

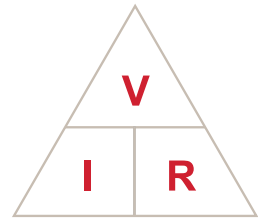
Single-Phase Equations

Ohm's Law

$$V = I \times R$$

$$I = \frac{V}{R}$$

$$R = \frac{V}{I}$$



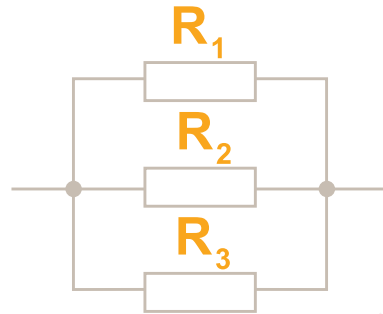
Total Series Resistance

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



Total Parallel Resistance

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



Single-Phase Power

$$I = \frac{P_{1\phi}}{V}$$

$$V = \sqrt{P_{1\phi} \times R}$$

$$R = \frac{P_{1\phi}}{I^2}$$

$$P_{1\phi} = V \times I$$

$$P_{1\phi} = I^2 \times R$$

$$I = \sqrt{\frac{P_{1\phi}}{R}}$$

$$V = \frac{P_{1\phi}}{I}$$

$$R = \frac{V^2}{P_{1\phi}}$$

$$P_{1\phi} = \frac{V^2}{R}$$

V = Volts
I = Ampere
P₁ = Watts
R = Ohms

Three-Phase Equations for Balanced Loads

Star (Y) Connected Load

V_P (Phase to neutral Voltage)

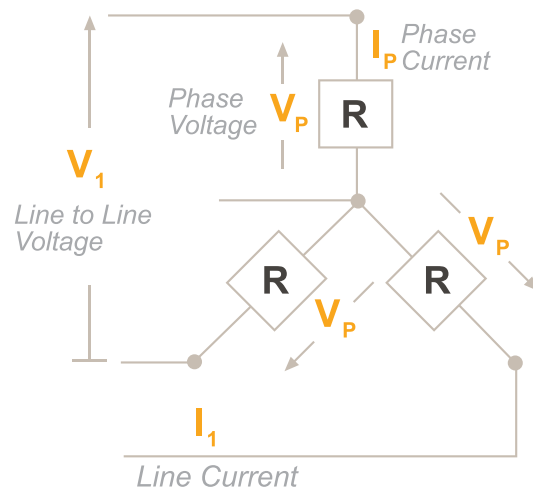
V_1 (Phase to phase Voltage)

$$V_1 = \sqrt{3} \times V_P$$

$$P_{3\phi} = \sqrt{3} \times V_1 \times I_1$$

$$I_1 = I_P = \frac{P_{3\phi}}{\sqrt{3} \times V_1}$$

$$R = \frac{3 \times V_P^2}{P_{3\phi}} = \frac{V_1^2}{P_{3\phi}}$$



if $V_P = 230V$ and $V_1 = 400V$, then

$$I_1 = I_P = \frac{P_{3\phi}}{693}$$

$$R = \frac{160\,000}{P_{3\phi}}$$

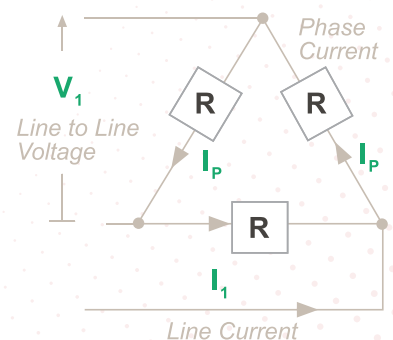
Delta (Δ) Connected Load

$$I_1 = \sqrt{3} \times I_P$$

$$P_{3\phi} = \sqrt{3} \times V_1 \times I_1$$

$$I_1 = \frac{P_{3\phi}}{\sqrt{3} \times V_1}$$

$$R = \frac{3 \times V_1^2}{P_{3\phi}}$$



if $V_1 = 400V$, then

$$I_1 = \frac{P_{3\phi}}{693} \quad I_P = \frac{P_{3\phi}}{1200} \quad R = \frac{480\,000}{P_{3\phi}}$$