SI Units of Kinematic and Electromagnetic Quantities

Quantity	Symbol	Common Units	Units Symbol	SI Base Units
Length	ℓ	Meters, m	m	m
Mass	m	Kilograms, kg	kg	kg
Time	t	Seconds, sec or s	s	s
Velocity	$\mathbf{v}$	m/s	m/s	m/s
Acceleration	$\mathbf{a}$	m/s^2	m/s^2	m/s^2
Force	$\mathbf{F} = m\mathbf{a} = d\mathbf{p}/dt$	Newtons = $kg\text{-}m/s^2$	N	$kg\text{-}m/s^2$
Momentum	$\mathbf{p} = m\mathbf{v}$	kg-m/s	kg-m/s	kg-m/s
Angular Momentum	$\boldsymbol{L} = \mathbf{r}\times\mathbf{p}$	$kg\text{-}m^2/s$ = Joule-sec = N-m-s	J-s = N-m-s	$kg\text{-}m^2/s$
Pressure	$P = F/A$	Pascals, Pa = N/m^2	Pa = N/m^2	$kg/m\text{-}s^2$
Energy, Work	E, W	Joules = N-m	J = N-m	$kg\text{-}m^2/s^2$
(Volume) Energy Density	U = E/V	$Joules/m^3$	J/m^3	$kg/m\text{-}s^2$
Power	P = dW/dt	Watts = Joules/sec	J/s	$kg\text{-}m^2/s^3$
Electric Charge	Q	Coulombs, C	C = A-s	Ampere-sec
Linear Elect. Charge Density	$\lambda = Q/L$	Coulombs/m	C/m	A-s/m
Surface Elect. Charge Density	$\sigma = Q/A$	$Coulombs/m^2$	C/m^2	$A\text{-}s/m^2$
Volume Elect. Charge Density	$\rho = Q/V$	$Coulombs/m^3$	C/m^3	$A\text{-}s/m^3$
Electric Potential	V	Volts = N-m/C	V = N-m/C	$kg\text{-}m^2/A\text{-}s^3$
Electric Field	$\mathbf{E} = \mathbf{F}/Q = -\nabla V$	Volts/m = N/C	V/m = N/C	$kg\text{-}m/A\text{-}s^3$
Electric Displacement	$\mathbf{D} = \varepsilon\mathbf{E}$	$Coulombs/m^2$	C/m^2	$A\text{-}s/m^2$
Electric Polarization	$\mathbf{P} = \varepsilon_o\chi_e\mathbf{E}$	$Coulombs/m^2$	C/m^2	$A\text{-}s/m^2$
Electric Flux	$\Phi_E = \mathbf{E}\bullet\boldsymbol{A} = Q/\varepsilon_o$	Volt-m = $N\text{-}m^2/C$	V-m = $N\text{-}m^2/C$	$kg\text{-}m^3/A\text{-}s^3$
Electric Displacement Flux	$\Phi_D = \mathbf{D}\bullet\boldsymbol{A} = Q$	Coulombs	C = A-s	A-s
Capacitance	$C = Q/V$	Farad = Coulomb/Volt	F = C/V	$A^2\text{-}s^4/kg\text{-}m^2$
Electric Permittivity	$\varepsilon = \varepsilon_o(1+\chi_e)$	Farads/m = $C^2/N\text{-}m^2$	F/m = C/V-m	$A^2\text{-}s^4/kg\text{-}m^3$
Electric Susceptibility	$\chi_e = K_e - 1 = \varepsilon/\varepsilon_o - 1$	Dimensionless	*	*
Electric Line Current	$I = \mathbf{J}\bullet\boldsymbol{A}_\perp = \mathbf{K}\bullet\boldsymbol{\ell}_\perp$	Amperes, Amps	A = C/s	A
Elect. Surface Current Density	$\mathbf{K}$	Amps/m	A/m	A/m
Elect. Volume Current Density	$\mathbf{J} = nq\mathbf{v}$	$Amps/m^2$	A/m^2	A/m^2
Magnetic Charge	g_m = "qv"	Amp-m = C-m/s	A-m	A-m
Magnetic Vector Potential	$\mathbf{A}$ = "$\mathbf{p}$/Q"	Tesla-m = Wb/m = N/A	T-m = N/A	$kg\text{-}m/A\text{-}s^2$
Magnetic Field	$\mathbf{B} = \nabla\times\mathbf{A}$	Teslas = Wb/m^2 = N/A-m	T = Wb/m^2	$kg/A\text{-}s^2$
Magnetic Displacement	$\mathbf{H} = 1/\mu_o\,\mathbf{B}$	Amps/m	A/m	A/m
Magnetization	$\mathbf{M} = \chi_m\mathbf{H}$	Amps/m	A/m	A/m
Magnetic Flux	$\Phi_m = \mathbf{B}\bullet\boldsymbol{A} = h/e$	Webers = Tesla-m^2 = N-m/A	Wb = T-m^2	$kg\text{-}m^2/A\text{-}s^2$
Inductance	$L = \Phi_m/I$	Henrys=Wb/A=T-m^2/A=N-m/A^2	H = N-m/A^2	$kg\text{-}m^2/A^2\text{-}s^2$
Magnetic Permeability	$\mu = \mu_o(1+\chi_m)$	Henrys/m =T-m/A = N/A^2	H/m = N/A^2	$kg\text{-}m/A^2\text{-}s^2$
Magnetic Susceptibility	$\chi_m = K_m - 1 = \mu/\mu_o - 1$	Dimensionless	*	*
Resistance	$R = \rho_c\ell/A = V/I$	Ohms, Ω	Ω =V/A	$kg\text{-}m^2/A^2\text{-}s^3$
Resistivity	$\rho_c = 1/\sigma_c$	Ohm-m, Ω-m	Ω-m =V-m/A	$kg\text{-}m^3/A^2\text{-}s^3$
Conductance	$G = 1/R = \sigma_c A/\ell$	Siemens = Ω^{-1} = "Mhos"	S = A/V	$A^2\text{-}s^3/kg\text{-}m^2$
Conductivity	$\sigma_c = 1/\rho_c$	Siemens/m = Ω^{-1}/m = "Mhos"/m	S/m = A/V-m	$A^2\text{-}s^3/kg\text{-}m^3$
Electric Charge	e	1.602×10^{-19} Coulombs	C	C
Magnetic Charge	g	3.291×10^{-9} Ampere-meters	A-m = C-m/s	A-m
Speed of Light (in vacuum)	$c = 1/\mathrm{sqrt}(\varepsilon_o\mu_o)$	2.998×10^{8} meters/sec	m/s	m/s
Elect. Permittivity Free Space	ε_o	8.85×10^{-12} Farads/meter	F/m = $C^2/N\text{-}m^2$	$A^2\text{-}s^4/kg\text{-}m^3$
Magn. Permeability Free Space	μ_o	$4\pi\times10^{-7}$ Henrys/meter	H/m = N/A^2	$kg\text{-}m/A^2\text{-}s^2$
Planck's Constant	h	6.626×10^{-34} Joule-sec	J-s = N-m-s	$kg\text{-}m^2/s$
Boltzmann's Constant	k_B	1.381×10^{-23} Joule/Kelvin	J/K = N-m/K	$kg\text{-}m^2/s^2\text{-}K$