

## SOME TECHNICAL UNITS

### The International (SI) system of units.

Its seven basic units, from which other units are derived, are given in the table below.

Dimension		Symbol	SI unit		Comment
			Name	Unit	
BASIC UNITS IN SI SYSTEM	Length	l	metre	m	
	Mass	m	kilogram	kg	
	Time	t	second	s	
	Electric current	I	ampere	A	
	Temperature	T	kelvin	K	
	Luminous intensity	I <sub>v</sub>	candela	cd	
	Molar heat capacity	n	mol	mol	
	Angle	a	radian	rad	Additional unit
DIVERTED SI-UNITS	Frequency	f	hertz	Hz	s <sup>-1</sup>
	Force	F	newton	N	1 N = 1 kgm/s <sup>2</sup>
	Pressure, stress	p, σ	pascal	Pa	1 Pa = 1 N/m <sup>2</sup>
	Energy, work, heat	E, W, Q	joule	J	1 J = 1 N × m
	Effect	P	watt	W	1 W = 1 J/s

### Decade prefixes

prefix	symbol	value
tera	T	10 <sup>12</sup>
giga	G	10 <sup>9</sup>
mega	M	10 <sup>6</sup>
kilo	k	10 <sup>3</sup>
hecto	h	10 <sup>2</sup>
deca	da	10 <sup>1</sup>

prefix	symbol	value
deci	d	10 <sup>-1</sup>
centi	c	10 <sup>-2</sup>
milli	m	10 <sup>-3</sup>
micro	μ	10 <sup>-6</sup>
nano	n	10 <sup>-9</sup>
pico	p	10 <sup>-12</sup>

### The Greek alphabet

A	α, ∞ <sup>*)</sup>	alpha	(a)	I	ι	iota	(i)	P	ρ	rho	(r, rh)
B	β	beta	(b)	K	κ	kappa	(k)	Σ	σ	sigma	(s)
Γ	γ	gamma	(g, n)	Λ	λ	lambda	(l)	T	τ	tau	(t)
Δ	δ, ∂ <sup>*)</sup>	delta	(d)	M	μ	mu	(m)	Υ	υ	upsilon	(y, u)
E	ε	epsilon	(e)	N	ν	nu	(n)	Φ	φ, φ <sup>*)</sup>	phi	(ph)
Z	ζ	zeta	(z)	Ξ	ξ	xi	(x)	X	χ	chi	(ch, h)
H	η	ëta	(e, ë)	O	ο	omicron	(o)	Ψ	ψ	psi	(ps)
Θ	θ, θ <sup>*)</sup>	theta	(th)	Π	π	pi	(p)	Ω	ω	omega	(o, ò)

<sup>\*)</sup> Old-style character

### Various units and conversions

Dimension	Name	Symbol	Unit	Conversion
Time	minute	min	s	1 h = 60 s
	hour	h	h	1 h = 60 min
	day	day	day	1 day = 24 h
	week	wk	wk	1 wk = 7 days
	year	yr	yr	1 yr = 365.242 days = 52.17 wk
Length	Angstrom	Å	m	1 Å = $10^{-10}$ m
	nautical mile		n mile	1 n mile = 1852 m
	wave length	$\lambda$	m	
Force	load	G (P,W)	N	1 kp = 9.807 N
	gravity	g	N	1 $g_n$ = 9.80665 m/s <sup>2</sup> (exact, at 45° N; at 60°N g = 9.82 m/s <sup>2</sup> )
	atmosphere		atm	1 atm
Modulus	elasticity modulus	E	Pa	1 kPa = 0.1 N/cm = 0.102 ton/m <sup>2</sup>
	deformation modulus	G	Pa	1 MPa = 10,2 kg/cm <sup>2</sup>
	shear modulus	K	Pa	
Density	mass density	$\rho$	kg/m <sup>3</sup>	
	force density	$\gamma$	kN/m <sup>3</sup>	
Flow	Lugeon	Lugeon	l/min/m	1 Lugeon = approx. $10^{-7}$ m/s (see definition)
	permeability coefficient	k	m/s	
	Darcy		m/s	1 Darcy = 1 cm <sup>3</sup> /s through 1 cm <sup>2</sup> at 1 atm and viscosity $\eta$ = 0.01 poise
Viscosity	dynamic viscosity	$\eta, \mu$	poise	1 poise = 0.1 Pa × s
	kinematic viscosity	$\nu$	m <sup>2</sup> /s	
Angle	degree	°		1° = $\pi/180$ rad = 0.017453 rad; 1 rad = 57.296° = 63.622 <sup>g</sup>
	new degree (gon)	g		1 <sup>g</sup> = $\pi/200$ rad = 0.015708 rad
Energy	calory		cal	1 cal = 4.1868 J = 4.1868 × 10 <sup>7</sup> erg 1 cal/s = 4.1868 W
	erg		erg	1 erg = 10 <sup>-7</sup> J
	kilowatthour		kWh	1 kWh = 3.6 × 10 <sup>6</sup> J = 3.6 MJ 1 MJ = 0.278 kWh
Heat	heat capacity	C	J/K	
	specific heat capacity	c	J/(K × kg)	
	thermal conductivity	l	W/K × m <sup>2</sup>	
Pressure	atmosphere (normal)		atm	1 atm = 760 mm Hg = 1.013 bar = 1.033 kg/m <sup>2</sup> = 0.101325 MPa
	bar		bar	1 bar = 10 <sup>5</sup> Pa
Others	moment of force	M	N × m	
	strain	$\epsilon, e$	none	1 $\epsilon$ = $\Delta l/l_o$
	Poisson's number	$\nu, \mu$	none	
	efficiency	$\eta$	none	
	factor of safety	FS	none	
	angle		rad	1 rad = 57.296° = 63.622 <sup>g</sup>
horsepower	hp		1 hp = 0.7457 kW	

## English and American units and their conversions

Dimension	Name	Unit	Conversions	
				<b>specific for USA</b>
Length	inch	in	1 in = 25.4 mm	
	foot	ft	1 ft = 12 in = 0.3048 m	
	yard	yd	1 yd = 3 ft = 0.9144 m	
	mile	mi	1 mi = 1609 m	
	league	league	1 league = 0.3333 n mile = 617.3 m	
	link	link	1 link = 20.12 cm	
	chain	chain	1 chain = 20.12 m	
	fathom	fathom	1 fathom = 6 ft = 1.829 m	
	hand	hand	1 hand = 4 in = 10.16 m	
Area	perch	perch	1 perch = 25.29 m <sup>2</sup>	
	are	are	1 are = 100 m <sup>2</sup>	
	rood	rood	1 rood = 40 perch = 10.12 are = 1012 m <sup>2</sup>	
	acre	acre	1 acre = 4 rood = 10 chain <sup>2</sup> = 4840 yd <sup>2</sup> = 4047 m <sup>2</sup>	
Weight	grain	grain	1 grain = 64.8 mg	
	carat	carat	1 carat (metric) = 0.200 g	
			1 carat (1877) = 3.168 grain = 0.2053 g	
	pound	lb	1 lb = 0.4536 kg	
	ounce	oz	1 oz = 28.35 g	
	(long) ton	ton	1 ton = 1016,05 kg (= 2240 lb)	
	short ton	sh cwt		1 sh cwt = 907.185 kg (=2000 lb)
	dram	dram	1 dram = 1.772 g	
	kip	kip	1 kip = 1000 lb = 453.6 kg	
slug	slug	1 slug = 32.17 lb = 14.59 kg 1 slug (metric) = 0.98 kg		
Volume	fluid ounce	fl.oz	1 fl.oz = 28.412 ml	1 fl.oz = 29.573 ml
	gill	gill	1 gill = 0.142 l	1 gill = 0.1182 l
	pint	pt	1 pt (UK) = 4 gill = 0.568 l	1 pt (liq)(US) = 0.473 l
				1 pt (dry) = 0.473 l
	quart	qt	1 qt (UK) = 2 pt = 1.136 l	1 qt (US) = 2 pt = 0.946 l
				1 qt (dry) = 1.101 l
	gallon	gal	1 gal (UK) = 4 qt = 4.546 l	1 gal (US) = 4 qt = 3.785 l
	peck	pk	1 pk = 2 gal (UK) = 9.092 l	1 pk = 8 qt = 8.81 l
	bushel	bu	1 bu (UK) = 8 gal (UK) = 36.37 l	1 bu = 4 pk = 35.24 l
barrel <sup>1)</sup>	bbl	1 bbl (UK) = 36 gal (UK) = 163.7 l	1 bbl (US) = 42 gal (US) 159 l <sup>2)</sup>	
		1 bbl (dry) = 115.6 l	1 bbl (dry) = 115.6 l	
quarter	quarter	1 quarter = 8 bu = 290.9 l		
Velocity	mile per hour	mile/h	1 mile/h = 0.447 m/s	
	knot	kn	1 kn = 0.514 m/s	
Flow velocity	permeability coefficient	ft/year	1 ft/year = 9.659 × 10 <sup>-9</sup> m/s	
		ft <sup>3</sup> /s	1 ft <sup>3</sup> /s = 0.02832 m <sup>3</sup> /s	
Pressure, stress	pound-force per inch <sup>2</sup>	psi	1 psi = 6.895 kPa	
	dyne	dyne	1 dyne = 10 <sup>-5</sup> N	
	atmosphere	atm	1 atm = 760 mm Hg = 1.013 bar = 1.470 psi = 0.101325 MPa	
	bar	bar	1 bar = 14.495 psi	
Effect	British thermal unit	Btu	1 Btu = 2.52 × 10 <sup>2</sup> cal = 1055 J	
	British horsepower	hp	1 hp = 745.7 kW (= 550 ft × lbf/s)	
Heat	degree Fahrenheit	°F	°F = °C × 9/5 + 32	
	degree Celcius	°C	°C = (°F - 32) × 5/9 = K - 273.16	

<sup>1)</sup> unit of both liquid and dry measure in UK and US Customary systems ranging from 31 to 42 gallons

<sup>2)</sup> for petroleum products