

**Practical No. 6: Determination of the voltage ratio and current ratio of single phase transformer.**

**I Practical Significance:**

A single phase Transformer is used for changing voltage levels in electronic circuits. Mostly electronic devices/ circuits are energized with DC supply. To lower the voltage level of AC supply voltage transformer is used and this lowered AC voltage level further rectified to DC supply. Voltage ratio of a transformer decides increasing or decreasing voltage level.

**II Industry/Employer Expected Outcome(s):**

Determine voltage and current ratio of single phase transformer.

**III Course Level Learning Outcome(s):**

Use different electrical machines by making connections.

**IV Laboratory Learning Outcome(s):**

LLO Determine the transformation ratio.

**V Relevant Affective Domain related outcome(s):**

Follow safety electrical rules for safe practices.

**VI Relevant Theoretical Background:**

**Voltage ratio:** The voltage ratio of a transformer is equal to the ratio of primary voltage and secondary voltage

$$\text{voltage ratio} = \frac{V_p}{V_s}$$

Where

$V_p$  = Primary voltage

$V_s$  = secondary voltage

**Current ratio:** The current ratio of a transformer is equal to the ratio of primary current and secondary current

$$\text{current ratio} = \frac{I_p}{I_s}$$

Where

$I_p$  = primary current  $I_s$  = secondary current

**XI Required Resources/apparatus/equipment with specification:**

| S. No. | Name of Resource          | Suggested Broad Specification                        | Quantity |
|--------|---------------------------|------------------------------------------------------|----------|
| 1      | Ammeter.                  | 0-10 A AC.                                           | 2        |
| 2      | Voltmeter.                | 0-300 V AC.                                          | 2        |
| 3      | Single phase transformer. | 1 KVA 230/115 V. <sup>Single phase</sup> transformer | 1        |
| 4      | Resistive load.           | Single phase 230 V, 15. Resistive load.              | 1.       |

**XII Actual procedure followed:**

- 1] Connect the circuit as per circuit diagram
- 2] Switch on power supply.
- 3] Note down reading of ammeter & voltmeter.
- 4] Calculate current & voltage ratio.

**XIII Observations and calculations:**

| Sr. No. | Primary Voltage (V <sub>p</sub> ) | Secondary Voltage (V <sub>s</sub> ) | Primary Current (I <sub>p</sub> ) | Secondary Current (I <sub>s</sub> ) | Voltage Ratio = (V <sub>p</sub> /V <sub>s</sub> ) | Current Ratio = (I <sub>p</sub> /I <sub>s</sub> ) |
|---------|-----------------------------------|-------------------------------------|-----------------------------------|-------------------------------------|---------------------------------------------------|---------------------------------------------------|
| 1       | 16                                | 7                                   | 1                                 | 1.8                                 | 2.28                                              | 0.55                                              |
| 2       | 65                                | 29                                  | 2                                 | 3.6                                 | 2.24                                              | 0.55                                              |
| 3       | 158                               | 74                                  | 3                                 | 5.7                                 | 2.13                                              | 0.52                                              |
| 4       | 216                               | 117                                 | 3.8                               | 7.7                                 | 1.84                                              | 0.49                                              |

**XIV Results:**

Voltage Ratio is greater and current ratio is less for given transformer

**XV Interpretation of results:**

- i] the voltage ratio is max (more).
- ii] the current ratio is less.

**XVI Conclusion and recommendation:**

Hence we learnt to determine the voltage ratio & current ratio of single phase transformer.

**XVII Practical related questions (Provide space for answers):**

1. Define transformer.
2. Define voltage ratio.
3. Define current ratio.
4. Define transformation ratio.
5. State EMF equation of single phase transformer.
6. Define step up and step down transformer.
7. Give applications of step up and step down transformer.

1]  $\rightarrow$  It is a static device which is used to convert one form of electrical energy into another form of electrical energy without change its frequency. is called as transformer.

2]  $\rightarrow$ ? The ratio of primary terminal voltage & secondary terminal voltage i.e.  $V_1$  &  $V_2$  it is called as the voltage ratio.

3]  $\rightarrow$  It is the ratio of primary current to secondary current but a current is inversely proportional to corresponding voltage. i.e.  $I_1$  is inversely proportional to  $V_1$  &  $V_2$  is inversely proportional to  $V_2$ .

4]  $\rightarrow$  The ratio of the number of turns in the secondary coil to the number of turns in the primary coil of the transformer.

5]  $E_1 = 4.44 f N_1 \phi_m$  &  $E_2 = 4.44 f N_2 \phi_m$ .

6]  $\rightarrow$ ? To increase the level of voltage using transformer this transformer called as step up & it is possible to reduce voltage level.

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using transformer. this transformer called as step down transformer.

7) → Step up transformer is used in power transmission to convert low voltage AC into high A. Vtg. A & step down to convert high to low.

XVIII References/Suggestions for further reading:

1. [www.electrical4u.com](http://www.electrical4u.com)
2. [www.howstuffworks.com](http://www.howstuffworks.com)
3. [www.electricaltechnology.org](http://www.electricaltechnology.org)

XIX Suggested Assessment Scheme:

| Performance Indicators     |                                           | Weightage |
|----------------------------|-------------------------------------------|-----------|
| Process Related : 15 Marks |                                           | 60 %      |
| 1                          | Handling of the components                | 10%       |
| 2                          | Identification of components              | 20%       |
| 3                          | Measuring value using suitable instrument | 30%       |