

TABLE 1-1 SI Base and Supplementary Quantities and Units

Quantity or "dimension"	SI unit	SI unit symbol ("abbreviation"); Use roman (upright) type
Base quantity or "dimension"		
length	meter	m
mass	kilogram	kg
time	second	s
electric current	ampere	A
thermodynamic temperature	kelvin	K
amount of substance	mole*	mol
luminous intensity	candela	cd
Supplementary quantity or "dimension"		
plane angle	radian	rad
solid angle	steradian	sr

*When the mole is used, the elementary entities must be specified; they may be atoms, molecules, ions, electrons, other particles, or specified groups of such particles.

TABLE 1-2a Derived Units of SI that Have Special Names

Quantity	Unit	Symbol	Formula
frequency (of a periodic phenomenon)	hertz	Hz	1/s
force	newton	N	(kg·m)/s ²
pressure, stress	pascal	Pa	N/m ²
energy, work, quantity of heat	joule	J	N·m
power, radiant flux	watt	W	J/s
quantity of electricity, electric charge	coulomb	C	A·s
electric potential, potential difference, electromotive force	volt	V	W/A
capacitance	farad	F	C/V
electric resistance	ohm	Ω	V/A
conductance	siemens	S	A/V
magnetic flux	weber	Wb	V·s
magnetic-flux density	tesla	T	Wb/m ²
inductance	henry	H	Wb/A
luminous flux	lumen	lm	cd·sr
illuminance	lux	lx	lm/m ²
activity (of radionuclides)	becquerel	Bq	1/s
absorbed dose	gray	Gy	J/kg

TABLE 1-2b Additional Common Derived Units of SI

Quantity	Unit	Symbol
acceleration	meter per second squared	m/s ²
angular acceleration	radian per second squared	rad/s ²
angular velocity	radian per second	rad/s
area	square meter	m ²
concentration (of amount of substance)	mole per cubic meter	mol/m ³
current density	ampere per square meter	A/m ²
density, mass	kilogram per cubic meter	kg/m ³
electric-charge density	coulomb per cubic meter	C/m ³
electric-field strength	volt per meter	V/m
electric-flux density	coulomb per square meter	C/m ²
energy density	joule per cubic meter	J/m ³
entropy	joule per kelvin	J/K
heat capacity	joule per kelvin	J/K
heat-flux density, irradiance	watt per square meter	W/m ²
luminance	candela per square meter	cd/m ²
magnetic-field strength	ampere per meter	A/m
molar energy	joule per mole	J/mol
molar entropy	joule per mole-kelvin	J/(mol·K)
molar-heat capacity	joule per mole-kelvin	J/(mol·K)
moment of force	newton-meter	N·m
permeability	henry per meter	H/m
permittivity	farad per meter	F/m
radiance	watt per square-meter-steradian	W/(m ² ·sr)
radiant intensity	watt per steradian	W/sr
specific-heat capacity	joule per kilogram-kelvin	J/(kg·K)
specific energy	joule per kilogram	J/kg
specific entropy	joule per kilogram-kelvin	J/(kg·K)
specific volume	cubic meter per kilogram	m ³ /kg
surface tension	newton per meter	N/m
thermal conductivity	watt per meter-kelvin	W/(m·K)
velocity	meter per second	m/s
viscosity, dynamic	pascal-second	Pa·s
viscosity, kinematic	square meter per second	m ² /s
volume	cubic meter	m ³
wave number	1 per meter	1/m

TABLE 1-3 SI Prefixes

Multiplication factor	Prefix	Symbol
1 000 000 000 000 000 000 = 10 ¹⁸	exa	E
1 000 000 000 000 000 = 10 ¹⁵	peta	P
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 ¹	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

* Generally to be avoided.

TABLE 1-4 Conversion Factors: U.S. Customary and Commonly Used Units to SI Units

Quantity	Customary or commonly used unit	SI unit	Alternate SI unit	Conversion factor; multiply customary unit by factor to obtain SI unit	
Space, t time					
Length	naut mi	km		1.852°	E + 00
	mi	km		1.609 344°	E + 00
	chain	m		2.011 68°	E + 01
	link	m		2.011 68°	E - 01
	fathom	m		1.828 8°	E + 00
	yd	m		9.144°	E - 01
	ft	m		3.048°	E - 01
		cm		3.048°	E + 01
	in	mm		2.54°	E + 01
	in	cm		2.54	E + 00
mil	µm		2.54°	E + 01	
Length/length	ft/mi	m/km		1.893 939	E - 01
Length/volume	ft/U.S. gal	m/m ³		8.051 964	E + 01
	ft/ft ³	m/m ³		1.076 391	E + 01
	ft/bbl	m/m ³		1.917 134	E + 00
Area	mi ²	km ²		2.589 988	E + 00
	section	ha		2.589 988	E + 02
	acre	ha		4.046 856	E - 01
	ha	m ²		1.000 000°	E + 04
	yd ²	m ²		8.361 274	E - 01
	ft ²	m ²		9.290 304°	E - 02
	in ²	mm ²		6.451 6°	E + 02
		cm ²		6.451 6°	E + 00
Area/volume	ft ² /in ³	m ² /cm ³		5.699 291	E - 03
	ft ² /ft ³	m ² /m ³		3.280 840	E + 00
Volume	cubem	km ³		4.168 182	E + 00
	acre-ft	m ³		1.233 482	E + 03
		ha·m		1.233 482	E - 01
	yd ³	m ³		7.645 549	E - 01
	bbl (42 U.S. gal)	m ³		1.589 873	E - 01
	ft ³	m ³		2.831 685	E - 02
		dm ³	L	2.831 685	E + 01
	U.K. gal	m ³		4.546 092	E - 03
		dm ³	L	4.546 092	E + 00
	U.S. gal	m ³		3.785 412	E - 03
		dm ³	L	3.785 412	E + 00
	U.K. qt	dm ³	L	1.136 523	E + 00
	U.S. qt	dm ³	L	9.463 529	E - 01
	U.S. pt	dm ³	L	4.731 765	E - 01
	U.K. fl oz	cm ³		2.841 307	E + 01
	U.S. fl oz	cm ³		2.957 353	E + 01
in ³	cm ³		1.638 706	E + 01	
Volume/length (linear displacement)	bbl/in	m ³ /m		6.259 342	E + 00
	bbl/ft	m ³ /m		5.216 119	E - 01
	ft ³ /ft	m ³ /m		9.290 304°	E - 02
	U.S. gal/ft	m ³ /m		1.241 933	E - 02
		L/m		1.241 933	E + 01
Plane angle	rad	rad		1	
	deg (°)	rad		1.745 329	E - 02
	min (')	rad		2.908 882	E - 04
	sec (")	rad		4.848 137	E - 06
Solid angle	sr	sr		1	
Time	year	a		1	
	week	d		7.0°	E + 00
	h	s		3.6°	E + 03
		min		6.0°	E + 01
	min	s		6.0°	E + 01
		h		1.666 667	E - 02
	mµs	ns		1	
Mass, amount of substance					
Mass	U.K. ton	Mg	t	1.016 047	E + 00
	U.S. ton	Mg	t	9.071 847	E - 01
	U.K. cwt	kg		5.080 234	E + 01
	U.S. cwt	kg		4.535 924	E + 01
	lbm	kg		4.535 924	E - 01
	oz (troy)	g		3.110 348	E + 01
	oz (av)	g		2.834 952	E + 01
	gr	mg		6.479 891	E + 01

TABLE 1-4 Conversion Factors: U.S. Customary and Commonly Used Units to SI Units (Continued)

Quantity	Customary or commonly used unit	SI unit	Alternate SI unit	Conversion factor; multiply customary unit by factor to obtain SI unit
Amount of substance	lbm·mol	kmol		4.535 924 E - 01
	std m ³ (0°C, 1 atm)	kmol		4.461 58 E - 02
	std ft ³ (60°F, 1 atm)	kmol		1.195 30 E - 03
Enthalpy, calorific value, heat, entropy, heat capacity				
Calorific value, enthalpy (mass basis)	Btu/lbm	MJ/kg	J/g	2.326 000 E - 03
		kJ/kg		2.326 000 E + 00
	cal/g cal/lbm	kWh/kg	J/g	6.461 112 E - 04
		kJ/kg J/kg		4.184° E + 00 9.224 141 E + 00
Caloric value, enthalpy (mole basis)	kcal/(g·mol)	kJ/kmol		4.184° E + 03
	Btu/(lb·mol)	kJ/kmol		2.326 000 E + 00
Calorific value (volume basis—solids and liquids)	Btu/U.S. gal	MJ/m ³	kJ/dm ³	2.787 163 E - 01
		kJ/m ³		2.787 163 E + 02
		kWh/m ³		7.742 119 E - 02
	Btu/U.K. gal	MJ/m ³	kJ/dm ³	2.320 800 E - 01
		kJ/m ³		2.320 800 E + 02
	Btu/ft ³	kWh/m ³	kJ/dm ³	6.446 667 E - 02
		MJ/m ³		3.725 895 E - 02
		kJ/m ³		3.725 895 E + 01
		kWh/m ³		1.034 971 E - 02
	cal/mL (ft·lbf)/U.S. gal	MJ/m ³		4.184° E + 00
kJ/m ³			3.581 692 E - 01	
Calorific value (volume basis—gases)	cal/mL	kJ/m ³	J/dm ³	4.184° E + 03
	kcal/m ³	kJ/m ³	J/dm ³	4.184° E + 00
	Btu/ft ³	kJ/m ³	J/dm ³	3.725 895 E + 01
		kWh/m ³		1.034 971 E - 02
Specific entropy	Btu/(lbm·°R)	kJ/(kg·K)	J/(g·K)	4.186 8° E + 00
	cal/(g·K)	kJ/(kg·K)	J/(g·K)	4.184° E + 00
	kcal/(kg·°C)	kJ/(kg·K)	J/(g·K)	4.184° E + 00
Specific-heat capacity (mass basis)	kWh/(kg·°C)	kJ/(kg·K)	J/(g·K)	3.6° E + 03
	Btu/(lbm·°F)	kJ/(kg·K)	J/(g·K)	4.186 8° E + 00
	kcal/(kg·°C)	kJ/(kg·K)	J/(g·K)	4.184° E + 00
Specific-heat capacity (mole basis)	Btu/(lb·mol·°F)	kJ/(kmol·K)		4.186 8° E + 00
	cal/(g·mol·°C)	kJ/(kmol·K)		4.184° E + 00
Temperature, pressure, vacuum				
Temperature (absolute)	°R	K		5/9
	K	K		1
Temperature (traditional)	°F	°C		5/9(°F - 32)
Temperature (difference)	°F	K, °C		5/9
Pressure	atm (760 mmHg at 0°C or 14,696 psi)	MPa		1.013 250° E - 01
		kPa		1.013 250° E + 02
		bar		1.013 250° E + 00
	bar	MPa		1.0° E - 01
		kPa		1.0° E + 02
		MPa		6.894 757 E - 03
	mmHg (0°C) = torr	kPa		6.894 757 E + 00
		bar		6.894 757 E - 02
		kPa		3.376 85 E + 00
	μmHg (0°C)	kPa		2.488 4 E - 01
	μ bar	kPa		1.333 224 E - 01
	mmHg = torr (0°C)	kPa		9.806 38 E - 02
	cmH ₂ O (4°C)	kPa		9.806 38 E - 02
	lb/ft ² (psf)	kPa		4.788 026 E - 02
	mHg (0°C)	Pa		1.333 224 E - 01
bar	Pa		1.0° E + 05	
dyn/cm ²	Pa		1.0° E - 01	
Vacuum, draft	inHg (60°F)	kPa		3.376 85 E + 00
	inH ₂ O (39.2°F)	kPa		2.490 82 E - 01
	inH ₂ O (60°F)	kPa		2.488 4 E - 01
	mmHg (0°C) = torr	kPa		1.333 224 E - 01
	cmH ₂ O (4°C)	kPa		9.806 38 E - 02
Liquid head	ft	m		3.048° E - 01
	in	mm		2.54° E + 01
		cm		2.54° E + 00
Pressure drop/length	psi/ft	kPa/m		2.262 059 E + 01

TABLE 1-4 Conversion Factors: U.S. Customary and Commonly Used Units to SI Units (Continued)

Quantity	Customary or commonly used unit	SI unit	Alternate SI unit	Conversion factor; multiply customary unit by factor to obtain SI unit
Density, specific volume, concentration, dosage				
Density	lbm/ft ³	kg/m ³		1.601 846 E + 01
		g/m ³		1.601 846 E + 04
	lbm/U.S. gal	kg/m ³		1.198 264 E + 02
		g/cm ³		1.198 264 E - 01
	lbm/U.K. gal	kg/m ³		9.977 633 E + 01
	lbm/ft ³	kg/m ³		1.601 846 E + 01
	g/cm ³	g/cm ³		1.601 846 E - 02
	lbm/ft ³	kg/m ³		1.0* E + 03
		kg/m ³		1.601 846 E + 01
Specific volume	ft ³ /lbm	m ³ /kg		6.242 796 E - 02
		m ³ /g		6.242 796 E - 05
	ft ³ /lbm	dm ³ /kg		6.242 796 E + 01
	U.K. gal/lbm	dm ³ /kg	cm ³ /g	1.002 242 E + 01
	U.S. gal/lbm	dm ³ /kg	cm ³ /g	8.345 404 E + 00
Specific volume (mole basis)	L/(g·mol)	m ³ /kmol		1
	ft ³ /(lb·mol)	m ³ /kmol		6.242 796 E - 02
Specific volume	bbl/U.S. ton	m ³ /t		1.752 535 E - 01
	bbl/U.K. ton	m ³ /t		1.564 763 E - 01
Yield	bbl/U.S. ton	dm ³ /t	L/t	1.752 535 E + 02
	bbl/U.K. ton	dm ³ /t	L/t	1.564 763 E + 02
	U.S. gal/U.S. ton	dm ³ /t	L/t	4.172 702 E + 00
	U.S. gal/U.K. ton	dm ³ /t	L/t	3.725 627 E + 00
Concentration (mass/mass)	wt %	kg/kg		1.0* E - 02
		g/kg		1.0* E + 01
	wt ppm	mg/kg		1
Concentration (mass/volume)	lbm/bbl	kg/m ³	g/dm ³	2.853 010 E + 00
	g/U.S. gal	kg/m ³		2.641 720 E - 01
	g/U.K. gal	kg/m ³	g/L	2.199 692 E - 01
	lbm/1000 U.S. gal	g/m ³	mg/dm ³	1.198 264 E + 02
	lbm/1000 U.K. gal	g/m ³	mg/dm ³	9.977 633 E + 01
	gr/U.S. gal	g/m ³	mg/dm ³	1.711 806 E + 01
	gr/ft ³	mg/m ³		2.288 351 E + 03
	lbm/1000 bbl	g/m ³	mg/dm ³	2.853 010 E + 00
	mg/U.S. gal	g/m ³	mg/dm ³	2.641 720 E - 01
	gr/100 ft ³	mg/m ³		2.288 351 E + 01
Concentration (volume/volume)	ft ³ /ft ³	m ³ /m ³		1
	bbl/(acre-ft)	m ³ /m ³		1.288 931 E - 04
	vol%	m ³ /m ³		1.0* E - 02
	U.K. gal/ft ³	dm ³ /m ³	L/m ³	1.605 437 E + 02
	U.S. gal/ft ³	dm ³ /m ³	L/m ³	1.336 806 E + 02
	mL/U.S. gal	dm ³ /m ³	L/m ³	2.641 720 E - 01
	mL/U.K. gal	dm ³ /m ³	L/m ³	2.199 692 E - 01
	vol ppm	cm ³ /m ³		1
		dm ³ /m ³	L/m ³	1.0* E - 03
	U.K. gal/1000 bbl	cm ³ /m ³		2.859 403 E + 01
	U.S. gal/1000 bbl	cm ³ /m ³		2.380 952 E + 01
	U.K. pt/1000 bbl	cm ³ /m ³		3.574 253 E + 00
	Concentration (mole/volume)	(lb·mol)/U.S. gal	kmol/m ³	
(lb·mol)/U.K. gal		kmol/m ³		9.977 644 E + 01
(lb·mol)/ft ³		kmol/m ³		1.601 846 E + 01
std ft ³ (60°F, 1 atm)/bbl		kmol/m ³		7.518 21 E - 03
Concentration (volume/mole)	U.S. gal/1000 std ft ³ (60°F/60°F)	dm ³ /kmol	L/kmol	3.166 91 E + 00
	bbl/million std ft ³ (60°F/60°F)	dm ³ /kmol	L/kmol	1.330 10 E - 01
Facility throughput, capacity				
Throughput (mass basis)	U.K. ton/year	t/a		1.016 047 E + 00
	U.S. ton/year	t/a		9.071 847 E - 01
	U.K. ton/day	t/d		1.016 047 E + 00
		t/h		4.233 529 E - 02
	U.S. ton/day	t/d		9.071 847 E - 01
		t/h		3.779 936 E - 02
	U.K. ton/h	t/h		1.016 047 E + 00
	U.S. ton/h	t/h		9.071 847 E - 01
	lbm/h	kg/h		4.535 924 E - 01

TABLE 1-4 Conversion Factors: U.S. Customary and Commonly Used Units to SI Units (Continued)

Quantity	Customary or commonly used unit	SI unit	Alternate SI unit	Conversion factor; multiply customary unit by factor to obtain SI unit
Throughput (volume basis)	bb/day	t/a		5.803 036 E + 01
		m ³ /d		1.589 873 E - 01
	ft ³ /day	m ³ /h		1.179 869 E - 03
	bb/h	m ³ /h		1.589 873 E - 01
	ft ³ /h	m ³ /h		2.831 685 E - 02
	U.K. gal/h	m ³ /h		4.546 092 E - 03
		L/s		1.262 803 E - 03
	U.S. gal/h	m ³ /h		3.785 412 E - 03
		L/s		1.051 503 E - 03
	U.K. gal/min	m ³ /h		2.727 655 E - 01
		L/s		7.576 819 E - 02
	m ³ /h		2.271 247 E - 01	
	L/s		6.309 020 E - 02	
Throughput (mole basis)	(lbm-mol)/h	kmol/h		4.535 924 E - 01
		kmol/s		1.259 979 E - 04
Flow rate				
Flow rate (mass basis)	U.K. ton/min	kg/s		1.693 412 E + 01
	U.S. ton/min	kg/s		1.511 974 E + 01
	U.K. ton/h	kg/s		2.822 353 E - 01
	U.S. ton/h	kg/s		2.519 958 E - 01
	U.K. ton/day	kg/s		1.175 980 E - 02
	U.S. ton/day	kg/s		1.049 982 E - 02
	million lbm/year	kg/s		5.249 912 E + 00
	U.K. ton/year	kg/s		3.221 864 E - 05
	U.S. ton/year	kg/s		2.876 664 E - 05
	lbm/s	kg/s		4.535 924 E - 01
	lbm/min	kg/s		7.559 873 E - 03
lbm/h	kg/s		1.259 979 E - 04	
Flow rate (volume basis)	bb/day	m ³ /d		1.589 873 E - 01
		L/s		1.840 131 E - 03
	ft ³ /day	m ³ /d		2.831 685 E - 02
		L/s		3.277 413 E - 04
	bb/h	m ³ /s		4.416 314 E - 05
		L/s		4.416 314 E - 02
	ft ³ /h	m ³ /s		7.865 791 E - 06
		L/s		7.865 791 E - 03
	U.K. gal/h	dm ³ /s	L/s	1.262 803 E - 03
	U.S. gal/h	dm ³ /s	L/s	1.051 503 E - 03
	U.K. gal/min	dm ³ /s	L/s	7.576 820 E - 02
	U.S. gal/min	dm ³ /s	L/s	6.309 020 E - 02
	ft ³ /min	dm ³ /s	L/s	4.719 474 E - 01
ft ³ /s	dm ³ /s	L/s	2.831 685 E + 01	
Flow rate (mole basis)	(lb-mol)/s	kmol/s		4.535 924 E - 01
	(lb-mol)/h	kmol/s		1.259 979 E - 04
	million scf/D	kmol/s		1.383 45 E - 02
Flow rate/length (mass basis)	lbm/(s-ft)	kg/(s-m)		1.488 164 E + 00
	lbm/(h-ft)	kg/(s-m)		4.133 789 E - 04
Flow rate/length (volume basis)	U.K. gal/(min-ft)	m ³ /s	m ³ /(s-m)	2.485 833 E - 04
	U.S. gal/(min-ft)	m ³ /s	m ³ /(s-m)	2.069 888 E - 04
	U.K. gal/(h-in)	m ³ /s	m ³ /(s-m)	4.971 667 E - 05
	U.S. gal/(h-in)	m ³ /s	m ³ /(s-m)	4.139 776 E - 05
	U.K. gal/(h-ft)	m ³ /s	m ³ /(s-m)	4.143 055 E - 06
	U.S. gal/(h-ft)	m ³ /s	m ³ /(s-m)	3.449 814 E - 06
Flow rate/area (mass basis)	lbm/(s-ft ²)	kg/(s-m ²)		4.882 428 E + 00
	lbm/(h-ft ²)	kg/(s-m ²)		1.356 230 E - 03
Flow rate/area (volume basis)	ft ³ /(s-ft ²)	m/s	m ³ /(s-m ²)	3.048° E - 01
	ft ³ /(min-ft ²)	m/s	m ³ /(s-m ²)	5.08° E - 03
	U.K. gal/(h-in ²)	m/s	m ³ /(s-m ²)	1.957 349 E - 03
	U.S. gal/(h-in ²)	m/s	m ³ /(s-m ²)	1.629 833 E - 03
	U.K. gal/(min-ft ²)	m/s	m ³ /(s-m ²)	8.155 621 E - 04
	U.S. gal/(min-ft ²)	m/s	m ³ /(s-m ²)	6.790 972 E - 04
	U.K. gal/(h-ft ²)	m/s	m ³ /(s-m ²)	1.359 270 E - 05
	U.S. gal/(h-ft ²)	m/s	m ³ /(s-m ²)	1.131 829 E - 05

TABLE 1-4 Conversion Factors: U.S. Customary and Commonly Used Units to SI Units (Continued)

Quantity	Customary or commonly used unit	SI unit	Alternate SI unit	Conversion factor; multiply customary unit by factor to obtain SI unit
Energy, work, power				
Energy, work	therm	MJ		1.055 056 E + 02
		kJ		1.055 056 E + 05
		kWh		2.930 711 E + 01
	U.S. tonf-mi	MJ		1.431 744 E + 01
	hp-h	MJ		2.684 520 E + 00
		kJ		2.684 520 E + 03
		kWh		7.456 999 E - 01
	ch-h or CV-h	MJ		2.647 780 E + 00
		kJ		2.647 780 E + 03
		kWh		7.354 999 E - 01
	kWh	MJ		3.6° E + 00
		kJ		3.6° E + 03
	Chu	kJ		1.899 101 E + 00
		kWh		5.275 280 E - 04
	Btu	kJ		1.055 056 E + 00
		kWh		2.930 711 E - 04
	kcal	kJ		4.184° E + 00
	cal	kJ		4.184° E - 03
	ft-lbf	kJ		1.355 818 E - 03
	lbf-ft	kJ		1.355 818 E - 03
J	kJ		1.0° E - 03	
(lbf-ft ²)/s ²	kJ		4.214 011 E - 05	
erg	J		1.0° E - 07	
Impact energy	kgf-m	J		9.806 650° E + 00
	lbf-ft	J		1.355 818 E + 00
Surface energy	erg/cm ²	mJ/m ²		1.0° E + 00
Specific-impact energy	(kgf-m)/cm ²	J/cm ²		9.806 650° E - 02
	(lbf-ft)/in ²	J/cm ²		2.101 522 E - 03
Power	million Btu/h	MW		2.930 711 E - 01
	ton of refrigeration	kW		3.516 853 E + 00
	Btu/s	kW		1.055 056 E + 00
	kW	kW		1
	hydraulic horsepower—hhp	kW		7.460 43 E - 01
	hp (electric)	kW		7.46° E - 01
	hp [(550 ft-lbf)/s]	kW		7.456 999 E - 01
	ch or CV	kW		7.354 999 E - 01
	Btu/min	kW		1.758 427 E - 02
	(ft-lbf)/s	kW		1.355 818 E - 03
	kcal/h	W		1.162 222 E + 00
	Btu/h	W		2.930 711 E - 01
	(ft-lbf)/min	W		2.259 697 E - 02
	Power/area	Btu/(s-ft ²)	kW/m ²	
cal/(h-cm ²)		kW/m ²		1.162 222 E - 02
Btu/(h-ft ²)		kW/m ²		3.154 591 E - 03
Heat-release rate, mixing power	hp/ft ³	kW/m ³		2.633 414 E + 01
	cal/(h-cm ³)	kW/m ³		1.162 222 E + 00
	Btu/(s-ft ³)	kW/m ³		3.725 895 E + 01
	Btu/(h-ft ³)	kW/m ³		1.034 971 E - 02
Cooling duty (machinery)	Btu/(bhp-h)	W/kW		3.930 148 E - 01
Specific fuel consumption (mass basis)	lbm/(hp-h)	mg/J	kg/MJ	1.689 659 E - 01
		kg/kWh		6.082 774 E - 01
Specific fuel consumption (volume basis)	m ³ /kWh	dm ³ /MJ	mm ³ /J	2.777 778 E + 02
	U.S. gal/(hp-h)	dm ³ /MJ	mm ³ /J	1.410 089 E + 00
	U.K. pt/(hp-h)	dm ³ /MJ	mm ³ /J	2.116 806 E - 01
Fuel consumption	U.K. gal/mi	dm ³ /100 km	L/100 km	2.824 807 E + 02
	U.S. gal/mi	dm ³ /100 km	L/100 km	2.352 146 E + 02
	mi/U.S. gal	km/dm ³	km/L	4.251 437 E - 01
	mi/U.K. gal	km/dm ³	km/L	3.540 064 E - 01

TABLE 1-4 Conversion Factors: U.S. Customary and Commonly Used Units to SI Units (Continued)

Quantity	Customary or commonly used unit	SI unit	Alternate SI unit	Conversion factor; multiply customary unit by factor to obtain SI unit	
Velocity (linear), speed	knot	km/h		1.852°	E + 00
	mi/h	km/h		1.609 344°	E + 00
	ft/s	m/s		3.048°	E - 01
		cm/s		3.048°	E + 01
	ft/min	m/s		5.08°	E - 03
	ft/h	mm/s		8.466 667	E - 02
	ft/day	mm/s		3.527 778	E - 03
		m/d		3.048°	E - 01
Corrosion rate	in/year (ipy)	mm/a		2.54°	E + 01
	mil/year	mm/a		2.54°	E - 02
Rotational frequency	r/min	r/s		1.666 667	E - 02
		rad/s		1.047 198	E - 01
Acceleration (linear)	ft/s ²	m/s ²		3.048°	E - 01
		cm/s ²		3.048°	E + 01
Acceleration (rotational)	rpm/s	rad/s ²		1.047 198	E - 01
Momentum	(lbm-ft)/s	(kg-m)/s		1.382 550	E - 01
Force	U.K. tonf	kN		9.964 016	E + 00
	U.S. tonf	kN		8.896 443	E + 00
	kgf (kp)	N		9.806 650°	E + 00
	lbf	N		4.448 222	E + 00
	dyn	mN		1.0	E - 02
Bending moment, torque	U.S. tonf-ft	kN-m		2.711 636	E + 00
	kgf-m	N-m		9.806 650°	E + 00
	lbf-ft	N-m		1.355 818	E + 00
	lbf-in	N-m		1.129 848	E - 01
Bending moment/length	(lbf-ft)/in	(N-m)/m		5.337 866	E + 01
	(lbf-in)/in	(N-m)/m		4.448 222	E + 00
Moment of inertia	lbm-ft ²	kg-m ²		4.214 011	E - 02
Stress	U.S. tonf/in ²	MPa	N/mm ²	1.378 951	E + 01
	kgf/mm ²	MPa	N/mm ²	9.806 650°	E + 00
	U.S. tonf/ft ²	MPa	N/mm ²	9.576 052	E - 02
	lbf/in ² (psi)	MPa	N/mm ²	6.894 757	E - 03
	lbf/ft ² (psf)	kPa		4.788 026	E - 02
	dyn/cm ²	Pa		1.0°	E - 01
Mass/length	lbm/ft	kg/m		1.488 164	E + 00
Mass/area structural loading, bearing capacity (mass basis)	U.S. ton/ft ²	Mg/m ²		9.764 855	E + 00
	lbm/ft ²	kg/m ²		4.882 428	E + 00
Miscellaneous transport properties					
Diffusivity	ft ² /s	m ² /s		9.290 304°	E - 02
	m ² /s	mm ² /s		1.0°	E + 06
	ft ² /h	m ² /s		2.580 64°	E - 05
Thermal resistance	(°C-m ² -h)/kcal	(K-m ²)/kW		8.604 208	E + 02
	(°F-ft ² -h)/Btu	(K-m ²)/kW		1.761 102	E + 02
Heat flux	Btu/(h-ft ²)	kW/m ²		3.154 591	E - 03
Thermal conductivity	(cal-cm)/(s-cm ² -°C)	W/(m-K)		4.184°	E + 02
	(Btu-ft)/(h-ft ² -°F)	W/(m-K)		1.730 735	E + 00
		(kJ-m)/(h-m ² -K)		6.230 646	E + 00
	(kcal-m)/(h-m ² -°C)	W/(m-K)		1.162 222	E + 00
	(Btu-in)/(h-ft ² -°F)	W/(m-K)		1.442 279	E - 01
	(cal-cm)/(h-cm ² -°C)	W/(m-K)		1.162 222	E - 01
Heat-transfer coefficient	cal/(s-cm ² -°C)	kW/(m ² -K)		4.184°	E + 01
	Btu/(s-ft ² -°F)	kW/(m ² -K)		2.044 175	E + 01
	cal/(h-cm ² -°C)	kW/(m ² -K)		1.162 222	E - 02
	Btu/(h-ft ² -°F)	kW/(m ² -K)		5.678 263	E - 03
		kJ/(h-m ² -K)		2.044 175	E + 01
	Btu/(h-ft ² -°R)	kW/(m ² -K)		5.678 263	E - 03
	kcal/(h-m ² -°C)	kW/(m ² -K)		1.162 222	E - 03

TABLE 1-4 Conversion Factors: U.S. Customary and Commonly Used Units to SI Units (Continued)

Quantity	Customary or commonly used unit	SI unit	Alternate SI unit	Conversion factor; multiply customary unit by factor to obtain SI unit
Volumetric heat-transfer coefficient	Btu/(s·ft ³ ·°F)	kW/(m ³ ·K)		6.706 611 E + 01
	Btu/(h·ft ³ ·°F)	kW/(m ³ ·K)		1.862 947 E - 02
Surface tension	dyn/cm	mN/m		1
Viscosity (dynamic)	(lbf·s)/in ²	Pa·s	(N·s)/m ²	6.894 757 E + 03
	(lbf·s)/ft ²	Pa·s	(N·s)/m ²	4.788 026 E + 01
	(kgf·s)/m ²	Pa·s	(N·s)/m ²	9.806 650° E + 00
	lbm/(ft·s)	Pa·s	(N·s)/m ²	1.488 164 E + 00
	(dyn·s)/cm ²	Pa·s	(N·s)/m ²	1.0° E - 01
	cP	Pa·s	(N·s)/m ²	1.0° E - 03
	lbm/(ft·h)	Pa·s	(N·s)/m ²	4.133 789 E - 04
Viscosity (kinematic)	ft ² /s	m ² /s		9.290 304° E - 02
	in ² /s	mm ² /s		6.451 6° E + 02
	m ² /h	mm ² /s		2.777 778 E + 02
	ft ² /h	m ² /s		2.580 64° E - 05
	cSt	mm ² /s		1
Permeability	darcy	μm ²		9.869 233 E - 01
	millidarcy	μm ²		9.869 233 E - 04
Thermal flux	Btu/(h·ft ²)	W/m ²		3.152 E + 00
	Btu/(s·ft ²)	W/m ²		1.135 E + 04
	cal/(s·cm ²)	W/m ²		4.184 E + 04
Mass-transfer coefficient	(lb·mol)/[h·ft ² (lb·mol/ft ³)]	m/s		8.467 E - 05
	(g·mol)/[s·m ² (g·mol/L)]	m/s		1.0 E + 01
Electricity, magnetism				
Admittance	S	S		1
Capacitance	μF	μF		1
Charge density	C/mm ³	C/mm ³		1
Conductance	S	S		1
	Ū (mho)	S		1
Conductivity	S/m	S/m		1
	Ū/m	S/m		1
	mŪ/m	mS/m		1
Current density	A/mm ²	A/mm ²		1
Displacement	C/cm ²	C/cm ²		1
Electric charge	C	C		1
Electric current	A	A		1
Electric-dipole moment	C·m	C·m		1
Electric-field strength	V/m	V/m		1
Electric flux	C	C		1
Electric polarization	C/cm ²	C/cm ²		1
Electric potential	V	V		1
	mV	mV		1
Electromagnetic moment	A·m ²	A·m ²		1
Electromotive force	V	V		1
Flux of displacement	C	C		1
Frequency	cycles/s	Hz		1
Impedance	Ω	Ω		1
Linear-current density	A/mm	A/mm		1
Magnetic-dipole moment	Wb·m	Wb·m		1
Magnetic-field strength	A/mm	A/mm		1
	Oe	A/m		7.957 747 E + 01
	gamma	A/m		7.957 747 E - 04
Magnetic flux	mWb	mWb		1

TABLE 1-4 Conversion Factors: U.S. Customary and Commonly Used Units to SI Units (Continued)

Quantity	Customary or commonly used unit	SI unit	Alternate SI unit	Conversion factor; multiply customary unit by factor to obtain SI unit	
Magnetic-flux density	mT	mT		1	
	G	T		1.0*	E - 04
	gamma	nT		1	
Magnetic induction	mT	mT		1	
Magnetic moment	A·m ²	A·m ²		1	
Magnetic polarization	mT	mT		1	
Magnetic potential difference	A	A		1	
Magnetic-vector potential	Wb/mm	Wb/mm		1	
Magnetization	A/mm	A/mm		1	
Modulus of admittance	S	S		1	
Modulus of impedance	Ω	Ω		1	
Mutual inductance	H	H		1	
Permeability	μH/m	μH/m		1	
Permeance	H	H		1	
Permittivity	μF/m	μF/m		1	
Potential difference	V	V		1	
Quantity of electricity	C	C		1	
Reactance	Ω	Ω		1	
Reluctance	H ⁻¹	H ⁻¹		1	
Resistance	Ω	Ω		1	
Resistivity	Ω·cm	Ω·cm		1	
	Ω·m	Ω·m		1	
Self-inductance	mH	mH		1	
Surface density of charge	mC/m ²	mC/m ²		1	
Susceptance	S	S		1	
Volume density of charge	C/mm ³	C/mm ³		1	
Acoustics, light, radiation					
Absorbed dose	rad	Gy		1.0*	E - 02
Acoustical energy	J	J		1	
Acoustical intensity	W/cm ²	W/m ²		1.0*	E + 04
Acoustical power	W	W		1	
Sound pressure	N/m ²	N/m ²		1.0*	
Illuminance	fc	lx		1.076 391	E + 01
Illumination	fc	lx		1.076 391	E + 01
Irradiance	W/m ²	W/m ²		1	
Light exposure	fc·s	lx·s		1.076 391	E + 01
Luminance	cd/m ²	cd/m ²		1	
Luminous efficacy	lm/W	lm/W		1	
Luminous exitance	lm/m ²	lm/m ²		1	
Luminous flux	lm	lm		1	
Luminous intensity	cd	cd		1	
Radiance	W/m ² ·sr	W/m ² ·sr		1	
Radiant energy	J	J		1	
Radiant flux	W	W		1	
Radiant intensity	W/sr	W/sr		1	
Radiant power	W	W		1	

TABLE 1-4 Conversion Factors: U.S. Customary and Commonly Used Units to SI Units (Concluded)

Quantity	Customary or commonly used unit	SI unit	Alternate SI unit	Conversion factor; multiply customary unit by factor to obtain SI unit	
Wavelength	Å	nm		1.0*	E - 01
Capture unit	10 ⁻³ cm ⁻¹	m ⁻¹		1.0*	E + 01
	m ⁻¹	m ⁻¹	10 ⁻³ cm ⁻¹	1	1
Radioactivity	Ci	Bq		3.7*	E + 10

* An asterisk indicates that the conversion factor is exact.

† Conversion factors for length, area, and volume are based on the international foot. The international foot is longer by 2 parts in 1 million than the U.S. Survey foot (land-measurement use).

NOTE: The following unit symbols are used in the table:

Unit symbol	Name	Unit symbol	Name
A	ampere	lm	lumen
a	annum (year)	lx	lux
Bq	becquerel	m	meter
C	coulomb	min	minute
cd	candela	'	minute
Ci	curie	N	newton
d	day	naut mi	U.S. nautical mile
°C	degree Celsius	Oe	oersted
°	degree	Ω	ohm
dyn	dyne	Pa	pascal
F	farad	rad	radian
fc	footcandle	r	revolution
G	gauss	S	siemens
g	gram	s	second
gr	grain	"	second
Gy	gray	sr	steradian
H	henry	St	stokes
h	hour	T	tesla
ha	hectare	t	tonne
Hz	hertz	V	volt
J	joule	W	watt
K	kelvin	Wb	weber
L, ℓ, l	liter		

NOTE: Copyright SPE-AIME, *The SI Metric System of Units and SPE's Tentative Metric Standard*, Society of Petroleum Engineers, Dallas, 1977.