

HIGH VOLTAGE TRANSFORMER EI 240 x 320

F1FRV rev 0

July 11th 2022

Can be used for RF output powers < ~6 kW CCS and < ~12 kW ICAS (service factor 50% MAXI)

ICAS = Intermittent Commercial and Amateur Service, as compared to CCS (Continuous Commercial Service).

Transformer to supply an amplifier of ~10 kW INPUT CCS MAXI (~20 kW INPUT ICAS MAXI).

Sheets: M6X

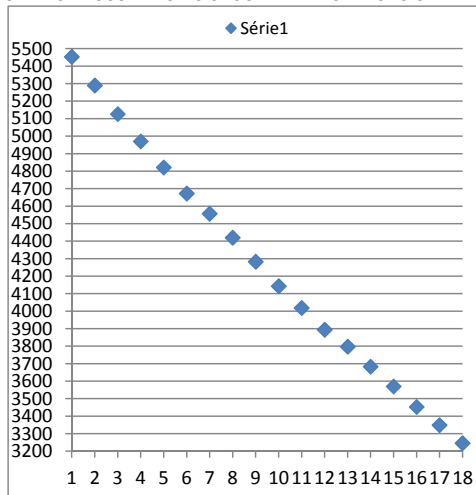
With 18 secondary voltages possibles, to have between ~3200 et ~5400 V DC with a current of 1,75 A on the tube, downstream a current limiting resistor to limit short circuit current to ~250 A maxi. Ambient temperature max: 40 °C

Frequency	50 Hz	Input data black on blue background
Nominal primary voltage	230 V	Modifiables input data in red on blue background
Design secondary current	2,5 A	Main results in red on yellow background
Secondary voltage under load	4000 V	Rectified & filtered with nominal primary: ~ 5467 V CC
Secondary voltage under load	3650 V	Rectified & filtered with nominal primary: ~ 4984 V CC
Secondary voltage under load	3350 V	Rectified & filtered with nominal primary: ~ 4570 V CC
Secondary voltage under load	3050 V	Rectified & filtered with nominal primary: ~ 4156 V CC
Secondary voltage under load	2800 V	Rectified & filtered with nominal primary: ~ 3811 V CC
Secondary voltage under load	2550 V	Rectified & filtered with nominal primary: ~ 3466 V CC
Primary power at 100%	10259 VA	Max secondary power required 10000 VA
Shell EI 240 x	320 mm	Primary current at max load 100% 44,6 A
Core length (thickness of core)	120 mm	Core width 80 mm
Sheet metal proliferation	0,96	Height of sheets winding window 240 mm
Real core cross section	92,16 cm2	Core insulation thickness 3 mm
Induction for calculations	1,350 Tesla	Shell filling 87,7 %
Sheets M6X 0,35 or 1W1/1W35/1W7 thk 0,5	0,42 W/kg @ 1T	Max Induction 1,360 Tesla
Nb of volts / turn	2,7819 V	Iron losses 0,78 W/kg
Nb of turns / volt	0,3595	MAX primary voltage (saturation) 271 V
Primary current density	1,995 A/mm2	Primary turns MAX 89
Calculated primary cross section area	22,36 mm2	Secondary turns (V max) 1438
Primary wire width	6,3 mm	Secondary voltage ratio V/Vmax Nb turns
Primary wire thickness	3,55 mm (see list)	4000 1 1438
Primary wire length	43 m about	3650 0,9125 1313
Primary resistance at 70°C	0,074 Ohm	3350 0,8375 1205
Primary layers number	3	3050 0,7625 1097
Secondary current density	2,070 A/mm2	2800 0,7 1008
Calculated secondary cross section area	1,21 mm2	2550 0,6375 918
Secondary wire diameter	1,25 mm (see list)	Secondary layers nb 8
Secondary wire length at Vmax	690 m about	Max voltage between secondary layers 688 V
Secondary resistance at Vmax at 20°C	9,90 Ohm	Secondary resistance at Vmaxi at 70°C 11,5 Ohm
Secondary voltage drop at Vmax at 70°C	29 V With >>>	2,5 A @ V maximum
Iron weight	50,2 kg about	Iron losses 39,0 W
Copper weight	15,9 kg about	Copper losses at 100% load 219,7 W
Accessories & varnish weight	6,0 kg about	Total losses at 100% load 258,7 W
Total weight	73 kg about	Efficiency at 100% load 97,5 %

Simulations avec des paramètres variables

Ambiant temperature	30 °C	Temperature transfo at no load: about	36 °C
Anode current under load	1,310 A DC	Selected secondary voltage	3 650 V AC
Service factor	50 % of time	Short circuit limitation total resistance	22 Ohm
No load primary voltage	230 V AC	Mains AC under load	230 V AC
No load secondary voltage	3 679 V AC	Secondary voltage drop	20 V AC
Power absorbed by the tube	6 559 W	Transformer efficiency	97,7 %
Necessary mains AC power	6 716 VA	Transformer primary current	30,3 A AC
Secondary voltage under load	3 659 V AC	Transformer secondary current	1,85 A AC
Short circuit current on tube	230 A DC	Température transfo in service: about	50 °C
Voltage on tube at no load: about	5 063 V CC	Voltage on tube under load: about,	5 007 V DC
Effective power dissipated in operation into HV short circuit current limitation resistance			19 W
Nota: HV short circuit current limitation resistance includes the resistance(s) installed on HV supply line, and intrinsic resistance of HV choke, located near tube (~5 Ohms).			
Energy into current limitation resistance IN CASE of HV short circuit			1152 kJ/s

CURVE OF POSSIBLES DC SECONDARY VOLTAGES UNDER LOAD



Service factor SSB normal voice ~20-25 %
Service factor SSB compressed voice ~30-35 %
Service factor CW, RTTY, SSTV ~50 %
Service factor https://www.w8ji.com/am_linear_amplifiers.htm for AM
Service factor FM 100 %

