SI UNITS

The 2001 Edition of the Boiler and Pressure Vessel Code is based on U.S. Customary (ft-lb) units of measurement, which are to be regarded as the standard. This supplement is provided as a convenience to the Code user and contains SI conversion factors for units contained in the Code. 01

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LIST OF SI UNITS FOR USE WITH ASME BOILER AND PRESSURE VESSEL CODE[1]

Quantity	Unit	Symbol	Other Units or Limitations
Space and Time			
plane angle	radian	rad	degree (decimalized)
length	meter	m	
area	square meter	m^2	
volume	cubic meter	m^3	liter (L) for liquid only (use without prefix other than in milliliter, mL)
time	second	s	minute (min), hour (h), day (d), week, and year
Periodic and Related Phenomena			
frequency	hertz	Hz	revolutions per second (r/s)
rotational frequency	revolutions per second	s^{-1}	revolutions per minute (r/m)
Mechanics			
mass	kilogram	kg	
density	kilogram per cubic meter	kg/m^3	
moment of inertia	kilogram · $meter^2$	$kg \cdot m^2$	
force	newton	N	
moment of force (torque)	newton-meter	$N \cdot m$	
pressure and stress	pascal	Pa	(pascal = newton per square meter)
energy, work	joule	J	kilowatt-hour (kW · h)
power	watt	W	
impact strength	joule	J	
section modulus	$meter^3$	m^3	
moment of section (second moment of area)	$meter^4$	m^4	
fracture toughness	$Pa \cdot \sqrt{m}$		
Heat			
temperature — thermodynamic [Note (2)]	kelvin	K	degree Celsius (°C)
temperature — other than thermodynamic	degree Celsius	°C	kelvin (K)
linear expansion coefficient	meter per meter-kelvin	K^{-1}	$°C^{-1}$
quantity of heat	joule	J	
heat flow rate	watt	W	
thermal conductivity	watt per meter-kelvin	$W/(m \cdot K)$	$W/(m \cdot °C)$
thermal diffusivity	square meter per second	m^2/s	
specific heat capacity	joule per kilogram-kelvin	$J/(kg \cdot K)$	$J/(kg \cdot °C)$
Electricity and Magnetism			
electric current	ampere	A	
electric potential	volt	V	
current density	ampere per $meter^2$	A/m^2	
magnetic field strength	ampere per meter	A/m	

NOTES:

(1) Conversion factors between SI units and U.S. customary are given in SI-1, "ASME Orientation and Guide for Use of SI (Metric) Units," and ASTM E 380.

(2) Preferred use for temperature and temperature interval is degrees Celsius (°C), except for thermodynamic and cryogenic work where kelvins may be more suitable. For temperature interval, 1 K = 1°C exactly.

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COMMONLY USED CONVERSION FACTORS[1]
(For Others See ASTM E 380)

Quantity	To Convert From	To	Multiply by [Note (2)]	
plane angle	degree	rad	1.745 329	E−02
length	in	m	2.54*	E−02
	ft	m	3.048*	E−01
	yd	m	9.144*	E−01
area	in^2	m^2	6.451 6*	E−04
	ft^2	m^2	9.290 304*	E−02
	yd^2	m^2	8.361 274	E−01
volume	in^3	m^3	1.638 706	E−05
	ft^3	m^3	2.831 685	E−02
	US gallon	m^3	3.785 412	E−03
	Imperial gallon	m^3	4.546 09	E−03
	liter	m^3	1.0*	E−03
mass	lbm	kg	4.535 924	E−01
	ton (metric) (mass)	kg	1.000 00*	E+03
	ton (short 2,000 lbm)	kg	9.071 847	E+02
force	kgf	N	9.806 65*	E+00
	lbf	N	4.448 222	E+00
bending, torque	kgf · m	N · m	9.806 65*	E+00
	lbf · in	N · m	1.129 848	E−01
	lbf · ft	N · m	1.355 818	E+00
pressure, stress	kgf/m^2	Pa	9.806 65*	E+00
	lbf/ft^2	Pa	4.788 026	E+01
	lbf/in^2 (psi)	Pa	6.894 757	E+03
	$kips/in^2$	Pa	6.894 757	E+06
	bar	Pa	1.0*	E+05
energy, work	Btu (IT) [Note (3)]	J	1.055 056	E+03
	ft · lbf	J	1.355 818	E+00
power	hp (550 ft · lbf/s)	W	7.456 999	E+02
fracture toughness	ksi $\sqrt{in}$	Pa · $\sqrt{m}$	1.098 843	E+06
temperature	°C	K	$t_K = t_C + 273.15$	
	°F	K	$t_K = (t_F + 459.67)/1.8$	
	°F	°C	$t_C = (t_F - 32)/1.8$	
temperature interval	°C	K	1.0*	E+00
	°F	K or °C	5.555 555	E−01

NOTES:
(1) Care should be taken when converting formulas or equations that contain constant terms or factors. The value of these terms must be understood and may also require conversion.
(2)(a) Relationships that are exact in terms of the base units are followed by a single asterisk.
(b) The factors are written as a number greater than 1 and less than 10 with 6 or less decimal places. The number is followed by the letter E (for exponent), a plus or minus symbol, and two digits which indicate the power of 10 by which the number must be multiplied to obtain the correct value. For example: 3.523 907 E−02 is $3.523\ 907 \times 10^{-2}$ or 0.035 239 07.
(3) International Table

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