

*Heaven's Light is Our Guide*



# Rajshahi University of Engineering & Technology

Department of Electrical & Computer Engineering

## Lab Report

Experiment No: 03

Name of the experiment: Study of the power measurement of a 3 – phase balanced system using two wattmeter method.

<b>Course Code</b>	ECE 1202
<b>Course Title</b>	<b>Circuits and Systems-II Sessional</b>
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**Name of the experiment:** Study of the power measurement of a 3 – phase balanced system using two wattmeter method.

### 3.1 Objective:

To examine and validate the power measurement of a 3 – phase balanced system using two wattmeter method.

### 3.2 Theory:

In a three-phase balanced system, there are three lines from the source. So, It is obvious that, three wattmeters have to be connected to three line to measure the power draw. But calculation shows that it is enough to calculate two wattmeters to calculate total power draw from a 3 –  $\phi$  balanced system.

Here, the power draw of the system,  $P = \sqrt{3}V_L I_L \cos\Theta$  where,  $\Theta = \cos\{\tan^{-1}(\sqrt{3}\frac{W_1 - W_2}{W_1 + W_2})\}$

### 3.3 Required Apparatus:

1. Source
2. VARIAC
3. Wattmeter
4. Ammeter
5. Resistor
6. Multimeter
7. Connecting wires

### 2.4 Circuit Diagram:

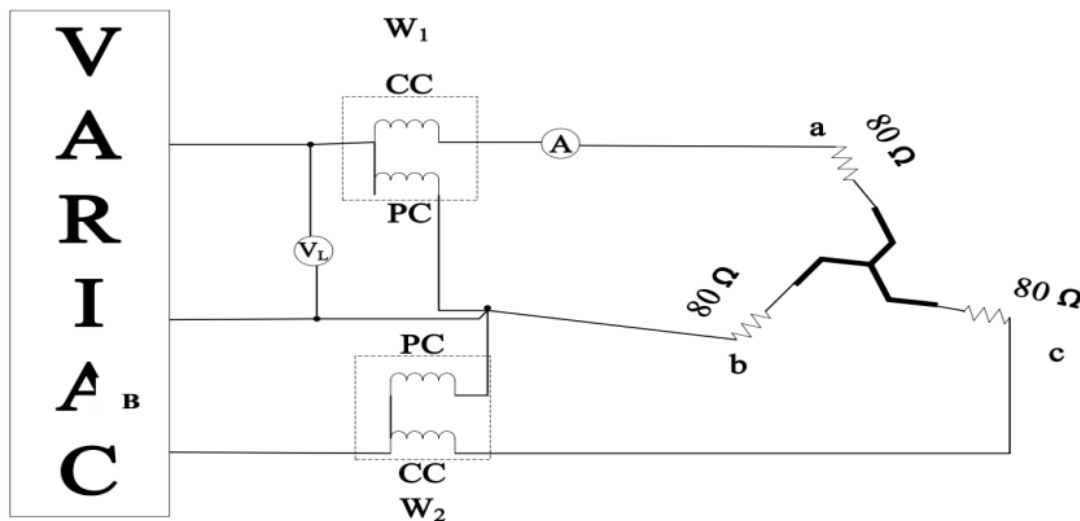


Fig. 3.1: Circuit diagram

### 3.5 Procedure:

The circuit was built according to the diagram and the readings were collected several times for verification.

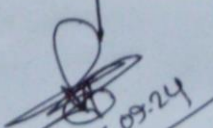
### 3.6 Data Table:

Sl No.	P <sub>1</sub> (W)	P <sub>2</sub> (W)	P <sub>t</sub> = P <sub>1</sub> + P <sub>2</sub> (W)	V <sub>L</sub> (V)	I <sub>L</sub> (A)	P <sub>C</sub> = $\sqrt{3}V_L I_L \cos\Theta$ (W)	Error = $\frac{P_c - P_t}{P_c} \times 100$ (%)
01	24	24	48	55	0.544	51.83	7.96
02	62	62	124	85	0.788	116.01	6.44%
03	82	82	164	102	0.9	159	3.04

Result

S1	P <sub>1</sub>	P <sub>2</sub>	P <sub>t</sub> = P <sub>1</sub> + P <sub>2</sub>	V <sub>L</sub>	I <sub>L</sub>	P <sub>C</sub> = $\sqrt{3}V_L I_L$	1.e
1	24	24	48	55	0.544	51.823	<del>15.14%</del> 7.96
2	49	49	98	70	0.661	90.141	<del>3.87%</del> 2.32%
3	62	62	124	85	0.788	116.01	6.44%
4	82	82	164	102	0.9	156	<del>5.14%</del> 3.04%

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### **3.7 Discussion:**

In the experiment, power in a three-phase balanced system was measured using the two wattmeter method. A three-phase load was connected, and the wattmeters were calibrated. After turning on the circuit, the readings were taken, and total power was calculated as:

$$\text{Total Power, } P_t = P_1 + P_2$$

The experiment showed that the two wattmeter method works well for measuring power in balanced three-phase systems.

### **3.8 Precautions:**

1. The connections should be made carefully.
2. The AC voltage source should be handled with care maintaining safety measures.
3. The readings of voltmeter and wattmeter should be taken as precisely as possible.

### **3.9 Reference:**

(i) Charles K. Alexandar and Matthew N. O. Sadiku, “Fundamentals of Electric Circuit”, 5<sup>th</sup> Edition, 1221 Avenue of the Americas, New York

(ii) Wikipedia