



Recurring Formulas

For Application Engineers

DESIRED DATA	ALTERNATING CURRENT THREE-PHASE	DIRECT CURRENT
Kilowatts	$\frac{1.73 \times \text{volts} \times \text{amps} \times \text{P.F.}}{1000}$	$\frac{\text{Volts} \times \text{amps}}{1000}$
kVA	$\frac{1.73 \times \text{volts} \times \text{amps}}{1000}$	
Reactive kVA	$\frac{1.73 \times \text{volts} \times \text{amps}}{1000} \left(\sqrt{1 - \text{P.F.}^2} \right)$	
Horse Power (Output)	$\frac{1.73 \times \text{volts} \times \text{amps} \times \text{Eff.} \times \text{P.F.}}{746 \times 100}$	$\frac{\text{Volts} \times \text{amps} \times \text{Eff.}}{746 \times 100}$
Amperes (When hp is known)	$\frac{\text{Hp} \times 746 \times 100}{1.73 \times \text{volts} \times \text{P.F.}}$	$\frac{\text{Hp} \times 746 \times 100}{\text{Volts} \times \text{Efficiency}}$
Amperes (When kW is known)	$\frac{\text{Kilowatts} \times 1000}{1.73 \times \text{volts} \times \text{P.F.}}$	$\frac{\text{Kilowatts} \times 1000}{\text{Volts}}$
Amperes (When kVA is known)	$\frac{\text{kVA} \times 1000}{1.73 \times \text{volts}}$	

Power Factor = $\frac{\text{Kilowatts}}{\text{kVa}}$	Motor kVa = $\frac{\text{Kilowatts}}{\text{Power Factor}}$
Power Factor (for 3-phase) = $\frac{\text{Kilowatts} \times 1000}{1.73 \times \text{Volts} \times \text{Amps}}$	Motor Full-Load Torque = $\frac{5250 \times \text{Full-Load HP}}{\text{Speed in RPM}}$
Motor Kilowatts = $\frac{\text{HP} \times 0.746 \times 100}{\text{Efficiency}}$	Synchronous Speed in RPM = $\frac{120 \times \text{Frequency}}{\text{Number of Poles}}$
Motor kVa = $\frac{\text{HP} \times 0.746 \times 100}{\text{Efficiency} \times \text{Power Factor}}$	

kVa of Three Phase A-C Circuits:

Three-wire (Balanced)

$$\text{kVa} = \text{Volts across any two wires} \times \text{amperes in any wire} \times 1.732/1000$$

Three-wire (Unbalanced):

$$\text{kVa} = \text{Volts across any two wires} \times \text{average of the amperes in the three wires} \times 1.732/1000$$

Four-wire (Balanced):

$$\text{kVa} = \text{Volts across any outside wire to neutral wire} \times \text{amperes in any outside wire} \times 3/1000$$

Four-wire (Unbalanced):

$$\text{kVa} = \text{Volts across any outside wire to neutral wire} \times \text{average of the amperes in three outside wires} \times 3/1000$$

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