

1.4 Converting between units

The following table lists common (and not so common) measures of physical quantities. The numerical values given are the SI equivalent of one unit measure of the non-SI unit. Hence 1 astronomical unit equals 149.5979×10^9 m. Those entries identified with a “*” in the second column represent exact conversions; so 1 abampere equals exactly 10.0 A. Note that individual entries in this list are not recorded in the index, and that values are “international” unless otherwise stated.

There is a separate section on temperature conversions after this table.

<i>unit name</i>	<i>value in SI units</i>	
abampere	10.0*	A
abcoulomb	10.0*	C
abfarad	1.0*	$\times 10^9$ F
abhenry	1.0*	$\times 10^{-9}$ H
abmho	1.0*	$\times 10^9$ S
abohm	1.0*	$\times 10^{-9}$ Ω
abvolt	10.0*	$\times 10^{-9}$ V
acre	4.046 856	$\times 10^3$ m ²
amagat (at stp)	44.614 774	mol m ⁻³
ampere hour	3.6*	$\times 10^3$ C
ångström	100.0*	$\times 10^{-12}$ m
apostilb	1.0*	lm m ⁻²
arcminute	290.888 2	$\times 10^{-6}$ rad
arcsecond	4.848 137	$\times 10^{-6}$ rad
are	100.0*	m ²
astronomical unit	149.597 9	$\times 10^9$ m
atmosphere (standard)	101.325 0*	$\times 10^3$ Pa
atomic mass unit	1.660 540	$\times 10^{-27}$ kg
bar	100.0*	$\times 10^3$ Pa
barn	100.0*	$\times 10^{-30}$ m ²
baromil	750.1	$\times 10^{-6}$ m
barrel (UK)	163.659 2	$\times 10^{-3}$ m ³
barrel (US dry)	115.627 1	$\times 10^{-3}$ m ³
barrel (US liquid)	119.240 5	$\times 10^{-3}$ m ³
barrel (US oil)	158.987 3	$\times 10^{-3}$ m ³
baud	1.0*	s ⁻¹
bayre	100.0*	$\times 10^{-3}$ Pa
biot	10.0	A
bolt (US)	36.576*	m
brewster	1.0*	$\times 10^{-12}$ m ² N ⁻¹
British thermal unit	1.055 056	$\times 10^3$ J
bushel (UK)	36.36 872	$\times 10^{-3}$ m ³
bushel (US)	35.23 907	$\times 10^{-3}$ m ³
butt (UK)	477.339 4	$\times 10^{-3}$ m ³
cable (US)	219.456*	m
calorie	4.186 8*	J

continued on next page ...



<i>unit name</i>	<i>value in SI units</i>	
candle power (spherical)	4π	lm
carat (metric)	200.0*	$\times 10^{-6}$ kg
cental	45.359 237	kg
centare	1.0*	m ²
centimetre of Hg (0 °C)	1.333 222	$\times 10^3$ Pa
centimetre of H ₂ O (4 °C)	98.060 616	Pa
chain (engineers')	30.48*	m
chain (US)	20.116 8*	m
Chu	1.899 101	$\times 10^3$ J
clusec	1.333 224	$\times 10^{-6}$ W
cord	3.624 556	m ³
cubit	457.2*	$\times 10^{-3}$ m
cumec	1.0*	m ³ s ⁻¹
cup (US)	236.588 2	$\times 10^{-6}$ m ³
curie	37.0*	$\times 10^9$ Bq
darcy	986.923 3	$\times 10^{-15}$ m ²
day	86.4*	$\times 10^3$ s
day (sidereal)	86.164 09	$\times 10^3$ s
debye	3.335 641	$\times 10^{-30}$ C m
degree (angle)	17.453 29	$\times 10^{-3}$ rad
denier	111.111 1	$\times 10^{-9}$ kg m ⁻¹
digit	19.05*	$\times 10^{-3}$ m
dioptre	1.0*	m ⁻¹
Dobson unit	10.0*	$\times 10^{-6}$ m
dram (avoirdupois)	1.771 845	$\times 10^{-3}$ kg
dyne	10.0*	$\times 10^{-6}$ N
dyne centimetres	100.0*	$\times 10^{-9}$ J
electron volt	160.217 7	$\times 10^{-21}$ J
ell	1.143*	m
em	4.233 333	$\times 10^{-3}$ m
emu of capacitance	1.0*	$\times 10^9$ F
emu of current	10.0*	A
emu of electric potential	10.0*	$\times 10^{-9}$ V
emu of inductance	1.0*	$\times 10^{-9}$ H
emu of resistance	1.0*	$\times 10^{-9}$ Ω
Eötvös unit	1.0*	$\times 10^{-9}$ m s ⁻² m ⁻¹
esu of capacitance	1.112 650	$\times 10^{-12}$ F
esu of current	333.564 1	$\times 10^{-12}$ A
esu of electric potential	299.792 5	V
esu of inductance	898.755 2	$\times 10^9$ H
esu of resistance	898.755 2	$\times 10^9$ Ω
erg	100.0*	$\times 10^{-9}$ J
faraday	96.485 3	$\times 10^3$ C
fathom	1.828 804	m
fermi	1.0*	$\times 10^{-15}$ m
Finsen unit	10.0*	$\times 10^{-6}$ W m ⁻²
firkin (UK)	40.914 81	$\times 10^{-3}$ m ³

continued on next page ...



<i>unit name</i>	<i>value in SI units</i>	
firkin (US)	34.068 71	$\times 10^{-3} \text{ m}^3$
fluid ounce (UK)	28.413 08	$\times 10^{-6} \text{ m}^3$
fluid ounce (US)	29.573 53	$\times 10^{-6} \text{ m}^3$
foot	304.8*	$\times 10^{-3} \text{ m}$
foot (US survey)	304.800 6	$\times 10^{-3} \text{ m}$
foot of water (4 °C)	2.988 887	$\times 10^3 \text{ Pa}$
footcandle	10.763 91	lx
footlambert	3.426 259	cd m^{-2}
footpoundal	42.140 11	$\times 10^{-3} \text{ J}$
footpounds (force)	1.355 818	J
fresnel	1.0*	$\times 10^{12} \text{ Hz}$
funal	1.0*	$\times 10^3 \text{ N}$
furlong	201.168*	m
g (standard acceleration)	9.806 65*	m s^{-2}
gal	10.0*	$\times 10^{-3} \text{ m s}^{-2}$
gallon (UK)	4.546 09*	$\times 10^{-3} \text{ m}^3$
gallon (US liquid)	3.785 412	$\times 10^{-3} \text{ m}^3$
gamma	1.0*	$\times 10^{-9} \text{ T}$
gauss	100.0*	$\times 10^{-6} \text{ T}$
gilbert	795.774 7	$\times 10^{-3} \text{ A turn}$
gill (UK)	142.065 4	$\times 10^{-6} \text{ m}^3$
gill (US)	118.294 1	$\times 10^{-6} \text{ m}^3$
gon	$\pi/200^*$	rad
grade	15.707 96	$\times 10^{-3} \text{ rad}$
grain	64.798 91*	$\times 10^{-6} \text{ kg}$
gram	1.0*	$\times 10^{-3} \text{ kg}$
gram-rad	100.0*	J kg^{-1}
gray	1.0*	J kg^{-1}
hand	101.6*	$\times 10^{-3} \text{ m}$
hartree	4.359 748	$\times 10^{-18} \text{ J}$
hectare	10.0*	$\times 10^3 \text{ m}^2$
hefner	902	$\times 10^{-3} \text{ cd}$
hogshead	238.669 7	$\times 10^{-3} \text{ m}^3$
horsepower (boiler)	9.809 50	$\times 10^3 \text{ W}$
horsepower (electric)	746*	W
horsepower (metric)	735.498 8	W
horsepower (UK)	745.699 9	W
hour	3.6*	$\times 10^3 \text{ s}$
hour (sidereal)	3.590 170	$\times 10^3 \text{ s}$
Hubble time	440	$\times 10^{15} \text{ s}$
Hubble distance	130	$\times 10^{24} \text{ m}$
hundredweight (UK long)	50.802 35	kg
hundredweight (US short)	45.359 24	kg
inch	25.4*	$\times 10^{-3} \text{ m}$
inch of mercury (0 °C)	3.386 389	$\times 10^3 \text{ Pa}$
inch of water (4 °C)	249.074 0	Pa
jansky	10.0*	$\times 10^{-27} \text{ W m}^{-2} \text{ Hz}^{-1}$

continued on next page ...

<i>unit name</i>	<i>value in SI units</i>	
jar	10/9*	$\times 10^{-9}$ F
kayser	100.0*	m^{-1}
kilocalorie	4.186 8*	$\times 10^3$ J
kilogram-force	9.806 65*	N
kilowatt hour	3.6*	$\times 10^6$ J
knot (international)	514.444 4	$\times 10^{-3}$ m s^{-1}
lambert	10/ π *	$\times 10^3$ cd m^{-2}
langley	41.84*	$\times 10^3$ J m^{-2}
langmuir	133.322 4	$\times 10^{-6}$ Pa s
league (nautical, int.)	5.556*	$\times 10^3$ m
league (nautical, UK)	5.559 552	$\times 10^3$ m
league (statute)	4.828 032	$\times 10^3$ m
light year	9.460 73*	$\times 10^{15}$ m
ligne	2.256*	$\times 10^{-3}$ m
line	2.116 667	$\times 10^{-3}$ m
line (magnetic flux)	10.0*	$\times 10^{-9}$ Wb
link (engineers')	304.8*	$\times 10^{-3}$ m
link (US)	201.168 0	$\times 10^{-3}$ m
litre	1.0*	$\times 10^{-3}$ m^3
lumen (at 555 nm)	1.470 588	$\times 10^{-3}$ W
maxwell	10.0*	$\times 10^{-9}$ Wb
mho	1.0*	S
micron	1.0*	$\times 10^{-6}$ m
mil (length)	25.4*	$\times 10^{-6}$ m
mil (volume)	1.0*	$\times 10^{-6}$ m^3
mile (international)	1.609 344*	$\times 10^3$ m
mile (nautical, int.)	1.852*	$\times 10^3$ m
mile (nautical, UK)	1.853 184*	$\times 10^3$ m
mile per hour	447.04*	$\times 10^{-3}$ m s^{-1}
milliard	1.0*	$\times 10^9$ m^3
millibar	100.0*	Pa
millimetre of Hg (0 °C)	133.322 4	Pa
minim (UK)	59.193 90	$\times 10^{-9}$ m^3
minim (US)	61.611 51	$\times 10^{-9}$ m^3
minute (angle)	290.888 2	$\times 10^{-6}$ rad
minute	60.0*	s
minute (sidereal)	59.836 17	s
month (lunar)	2.551 444	$\times 10^6$ s
nit	1.0*	cd m^{-2}
noggin (UK)	142.065 4	$\times 10^{-6}$ m^3
oersted	1000/(4 π)*	A m^{-1}
ounce (avoirdupois)	28.349 52	$\times 10^{-3}$ kg
ounce (UK fluid)	28.413 07	$\times 10^{-6}$ m^3
ounce (US fluid)	29.573 53	$\times 10^{-6}$ m^3
pace	762.0*	$\times 10^{-3}$ m
parsec	30.856 78	$\times 10^{15}$ m

continued on next page ...

<i>unit name</i>	<i>value in SI units</i>	
peck (UK)	9.092 18*	$\times 10^{-3} \text{ m}^3$
peck (US)	8.809 768	$\times 10^{-3} \text{ m}^3$
pennyweight (troy)	1.555 174	$\times 10^{-3} \text{ kg}$
perch	5.029 2*	m
phot	10.0*	$\times 10^3 \text{ lx}$
pica (printers')	4.217 518	$\times 10^{-3} \text{ m}$
pint (UK)	568.261 2	$\times 10^{-6} \text{ m}^3$
pint (US dry)	550.610 5	$\times 10^{-6} \text{ m}^3$
pint (US liquid)	473.176 5	$\times 10^{-6} \text{ m}^3$
point (printers')	351.459 8*	$\times 10^{-6} \text{ m}$
poise	100.0*	$\times 10^{-3} \text{ Pa s}$
pole	5.029 2*	m
poncelot	980.665*	W
pottle	2.273 045	$\times 10^{-3} \text{ m}^3$
pound (avoirdupois)	453.592 4	$\times 10^{-3} \text{ kg}$
poundal	138.255 0	$\times 10^{-3} \text{ N}$
pound-force	4.448 222	N
promaxwell	1.0*	Wb
psi	6.894 757	$\times 10^3 \text{ Pa}$
puncheon (UK)	317.974 6	$\times 10^{-3} \text{ m}^3$
quad	1.055 056	$\times 10^{18} \text{ J}$
quart (UK)	1.136 522	$\times 10^{-3} \text{ m}^3$
quart (US dry)	1.101 221	$\times 10^{-3} \text{ m}^3$
quart (US liquid)	946.352 9	$\times 10^{-6} \text{ m}^3$
quintal (metric)	100.0*	kg
rad	10.0*	$\times 10^{-3} \text{ Gy}$
rayleigh	10/(4 π)	$\times 10^9 \text{ s}^{-1} \text{ m}^{-2} \text{ sr}^{-1}$
rem	10.0*	$\times 10^{-3} \text{ Sv}$
REN	1/4 000*	S
reyn	689.5	$\times 10^3 \text{ Pa s}$
rhe	10.0*	$\text{Pa}^{-1} \text{ s}^{-1}$
rod	5.029 2*	m
roentgen	258.0	$\times 10^{-6} \text{ C kg}^{-1}$
rood (UK)	1.011 714	$\times 10^3 \text{ m}^2$
rope (UK)	6.096*	m
rutherford	1.0*	$\times 10^6 \text{ Bq}$
rydberg	2.179 874	$\times 10^{-18} \text{ J}$
scruple	1.295 978	$\times 10^{-3} \text{ kg}$
seam	290.949 8	$\times 10^{-3} \text{ m}^3$
second (angle)	4.848 137	$\times 10^{-6} \text{ rad}$
second (sidereal)	997.269 6	$\times 10^{-3} \text{ s}$
shake	100.0*	$\times 10^{-10} \text{ s}$
shed	100.0*	$\times 10^{-54} \text{ m}^2$
slug	14.593 90	kg
square degree	($\pi/180$) ² *	sr
statampere	333.564 1	$\times 10^{-12} \text{ A}$
statcoulomb	333.564 1	$\times 10^{-12} \text{ C}$

continued on next page ...



<i>unit name</i>	<i>value in SI units</i>	
statfarad	1.112 650	$\times 10^{-12}$ F
stathenry	898.755 2	$\times 10^9$ H
statmho	1.112 650	$\times 10^{-12}$ S
statohm	898.755 2	$\times 10^9$ Ω
statvolt	299.792 5	V
stere	1.0*	m ³
sthène	1.0*	$\times 10^3$ N
stilb	10.0*	$\times 10^3$ cd m ⁻²
stokes	100.0*	$\times 10^{-6}$ m ² s ⁻¹
stone	6.350 293	kg
tablespoon (UK)	14.206 53	$\times 10^{-6}$ m ³
tablespoon (US)	14.786 76	$\times 10^{-6}$ m ³
teaspoon (UK)	4.735 513	$\times 10^{-6}$ m ³
teaspoon (US)	4.928 922	$\times 10^{-6}$ m ³
tex	1.0*	$\times 10^{-6}$ kg m ⁻¹
therm (EEC)	105.506*	$\times 10^6$ J
therm (US)	105.480 4*	$\times 10^6$ J
thermie	4.185 407	$\times 10^6$ J
thou	25.4*	$\times 10^{-6}$ m
tog	100.0*	$\times 10^{-3}$ W ⁻¹ m ² K
ton (of TNT)	4.184*	$\times 10^9$ J
ton (UK long)	1.016 047	$\times 10^3$ kg
ton (US short)	907.184 7	kg
tonne (metric ton)	1.0*	$\times 10^3$ kg
torr	133.322 4	Pa
townsend	1.0*	$\times 10^{-21}$ V m ²
troy dram	3.887 935	$\times 10^{-3}$ kg
troy ounce	31.103 48	$\times 10^{-3}$ kg
troy pound	373.241 7	$\times 10^{-3}$ kg
tun	954.678 9	$\times 10^{-3}$ m ³
XU	100.209	$\times 10^{-15}$ m
yard	914.4*	$\times 10^{-3}$ m
year (365 days)	31.536*	$\times 10^6$ s
year (sidereal)	31.558 15	$\times 10^6$ s
year (tropical)	31.556 93	$\times 10^6$ s

Temperature conversions

From degrees Celsius ^a	$T_K = T_C + 273.15$	(1.1)	T_K temperature in kelvin T_C temperature in °Celsius
From degrees Fahrenheit	$T_K = \frac{T_F - 32}{1.8} + 273.15$	(1.2)	T_F temperature in °Fahrenheit
From degrees Rankine	$T_K = \frac{T_R}{1.8}$	(1.3)	T_R temperature in °Rankine

^aThe term “centigrade” is not used in SI, to avoid confusion with “10⁻² of a degree”.

