴	2.684 × 10 ⁻⁵	—
kJ/m ³	1000	1	10 ⁻³	0.2388	0.02684	—
MJ/m ³	10 ⁶	1000	1	238.8	26.84	4.309 × 10 ⁻⁵
kcal/m ³	4187	4.187	4.187 × 10 ⁻³	1	0.1124	1.804 × 10 ⁻⁷
Btu/ft ³	3.726 × 10 ⁴	37.26	0.03726	8.899	1	1.605 × 10 ⁻⁶
therm/UK gal	—	—	2.321 × 10 ⁴	5.543 × 10 ⁶	6.229 × 10 ⁵	1

Dynamic Viscosity

SI unit: N s/m².

Metric unit: cP (centipoise), P (poise) (1 P = 100 g/m s).

Imperial unit: lb_m/ft h.

	lb _m /ft h	P	cP	N s/m ²
lb _m /ft h	1	4.133 × 10 ⁻³	0.4134	4.134 × 10 ⁻⁴
P	241.9	1	100	0.1
cP	2.419	0.01	1	10 ⁻³
N s/m ²	2419	10	1000	1

Additional unit: 1 Pa s = 1 N s/m².

Kinematic Viscosity

SI unit: m²/s.

Metric unit: cSt (centistokes), St (stokes).

Imperial unit: ft²/s.

	ft ² /s	m ² /s	cSt	St
ft ² /s	1	0.0929	9.29 × 10 ⁴	929
m ² /s	10.764	1	10 ⁶	10 ⁴
cSt	1.0764 × 10 ⁻⁵	10 ⁻⁶	1	0.01
St	1.0764 × 10 ⁻³	10 ⁻⁴	100	1