

Design of single phase transformer

Specifications:

Power ratings = 150 VA.

Primary/secondary volt = 230/15 V

Precision of losses = 10 %

Design of primary coil:

Secondary winding load = 10+150 = 160VA

Primary current $I_p = 160\text{VA}/230\text{V} = 0.6957\text{A}$

Conductor area $A = 0.6957/2.5 = 0.278 \text{ mm}^2$

Equivalent conductor diameter:

$$d = \sqrt{4A/\pi}$$

$$d = \sqrt{4(0.278)/\pi} = 0.5954 \text{ mm}$$

From the table the standard wire gauge for the above diameter of 0.5954mm is given as:

$$\text{SWG} = 24$$

Design of secondary coil:

Secondary current $I_s = 150/15 = 10 \text{ A}$

Conductor area $A = 10/2.5 = 4 \text{ mm}^2$

Equivalent conductor diameter:

$$d = \sqrt{4A/\pi}$$

$$d = \sqrt{4(4)/\pi} = 2.257 \text{ mm}$$

From the table the standard wire gauge for the above diameter of 2.257mm is given as:

$$\text{SWG} = 15\frac{3}{4}$$

Gross core Area:

$$A_i = \sqrt{160/5.6}$$

$$A_i = 5.345 \text{ inch}^2$$

Provision for processing and varnish insulation.

$$A_g = 1.1 \times A_i$$

$$A_g = 5.879$$

Width of the thickness of core must be at least equal to as twice as the width of the core so that turns can be easily accommodated in the window space.

Number of turns of primary and secondary coils:

Voltage per turn $E_t = 7.5/2.2823 = 3.2862$ volt/turn

Primary number of turns = primary voltage \times voltage per turn

Primary number of turns = $230 \times 3.2862 = 755.817$ turns

For safe side we will take number of **primary** turns = 756 turns

Secondary number of turns = secondary voltage \times voltage per turn

Secondary number of turns = $24 \times 3.2862 = 78.8688$ turns

For safe side we will take number of **secondary** turns = 79 turns

