

9.MEASUREMENT OF 3 – PHASE POWER BY 2-WATTMETERS

Objective:

Measurement of power by 2-wattmeters for balanced loads in a 3-phase circuit .

Apparatus:

Hardware:	Name of the apparatus	Quantity
	32 Amps, 3 pole Fuse Switch	1 No
	0 -300 W, U.P.F. Wattmeters	1 No
	0 – 10 A, Ammeter	1 No
	0-300 V, Voltmeter	1 No

Theory :

In a 3-phase, 3-wire system, power can be measured using two wattmeters for balance and unbalanced loads and also for star, delta type loads.

This can be verified by measuring the power consumed in each phase. In this circuit, the pressure coils are connected between two phase such that one of the line is coinciding for both the meters.

$$P_1 + P_2 = 3 V_{ph} I_{ph} \cos\theta$$

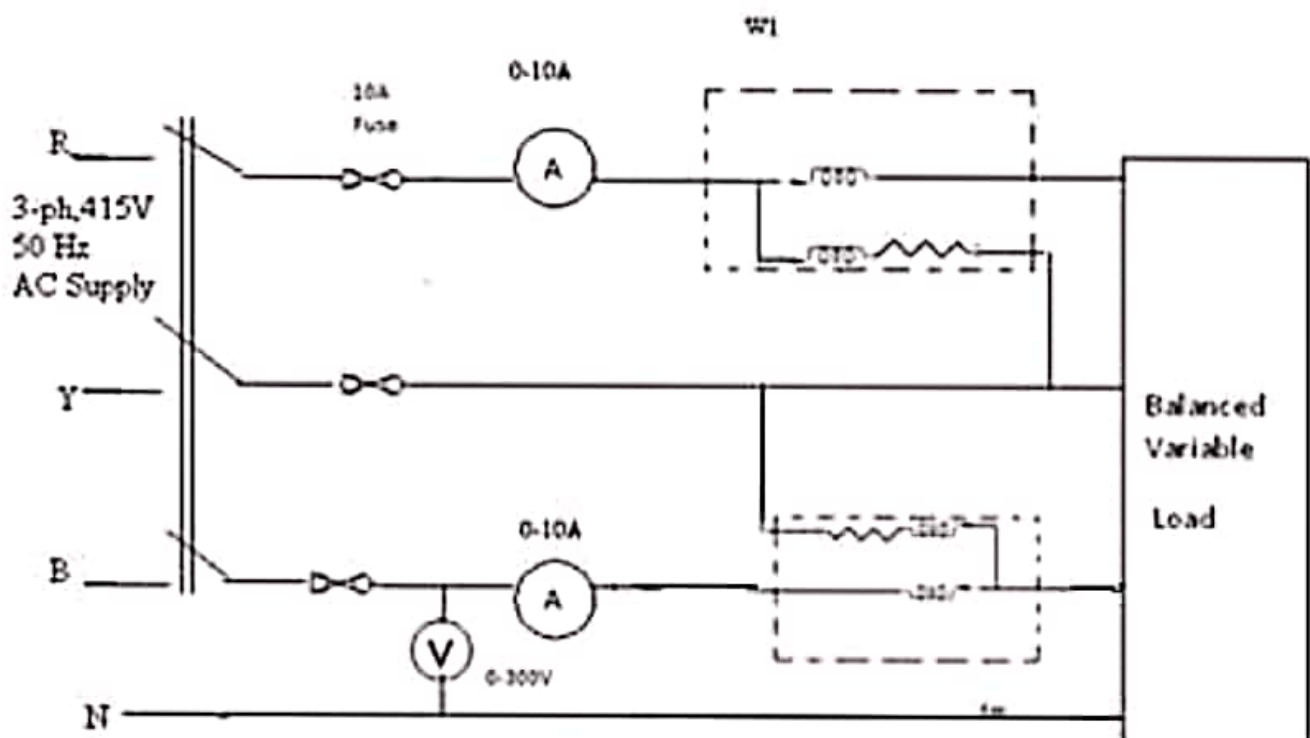
$$\text{Power factor } \cos\theta = \cos \left(\tan^{-1} \sqrt{3} \left(\frac{P_1 - P_2}{P_1 + P_2} \right) \right)$$

Procedure:

- Connect the circuit as shown in the circuit diagram.
- Keep all the toggle switches in ON condition.

- c) Switch on equal loads on each phase i.e. balanced load must be maintained with different load combinations.
- d) Connect the ammeter in R-Phase and then switch OFF the toggle switch connected across the ammeter symbol.
- e) Connect the pressure coils of two wattmeter across R-Y phase and B-Y phase respectively, current coil in R-phase and B-phase .
- f) For different balanced loads take readings of wattmeters W1 and W2.

Circuit Diagram:



Observations:

Type of Load (W)	W ₁ KW	W ₂ KW	I ₁ Amps	I ₂ Amps	V _{ph} Volts	W ₁ + W ₂ KW	P KW

R	Y	B	W_1	W_2	I_R	I_B	V_{ph}	$(W_1 + W_2) \times 2$	P KW

Result:

Measurement of power by 2-wattmeters for balanced loads in a 3-phase circuit is determined.