Basic Electrical Formulas

Volts (E):

Volts = square root of (watts x ohms)

Volts = watts / amperes

Volts = amperes x ohms

Ohms (R):

Ohms = volts / amperes

Ohms = volts² / watts

Ohms = watts / amperes²

Watts (W):

Watts = volts² / ohms

Watts = amperes² x ohms

Watts = volts x amperes

Amperes (I):

Amps = volts / ohms

Amps = watts / volts

Amps = square root of (watts / ohms)

AC Motor Formulas:

E = voltage / I = amps / W = watts / PF = power factor / Eff = efficiency / HP = horsepower

Single Phase:

Current (amps) I = $\dfrac{\text{HP x 746}}{\text{E x Eff x PF}}$ (where hp is known)

Current (amps) I = $\dfrac{\text{KW x 1000}}{\text{E x PF}}$ (where KW is known)

Current (amps) I = $\dfrac{\text{Kva x 1000}}{\text{E}}$ (where Kva is known)

Horsepower (hp) (hp) = $\dfrac{\text{I x E x Eff x PF}}{746}$

Kilowatts (KW) (KW) = $\dfrac{\text{I x E x PF}}{1000}$

Kilovolt-Amps (Kva) Kva = $\dfrac{\text{I x E}}{1000}$

Three Phase:

Current (amps)   I =

$$I = \frac{HP \times 746}{1.73 \times E \times Eff \times PF}$$ (where hp is known)

Current (amps)   I =

$$I = \frac{KW \times 1000}{1.73 \times E \times PF}$$ (where KW is known)

Current (amps)   I =

$$I = \frac{Kva \times 1000}{1.73 \times E}$$ (where Kva is known)

Horsepower (hp)   HP =

$$HP = \frac{1.73 \times I \times E \times Eff \times PF}{746}$$ (where hp is known)

Kilowatts (KW)   WK =

$$WK = \frac{1.73 \times I \times E \times PF}{1000}$$ (where hp is known)

Kilovolt-Amps (Kva) Kva =

$$Kva = \frac{1.73 \times I \times E}{1000}$$ (where hp is known)

AC Efficiency and Power Factor Formulas:

Single Phase Efficiency: $\dfrac{746 \times HP}{E \times I \times PF}$

Single Phase Power Factor: $\dfrac{Input\ Watts}{V \times A}$

Three Phase Efficiency: $\dfrac{746 \times HP}{E \times I \times PF \times 1.732}$

Three Phase Power Factor: $\dfrac{\text{Input Watts}}{E \times I \times 1.732}$

Electrical Rules of Thumb:

Sync Speed Approx. Torque

rpm	lb-ft per hp
3600	1.4
1800	3
1200	4.5
900	5.8

Rated   Approximate Amps / hp

Voltage	Single Phase	Three Phase
115	10	
230	5	2.5
460		1.25
575		1

Note: This information is provided as a quick reference resource and is not intended to serve as a substitute for qualified engineering assistance. While every effort has been made to ensure the accuracy of this information, errors can occur. As such, neither IFP, any of its affiliated companies nor its employees will assume any liability for damage, injury or misapplication as result of using this reference guide.