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DOUBLE HOLDER WELDING TRANSFORMER

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Introduction :

A welding transformer has two circuits one is primary and other is secondary circuit. These two winding have no electrical connections but magnetically they are coupled together. The main function of transformer is to change high voltages low amperage ac power for welding. The input voltage to transformer may be 440 V or 220V Generally a welding transformer is a step-down transformer .In welding transformer there are generally Voltageis controlled by using

1)Choke

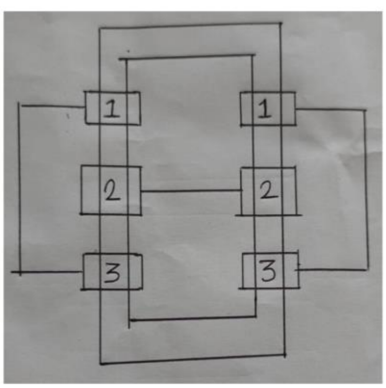
ii) By using Rotory Switch

In welding transformer choke is connected in series with the secondary circuit in order to control or vary current. Also choke can absorb voltage fluctuations choke is important for stability of arc.

In case of Hand methods of arc welding usually a current range of 60 Amps to the 250Amp at a voltage 30 to 40 Volts for a good welder .As per standard 100 Volt is maximum open circuit voltage for the welding.

By using choke to vary or control current the separate space is required .Now again we can control current by moving core that means we can vary flux linking with secondary ,so current is vary flux in proportion with flux. But separate mechanism required to move the core specifically. Normal welding rods that are used for steel work required to strike & maintain arcis [40-60 V,60-80,80- 100V].

Welding transformer now available in market that has features of control both voltage & current & if we provide tapping to secondary side & current by choke it is too much space is required for that to achive both the feature i.e. current & voltage control following design is suitable one pole way rotary switch is used to change the O.C.



1) sub secondary

2) Main Primary

3) Main secondary

Fig No.1.Construction Diagram

Construction & Operation :

This is electrically a single phase transformer. But in market it is called so because it is designed or constructed to work either on 250 volts (i. e. phase and neutral) or 440 volts (i.e, two phase lines of a 3 phase a. c. supply).

There are two primary windings which can be connected either in series or in parallel When the machine is to work on two phase lines (Double phase) the primaries are connected in series, and when the machine is to work on single phase (phaseand neutral) the primaries are connected in parallel.

Sr.no.	Tap No	Voltage Range
1	E-1	34
2	E-2	43
3	E-3	47
4	E-4	52
5	E-5	56

Table No.1.Output Voltage

There are two types multiway rotary switches used one is six multiway switch this mainprimary side used to change voltage

Design Aspects :

Design Of

Core :

- **V1*I1=V2*I2**
- 400*I1=60*300
- I1=60*300/400
- I1=45A
- KVA=Q=400*45/1000 =18 KVA
- Et=1v
- Et=$4.44 * F * \emptyset m$
- $\emptyset m$=0.004wb
- Bm=1.1 wb/m^2
- Ai=Et/4.44*f*Bm =1/(4.44*50*1.1)
- Ai=0.004m^2

d=$\sqrt{Ai/k}$ = $0.1264m$

- Agi=0.5*d^2 =0.5*(0.1264)^2
- Agi=0.0062m^2
- Width of core=$\sqrt{Agi}$ = 0.0062 = $10cm$
- Now Hw*Ww =9.30*10^3=Aw
- Hw(D-d)=9.30*10^3
- Hw=(9.30*10^3)/19.88 =407.8mm
- **Window Dimension**
- For About 18 KVA transformer
- Kw=8/(30+kv) =8/(30+0.4) =0.264
- ∂ =5A/mm^2
- Q=2.22*f*Bm*Kw*Aw*Ai*10^3
- Aw=15*10^3/(2.22*50*1.1*0.264*5* 10^6*0.01*10^-3)
- 9.30*10^3 mm^2
- **Winding Design**
- Hv winding turns= Tp=Vs/Et=60/1=60
- LV winding turns =Ts=Vp/Et
- =400/1 =400
- Hv winding current =Ip=KVA*1000/Vs=18*1000/60 =300 Amp
- LVwindingcurrent =Is=KVA*1000/400=18*1000/400 =45Amp
- Hv winding area ap =Is/2 =300/2 =150mm^2
- Lv winding area as =Ip/2 =45/2 =22.5mm^2
- **Yoke Design**
- Flux density in yoke =1/1.2= 0.0833 wb/m^2
- Net area of yoke= 1.2*0.007 =0.084m^2
- Gross area of yoke =0.0084/0.9 =0.0093m^2
- Depth of yoke (Dy)=0.85*d =0.85*0.1247 =0.106m
- Height of yoke (Hy)=gross area of yoke /Dy = 0.0093/0.106 =0.087m

ii) Cooling :

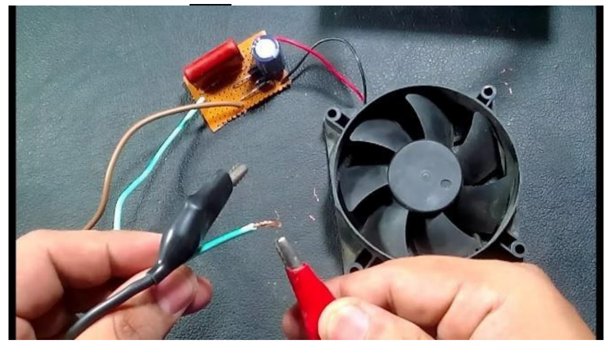


Fig No.2.Cooling Fan(LSM)

In conventional method, of cooling of welding transformer single phase motor is used. This motor is of shaded pole type or capacitor type.but in this the motor construction is similar to that of shaded pole motor.

The stator is made attaching laminated steel sections. slot is provided to the pole face. shading coil is wound on the slot. very less number of turns are wound on the remainder which is thick conductor which can able to carry the full load current of theequipment.

The motor is run only with load i.e.in proportion with the load current.

Sr.No.	Current(Amp)	voltage(volt)
1	232	34
2	215	43
3	191	47
4	184	52
5	165	56

Table No.2.output of welding

When load increase current also increase this heating & cooling is proportionate.

Now, in market some electronics welding machinesarc also available, smooth welding is done by that machines,but the major disadvantages of electronicswelding machines arc the internal components get short circuited. by the conductive dust &repair cost is also high.Solid voltage &current controlled welding machines is always better.

Conclusion:

A welding transformer 18 KVA, 2 phase, 50 Hz, step down is designed and manufactured for different current ranges. This is suitable for various electrodes required for welding of different metals. Joints are welded using this transformer are electrically and mechanically carry sounds. Designed transformer is having duty cycle of 60% for continuous operation.

If we compare the voltage and current control welding transformer with ordinary welding transformer for same application found that the cost of machineis nearly one-fourth of ordinary machine because one voltage and current control welding transformer is equal to four ordinary transformer of different voltages. Therefore cost saving is more.

References

1. Text book“WeldingTransformer” by Mr.S.J.Kulkarni