

Ohm's Law – Watt's Law

Voltage
E

Current Resistance
I R

Ohm's Law Circle

Power
P

Current Voltage
I E

PIE Circle

Power Factor

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

$$\cos \theta = PF$$

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

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:

$$P = I \times E \times PF$$

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.

$$P_{3\phi} = I \times E \times PF \times 1.73$$

Transformer

Step Down 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