Variations of Ohm's Law

Volts

Volts = Amperes X Ohms

$$\text{Volts} = \frac{\text{Watts}}{\text{Amperes}}$$

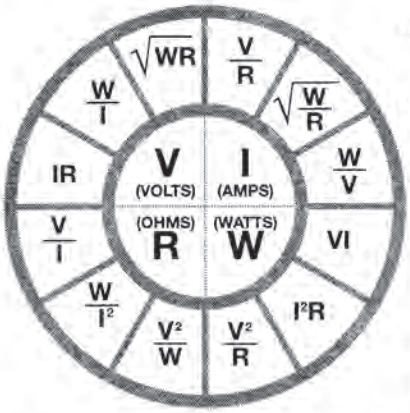
$$\text{Volts} = \sqrt{\text{Watts X Ohms}}$$

Ohms

$$\text{Ohms} = \frac{\text{Volts}}{\text{Amperes}}$$

$$\text{Ohms} = \frac{\text{Watts}}{\text{Amperes}^2}$$

$$\text{Ohms} = \frac{\text{Volts}^2}{\text{Watts}}$$



Amperes

$$\text{Amperes} = \frac{\text{Volts}}{\text{Ohms}}$$

$$\text{Amperes} = \sqrt{\frac{\text{Watts}}{\text{Ohms}}}$$

$$\text{Amperes} = \frac{\text{Watts}}{\text{Volts}}$$

Watts

$$\text{Watts} = \frac{\text{Volts}^2}{\text{Ohms}}$$

Watts = Amperes² X Ohms

Watts = Volts X Amperes

Wattage varies directly as ratio of voltages squared

$$W_2 = W_1 \times \left(\frac{V_2}{V_1}\right)^2$$

$$\text{3 Phase Amperes} = \frac{\text{Total Watts}}{\text{Volts X 1.7321}}$$

Electrical Formulas

Amperes, Horsepower, Kilowatts and KVA

To find	Single phase	Three phase	Direct current
Kilowatts	$\frac{I \times V \times PF}{1000}$	$\frac{I \times V \times 1.73 \times PF}{1000}$	$\frac{I \times V}{1000}$
KVA	$\frac{I \times V}{1000}$	$\frac{I \times V \times 1.73}{1000}$	–
Horsepower	$\frac{I \times V \times \%\ Eff \times PF}{746}$	$\frac{I \times V \times 1.73 \times \%\ Eff \times PF}{746}$	$\frac{I \times V \times \%\ Eff}{746}$
Amperes when Horsepower is known	$\frac{HP \times 746}{V \times \%\ Eff \times PF}$	$\frac{HP \times 746}{1.73 \times V \times \%\ Eff \times PF}$	$\frac{HP \times 746}{V \times \%\ Eff}$
Amperes when Kilowatts is known	$\frac{kW \times 1000}{V \times PF}$	$\frac{kW \times 1000}{1.73 \times Vx PF}$	$\frac{kW \times 1000}{V}$
Amperes when KVA is known	$\frac{KVA \times 1000}{V}$	$\frac{KVA \times 1000}{1.73 \times V}$	
V=Volts	I = Amperes	% Eff = Per cent efficiency	PF = Power factor

$\text{Amperage} = \frac{\text{Wattage (W)}}{\text{Voltage (V)}}$	Amperage (AMP) x Resistance (Ω) = Voltage

Average efficiency and power factor values of motors:

When the actual efficiencies and power factors of the motors to be controlled are not known, the following approximations may be used.

Efficiencies:

DC motors, 35 horsepower and less .....80% to 85%
DC motors, above 35 horsepower .....85% to 90%
Synchronous motors (at 100% Power factor).....92% to 95%

"Apparent" efficiencies (= Efficiency x Power factor):

Three phase induction motors, 25 horsepower and less.....70%
Three phase induction motors, above 25 horsepower.....80%
These figures may be decreased slightly for single phase induction motors.