Units and Measurements

Dimensional Formulae and Dimensional Equations

Physical Quantity	Symbol	Dimensional Formula	SI Unit
Length	L	$[L]$	meter (m)
Mass	M	$[M]$	kilogram (kg)
Time	T	$[T]$	second (s)
Electric Current	I	$[I]$	ampere (A)
Temperature	θ	$[\theta]$	kelvin (K)
Amount of Substance	N	$[N]$	mole (mol)
Luminous Intensity	J	$[J]$	candela (cd)
Area	A	$[L^2]$	square meter (m²)
Volume	V	$[L^3]$	cubic meter (m³)
Velocity	v	$[LT^{-1}]$	meter per second (m/s)
Acceleration	a	$[LT^{-2}]$	meter per second squared (m/s²)
Force	F	$[MLT^{-2}]$	newton (N)
Pressure	P	$[ML^{-1}T^{-2}]$	pascal (Pa)
Energy / Work	E, W	$[ML^2T^{-2}]$	joule (J)
Power	P	$[ML^2T^{-3}]$	watt (W)
Density	ρ	$[ML^{-3}]$	kilogram per cubic meter (kg/m³)
Momentum	p	$[MLT^{-1}]$	kilogram meter per second (kg·m/s)
Frequency	f	$[T^{-1}]$	hertz (Hz)
Electric Charge	Q	$[IT]$	coulomb (C)
Electric Potential	V	$[ML^2T^{-3}I^{-1}]$	volt (V)
Electric Field	E	$[MLT^{-3}I^{-1}]$	newton per coulomb (N/C) or volt per meter (V/m)
Electric Resistance	R	$[ML^2T^{-3}I^{-2}]$	ohm (Ω)
Capacitance	C	$[M^{-1}L^{-2}T^4I^2]$	farad (F)
Magnetic Flux	Φ	$[ML^2T^{-2}I^{-1}]$	weber (Wb)
Magnetic Field	B	$[MT^{-2}I^{-1}]$	tesla (T)
Inductance	L	$[ML^2T^{-2}I^{-2}]$	henry (H)

Dimensional Equations

Dimensional equations express a physical quantity in terms of the fundamental quantities (mass, length, time, etc.) represented by their respective dimensions.

Example:

- **Force**: $F = ma$

  - $[F] = [M][L][T^{-2}]$
  - Dimensional equation: $[F] = [MLT^{-2}]$

- **Energy**: $E = F \cdot d$

  - $[E] = [F][L]$
  - $[E] = [MLT^{-2}][L]$
  - Dimensional equation: $[E] = [ML^2 T^{-2}]$

Understanding dimensional formulae and dimensional equations is essential for verifying the consistency of physical equations and converting units in various scientific calculations.