

Physical Quantities

	Quantity	Definition	Formula	Units	Dimensions
M E C H A N I C A L	Length or Distance	<i>fundamental</i>	d	m (meter)	<i>L (Length)</i>
	Time	<i>fundamental</i>	t	s (second)	<i>T (Time)</i>
	Mass	<i>fundamental</i>	m	kg (kilogram)	<i>M (Mass)</i>
	Area	distance ²	$A = d^2$	m ²	L^2
	Volume	distance ³	$V = d^3$	m ³	L^3
	Density	mass / volume	$d = m/V$	kg/m ³	M/L^3
	Velocity	distance / time	$v = d/t$	m/s	L/T
	Acceleration	velocity / time	$a = v/t$	m/s ²	L/T^2
	Momentum	mass × velocity	$p = mv$	kg·m/s	ML/T
	Force Weight	mass × acceleration mass × (accel. of grav.)	$F = ma$ $W = mg$	N (newton) = kg·m/s ²	ML/T^2
	Pressure or Stress	force / area	$p = F/A$	Pa (pascal) = N/m ² = kg/(m·s ²)	M/LT^2
	Energy or Work Kinetic Energy Potential Energy	force × distance mass × velocity ² / 2 mass × (accel. of grav.) × height	$E = Fd$ $KE = mv^2/2$ $PE = mgh$	J (joule) = N·m = kg·m ² /s ²	ML^2/T^2
	Power	energy / time	$P = E/t$	W (watt) = J/s = kg·m ² /s ³	ML^2/T^3
	Impulse	force × time	$I = Ft$	N·s = kg·m/s	ML/T
Action	energy × time momentum × distance	$A = Et$ $A = pd$	J·s = kg·m ² /s	ML^2/T	
A N G U L A R	Angle	<i>fundamental</i>	θ	° (degrees) or rad (radians) 360° = 2π rad	<i>dimensionless</i>
	Cycles	<i>fundamental</i>	n	cyc (cycles)	<i>dimensionless</i>
	Frequency	cycles / time	$f = n/t$	Hz (hertz) = cyc/s = 1/s	$1/T$
	Angular Velocity	angle / time	$\omega = \theta/t$	rad/s = 1/s	$1/T$
	Angular Acceleration	angular velocity / time	$\alpha = \omega/t$	rad/s ² = 1/s ²	$1/T^2$
	Moment of Inertia	mass × radius ²	$I = mr^2$	kg·m ²	ML^2
	Angular Momentum	radius × momentum (mom. of inert.) × (ang. vel.)	$L = rp$ $L = I\omega$	kg·m ² /s	ML^2/T
	Torque	radius × force (mom. of inert.) × (ang. accel.)	$T = rF$ $T = Ia$	N·m = kg·m ² /s ²	ML^2/T^2

T H E R M A L	Temperature	<i>fundamental</i>	T	°C (celsius) or K (kelvin)	<i>K (Temp.)</i>
	Heat	heat energy	Q	J (joule) = $\text{kg}\cdot\text{m}^2/\text{s}^2$	ML^2/T^2
	Entropy	heat / temperature	$S = Q/T$	J/K	ML^2/T^2K
E L E C T R O M A G N E T I C	Electric Charge (+/-)	<i>fundamental</i>	q	C (coulomb)	<i>C (Charge)</i>
	Current	charge / time	$i = q/t$	A (amp) = C/s	C/T
	Voltage or Potential	energy / charge	$V = E/q$	V (volt) = J/C	ML^2/CT^2
	Resistance	voltage / current	$R = V/i$	Ω (ohm) = V/A	ML^2/C^2T
	Capacitance	charge / voltage	$C = q/V$	F (farad) = C/V	C^2T^2/ML^2
	Inductance	voltage / (current / time)	$L = V/(i/t)$	H (henry) = $V\cdot s/A$	ML^2/T^2
	Electric Field	voltage / distance force / charge	$E = V/d$ $E = F/q$	$V/m = N/C$	ML/CT^2
	Electric Flux	electric field \times area	$\Phi_E = EA$	$V\cdot m = N\cdot m^2/C$	ML^3/CT^2
	Magnetic Field	force / (charge \times velocity)	$B = F/qv$	T (tesla) = Wb/m^2 $= N\cdot s/(C\cdot m)$	M/CT
Magnetic Flux	magnetic field \times area	$\Phi_M = BA$	Wb (weber) = $V\cdot s$ $= J\cdot s/C$	ML^2/CT	

Mass, energy, momentum, angular momentum, and charge are conserved, which means the the total amount doesn't change in an isolated system.

Keith Enevoldsen's Think Zone