



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 = $\frac{2 \times K \times I \times L}{\text{CM}}$	<p>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</p> <p>L = Length of conductor in feet</p> <p>I = Current in conductor (amperes)</p> <p>CM = Circular mil area of conductor</p>
	CM = $\frac{2K \times L \times I}{\text{VD}}$	
Three Phase	VD = $\frac{1.73 \times K \times I \times L}{\text{CM}}$	
	CM = $\frac{1.73 \times K \times L \times I}{\text{VD}}$	

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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