

POLARITY MARKING & CONVERSION

OF TWO – WINDING TRANSFORMER INTO AUTO TRANSFORMER

- Apparatus :**
- 1) Two winding transformer (230 / 115 V, 1 KVA)
 - 2) Voltmeter (0-300 V) 1 No. (0-150 V) 2Nos.
 - 3) Ammeter (0-5 A) 3 Nos.
 - 4) Loading rheostat (5 KW)
 - 5) Single phase dimmerstat (2 KVA)
 - 6) Transformer (Teaser with tapping on primary & secondary)

Circuit Diagram :

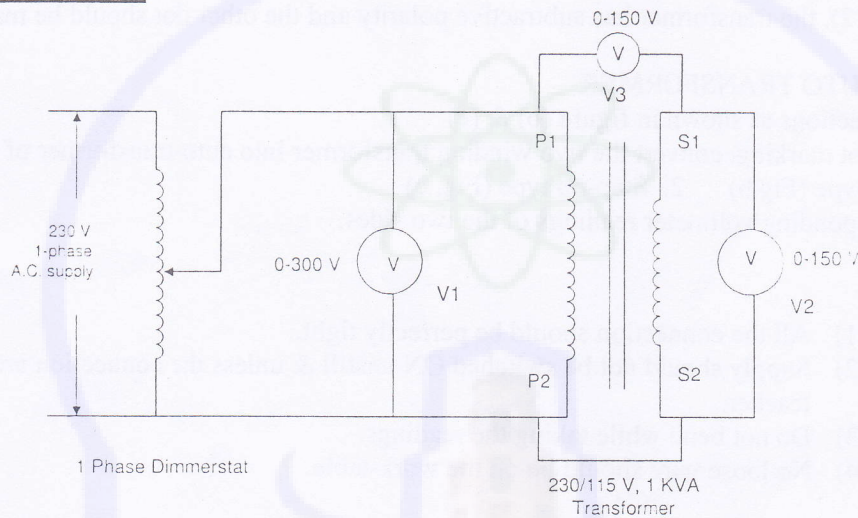


Figure (a) Polarity marking on two winding transformer.

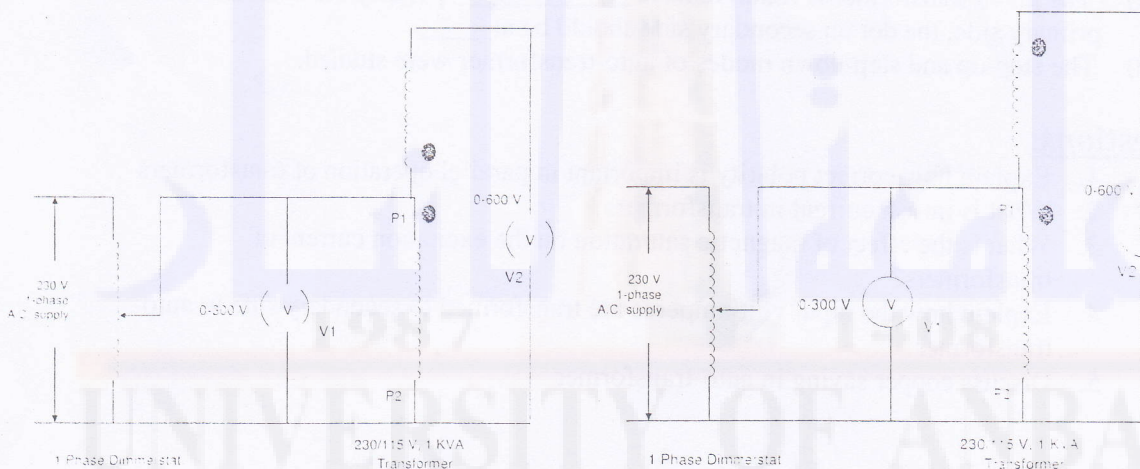


Fig (b) & (c) Conversion of two-winding transformer into auto-transformer

Theory : It should cover the following points

- 1) Explanation of dot and cross marking in general
- 2) Concept of polarity marking of two mutually coupled coils.
- 3) Importance of correct polarity in parallel operation of transformers
- 4) Auto transformer

Procedure :

(A) POLARITY MARKING

- i) Make the connections as shown in figure (a)
- ii) Connect the primary winding P1 – P2 to supply.
- iii) Short circuit the terminals P2 & S2
- iv) Connect the voltmeters across primary & secondary windings of transformer & one voltmeter across P1 and S1
- v) Switch on the supply.
- vi) By varying the input voltage with the help of dimmerstat take various reading V_1 , V_2 and V_3 for various steps of input voltage.
- vii) Analyse the readings and decide about polarity marking of two windings of transformer.
For this assume that a dot is present at terminal P1 of the primary winding.
If $V_3 = (V_1 + V_2)$, the transformer has additive polarity and the other dot should be marked at S2.
If $V_3 = (V_1 - V_2)$, the transformer has subtractive polarity and the other dot should be marked at S1.

(B) AUTO TRANSFORMER

- i) Make the connections as shown in figure (b) & (c)
- ii) Based on the dot marking, convert the two winding transformer into auto-transformer of
 1. Step down type (Fig.b)
 2. Step-up type (Fig. c)
- iii) Note the corresponding voltmeter readings of the two sides.

Precautions:

- 1) All the connection should be perfectly tight.
- 2) Supply should not be switched ON unstill & unless the connection are checked by the teacher.
- 3) Do not bend while taking the readings.
- 4) No loose wire should lie on the work-table.

Conclusion:

- a) The given transformer is found to have _____ polarity . If a dot is marked at P1 on primary side, the dot on secondary side should be at _____
- b) The step-up and step-down modes of auto-transformer were studied.

Viva Questions:

1. Explain how correct polarity is important in parallel operation of transformers
2. What is inrush current in transformers?
3. What is the effect of magnetic saturation on the excitation current of transformers?
4. Explain how the input volt-amperes are transformed to secondary side in auto-transformer
5. Discuss copper saving in auto-transformer