PENGUKURAN DAYA

$P = V.I$

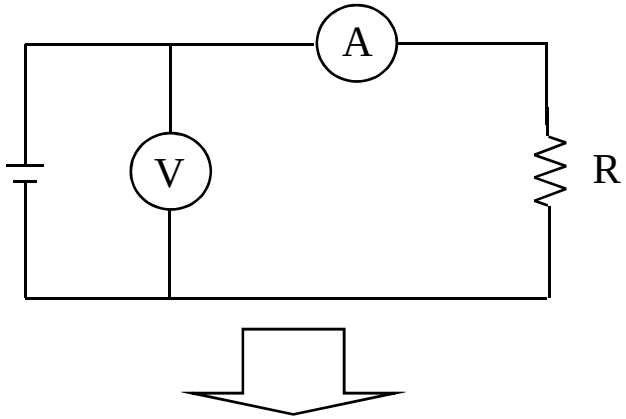
$P = V\,I\,\cos\phi$

$P = \sqrt{3}\ V_L\ I_L\ \cos\phi$

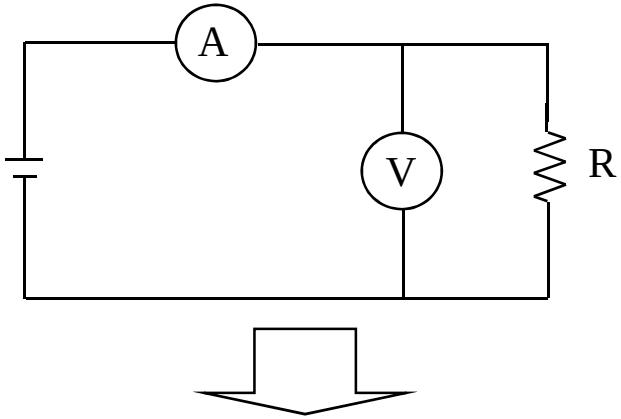
$P = V_1\,I_1\,\cos\phi_1 + V_2\,I_2\,\cos\phi_2 + V_3\,I_3\,\cos\phi_3$

PENGUKURAN DAYA ARUS SEARAH

a. Metode Volt-Ampere-meter

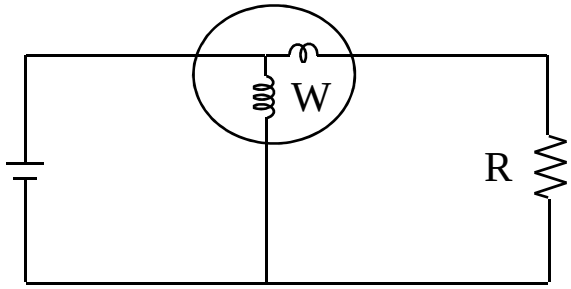


Beban Kecil
Arus Kecil
Perubahan Tegangan kecil



Beban Besar
Arus Besar
Perubahan Tegangan besar

b. Metode Watt-meter

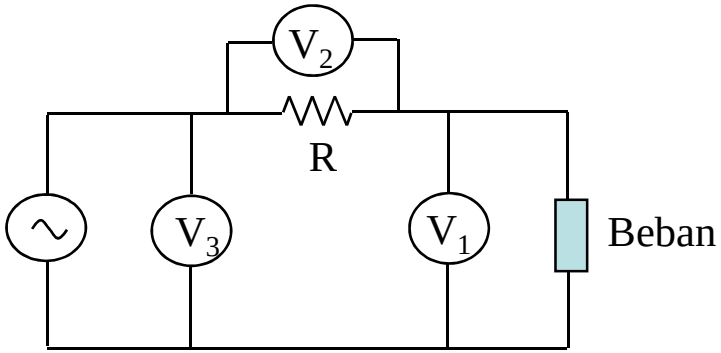


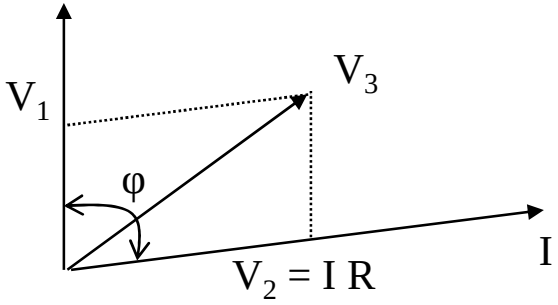
Besar Beban sesuai dengan penunjukkan Watt-meter Prinsip kerja : Kombinasi Antara AM dan VM

PENGUKURAN DAYA ARUS BOLAK BALIK

A. Sistem 1 Phasa

a. Metode 3 Volt-meter





$$V_3^2 = V_1^2 + V_2^2 + 2V_1V_2\cos\varphi$$

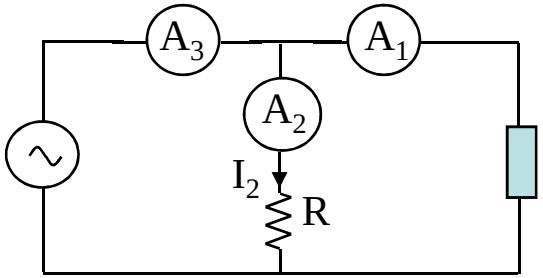
$$= V_1^2 + V_2^2 + 2V_1 I R\cos\varphi$$

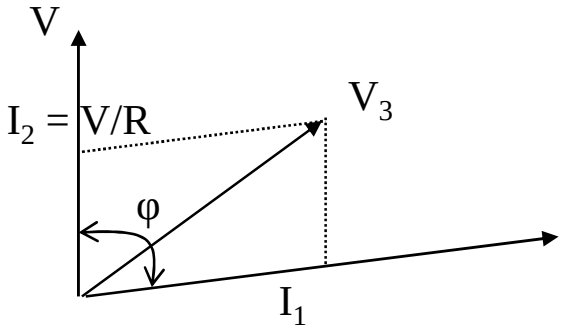
$$W = V_1 I\cos\varphi = V_1\frac{V_2}{R}\cos\varphi$$

$$V I\cos\varphi = \frac{V_3^2 - V_2^2 - V_1^2}{2R} \Rightarrow \text{Beban}$$

$$pf = \cos\varphi = \frac{V_3^2 - V_2^2 - V_1^2}{2V_1V_2} \Rightarrow \text{Faktor Daya}$$

b. Metode 3 Ampere-meter





$$I_3^{\,2} = I_1^{\,2} + I_2^{\,2} + 2I_1 I_2 \cos\varphi$$

$$= I_1^{\,2} + I_2^{\,2} + 2I_1 \frac{V}{R} \cos\varphi$$

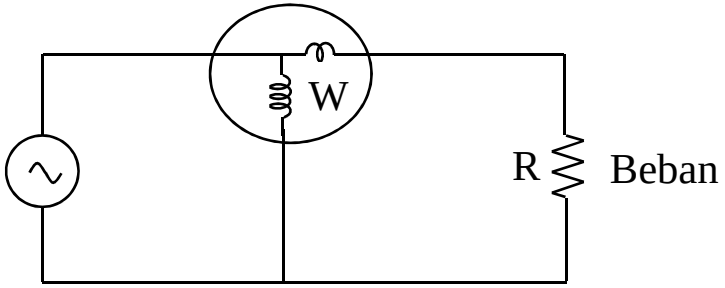
$$W = V I_1 \cos\varphi$$

$$= I_2 R I_1 \cos\varphi$$

$$V I \cos\varphi = \frac{R\,(I_3^{\,2} - I_2^{\,2} - I_1^{\,2})}{2} \Rightarrow \text{Beban}$$

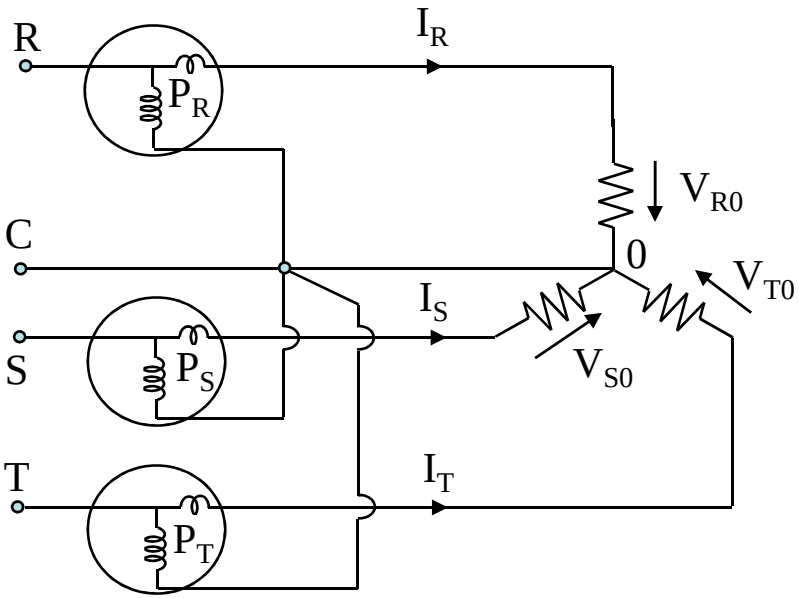
$$pf = \cos\varphi = \frac{I_3^{\,2} - I_2^{\,2} - I_1^{\,2}}{2 I_1 I_2} \Rightarrow \text{Faktor Daya}$$

c. Metode Watt-meter



$P = V\ I \cos \varphi$

B. Sistem 3 Phasa



$P_{total} = (V_{R0} I_R + V_{S0} I_S + V_{T0} I_T) + \nu (I_R + I_S + I_T)$

$\nu = \text{beda tegangan} = \text{sangat kecil} \approx 0$

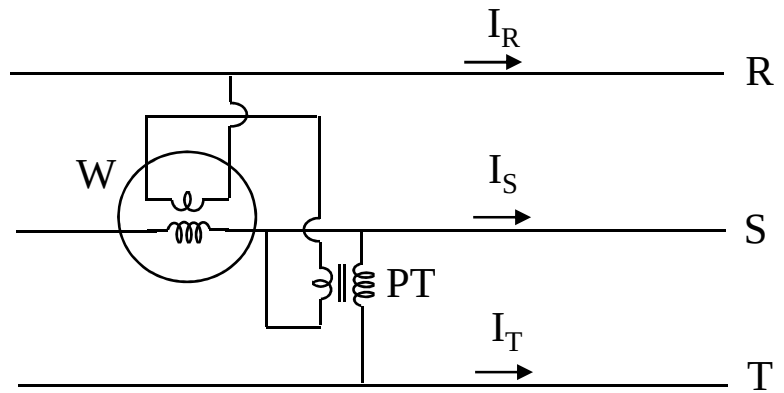
$I_R + I_S + I_T = 0 \rightarrow \text{Hk. kirchoff}$

maka :

$P_{total} = V_R I_R + V_S I_S + V_T I_T$

A. Pengukuran sistem 3 phasa untuk beban seimbang

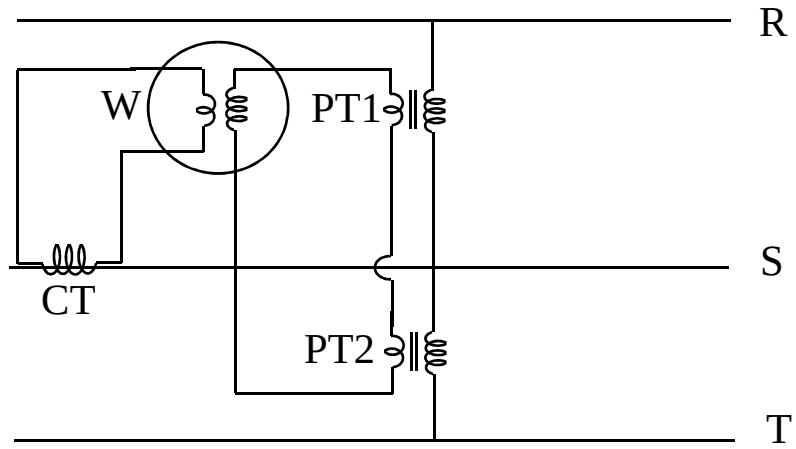
Metode 1 Watt-meter



W = Watt meter

PT = Transformator Tegangan (1:1)

CT = Transformator Arus



$V_R = \sqrt{3}\ V_S$

PENGUKURAN DAYA REAKTIF

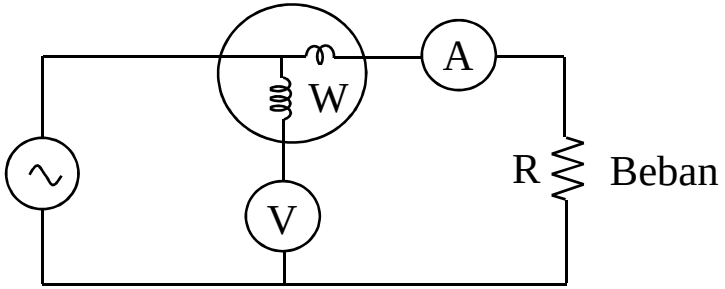
$S = P + jQ$

$P = V\,I\,\text{Cos}\,\varphi$

$Q = V\,I\,\text{Sin}\,\varphi$

Daya reaktif merupakan daya dengan pergeseran antara arus dan tegangan sebesar sudut 90^0

Pengukuran daya dengan Volt dan Ampere-meter



Pengukuran daya reaktif dapat dilakukan dengan menggunakan VAR meter yang prinsipnya adalah pergeseran phasa sebesar 90^0

Pergeseran phasa 90^0 didapat dengan :

a. Ekstra elemen
b. Watt Elemen