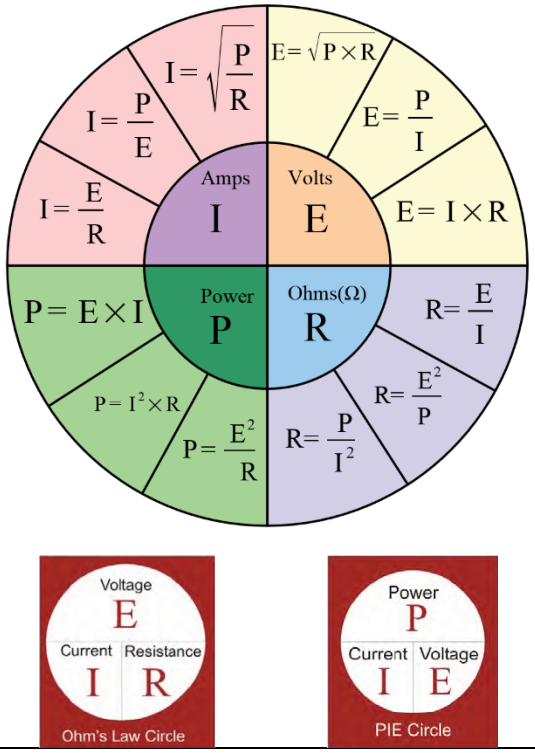
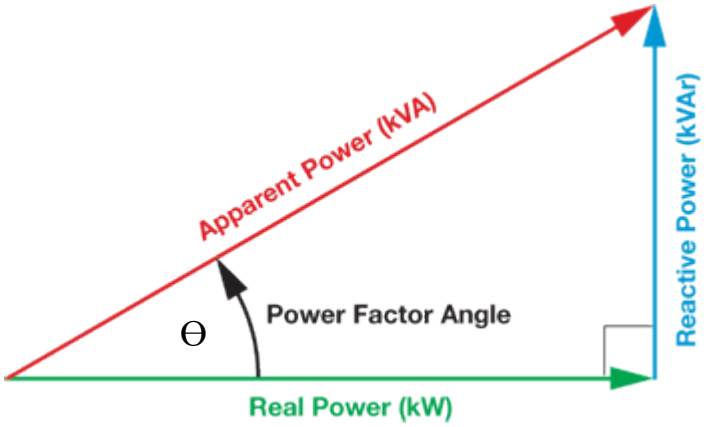
Ohm's Law – Watt's Law



Power Factor



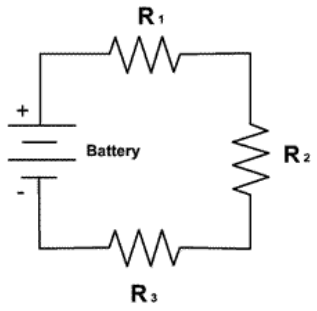
$$PF = \frac{\text{Real Power (KW)}}{\text{Apparent Power (kVA)}}$$

$$\text{Cos } \theta = PF$$

$$\text{Tan } \theta = \frac{\text{kVAR}}{\text{kW}}$$

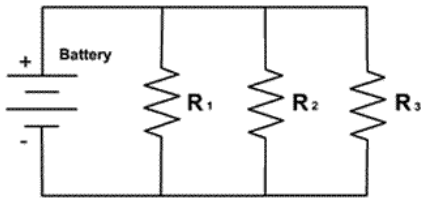
Resistors in series

$$R_{total} = R_1 + R_2 + R_3 \ldots\ldots$$



Resistors in parallel

$$\frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \ldots\ldots$$



AC Circuits

Single-Phase AC

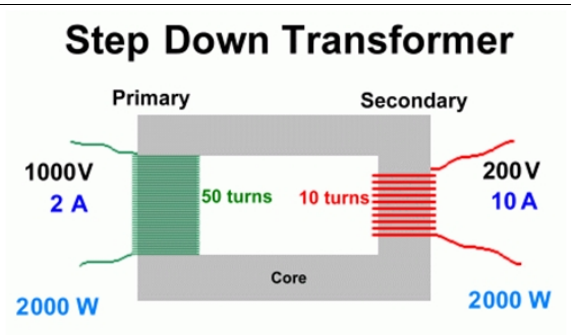
The Watt's Law formulas for DC circuits also apply to single-phase (1ϕ) AC circuits containing only resistance.

If inductance or capacitive reactance puts the circuit out of phase, the power factor must be added to the basic power formula: **P = I x E x PF**

Three-Phase AC

The formula for a three-phase (3ϕ) system includes another term called the "three-phase factor", which is a constant equal to the square root of 3, or 1.73. $\mathbf{P_{3\phi} = I \text{ x } E \text{ x } PF \text{ x } 1.73}$

Transformer



$$E_S = E_P \times \frac{N_S}{N_P}$$

N_P = number of turns of the primary
N_S = number of turns of the secondary

Reactance Formulas

Inductor

$X_L = 2\Pi f L\ (\Omega)$ Where L is in Henrys

Capacitor

$X_C = 1 / 2\Pi f C\ (\Omega)$ Where C is in Farads

Impedance Formula

$Z = \sqrt{R^2 + (X_L - X_C)^2}$ in Ohms (for series circuit)