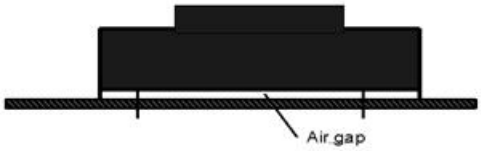
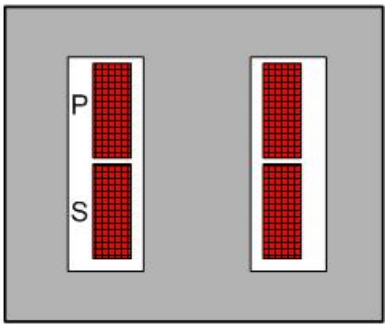
Topic1 / Design1

Designing inherently short-circuit-proof, potted safety transformers 12V, 0.166A in accordance with IEC 61558

Input parameters

Primary	Voltage	120V +-10%, 60Hz, sine wave
	Wire	Cu, round, single insulated
	Layer insulation	No
	Final insulation	No
Secondary	Nominal output voltage	12V
	Nominal output current	0.15A @ 80 Ohm
	Wire	Cu, round, single insulated
	Layer insulation	No
	Final insulation	
Core	Size	EI 25, stack ¾, no holes
	Steel	
		M45, alternate stacking, not annealed
Bobbin	Size	For core EI 25/(3/4)
	Typ	Double section
Case	Size	1” x 0.75” x 1.25”, potted
Design	Insulation class	B, max. operating temperature 120C, max. short-circuit temperature 175C
	Ambient temperature	40C
	Regulation	100%, for min short-circuit current and max. output power
	Induction	1.1T, to limit the no-load temperature due to the high value of the regulation





#*0	DIAGNOSE	Page 0
Name	:1 X EI 25/(3/4) 1280-0	
Steel	-:M45 Gauge 24 / 0.0250"	
Number of Sections	-:2	
max.Cu-Fill Factor	%:89.9	
max. parallel Wires	:1	
Induction on Load	T:1.274	
Max. Induction	T:1.628	
Max.Cu-Temp.rise on load	°K:49.	
Max.Cu-Temp.rise no-load	°K:30.4	
Regulation	%:98.8	
I^Inrush/I^nom-Factor	*:4.	
Input Current No-Load	%:91.7	

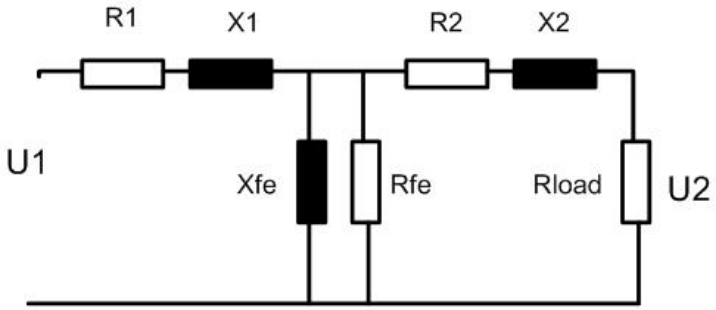


Fig. 5a

Low Frequency Scheme of a Transformer

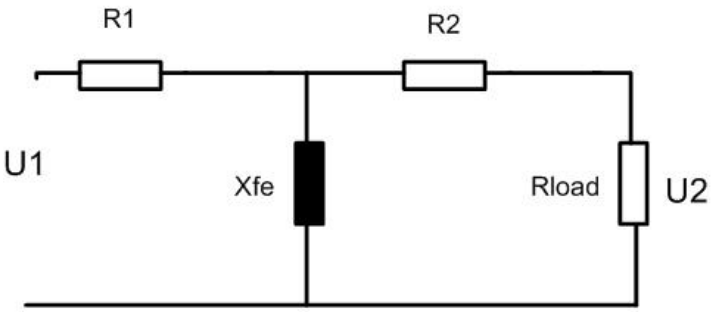


Fig. 5b

Low Frequency, Low Power (<5VA)
Scheme of a Transformer

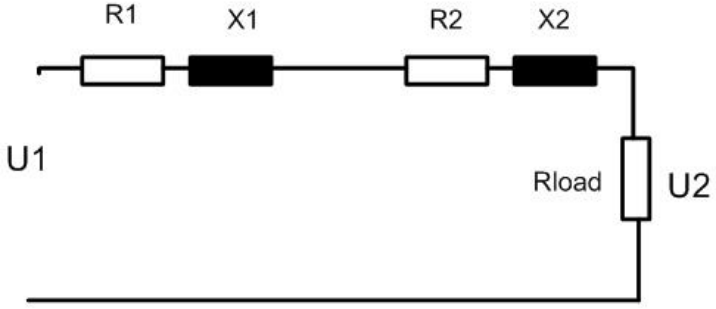


Fig. 5c

Low Frequency, > 5VA Power, Low Induction (< 1T)
Scheme of a Double-Section Transformer

Fig. 5

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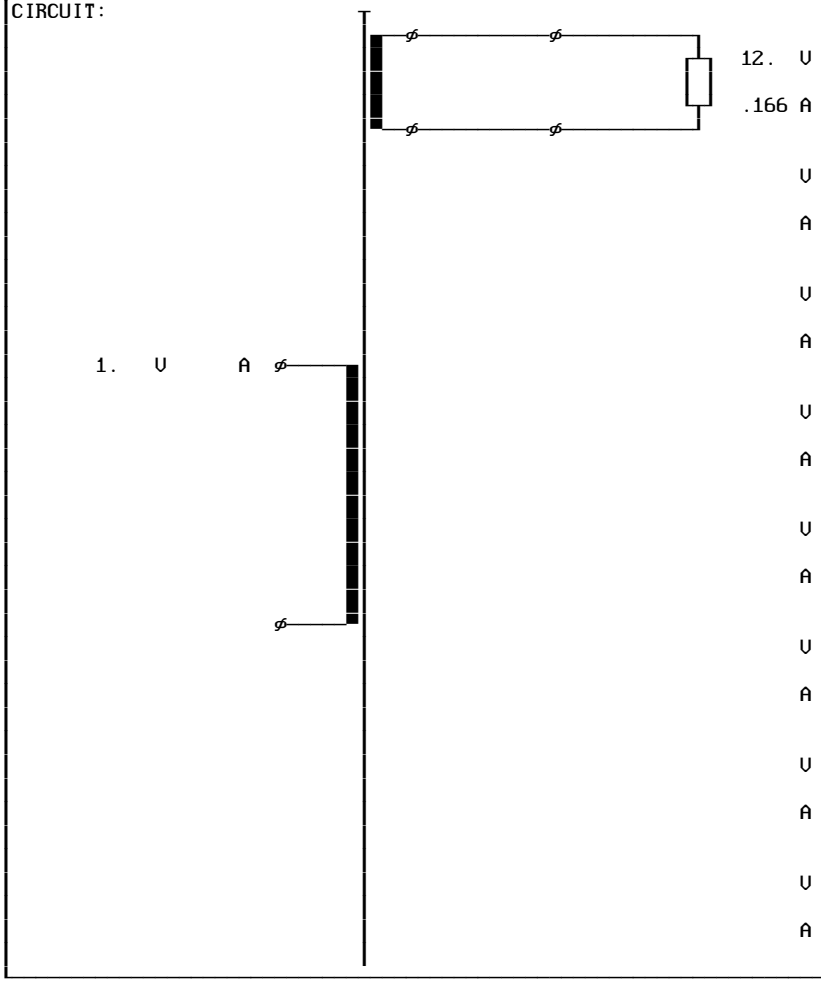
PRIMARY	U(V)	I(A)
Circuit-:1	1.	
Overult*:1.10	.	
Wire :0.0	.	
I/L. mil:0.	.	
I/E. mil:0.	.	
Formfac.:1.11	.	
Fre.Hz:60	.	
dI/Io :100	.	

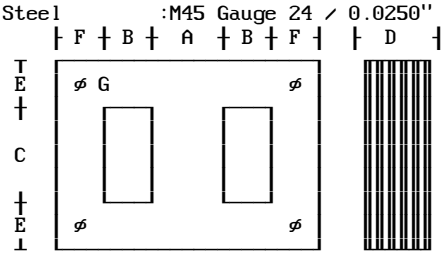
SECOND. 1--- 2--- 3--- 4--- 5--- 6--- 7--- 8---
Circuit-:11
Volta. V:12.
Curre. A:.166
Wire :0
I/L mil:0.0
I/E mil:0.0

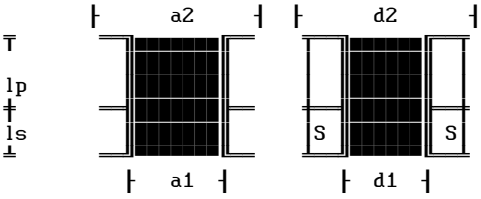
Regulat. %:100.0	Steel -:17	Cooling *:1.00	Bobbin -:2
Udiode V:0.8	Induction T:1.27	Force ft/s:0.00	P/S-Order -:1
dUdiode V:.1	Remanence *:0.35	Bracket -:0	Rac/Rdc *:1.05
Ripple %:5.	W/kg *:1.00	Radiator -:0	Space *:0.90
Tmp. Amb.°C:40	VAr/kg *:1.00	Chassis -:1.00	Vertical -:1
Tmp.rise °K:75	Gap *:1.00	Channel in:0.00	Horizontal -:1
Time 1 Min:30.0	Annealed -:0	Cu-Surface*:1.00	Impregnat. -:2
Load 1 *:1.0	Stacking *:1.00	Rth-varni.*:1.00	Spread %:0
Time 2 Min:30.0	Hole -:1	Rth-comp. *:2.00	Selection -:2
Load 2 *:1.0	Assembly -:1	Case -:1	Criterion -:1

CIRCUIT:

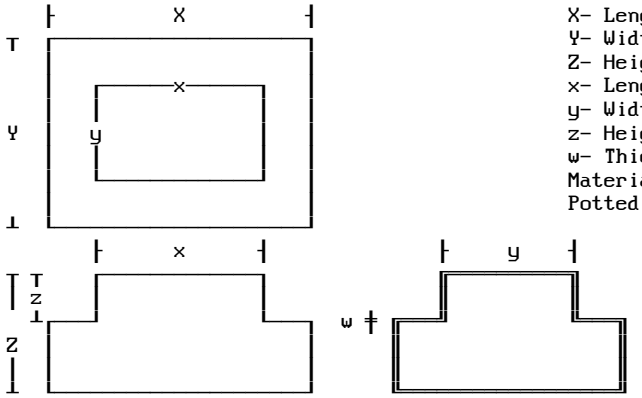


Name :1XEI 25/(3/4) 1280-0
Steel :M45 Gauge 24 / 0.0250" /25.59





Weight	lb:.1
Gap total	in:0.000
A-Limb	in:0.25
B-Width	in:0.25
C-Height	in:0.50
D-Stack	in:0.75
E-Yoke 1	in:0.13
F-Yoke 2	in:0.13
G-Hole	in:0.00
Radiator Fin	:0
Radiator Chan.	:0
a1	cm:0.33
a2	cm:0.73
d1	cm 0.81
d2	cm 1.24
l	cm:
lp	cm:0.20
ls	cm:0.20
Margin	cm:0.04



X- Length 1	in:1.03
Y- Width 1	in:0.78
Z- Height 1	in:1.28
x- Length 2	in:0.78
y- Width 2	in:0.53
z- Height 2	in:0.25
w- Thickness	in:0.01
Material	:
Potted	:

	Typ	Windun	MTI	DN	DN	Par	D/ø mil	B/ø mil	W/L	L	I/L mil	I/E mil	Weight lb	RWH %
1	1	20.1	C00	20.0	20.0	1	32.	32.	5	4.1	.	.	.015	89.
2														
3														
4														
5														
6														
7														
8														
1	11	481.6	C00	33.5	33.5	1	6.7	6.7	25	19.	.	.	.015	78.
2														
3														
4														
5														
6														
7														
8														
TOTAL													.029	89.

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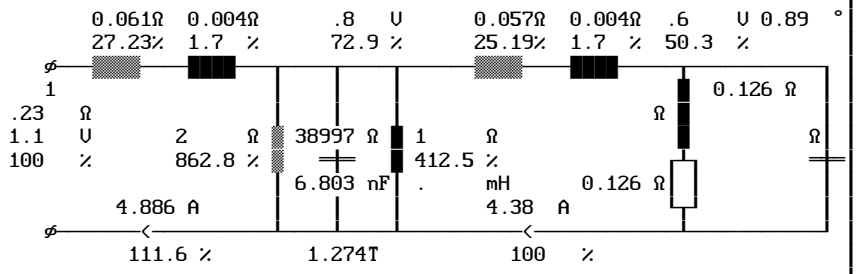
NOMINAL OPERATION at Temperature °C 88.8 and Overvoltage 1.10

Output Power on Load	W:2.42	Output Power of Transfor.	W:2.42
Cu Losses	W:2.55	Fe-Losses active	W:.33
Short-Circuit-Volt. cold	%:41.52	Regulation	%:98.81
Instantaneous pow. .5/95&	W:3.	Efficiency of Transformer	%:45.67
dT Fe average Surface	°K:43.8	dT primary	°K:49.
dT Case aver. Surface	°K:40.5	dT secondary	°K:48.7



DUTY CYCLE OPERATION at Amb.Temperature °C 40. and Overvoltage 1.10

dT Fe average Surface	°K:43.9	dT primary	°K:49.
dT Gehäuse av. Surface	°K:40.6	dT secondary	°K:48.7

NO LOAD OPERATION at Amb.Temperature °C 40. and Overvoltage 1.10

Losses active	W:1.66	Losses reactive	VAr:4.64
Current factor	%:91.68	Induction	T:1.628
dT Fe average Surface	°K:27.6	dT primary	°K:30.4
dT Gehäuse av. Surface	°K:25.5	Rezonance frequency	kHz:38.9

SHORT-CIRCUIT OPERATION at Amb.Temperature °C 40. and Overvoltage 1.10

Losses active	W:12.89	Losses reactive	VAr:1.16
Current factor cold	%:240.9	Induction	T:.822
dT Fe average Surface	°K:104.7	dT primary	°K:121.3
dT Gehäuse av. Surface	°K:95.5	dT secondary	°K:121.

PRIMARY (Tap:1) 1---- 2---- 3---- 4---- 5---- 6---- 7---- 8-----

Voltage Input/Output	V:1.1
Out. Voltage no load	V:
Current Input/Output	A:4.886
Load on output	Ω:
Power factor of load	:
Current in segment	A:4.886
Current density A/in^2	:6099.
Icc-Current cold	A:11.77
Io -Current	A:4.479
Inrush Current peak	^A:27.59
Inrush Current rms	A:11.3
Cu-Losses	W:1.5
Resistance cold	Ω:.0491
Reactance	Ω:.0038
Eddy-Current Factor	:1.

SECONDARY 1---- 2---- 3---- 4---- 5---- 6---- 7---- 8-----

Output Voltage		V:13.24
Output Current		A:0.183
Out. Voltage no load		V:24.5
Sec. Voltage		V:13.24
Sec. Current		A:0.183
Current density A/in^2		:5192.
Sec. Voltage cold		V:14.7
Load on output		Ω:72.28
Power factor of load		:1.000
Icc	cold	A:0.48
Cu-Losses	warm	W:1.088
Resistance	cold	Ω:25.99
Reactance		Ω:2.194
Eddy-Current Factor		:1.
Capacitor		mF:.

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