AC Motor Formula

To Find Amperes when HP is known:

Single Phase
\[ I = \frac{746 \times HP}{E \times \text{Eff} \times PF} \]

Two Phase - *(4 - wire)
\[ I = \frac{746 \times HP}{2 \times E \times \text{Eff} \times PF} \]

Three Phase
\[ I = \frac{746 \times HP}{1.73 \times E \times \text{Eff} \times PF} \]

To find Amperes when KW is known:

Single Phase
\[ I = \frac{1000 \times KW}{E \times PF} \]

Two Phase - *(4 - wire)
\[ I = \frac{1000 \times KW}{2 \times E \times PF} \]

Three Phase
\[ I = \frac{1000 \times KW}{1.73 \times E \times PF} \]

To find Amperes when KVA is known:

Single Phase
\[ I = \frac{1000 \times KVA}{E} \]

Two Phase - *(4 - wire)
\[ I = \frac{1000 \times KVA}{2 \times E} \]

Three Phase
\[ I = \frac{1000 \times KVA}{1.73 \times E} \]

To find Kilowatts Input:

Single Phase
\[ KW = \frac{E \times I \times PF}{1000} \]

Two Phase - *(4 - wire)
\[ KW = \frac{2 \times E \times I \times PF}{1000} \]

Three Phase
\[ KW = \frac{1.73 \times E \times I \times PF}{1000} \]

To find Kilovolt Amperes:

Single Phase
\[ KVA = \frac{E \times I}{1000} \]

Two Phase - *(4 - wire)
\[ KVA = \frac{2 \times E \times I}{1000} \]

Three Phase
\[ KVA = \frac{1.73 \times E \times I}{1000} \]

To find Horsepower Output:

Single Phase
\[ HP = \frac{E \times I \times \text{Eff} \times PF}{746} \]

Two Phase - *(4 - wire)
\[ HP = \frac{2 \times E \times I \times \text{Eff} \times PF}{746} \]

Three Phase
\[ HP = \frac{1.73 \times E \times I \times \text{Eff} \times PF}{746} \]

* For two phase three wire balanced circuits, the Amperes in common conductor = 1.41 times that in either of the two.
Synchronous Speed: \[ n_s = \frac{120\times f}{P} \]

Frequency: \[ f = \frac{P\times n_s}{120} \]

Number of poles: \[ P = \frac{120\times f}{n_s} \]

Relation between horsepower, torque and speed:

\[ HP = \frac{T\times n}{5250} \]
\[ T = \frac{5250\times HP}{n} \]
\[ n = \frac{5250\times HP}{T} \]

Motor Slip:

\[ \%\text{Slip} = \frac{n_s - n}{n_s} \times 100 \]