Electric Motor Formulas

To Find	DC	1Ø	3Ø
HP	$\frac{E \times I \times Efficiency}{746}$	$\frac{E \times I \times Efficiency \times PF}{746}$	$\frac{\sqrt{3} \times E \times I \times Efficiency \times PF}{746}$
Current (I)	$\frac{746 \times HP}{E \times Efficiency}$	$\frac{746 \times HP}{E \times Efficiency \times PF}$	$\frac{746 \times HP}{E \times Efficiency \times PF \times \sqrt{3}}$
Efficiency	$\frac{746 \times HP}{E \times I}$	$\frac{746 \times HP}{E \times I \times PF}$	$\frac{746 \times HP}{E \times I \times PF \times \sqrt{3}}$
Power Factor	N/A	$\frac{Input\ Watts}{E \times I}$	$\frac{Input\ Watts}{E \times I \times \sqrt{3}}$

Power Factor = True Power (Watts) / Apparent Power (Volt-Ampere). Always ≤ 1 (unity)

% Efficiency = Output / Input x 100 Always < 100%

Mechanical Speed Adjustment: RPM 1 x PULLEY 1 = RPM 2 x PULLEY 2

Voltage Drop: 1Ø $Vd = \frac{2 K I L}{CM}$ 3Ø $Vd = \frac{\sqrt{3} K I L}{CM}$ $CM = d^2\ 1000$

Synchronous Speed = $\frac{120 f}{p}$ f = Frequency in cycles per second (Hertz)
P = Number of Poles

% Slip = $\frac{SYN\ RPM - SHAFT\ RPM}{SYN\ RPM} \times 100$

HORSE POWER = $\frac{FOOT\text{-}POUNDS}{550 \times SECONDS} = \frac{FOOT\text{-}POUNDS}{33{,}000 \times MINUTES}$

HORSE POWER = $\frac{550\ FOOT\ POUNDS}{SECOND} = \frac{FORCE \times RPM}{5250} = \frac{TORQUE \times RPM}{5250}$

WORK = FORCE x DISTANCE HP = WORK / TIME

WORK (Linear) ~ Ft-lb TORQUE (Rotational) ~ Lb-Ft

CIRCUMFERENCE = $\pi \times d = \pi \times 2r$