Heaven's Light is Our Guide

.

Rajshahi University of Engineering & Technology

Department of Electrical & Computer Engineering

Lab Report

Course Code : ECE 1202

Course Title : Circuits and Systems- II

Experiment no :02

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Submitted To:	Submitted By:
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Name of the Experiment: Study the relationship between phase current and line current of a delta connected three phase balanced system.

Theory: In a delta-connected three-phase balanced system, the phase current and the line current have a specific relationship due to the configuration of the circuit. In a delta connection, each phase winding is connected between two line conductors, forming a closed loop for each phase. The line current is the current flowing through each line conductor, while the phase current is the current flowing through each winding.

The relationship between the line current and the phase current in a delta-connected system is given by -

$$I_L = \sqrt{3} I_P$$

This occurs because the line current is the vector sum of the currents in two phase windings, leading to a multiplication factor of $\sqrt{3}$. Consequently, the line current in a delta system is $\sqrt{3}$ times greater than the phase current, illustrating the interdependence and phase shift inherent in three-phase power systems.

$$I_p = \frac{I_L}{\sqrt{3}}$$

$$v_P = v_L$$

Required Apparatus:

1.Source

2.Variac

3.Ammeter

4.Connecting wires

Circuit Diagram:

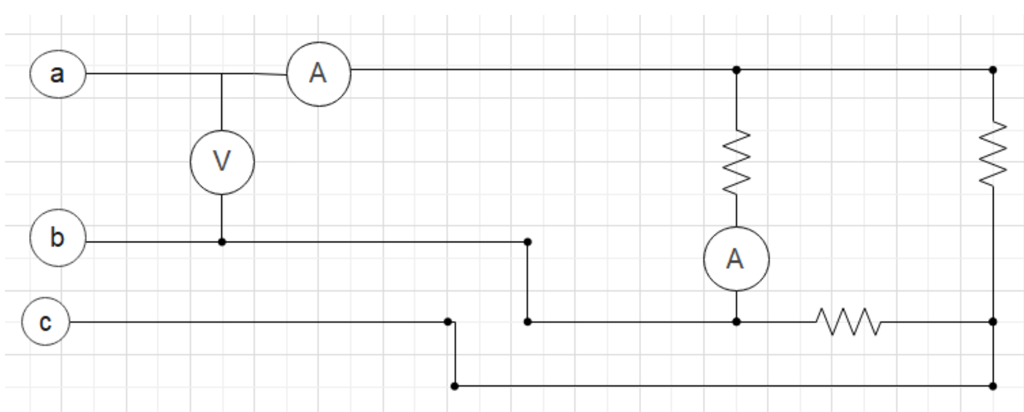

Fig. Circuit Diagram

Data Table:

Sl.	I_L	I_p(Cal)	I_p(Measure)	V_p	V_L	Error
1	2.18	1.25	1.23	37.8	37	1.6%
2	2.78	1.605	1.57	48	48.5	2.18%
3	2.49	1.437	1.39	43	43	3.27%
4	2.77	1.59	1.56	48.1	48.3	1.88%
5	3.32	1.91	1.88	57.3	57.6	1.93%

Calculation:

For 1st Calculation:

$I_L = 2.18$ A , $I_p = \frac{2.18}{\sqrt{3}} = 1.25$ A, $I_P(m) = 1.23$ A , e= $\left|\frac{1.25-1.23}{1.25}\right|$= 1.6%

For 2nd Calculation:

$I_L = 2.78$ A , $I_p = \frac{2.78}{\sqrt{3}} = 1.605$ A, $I_P(m) = 1.57$ A , e= $\left|\frac{1.605-1.57}{1.605}\right|$= 2.18%

For 3rd t Calculation:

$I_L = 2.49$ A , $I_p = \frac{2.49}{\sqrt{3}} = 1.437$ A, $I_P(m) = 1.39$ A , e= $\left|\frac{1.437-1.39}{1.437}\right|$= 3.27%

For 4th Calculation:

$I_L = 2.77$ A , $I_p = \frac{2.77}{\sqrt{3}} = 1.59$A, $I_P(m) = 1.56$A , e= $\left|\frac{1.59-1.56}{1.59}\right|$= 1.88%

For 1st Calculation:

$I_L = 3.32$ A , $I_p = \frac{3.32}{\sqrt{3}} = 1.91$ A, $I_P(m) = 1.88$ A , e= $\left|\frac{1.91-1.88}{1.91}\right|$= 1.93%

Conclusion:

The experiment on the relationship between phase current and line current in a delta-connected three-phase balanced system confirms that the line current is $\sqrt{3}$ times the phase current. This relationship is intrinsic to the delta configuration due to the vector sum of currents in the phase windings. Understanding this relationship is crucial for accurately analyzing and designing three-phase electrical systems, ensuring efficient power distribution and proper functioning of electrical machinery. The experimental results align with theoretical predictions, validating the fundamental principles of three-phase power systems and their applications in electrical engineering.