



Here are some common formulas that are frequently used in the field.



Options:

- Motor Formulas
- Transformer Formulas

E = Voltage / I = Amps / W = Watts / PF = Power Factor / Eff = Efficiency / HP = Horsepower

AC/DC Formulas				
To Find	Direct Current	AC / 1phase 115v or 120v	AC / 1phase 208,230, or 240v	AC 3 phase All Voltages
Amps when Horsepower is Known	$\frac{HP \times 746}{E \times Eff}$	$\frac{HP \times 746}{E \times Eff \times PF}$	$\frac{HP \times 746}{E \times Eff \times PF}$	$\frac{HP \times 746}{1.73 \times E \times Eff \times PF}$
Amps when Kilowatts is known	$\frac{kW \times 1000}{E}$	$\frac{kW \times 1000}{E \times PF}$	$\frac{kW \times 1000}{E \times PF}$	$\frac{kW \times 1000}{1.73 \times E \times PF}$
Amps when kVA is known		$\frac{kVA \times 1000}{E}$	$\frac{kVA \times 1000}{E}$	$\frac{kVA \times 1000}{1.73 \times E}$
Kilowatts	$\frac{I \times E}{1000}$	$\frac{I \times E \times PF}{1000}$	$\frac{I \times E \times PF}{1000}$	$\frac{I \times E \times 1.73 \times PF}{1000}$
Kilovolt-Amps		$\frac{I \times E}{1000}$	$\frac{I \times E}{1000}$	$\frac{I \times E \times 1.73}{1000}$
Horsepower (output)	$\frac{I \times E \times Eff}{746}$	$\frac{I \times E \times Eff \times PF}{746}$	$\frac{I \times E \times Eff \times PF}{746}$	$\frac{I \times E \times Eff \times 1.73 \times PF}{746}$

Three Phase Values

For 208 volts x 1.732, use 360
 For 230 volts x 1.732, use 398
 For 240 volts x 1.732, use 416
 For 440 volts x 1.732, use 762
 For 460 volts x 1.732, use 797
 For 480 Volts x 1.732, use 831

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AC Efficiency and Power Factor Formulas		
To Find	Single Phase	Three Phase
Efficiency	$\frac{746 \times \text{HP}}{E \times I \times \text{PF}}$	$\frac{746 \times \text{HP}}{E \times I \times \text{PF} \times 1.732}$
Power Factor	$\frac{\text{Input Watts}}{V \times A}$	$\frac{\text{Input Watts}}{E \times I \times 1.732}$

Power - DC Circuits
Watts = E x I
Amps = W / E

Ohm's Law / Power Formulas	
	<p>P = watts</p> <p>I = amps</p> <p>R = ohms</p> <p>E = Volts</p>

Voltage Drop Formulas		
Single Phase (2 or 3 wire)	VD =	$\frac{2 \times K \times I \times L}{\text{CM}}$
	CM =	$\frac{2K \times L \times I}{\text{VD}}$
Three Phase	VD =	$\frac{1.73 \times K \times I \times L}{\text{CM}}$
	CM =	$\frac{1.73 \times K \times L \times I}{\text{VD}}$

K = ohms per mil foot
(Copper = 12.9 at 75°)
(Alum = 21.2 at 75°)
Note: K value changes with temperature. See Code chapter 9, Table 8
L = Length of conductor in feet
I = Current in conductor (amperes)
CM = Circular mil area of conductor

Check out these Online Calculators!

If there is anything you would like to add or if you have any comments please feel free to email E.T.E. at ete@elec-toolbox.com.

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