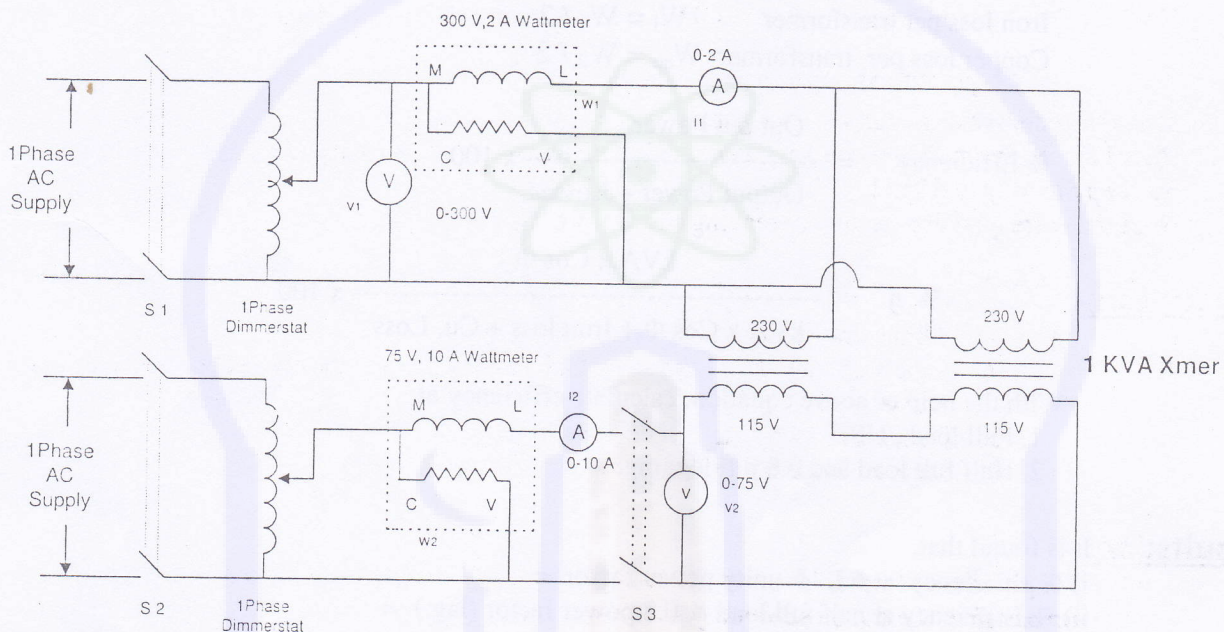


BACK TO BACK TEST ON SINGLE-PHASE TRANSFORMERS

- Apparatus:**
- 1) Two transformers, (1- phase, 1 kVA, 220 /115 V,)
 - 2) Two dimmer stats, (0-270 V, 1- phase, 5 A)
 - 3) Voltmeter, (0-300 V),(0-75 V)
 - 4) Ammeter, (0-2 A),(0-10 A)
 - 5) Wattmeter (0-300 V, 2 A),(0-75 V, 10 A)
 - 6) Connecting wires.

Circuit Diagram:



Theory:

It should include the following.

1. Purpose of this test
2. How full load losses are produced in this test without actually loading any transformer.
3. Explanation about the circuit diagram.

Procedure:

- 1) Make the connections as shown in circuit diagram.
- 2) Keep switches S2 & S3 open and the dimmerstats at zero position.
- 3) Switch ON the supply and check the correctness of polarities of the two transformers. If $V_2 = 0$ then polarities of connected transformers are correct i.e. connections are back to back and emf induced in secondaries are in phase opposition but if $V_2 = 2 \times K \times V_1$, then secondary emfs are in phase, in that case change the polarities of any one secondary winding.
- 4) Note down the readings of V_1 , I_1 and W_1
- 5) Now close switch S2, S3 and increase dimmerstat output voltage gradually so that full load current flows through secondary windings.
- 6) Note down V_2 , I_2 and W_2 . While doing so, the values shown by V_1 , I_1 and W_1 should not deviate from their earlier readings.

Observation Table:

SR. No.	Primary voltage V1	Primary current I2	Primary power Iron loss W1	Secondary voltage V2	Secondary Current I2	Secondary power Cu. Loss W2

Calculations:

$$\text{Iron loss per transformer } W_i = W_1 / 2$$

$$\text{Copper loss per transformer } W_{cu} = W_2 / 2$$

$$\% \text{ Efficiency} = \frac{\text{Out put Power}}{\text{Output Power} + \text{Losses}} \times 100$$

$$\% \eta = \frac{\text{kVA} \times \text{Cos } \Phi}{\text{kVA} \times \text{Cos } \Phi + \text{Iron loss} + \text{Cu. Loss}} \times 100$$

With the help of above equation, calculate efficiency at

1. Full load , UPF
2. Half full load and 0.8 p.f. lagging.

Results:

It is found that,

- i) % Efficiency at F.L. & unity power factor =
- ii) % Efficiency at half full load & 0.8 power factor (lag.) =

Viva Questions:

1. What is the condition to be satisfied by the two transformers to be tested using this method?
2. What is the main advantage of this test?
3. Other than losses and efficiency, what else can be determined from this test?
4. How are the full load conditions simulated?
5. How are the losses separated?