The 4-d SI and the 3-d cgs systems of units: dimensions and conversion factors

constants		SI	Gauss	esu	emu
α		1	4π	4π	4π
β		1	c	1	1
ε_0		$(4\pi)^{-1}10^7\,\{c\}^{-2}\,\mathrm{m^{-3}\,kg^{-1}\,s^4\,A^2}$	1	1	c^{-2}
μ_0		$4\pi\times10^{-7}\,\mathrm{m\,kg\,s^{-2}\,A^{-2}}$	1	c^{-2}	1
c		$299\,792\,458\ \mathrm{m\,s^{-1}}$	$299\,792\,458\times10^2\ \mathrm{cm\,s^{-1}}$	$299\,792\,458\times10^2\ \mathrm{cm\,s^{-1}}$	$299\,792\,458\times10^2\ \mathrm{cm\,s^{-1}}$

quantity		SI unit	SI dimension	Gauss unit	Gauss dimension	Gauss 1 SI =	esu unit	esu dimension	esu 1 SI =	emu unit	emu dimension	emu 1 SI =
length	l	meter m	$\mathbf{m}$	cm	$\mathbf{cm}$	10^2	cm	$\mathbf{cm}$	10^2	cm	$\mathbf{cm}$	10^2
mass	m	kilogram kg	$\mathbf{kg}$	g	$\mathbf{g}$	10^3	g	$\mathbf{g}$	10^3	g	$\mathbf{g}$	10^3
time	t	second s	$\mathbf{s}$	s	$\mathbf{s}$	1	s	$\mathbf{s}$	1	s	$\mathbf{s}$	1
frequency	ν	hertz Hz	$\mathrm{s^{-1}}$	Hz	$\mathrm{s^{-1}}$	1	Hz	$\mathrm{s^{-1}}$	1	Hz	$\mathrm{s^{-1}}$	1
force	$\mathbf{F}$	newton N	$\mathrm{m\,kg\,s^{-2}}$	dyn	$\mathrm{cm\,g\,s^{-2}}$	10^5	dyn	$\mathrm{cm\,g\,s^{-2}}$	10^5	dyn	$\mathrm{cm\,g\,s^{-2}}$	10^5
energy	E,W	joule J	$\mathrm{m^2\,kg\,s^{-2}}$	erg	$\mathrm{cm^2\,g\,s^{-2}}$	10^7	erg	$\mathrm{cm^2\,g\,s^{-2}}$	10^7	erg	$\mathrm{cm^2\,g\,s^{-2}}$	10^7
power	P	watt W	$\mathrm{m^2\,kg\,s^{-3}}$	erg/s	$\mathrm{cm^2\,g\,s^{-3}}$	10^7	erg/s	$\mathrm{cm^2\,g\,s^{-3}}$	10^7	erg/s	$\mathrm{cm^2\,g\,s^{-3}}$	10^7
voltage	V	volt V	$\mathrm{m^2\,kg\,s^{-3}\,A^{-1}}$	esu	$\mathrm{cm^{1/2}\,g^{1/2}\,s^{-1}}$	$10^8\,c^{-1}$	esu	$\mathrm{cm^{1/2}\,g^{1/2}\,s^{-1}}$	$10^8\,c^{-1}$	emu	$\mathrm{cm^{3/2}\,g^{1/2}\,s^{-2}}$	10^8
electric field	$\mathbf{E}$	V/m	$\mathrm{m\,kg\,s^{-3}\,A^{-1}}$	esu	$\mathrm{cm^{-1/2}\,g^{1/2}\,s^{-1}}$	$10^6\,c^{-1}$	esu	$\mathrm{cm^{-1/2}\,g^{1/2}\,s^{-1}}$	$10^6\,c^{-1}$	emu	$\mathrm{cm^{1/2}\,g^{1/2}\,s^{-2}}$	10^6
electric charge	Q	coulomb C	$\mathrm{s\,A}$	esu	$\mathrm{cm^{3/2}\,g^{1/2}\,s^{-1}}$	$10^{-1}\,c$	esu	$\mathrm{cm^{3/2}\,g^{1/2}\,s^{-1}}$	$10^{-1}\,c$	emu	$\mathrm{cm^{1/2}\,g^{1/2}}$	10^{-1}
electric displacement	$\mathbf{D}$	C/m²	$\mathrm{m^{-2}\,s\,A}$	esu	$\mathrm{cm^{-1/2}\,g^{1/2}\,s^{-1}}$	$4\pi\,10^{-5}\,c$	esu	$\mathrm{cm^{-1/2}\,g^{1/2}\,s^{-1}}$	$4\pi\,10^{-5}\,c$	emu	$\mathrm{cm^{-3/2}\,g^{1/2}}$	$4\pi\,10^{-5}$
electric current	I	ampere A	$\mathbf{A}$	abamp	$\mathrm{cm^{1/2}\,g^{1/2}\,s^{-1}}$	10^{-1}	esu	$\mathrm{cm^{3/2}\,g^{1/2}\,s^{-2}}$	$10^{-1}c$	abamp	$\mathrm{cm^{1/2}\,g^{1/2}\,s^{-1}}$	10^{-1}
magnetic field	$\mathbf{H}$	A/m	$\mathrm{m^{-1}\,A}$	Oe	$\mathrm{cm^{-1/2}\,g^{1/2}\,s^{-1}}$	$4\pi\,10^{-3}$	esu	$\mathrm{cm^{1/2}\,g^{1/2}\,s^{-2}}$	$4\pi\,10^{-3}\,c$	Oe	$\mathrm{cm^{-1/2}\,g^{1/2}\,s^{-1}}$	$4\pi\,10^{-3}$
magnetic flux	Φ	weber Wb	$\mathrm{m^2\,kg\,s^{-2}\,A^{-1}}$	Mx	$\mathrm{cm^{3/2}\,g^{1/2}\,s^{-1}}$	10^8	esu	$\mathrm{cm^{1/2}\,g^{1/2}}$	$10^8\,c^{-1}$	Mx	$\mathrm{cm^{3/2}\,g^{1/2}\,s^{-1}}$	10^8
magnetic induction	$\mathbf{B}$	tesla T	$\mathrm{kg\,s^{-2}\,A^{-1}}$	G	$\mathrm{cm^{-1/2}\,g^{1/2}\,s^{-1}}$	10^4	esu	$\mathrm{cm^{-3/2}\,g^{1/2}}$	$10^4\,c^{-1}$	G	$\mathrm{cm^{-1/2}\,g^{1/2}\,s^{-1}}$	10^4
electric polarization	$\mathbf{P}$	C/m²	$\mathrm{m^{-2}\,s\,A}$	esu	$\mathrm{cm^{-1/2}\,g^{1/2}\,s^{-1}}$	$10^{-5}c$	esu	$\mathrm{cm^{-1/2}\,g^{1/2}\,s^{-1}}$	$10^{-5}\,c$	emu	$\mathrm{cm^{-3/2}\,g^{1/2}}$	10^{-5}
magnetization	$\mathbf{M}$	A/m	$\mathrm{m^{-1}\,A}$	emu	$\mathrm{cm^{-1/2}\,g^{1/2}\,s^{-1}}$	10^{-3}	esu	$\mathrm{cm^{1/2}\,g^{1/2}\,s^{-2}}$	$10^3\,c$	emu	$\mathrm{cm^{-1/2}\,g^{1/2}\,s^{-1}}$	10^{-3}
electric resistance	R	ohm Ω	$\mathrm{m^2\,kg\,s^{-3}\,A^{-2}}$	1	1	$10^9\,c^{-1}$	esu	$\mathrm{cm^{-1}\,s}$	$10^9\,c^{-2}$	emu	$\mathrm{cm\,s^{-1}}$	10^9
capacitance	C	farad F	$\mathrm{m^{-2}\,kg^{-1}\,s^4\,A^2}$	esu	cm	$10^{-9}\,c^2$	esu	cm	$10^{-9}\,c^2$	emu	$\mathrm{cm^{-1}\,s^2}$	10^{-9}
self-inductance	L	henry H	$\mathrm{m^2\,kg\,s^{-2}\,A^{-2}}$	emu	cm	10^9	esu	$\mathrm{cm^{-1}\,s^2}$	$10^9\,c^{-2}$	emu	cm	10^9

deci (d) = 10^{-1}	centi (c) = 10^{-2}	milli (m) = 10^{-3}	micro (μ) = 10^{-6}	nano (n) = 10^{-9}	pico (p) = 10^{-12}	femto (f) = 10^{-15}	atto (a) = 10^{-18}
deca (da) = 10^{1}	hecto (h) = 10^{2}	kilo (k) = 10^{3}	mega (M) = 10^{6}	giga (G) = 10^{9}	tera (T) = 10^{12}	peta (P) = 10^{15}	exa (E) = 10^{18}

$$\mathrm{div}\,\mathbf{D} = \alpha\rho \qquad \mathrm{div}\,\mathbf{B} = 0 \qquad \mathrm{rot}\,\mathbf{E} = -\frac{1}{\beta}\frac{\partial \mathbf{B}}{\partial t} \qquad \mathrm{rot}\,\mathbf{H} = \frac{\alpha}{\beta}\,\mathbf{J} + \frac{1}{\beta}\frac{\partial \mathbf{D}}{\partial t} \qquad \mathbf{D} = \varepsilon_0\mathbf{E} + \alpha\mathbf{P} \qquad \mathbf{B} = \mu_0(\mathbf{H} + \alpha\mathbf{M}) \qquad \varepsilon_0\mu_0\,c^2 = \beta^2$$

$$\mathrm{div}\,\mathbf{J} + \frac{1}{\beta}\frac{\partial \rho}{\partial t} = 0 \qquad \mathbf{B} = \mathrm{rot}\,\mathbf{A} \qquad \mathbf{E} = -\mathrm{grad}\,\Phi - \frac{1}{\beta}\frac{\partial \mathbf{A}}{\partial t} \qquad \mathbf{F} = Q\left(\mathbf{E} + \frac{1}{\beta}\mathbf{v}\times\mathbf{B}\right) \qquad F = \frac{\alpha}{4\pi\varepsilon_0}\frac{Q_1 Q_2}{r^2} \qquad F = -\frac{\alpha\mu_0}{4\pi\beta^2}\frac{2I_1 I_2 l}{r}$$