UNITS · SI ↔ IMPERIAL · ENGINEERING CONVERSIONS · REFERENCE DOCUMENT · PUBLIC

Unit conversion reference

The conversion factors product engineers reach for daily — length, force, pressure, torque, energy, power, temperature, viscosity and rotation — SI ↔ imperial in one place.

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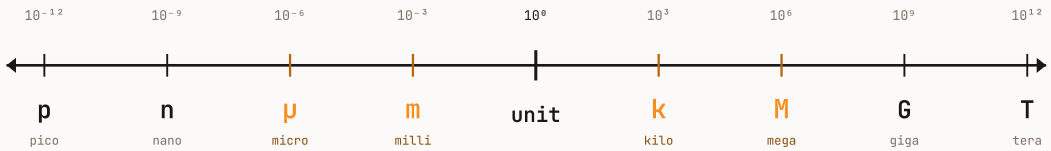
ABSTRACT

A single-page conversion reference for the units that come up in mechanical and electromechanical design. SI is the working system; the imperial equivalents are here because suppliers, datasheets and legacy drawings still use them.

Section 1 is SI basics and prefixes. Sections 2–6 are the conversion tables: length/area/volume, mass/force, pressure/stress, torque/energy/power, and temperature/viscosity/rotation. Convert by multiplying through unit factors and watch significant figures.

SI PREFIXES — POWERS OF TEN



each step = ×1000 · move the decimal three places

SI PREFIXES STEP BY ×1000 — MICRO, MILLI, KILO, MEGA ARE THE ENGINEERING STAPLES. THE TABLES BELOW COVER THE SI ↔ IMPERIAL FACTORS YOU ACTUALLY USE ON HARDWARE.

CONTENTS

1. SI basics and prefixes

SI is built on base units (metre, kilogram, second, ampere, kelvin) and coherent derived units (newton = kg·m/s², pascal = N/m², joule = N·m, watt = J/s). Prefixes scale by powers of ten — each common step is ×1000:

`μ (micro)`	10^{-6} — microns (μm) for tolerances and surface finish
`m (milli)`	10^{-3} — millimetres, the default mechanical length unit
`k (kilo)`	10^{3} — kN, kPa, kg
`M (mega)`	10^{6} — MPa (the working stress unit), MJ
`G (giga)`	10^{9} — GPa (modulus of elasticity)

Convert by chaining unit factors (multiply by ratios equal to 1) and keep significant figures honest — a conversion can't add precision the measurement didn't have. 1 MPa = 1 N/mm² is the handy identity for stress.

2. Length, area, volume

CONVERT	× FACTOR	TO
inch (in)	25.4	mm
foot (ft)	0.3048	m
mil (0.001 in)	25.4	µm
inch²	645.16	mm²
foot²	0.0929	m²
inch³	16.387	cm³
US gallon	3.785	litre
foot³	28.317	litre

3. Mass and force

CONVERT	× FACTOR	TO
pound-mass (lb)	0.4536	kg
ounce (oz)	28.35	g
pound-force (lbf)	4.448	N
kilogram-force (kgf)	9.807	N
N	0.2248	lbf
metric ton	1000	kg

4. Pressure and stress

CONVERT	× FACTOR	TO
psi	6.895	kPa
ksi	6.895	MPa
MPa	145.0	psi
bar	100	kPa
bar	14.50	psi
atm	101.325	kPa
MPa	1.0	N/mm²

5. Torque, energy, power

CONVERT	× FACTOR	TO
lbf·ft	1.356	N·m
lbf·in	0.1130	N·m
N·m	0.7376	lbf·ft
calorie	4.184	J
BTU	1055	J
kWh	3.6	MJ
horsepower (hp)	745.7	W
W	0.001341	hp

6. Temperature, viscosity, rotation

CONVERT	FORMULA / FACTOR	TO
°F → °C	(°F − 32) / 1.8	°C
°C → °F	°C × 1.8 + 32	°F
°C → K	°C + 273.15	K
dynamic visc. cP	1	mPa·s (= 0.001 Pa·s)
kinematic visc. cSt	1	mm^2/s (= 10^{-6} m^2/s)
density g/cm³	1000	kg/m^3
lb/in³	27.68	g/cm^3
rpm	0.10472	rad/s
m/s	3.600	km/h
m/s	3.281	ft/s
radian	57.296	degree

Kinematic viscosity ν = dynamic μ / density ρ. Surface speed v = ω·r (ω in rad/s) — handy for the bearing ndm and plain-bearing PV checks.