

# Electrical Units

Quantity	Symbol	Equation	SI unit	SI unit symbol	CGS unit	Ratio of Magnitude of SI to cgs unit
Current	$I, i$	$I = E/R; I = E/Z; I = Q/t$	Ampere	A	Abampere	$10^{-1}$
Quantity	$Q, q$	$Q = it; Q = CE$	Coulomb	C	Abcoulomb	$10^{-1}$
Electromotive force	$E, e$	$E = IR; E = W/Q$	Volt	V	Abvolt	$10^8$
Resistance	$R, r$	$R = E/I; R = \rho l / A$	Ohm	$\Omega$	Abohm	$10^9$
Resistivity	$\rho$	$\rho = RA / l$	Ohm-metre	$\Omega \cdot m$	Abohm-cm	$10^{11}$
Conductance	$G, g$	$G = \gamma A / l; G = A/\rho l$	Siemens	S	Abmho	$10^{-9}$
Conductivity	$\gamma$	$\gamma = 1/\rho; \gamma = l / RA$	Siemens/meter	S/m	Abmho/cm	$10^{-11}$
Capacitance	$C$	$C = Q/E$	Farad	F	Abfarad*	$10^{-9}$
Permittivity	$\epsilon$		Farads/meter	F/m	Stat farad*/cm	$8.85 \times 10^{-12}$
Relative permittivity	$\epsilon_r$	$\epsilon_r = \epsilon/\epsilon_0$	Numerical		Numerical	1
Self-inductance	$L$	$L = -N(d\phi/dt)$	Henry	H	Abhenry	$10^9$
Mutual inductance	$M$	$M = K(L_1 L_2)^{1/2}$	Henry	H	Abhenry	$10^9$
Energy	$J$	$J = eit$	Joule	J	Erg	$10^7$
	$kwh$	$kwh = kw/3600; 3.6 MJ$	Kilowatthour	kWh		$36 \times 10^{12}$
Active power	$W$	$W = J/t; W = EI \cos \theta$	Watt	W	Abwatt	$10^7$
Reactive power	$jQ$	$Q = EI \sin \theta$	Var	var	Abvar	$10^7$
Apparent power	$VA$	$VA = EI$	Volt-ampere	VA		
Power factor	$pf$	$pf = W/VA; pf = W/(W + jQ)$				1
Reactance, inductive	$X_L$	$X_L = 2\pi fL$	Ohm	$\Omega$	Abohm	$10^9$
Reactance, capacitive	$X_C$	$X_C = 1/(2\pi fC)$	Ohm	$\Omega$	Abohm	$10^9$
Impedance	$Z$	$Z = E/I; Z = R + j(X_L - X_C)$	Ohm	$\Omega$	Abohm	$10^9$
Conductance	$G$	$G = R/Z^2$	Siemens	S	Abmho	$10^{-9}$
Susceptance	$B$	$B = X/Z^2$	Siemens	S	Abmho	$10^{-9}$
Admittance	$Y$	$Y = I/E; Y = G + jB$	Siemens	S	Abmho	$10^{-9}$
Frequency	$f$	$f = 1/T$	Hertz	Hz	Cps Hz	1
Period	$T$	$T = 1/f$	Second	s	Second	1
Time constant	$T$	$L/R; RC$	Second	s	Second	1
Angular velocity	$\omega$	$\omega = 2\pi f$	Radians/second	rad/s	Radians/second	1

\*1 Abfarad (EMU Units) =  $9 \times 10^{20}$  stat farads (ESU units).