Appendix I

Conversion Factors for the SI System of Units

(Note, the abbreviation SI means Système International d'Unitès, ref: 11th General Conference of Weight and Measures, date 1960). The conversion factors shown below can be found in many documents, for example in References 1 to 7 are a few sources.

I.1 FUNDAMENTAL SI UNITS

Seven basic units

Quantity	Name of SI unit	Symbol
Amount of a substance	mole	mol
Current	ampere	A
Length	metre	m
Luminous intensity	candela	cd
Mass	kilogram	kg
Temperature	Kelvin	K
Time	seconds	s

Two additional SI units

Quantity	Name of SI unit	Symbol
Plain angle	radian	rad
Solid angle	steradian	sr

I.2 DERIVED NON-ELECTRICAL UNITS

Non-electrical units	Name of SI unit	Symbol
Energy, work done and heat	joule	J
Force	newton	N

(*continued overleaf*)

Handbook of Electrical Engineering: For Practitioners in the Oil, Gas and Petrochemical Industry. Alan L. Sheldrake
 ISBN: 0-471-49631-6

Non-electrical units	Name of SI unit	Symbol
Illumination	lux	lx
Luminous flux	lumen	lm
Mechanical stress	pascal	Pa
Power	watt	W
Pressure	pascal	Pa

I.3 DERIVED ELECTRICAL UNITS

Electrical units	Name of SI unit	Symbol
Capacitance	farad	F
Charge	coulomb	C
Conductance	siemens	S
Inductance	henry	H
Magnetic flux	weber	Wb
Magnetic flux density	tesla	T
Potential, potential difference, electromotive force, (voltage, volt-drop)	volt	V
Resistance	ohm	Ω

I.4 CONVERSIONS

I.4.1 Length

Convert	to	Multiply by
fathom	m	1.8288
ft, feet	m	0.3048
in, inch	mm	25.4
km	miles	0.62137
m	inch	39.3701
m	ft	3.2808
mil = 0.001 inch	mm	0.0254
mile	km	1.60934
Mm	inch	0.0393701
UK nautical mile	km	1.85318
US nautical mile	km	1.85200
yd, yard	m	0.9144

I.4.2 Area

Convert	to	Multiply by
acre	m^2	4046.86
acre	km^2	0.00404686
acre	ha	0.404686
circular mil	mm^2	0.0005067
ft^2	m^2	0.0929030
in^2	mm^2	645.16
in^2	m^2	0.00064516
m^2	ft^2	10.7636
$mile^2$	km^2	2.58999
$mile^2$	ha	258.999
mm^2	$inch^2$	0.001550
yd^2	m^2	0.836127

I.4.3 Volume

Convert	to	Multiply by
dm^3	l	1.0
ft^3	UKgal	6.2288
ft^3	USgal	7.4805
ft^3	dm^3	28.3168
in^3	mm^3	16387.1
litre	UK pints	1.7597
litre	US pints	2.1127
litre	Usgal	0.2641779
litre	Ukgal	0.2199756
m^3	litre	1000.0
m^3	UKgal	219.97
m^3	Usgal	264.172
oz (fluid ounce)	cm^3	28.4131
pint	dm^3	0.568261
pint	l	0.568261
quart	dm^3	1.13652
UK gallon	dm^3	4.54609
UK gallon	l	4.54609
UK gallon	UK pint	8.00
UK gallon	ft^3	0.1605
UK gallon	US gallon	1.20095
US gallon	dm^3	3.78541
US gallon	l	3.78541
US gallon	US pint	10.0

(*continued overleaf*)

Convert	to	Multiply by
US pint	UK pint	1.20095
US gallon	ft^3	0.1337
US gallon	in^3	231.03
US gallon	UK gallon	0.832674
US barrel	US gallons	42.0
US barrel	UK gallons	34.97
yd^3	m^3	0.764555

I.4.4 Mass and Density

Convert	to	Multiply by
lb	kg	0.45359237
lb/ft^3	kg/m^3	16.0185
lb/in^3	Mg/m^3	27.6799
kg/m^3	lt/ft^3	0.03243
lb/UK gal	kg/m^3	0.099776
lb/US gal	kg/m^3	0.119826
oz (ounce)	g	28.3495
oz (troy)	g	31.1035
slug	kg	14.5939
UK ton (long ton)	kg	1016.05
UK ton (long ton)	tonne	1.01605
US ton (short ton)	kg	907.185
kg	lb	2.2046

I.4.5 Velocity and Acceleration

Convert	to	Multiply by
ft/min	m/s	0.00508
ft/s	m/s	0.3048
ft/s^2	m/s^2	0.3048
km/h	m/s	0.277778
miles/hour	m/s	0.44704
miles/hour	km/h	1.609344
UK knot	km/h	1.85318
US knot	km/h	1.85200

I.4.6 FORCE

Convert	to	Multiply by
dyne	N	10^{-8}
kgf	N	9.80665
lbf	N	4.44822
ozf	N	0.278014
poundal	N	0.138255
tonf (UK)	kN	9.96402

I.4.7 Torque

Convert	to	Multiply by
dyne-cm	N-m	10^{-7}
kmf-m	N-m	9.80665
lbf-ft	N-m	1.35582
lbf-in	N-m	0.112985

I.4.8 Power

Convert	to	Multiply by
ch (metric HP)	W	735.499
ft-lbf/s	W	1.35582
hp or HP	W	745.700
hp or HP	ft-lbf/s	550.0
hp or HP	kgf-m/s	76.04
hp or HP	W	745.70
kgf-m/s	W	9.80665
kW	ft-lbf/s	737.6
kW	hp	1.3410

I.4.9 Energy and Work

Convert	to	Multiply by
BTU or btu	kJ	1.05506
btu	international cal	251.996
btu	15°C cal	252.074
btu	thermochem cal	252.164
btu	ft-lbf	778.6(778.17)
btu	kcal	0.252
btu	kgf-m	107.6
btu	W-s	1055.0

(*continued overleaf*)

Convert	to	Multiply by
btu	kW-h	0.00002931
btu/ft^3	kcal/m^3	8.899
btu/lb	kcal/kg	0.5556
erg	J	10^{-7}
ft-lbf	J	1.35582
ft-pdl	J	0.0421401
hp-h, HP-h	MJ	2.68452
international-cal	J	4.18680
kgf-m	J	9.80665
kJ	btu	0.9478
kJ	kW-h	0.000278
kJ	Btu	0.9478
kJ	ft-lbf	737.6
kW-h	MJ	3.6
litre-atmosphere	J	101.328
therm	btu	100000.0
therm	MJ	105.506
thermo chemical-cal	J	4.18400
15°C-cal	J	4.18550

I.4.10 Pressure

Convert	to	Multiply by
atm, atmosphere	kN/m^2	101.325
atm, atmosphere	Pa	101325.0
atm, atmosphere	bar	1.01325
atm (international)	lbf/in^2	14.6959
atm (international)	lbf/ft^2	2116.22
atm (international)	kgf/m^2	10332.27
atm (international)	in of water 60°F	407.17
atm (international)	in of mercury 32°F	29.921
atm (international)	mm of mercury 32°F	760.00
at (metric technical)	kgf/cm^2	1.0
at (metric technical)	bar	0.98066
at (metric technical)	lbf/in^2	14.2233
bar	lbf/in^2	14.5
bar	ft of water	33.455
bar	m of water	10.2
bar	mm of mercury	750.1
bar	in of mercury	29.53
b, bar	N/m^2	100000.0
b, bar	kPa	100.0
inches of water	mb	2.49089

Convert	to	Multiply by
inches of mercury	mb	33.8639
inches of mercury	N/m^2	3386.39
kgf/cm^2	kN/m^2	98.0665
kgf/m^2	N/m^2	9.80665
lbf/in^2	mb	68.9476
lbf/in^2	kgf/cm^2	0.0703
lbf/in^2	N/m^2	6894.76
mm of mercury	mb	1.33322
N/m^2	lbf/in^2	0.000145
N/m^2	ft of water	0.0003345
N/m^2	mm of mercury	0.0075
N/m^2	m of water	0.000102
N/m^2	in of mercury	0.0002953
Pa, pascal	N/m^2	1.0
pdl/ft^2	N/m^2	1.48816
pressure in inches of water	lbf/in^2	0.036127
torr (mm of Hg)	N/m^2	133.322
UK ton/ft^2	kN/m^2	107.252

I.4.11 Moment of Inertia and Momentum

Convert	to	Multiply by
$lb\text{-}in^2$	$kg\text{-}m^2$	2.92640×10^{-4}
$lb\text{-}ft^2$	$kg\text{-}m^2$	0.042140
lb-ft/s (linear)	kg-m/s	0.138255
lb-ft/s (rotational)	kg-m/s	0.042140
$oz\text{-}in^2$	$kg\text{-}m^2$	1.82900×10^{-6}

I.4.12 Illumination

Convert	to	Multiply by
angular degrees	rad	3.1415926536/180.0
cd/ft^2	cd/m^2	10.7639
cd/in^2	cd/m^2	1550.0
footcandle, lm/ft^2	lx	10.7639
phot, lm/ft^2	lx	10000.0
radians	degrees	180.0/3.1415926536 =57.2957795131

I.4.13 Electricity and Magnetism

Convert	to	Multiply by
gauss	tesla, T	10^{-4}
gilbert	A	$10/4\pi$
kWh	J	3.5×10^6
kV/in	kV/m	39.3701
maxwell	weber, Wb	10^{-8}
oersted	A/m	$1000/4\pi$
V/mil	kV/m	39.3701

I.4.14 Miscellaneous Quantities

Convert	to	Multiply by
°C	°K	C + 273.15
°C	°F	F = 32 + C9/5
°F	°C	C = (F − 32)5/9
°F	°K	K = (F + 459.67)5/9
°R	°F	F = R − 459.67
°R	°K	5/9
ft^3/ min	USbarrels/day	256.475
imperial ton	lb	2240.0
US short ton	lb	2000.0
imperial slug	lb	32.1740
in^3 of water (60°F)	in^3 of mercury (32°F)	0.073551
in^3 of mercury (32°F)	in^3 of water (60°F)	13.596
in^3 of mercury (32°F)	lb	0.4905
kg	lb	2.20462
kN	kgf	101.97
kN	lbf	224.81
kg/s	lb/h	7936.64
kg/s	UKton/h	3.5431
lbf	kgf	0.4536
lb/ft^3	kg/m^3	16.0185
lb/in^3	g/cm^3	27.68
m/s	ft/s	3.28084
m^3/h	ft^3/ min	0.5886
m^3/h	UKgal/min	3.666
m^3/h	USgal/min	4.403
m^3/h	USbarrels/day	150.955
m^3/ kg	ft^3/lb	16.02
Metric tonne	kg	1000.0
miles/UKgal	km/litre	0.354005
UKgal/mile	litre/km	2.82481
UKgal/min	USbarrels/day	41.175
Usgal/min	USbarrels/day	34.286

Convert	to	Multiply by
USbarrels/day	USgal/min	0.029
USbarrels/day	ft^3/h	0.2339
calorific value, btu/ft^3	kJ/m^3	37.2589
specific heat capacity (btu/lb-°F)	J/kg-°CorK	4186.8
specific heat capacity ($btu-s/ft^3$-°F)	kJ/m^3-°CorK	67.0661
specific entropy (btu/lb-°F)	J/kg-°CorK	4186.8
thermal resistivity (ft^2-h-°F/btu-in)	m^2-s-°C/J-m	6.93347
specific energy (btu/lb)	J/kg	2327.0
heat flow rate (btu/hour)	W or J/s	0.293071
heat flow rate (kcal/hour)	W	1.163
thermal conductivity (kW/m-°K)	btu/ft-h-°R	0.2388

I.5 INTERNATIONAL STANDARDS ORGANISATION (ISO) CONDITIONS

Standard altitude	0.0m, sea level
Standard pressure	29.9212 inches of mercury 1.013250 bar or 14.6959 lbf/in^2
Standard relative humidity	0.0
Standard temperature	15.0°C or 59.0°F

I.6 STANDARD TEMPERATURE AND PRESSURE (STP) CONDITIONS

Standard pressure	29.9212 inches of mercury 1.013250 bar or 14.6959 lbf/in^2
Standard temperature	0.0°C or 32.0°F

I.7 REGULARLY USED CONSTANTS

Constants	Numerical value	Symbol
Absolute zero temperature	−273.16°C	
Absolute zero temperature	−459.69°F	
Absolute zero temperature	0.0°K	

(*continued overleaf*)

Constants	Numerical value	Symbol
Acceleration	9.80665 m/s^2	g
due to gravity	32.174 ft/s^2	g
Base of natural logarithms	2.7182818285	e
Density of water	1.0 kg/m^3 = 0.062428 lb/ft^3	
Pi	3.1415926536	π
Specific volume of water	1.0 m^3/kg = 16.01850 ft^3/lb	

I.8 REGULARLY USED PREFIXES

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

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