Topic Welding/ Design1

Designing rectifier transformer for welding with 26Vdc, 200Adc

Input parameters

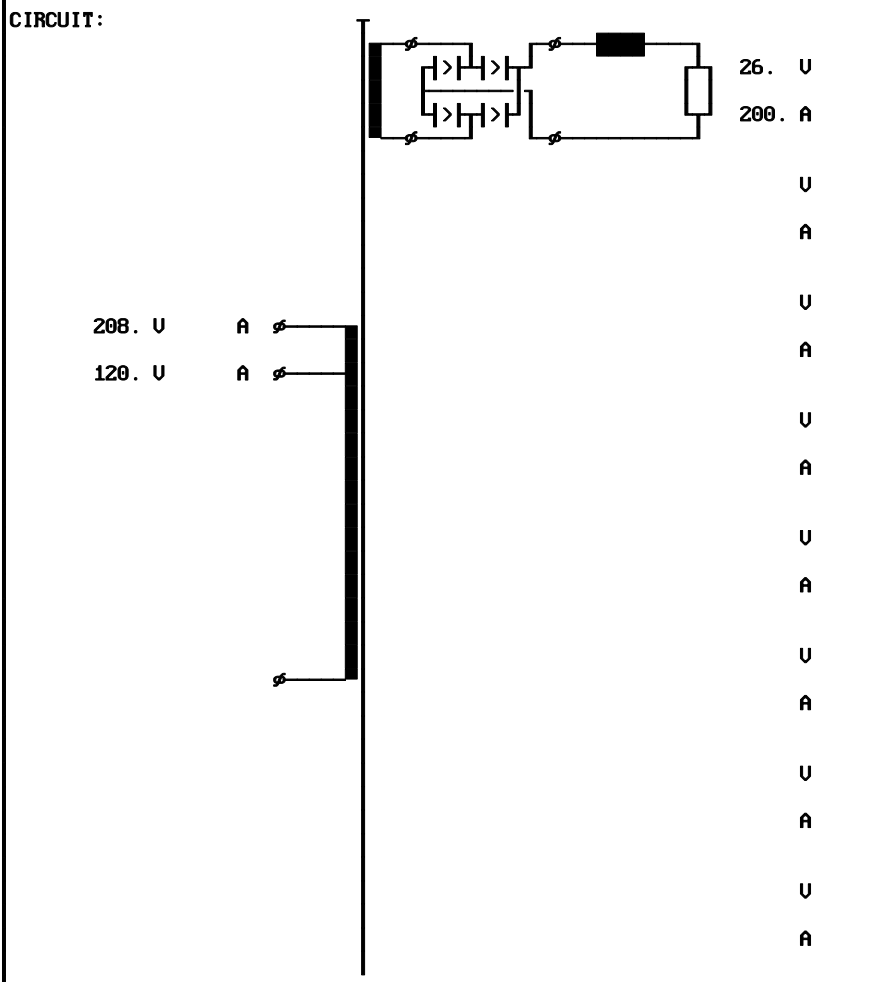| Input	Voltage	120V and 208V+-10%, 60Hz, sine wave
	Wire	Al, round, single insulated, wound outside
Output	Nominal DC output voltage	26Vdc, via one phase rectifier bridge and smoothing choke
	Nominal DC output current	200Adc during 1.5 minutes and 8.5 minutes pause
	Wire	Al, rectangular wire, wound inside
Core	Steel	M45, alternate stacking, not annealed
Bobbin	Type	Single section tube for EE 200/3" or EI long 150/75
Design	Insulation class	H, max. nominal g temperature 165°C at ambient temperature 40°C, ventilated with 3 ft/s airflow
	Criterion of design	Low price , high temperature rise

General rules

1. The welding transformers are normally forced cooled with airflow 0ver 3 ft/s
2. The welding transformers work in duty cycle operation mode and the winding losses are much higher than core losses. Due to this fact you can use cheap steel quality and relative high induction.
3. The welding transformers with Al wires are bigger, cooler but cheaper.
4. The welding transformers are always protected by a thermal fuse

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#*0                    DIAGNOSE                  Page 0

Name                    :1 X EIL 200/(3)
Steel                   -:M45 Gauge 24 / 0.0250"

Number of Sections      -:1
max.Cu-Fill Factor      %:71.5
max. parallel Wires      :1

Induction on Load       T:1.456
Max. Induction          T:1.566

Max.Cu-Temp.rise on load  °K:118.3
Max.Cu-Temp.rise no-load  °K:40.8
Regulation              %:15.2

I^Inrush/I^nom-Factor    *:8.7
Input Current No-Load   %:7.2
```

```
PRIMARY        U(U) I(A) | SECOND.   1--- 2--- 3--- 4--- 5--- 6--- 7--- 8---
Circuit-:1     120.      | Circuit-:32
Overvlt*:1.00  208.      | Volta. V:26.
Wire     :-0.0 .         | Curre. A:200.
I/L. mil:1.    .         | Wire     :-4
I/E. mil:1.    .         | I/L  mil:0.0
Formfac.:1.11 .          | I/E  mil:10.0
Fre.Hz:60      .         |
dI/Io    :100  .         |
```

```
Regulat.  %:50.0 | Steel      -:17  | Cooling   *:1.00 | Bobbin      -:1
Udiode   V:1.5   | Induction T:1.46 | Force  ft/s:3.00 | P/S-Order   -:2
dUdiode  V:.1    | Remanence *:0.35 | Bracket     -:1  | Rac/Rdc    *:1.10
Ripple    %:5.   | W/kg       *:1.00| Radiator    -:0  | Space      *:2.00
Tmp. Amb.°C:40   | VAr/kg     *:1.00| Chassis   -:1.00 | Vertical    -:1
Tmp.rise °K:125  | Gap        *:1.00| Channel  in:0.00 | Horizontal  -:1
Time 1  Min:1.5  | Annealed   -:0   | Cu-Surface*:1.00 | Impregnat.  -:2
Load 1    *:1.0  | Stacking   *:1.00| Rth-varni.*:1.00 | Spread      %:0
Time 2  Min:8.5  | Hole       -:1   | Rth-comp. *:1.00 | Selection   -:1
Load 2    *:.0   | Assembly   -:1   | Case        -:0  | Criterion   -:2
```
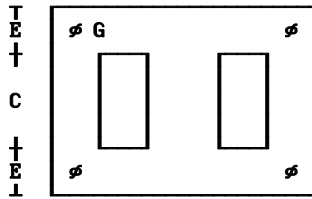
CIRCUIT:


```
                                              26. U
                                              200. A

                                                  U
                                                  A

                                                  U
208. U      A                                     A

120. U      A
                                                  U
                                                  A

                                                  U
                                                  A

                                                  U
                                                  A

                                                  U
                                                  A

                                                  U
                                                  A

                                                  U
                                                  A
```

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```
Name          :1XEIL 200/(3)
Steel         :M45 Gauge 24 / 0.0250"                                    /25.59
```

⊢ F ┼ B ┼ A ┼ B ┼ F ⊣ ⊢ D ⊣	Weight	lb:29.52
	Gap total	in:0.000
⌀ G ⌀	A-Limb	in:2.00
	B-Width	in:1.00
	C-Height	in:6.00
	D-Stack	in:3.00
	E-Yoke 1	in:1.00
⌀ ⌀	F-Yoke 2	in:1.00
	G-Hole	in:0.31
	Radiator Fin	:0
⊢ a2 ⊣ ⊢ d2 ⊣	Radiator Chan.	:0
	a1	cm:2.18
	a2	cm:3.94
P S S P	d1	cm 3.16
	d2	cm 5.64
	l	cm:5.78
	lp	cm:
⊢ a1 ⊣ ⊢ d1 ⊣	ls	cm:
	Margin	cm:0.11
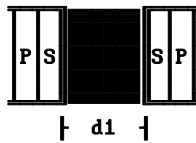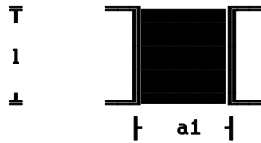
```
X- Length 1   in:
Y- Width  1   in:
Z- Height 1   in:
x- Length 2   in:
y- Width  2   in:
z- Height 2   in:
w- Thickness in:
Material        :
Potted          :
```

	Typ	Windun	MTI	DN	DN	Par	D/⌀ mil	B/⌀ mil	W/L	L	I/L mil	I/E mil	Weight lb	RWH %
1	1	76.5	A00	8.0	8.0	1	128.	128.	42	1.8	1.	1.	1.254	33.
2	1	132.5	A00	12.0	12.0	1	80.8	80.8	67	.83	1.	1.	.398	10.
3														
4														
5														
6														
7														
8														
1	32	24	A11	10.0	97.0	1	102.	410.	13	1.8	.	10.	1.097	27.
2														
3														
4														
5														
6														
7														
8														
TOTAL													2.749	71.

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```
NOMINAL OPERATION      at Temperature °C 158.2  and    Overvoltage 1.00
Output Power on Load        W:5275.   Output Power of Transfor. W:6526.
Cu Losses                   W:994.6   Fe-Losses active          W:88.79
Short-Circuit-Volt. cold    %:9.15    Regulation                %:15.17
Instantaneous pow. .5/95&   W:11762   Efficiency of Transformer %:82.96
dT Fe average  Surface      °K:210.9  dT primary                °K:337.4
dT Case aver.  Surface      °K:.       dT secondary             °K:339.3


        0.134Ω  0.016Ω      111.4V      0.116Ω  0.016Ω  104.2 V -0.85 °
        7.09 %  0.87 %      92.9 %      6.13 %  0.87 %  86.83 %

  ∮
   1                                                          1.663 Ω
  1.89  Ω                                              Ω
  120.  V         140   Ω  52505 Ω  52   Ω                             Ω
  100   %         7397. %          2733. %
                           .505  nF  .      mH      1.663 Ω
        63.49 A                          62.63 A
  ∮-------<                            <
        101.4 %      1.456T          100   %
```
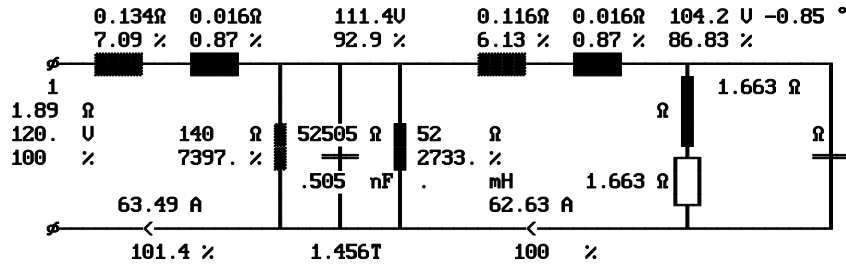
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DUTY CYCLE OPERATION  at Amb.Temperature °C 40.  and Overvoltage 1.00
dT Fe average  Surface      °K:61.9   dT primary                °K:118.1
dT Gehäuse av. Surface      °K:.       dT secondary             °K:118.3
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```
NO LOAD OPERATION      at Amb.Temperature °C 40.  and Overvoltage 1.00
Losses    active            W:101.1   Losses    reactive        VAr:540.7
Current factor              %:7.22    Induction                 T:1.566
dT Fe average  Surface      °K:49.1   dT primary                °K:40.8
dT Gehäuse av. Surface      °K:.       Rezonance frequency      kHz:19.1
```

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SHORT-CIRCUIT OPERATION at Amb.Temperature °C 40.  and Overvoltage 1.00
Losses    active            W:81731   Losses    reactive        VAr:15799
Current factor cold         %:1092.   Induction                 T:.771
dT Fe average  Surface      °K:1968.  dT primary                °K:2638.
dT Gehäuse av. Surface      °K:.       dT secondary             °K:2696.
```

```
PRIMARY (Tap:1  )      1---- 2---- 3---- 4---- 5---- 6---- 7---- 8-----
Voltage Input/Output V:120.  208.
Out. Voltage no load V:
Current Input/Output A:63.49
Load on output       Ω:
Power factor of load  :
Current in segment   A:63.49 0.
Current density A/in^2:4898. 0.
Icc-Current    cold  A:693.7
Io -Current          A:4.584
Inrush Current peak ^A:782.0
Inrush Current rms   A:366.1
Cu-Losses            W:540.1
Resistance     cold  Ω:.0854 .2583
Reactance            Ω:.0164 .0088
Eddy-Current Factor   :1.01  1.
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```
SECONDARY              1---- 2---- 3---- 4---- 5---- 6---- 7---- 8-----
Output Voltage       V:26.2
Output Current       A:201.3
Out. Voltage no load V:30.59
Sec. Voltage         V:32.42
Sec. Current         A:201.3
Current density A/in^2:4814.
Sec. Voltage cold    V:32.4
Load on output       Ω:.16
Power factor of load  :1.000
Icc          cold  A:2228.
Cu-Losses    warm  W:454.5
Resistance   cold  Ω:.0072
Reactance          Ω:.0016
Eddy-Current Factor   :1.01
Capacitor          mF:.
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