## Formulas - Electrical

**VOLTS =**

$Amps \ x \ Ohms \qquad \dfrac{Watts}{Amps} \qquad \sqrt{Watts \ x \ Ohms}$

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**AMPS =**

$\dfrac{Volts}{Ohms} \qquad \dfrac{Watts}{Volts} \qquad \sqrt{\dfrac{Watts}{Ohms}}$

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**WATTS =**

$Volts \ x \ Amps \qquad Amps^2 \ x \ Ohms \qquad \dfrac{Volts^2}{Ohms}$

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**OHMS =**

$\dfrac{Volts}{Amps} \qquad \dfrac{Volts^2}{Watts} \qquad \dfrac{Watts}{Amps^2}$

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$Power \ Factor = \dfrac{KW}{KVA} = Cos \ \Theta$

| Single Phase | Three Phase |
|---|---|

$KW = \dfrac{\sqrt{ \ x \ A \ x \ PF}}{1000} \qquad \dfrac{\sqrt{3} \ x \ V \ x \ A \ x \ PF}{1000}$

$KVA = \dfrac{V \ x \ A}{1000} \qquad \dfrac{\sqrt{3} \ x \ V \ x \ A}{1000}$

$AMPS = \dfrac{KVA \ x \ 1000}{V} \qquad \dfrac{KVA \ x \ 1000}{\sqrt{3} \ x \ V}$

$\sqrt{3} = 173$

*Approx. Motor KVA = Motor Horsepower (At Full Load)*

_Capacitors Connected In Parallel_ $C_1 + C_2 + C_3 = C \ Total$

_Capacitors Connected In Series_

| **For Two** | **More Than Two** |
|---|---|

$\dfrac{C_1 \ x \ C_2}{C_1 + C_2} = C \ Total \qquad \dfrac{1}{\dfrac{1}{C_1} + \dfrac{1}{C_2} + \dfrac{1}{C_3}} = C \ Total$

### VOLTAGE UNBALANCE

$\% \ Voltage \ Unbalance =$

$\dfrac{100 \ x \ Max. \ Voltage \ Deviation \ From \ Average \ Voltage}{Average \ Voltage}$

### BOOST TRANS.:

$Rating \ Plate \ F.L.A. \ x \ Rating \ Plate \ VOLTS = KVA$

$\dfrac{Rating \ Plate \ VOLTS}{Rating \ Plate \ VOLTS \ — \ Norm. \ Line \ VOLTS} = FACTOR$

$\dfrac{KVA}{FACTOR} = Trans. \ KVA \ Rating$

$\left(\dfrac{V_2}{V_1}\right)2 \ x \ Heater \ Rating = Rating \ @ \ New \ Voltage$

$V_1 \ Rated \ Volts \quad V_2 = Measured \ Volts$
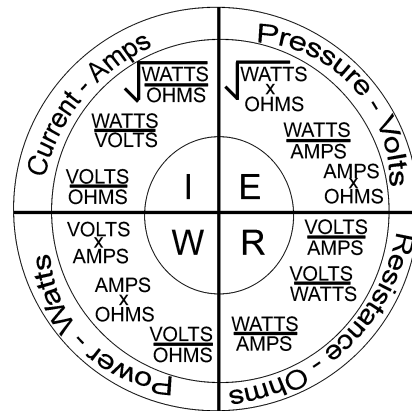


This chart shows four ways to figure each value: Amps (I), Volts (E), Ohms (R) or Watts (W).

**Example:** A 4800 Watt electric heat element is connected to a 240 Volt circuit. How many Amps does it draw?

**Solution:** Locate Amps section of chart: $\dfrac{Watts \ (W)}{Volts \ (E)} = Amps \ (I)$

Thus 4800 ÷ 240 = 20 Amps. Carried further, what is the resistance?

$\dfrac{Volts^2 \ E^2}{Watts \ (W)} = Ohms \ (R) \ 240 \ x \ 240 ÷ 4800 = 12 \ Ohms.$

### Conversion Table For
### Watts - Amperes - Volts

| Watts | Voltage ( C - Single Phase) | | | |
|---|---|---|---|---|
| | 120 | 208 | 240 | 277 |
| | Amperes | | | |
| 500 | 4.2 | 2.4 | 2.1 | 1.8 |
| 1000 | 8.3 | 4.8 | 4.2 | 3.8 |
| 1500 | 12.5 | 7.2 | 6.3 | 5.4 |
| 2000 | 16.7 | 9.6 | 8.3 | 7.2 |
| 2500 | 20.9 | 12.0 | 10.4 | 9.0 |
| 3000 | 25.0 | 14.4 | 12.5 | 10.6 |
| 3500 | 29.2 | 16.8 | 14.5 | 12.6 |