



Units of measurement

SI base units

The **International System of Units** – abbreviated as **SI** from the French name, *Système International d'Unités* – is the most widely used system of measurements. Some **SI units**, such as metres and kilograms, are often described as **metric units**. The seven **base units** of the SI system are shown in the table below.

Quantity	Unit	Abbreviation
length	metre	m
mass	kilogram	kg
time	second	s
electric current	ampere	A
thermodynamic temperature	kelvin	K
amount of substance	mole	mol
luminous intensity	candela	cd

Note: 0 kelvin (K) = -273 degrees Celsius (°C). 0 K is the lowest possible temperature – often called absolute zero.

SI derived units

SI derived units are related to the SI base units. They include a wide range of specific units. The table below lists SI derived units commonly used in engineering.

Quantity	Unit	Abbreviation	Notes
length	millimetre	mm	1 mm = 0.001 m
	centimetre	cm	1 cm = 0.01 m
	kilometre	km	1 km = 1,000 m
area	square metre	m ²	1 m ² = 1 m × 1 m
	square millimetre	mm ²	1 mm ² = 1 mm × 1 mm
volume	cubic metre	m ³	1 m ³ = 1 m × 1 m × 1 m
	cubic centimetre	cc	1 cc = 1 cm × 1 cm × 1 cm
volume of liquid	litre	l	1 l = 0.001 m ³
mass	gram	g	1 g = 0.001 kg
	tonne	T	1 T = 1,000 kg
force	newton	N	1 N = the force exerted by the earth's gravity on a mass of approximately 0.1 kg
density	kilograms per cubic metre	kg/m ³	If a volume of 1 m ³ of material has a mass of 1 kg its density = 1 kg/m ³ .
pressure and stress	Pascal	Pa	1 Pa = 1 N/m ²

Quantity	Unit	Abbreviation	Notes
speed/velocity	metres per second	m/s	If an object travels 1 metre in 1 second, its speed or velocity is 1 m/s.
	kilometres per hour	km/h	If an object travels 1 kilometre in 1 hour, its speed or velocity is 1 km/h.
acceleration	metres per second squared	m/s ²	If the speed or velocity of an object increases by 1 m/s every second, it has a rate of acceleration of 1 m/s ² .
moments and torque	newton metres	Nm	1 Nm = 1 N of force exerted at a distance of 1 m from a fulcrum or axis of rotation
temperature	degree Celsius	°C	Temperature in °C = temperature in kelvin (K) + 273 (see note under base units above)
frequency	hertz	Hz	1 Hz = 1 cycle per second
angular movement	radian	rad	2π rad = 360 degrees
angular velocity	radians per second	rad/s	If an object rotates through 1 radian in 1 second, its angular velocity is 1 rad/s.
angular acceleration	radians per second squared	rad/s ²	If the angular velocity of an object increases by 1 rad/s every second, its angular acceleration is 1 rad/s ² .
rotational velocity	revolutions per minute	rpm	If a revolving shaft or wheel makes 1,000 rotations every minute, its rotational velocity is 1,000 rpm.
energy	joule	J	If a force of 1 N is needed to keep an object moving, the work required to move the object over 1 m = 1 J.
power	watt	W	1 W = 1 J/s
specific heat capacity	joules per kilogram degrees Celsius	J/(kg °C)	If 1 J of energy is needed to raise the temperature of 1 kg of a substance by 1°C, its specific heat capacity is 1 J/(kg °C).
latent heat of fusion and latent heat of vaporization	joules per kilogram	J/kg	If 1 J of energy is needed to change the state of 1 kg of a substance, its latent heat of fusion/vaporization is 1 J/kg.