Triode *Type CAT21*

(VHF AMPLIFIER)

General. A transmitting triode with a water-cooled anode and fitted with a pure tungsten filament. This valve is suitable for use as an amplifier at frequencies up to 100 Mc/s.

Cooling. The anode (which forms part of the valve envelope) must be fitted with a specially designed water jacket for cooling by direct contact with the circulating water. The rated flow should not be less than 8 gallons per minute. The temperature of the cooling water must not be greater than 150°F (65°C) at the outlet and the temperature rise should not exceed 27°F (15°C).

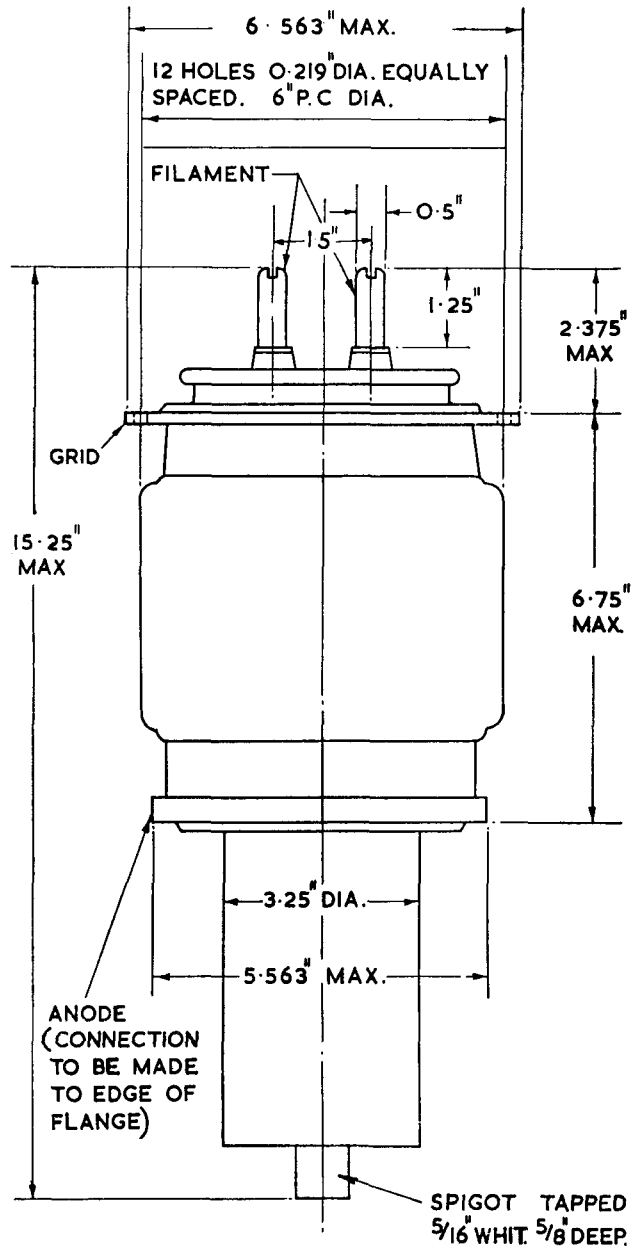
The anode and filament seals require forced air cooling. The air flow to the seals should be 30 cu. ft. per minute.

All cooling supplies must be in operation before any voltages are applied to the valve and must continue, for at least 15 minutes, after all voltages have been removed.

Filament Starting. The cold resistance of the filament is 0.0032 Ω. The filament current must not exceed 350 A at any time. If the valve is operated for periods greater than 5 minutes without anode voltage being applied, the filament voltage must be reduced to one-half its normal value during the standby period.

HT Switching. It is not permissible to apply directly HT voltage in excess of one-half of the maximum rated anode voltage. When the valve is to be operated at a higher voltage the HT should either be gradually increased from a low value or two-position switching employed.

Mounting. The valve must be completely supported by its water jacket, which should be adjustable so that the axis of the valve may be made truly vertical. Rigid connections must be made to the anode only.



MARCONI'S WIRELESS TELEGRAPH COMPANY LIMITED

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Seasoning. Whenever a new valve is put into service, or when a valve has been idle for a period of approximately 2 months, it must be seasoned by operating for at least one hour at half the normal voltage and current. The anode voltage should then be increased slowly to the normal value.

APPROXIMATE DATA

V_f		12	V*
I_f		320	A
$V_{a(max)}$		10	kV
$p_{a(max)}$		20	kW
$p_{gl(max)}$		1·5	kW
$I_{gl(pk)\ (max)}$		100	A
μ	taken at Va 5 kV, V_{gl} −50 V	21	
r_a	taken at Va 5 kV, V_{gl} −50 V	1,050	Ω
g_m	taken at Va 5 kV, V_{gl} −50 V	20	mA/V
c_{a-g_1}		1·1	pF
c_{a-k}		32	pF
c_{gl-k}		42	pF

*The values of filament voltages for 25 A and 36 A emission at 90% saturation are marked on each valve.

Typical Operation

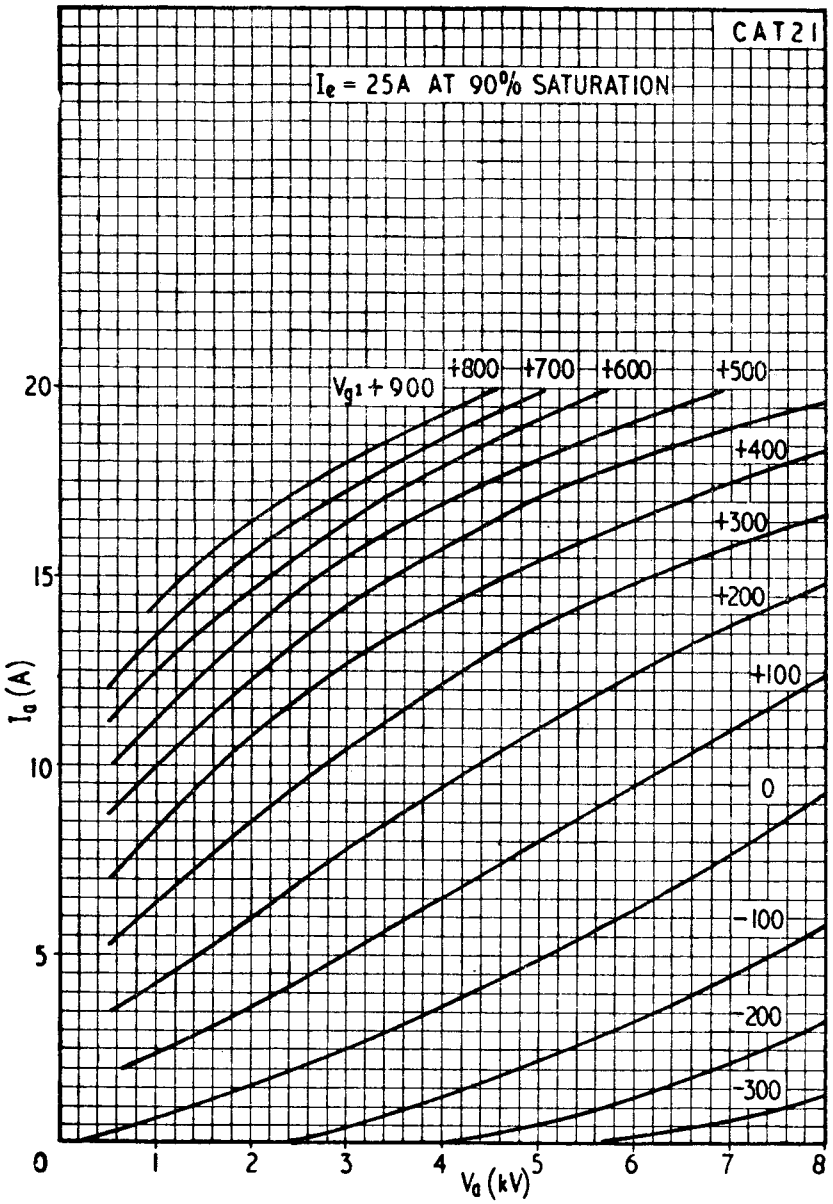
HF POWER AMPLIFIER.
CLASS C TELEGRAPHY

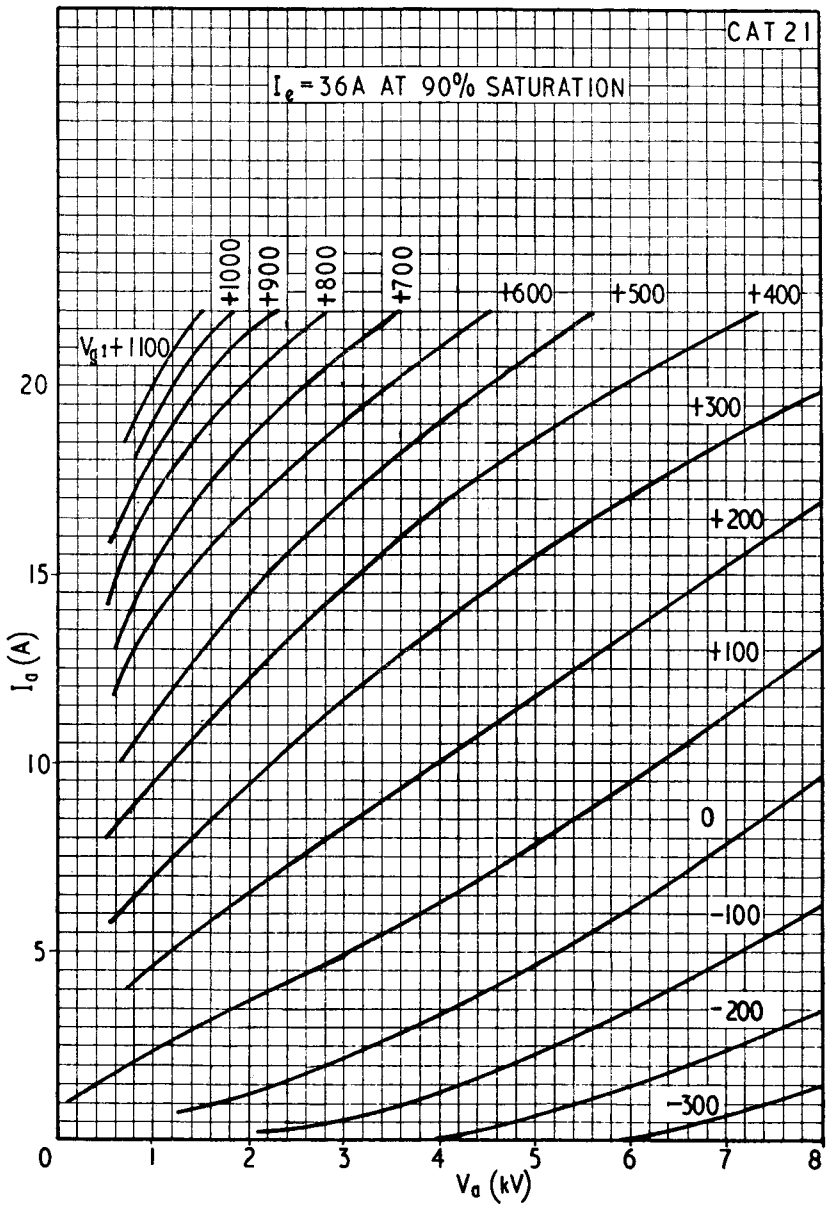
(One valve, key down conditions, unmodulated)

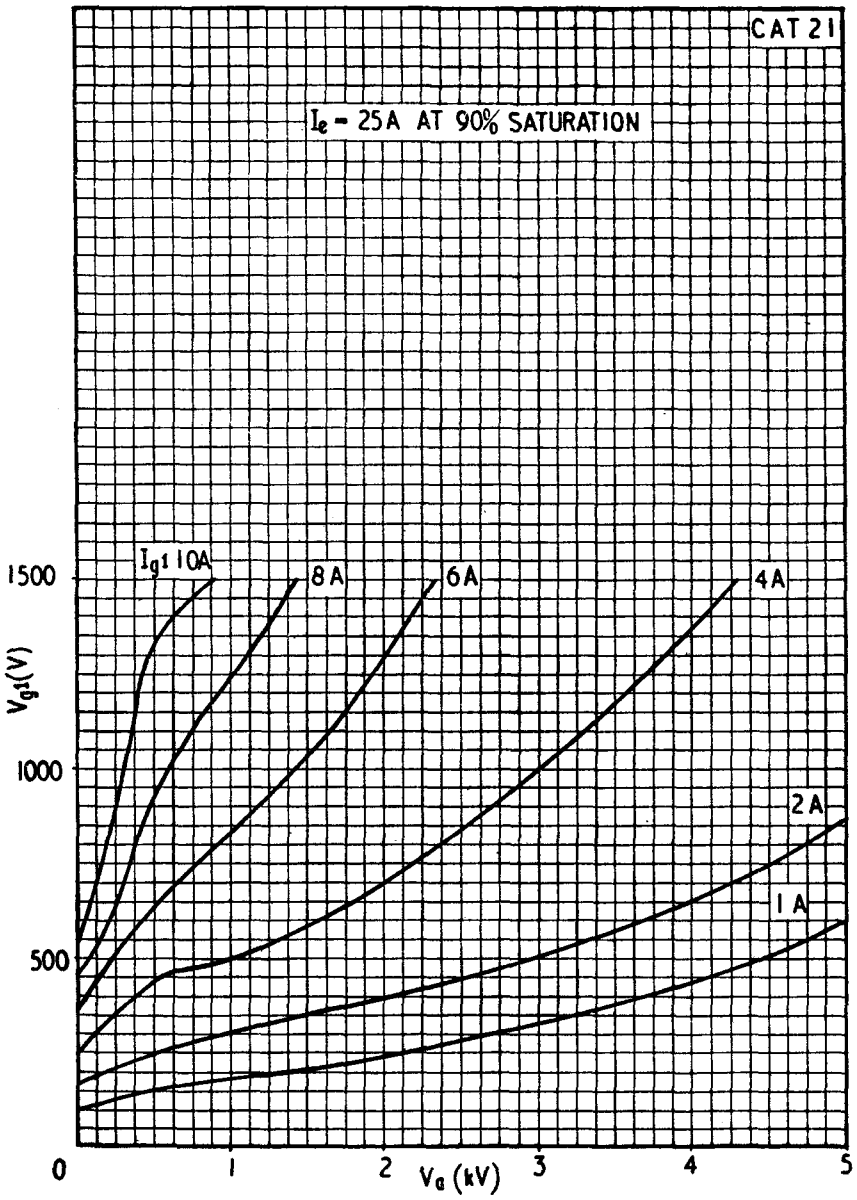
$I_{e(pk)}$		36	36	30	25	25	A
V_a		10	7	5	10	7	kV
I_a		5·6	5·6	5·9	4·6	4·6	A
V_{gl}		−1,440	−760	−510	−940	−630	V
$v_{gl(pk)}$		2,590	1,710	1,460	1,940	1,630	V
I_{gl}	(a)	1·3	1·5	1·6	0·9	1·2	A
P_{dr}	(a)	3·4	2·5	2·3	1·75	1·9	kW
p_a		16·6	13·3	12·7	14·7	11·2	kW
P_{out}		39·4	25·9	16·8	31·3	21·0	kW
Z_a		810	580	360	1,020	720	Ω

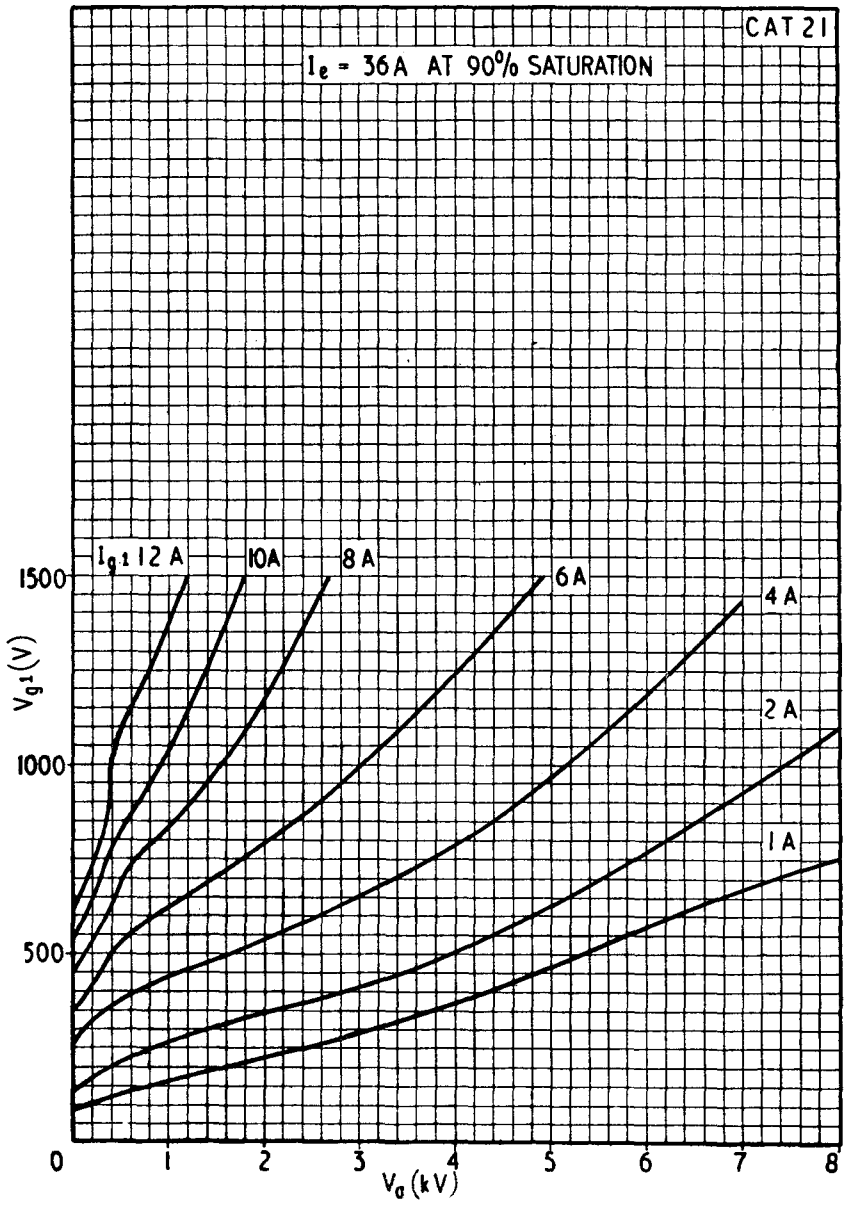
The data given for typical operating conditions applies to operation at frequencies up to 50 Mc/s. At higher frequencies the anode voltage must be reduced in accordance with the following table:

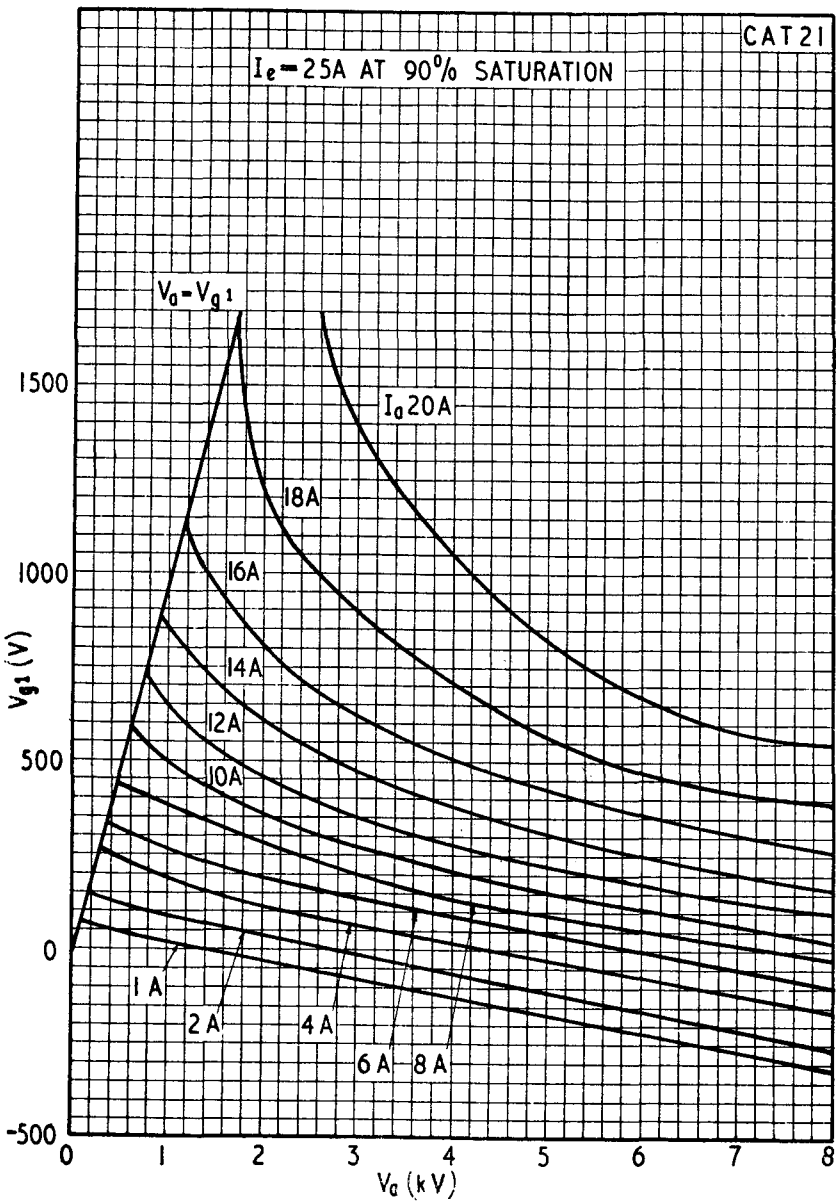
f (Mc/s)	50	75	100
% $V_{a(max)}$	100	68	60

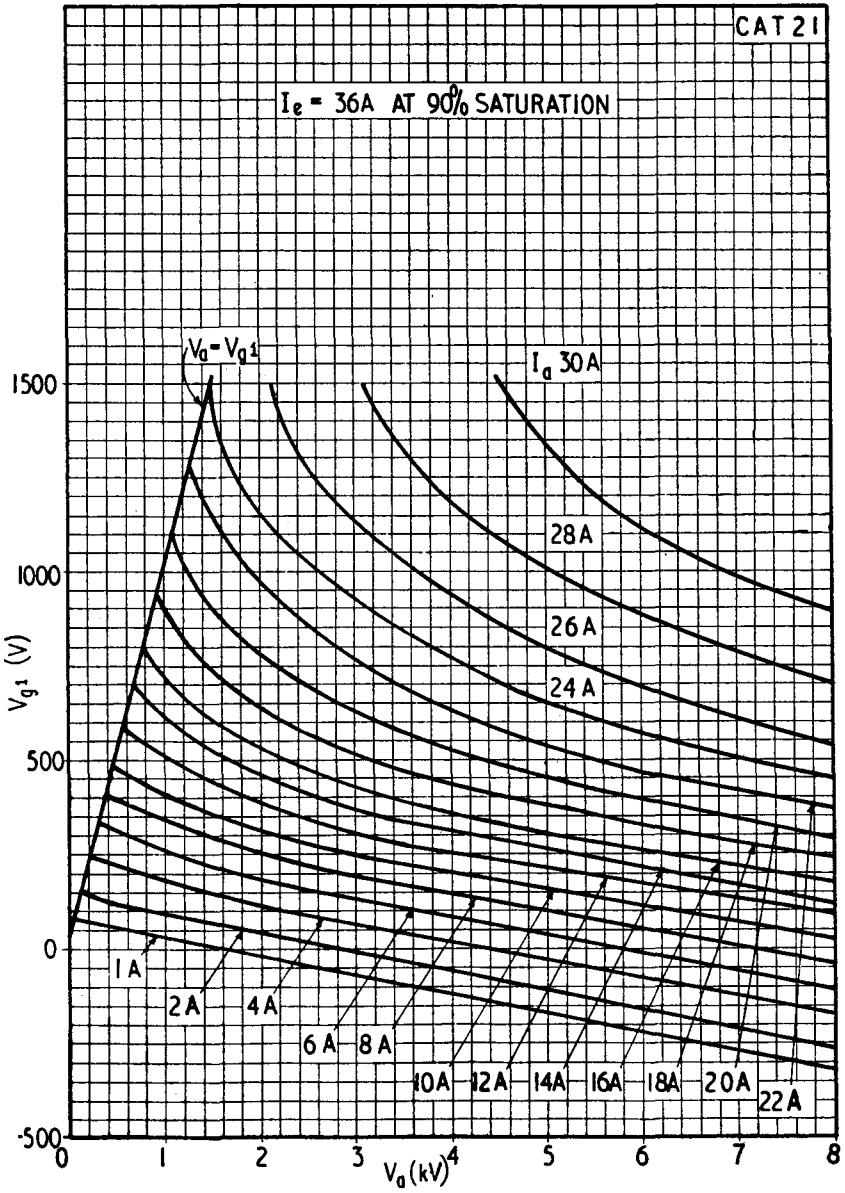

CAT21
I_e = 25A AT 90% SATURATION
V_{g1} + 900
+800
+700
+600
+500
+400
+300
+200
+100
0
-100
-200
-300
I_a (A)
V_a (kV)
0
1
2
3
4
5
6
7
8
5
10
15
20

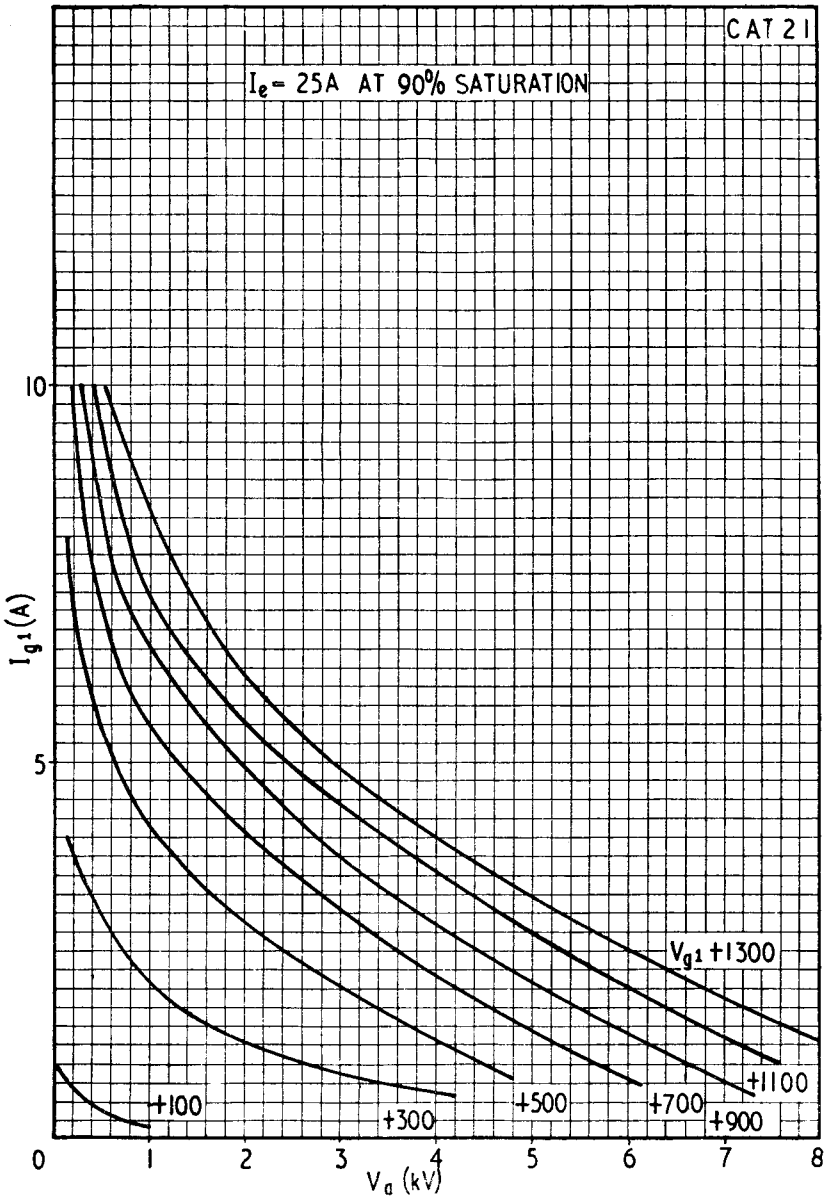

CAT21
I_e = 36A AT 90% SATURATION
V_{g1} + 1100
+1000
+900
+800
+700
+600
+500
+400
+300
+200
+100
0
-100
-200
-300
I_a (A)
V_a (kV)
0
1
2
3
4
5
6
7
8
5
10
15
20

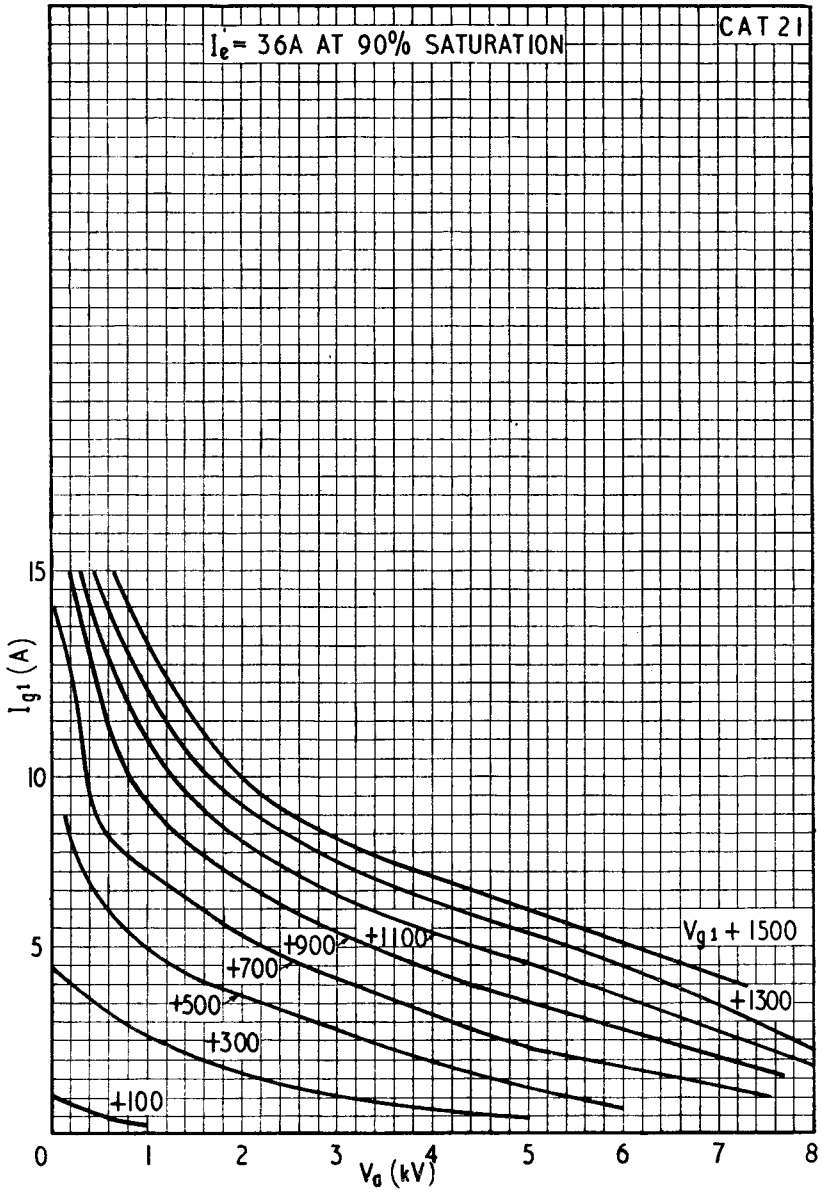

CAT 21
I_e = 25A AT 90% SATURATION
I_{g1} 10A
8A
6A
4A
2A
1A
1500
1000
500
V_{g1}(V)
0
1
2
3
4
5
V_a (kV)

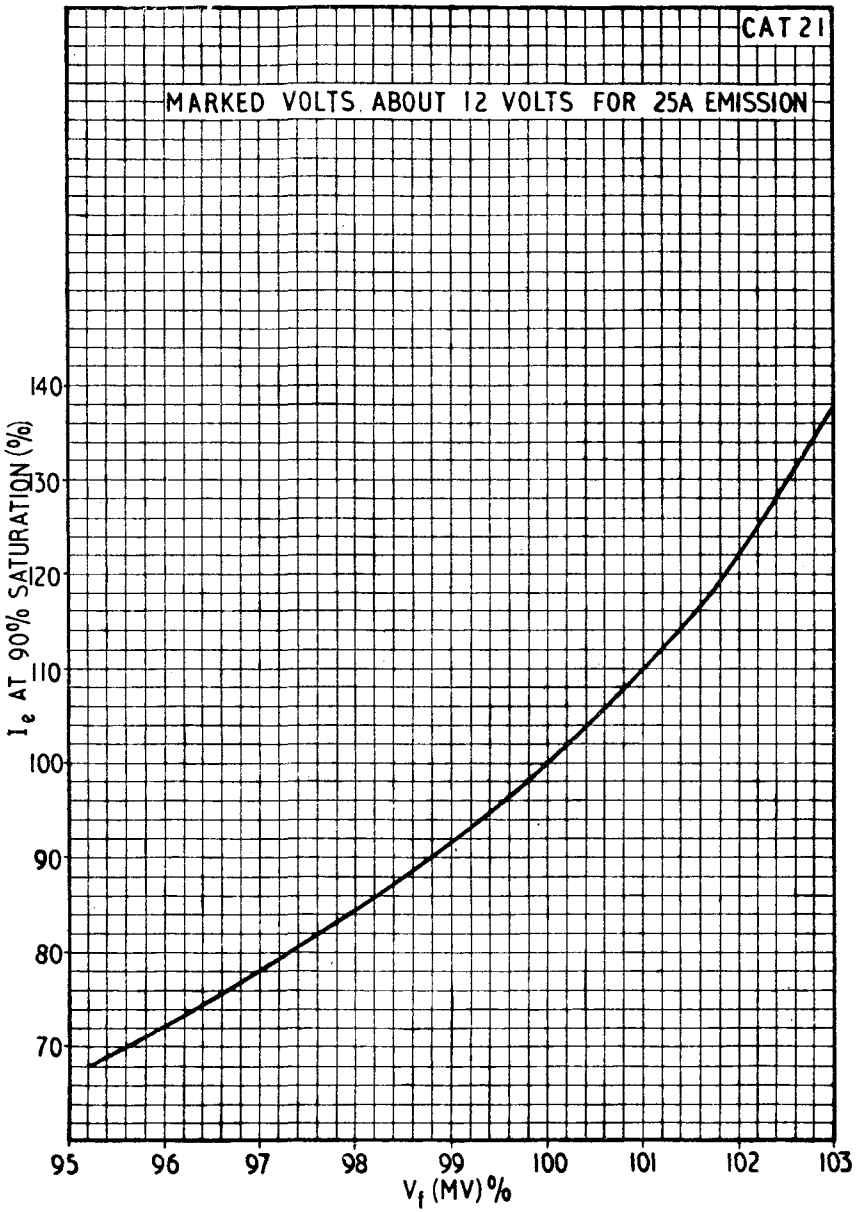

CAT 21
I_e = 36A AT 90% SATURATION
I_{g1} 12 A
10A
8 A
6A
4 A
2 A
1 A
1500
1000
500
V_{g1}(V)
0
1
2
3
4
5
6
7
8
V_a (kV)

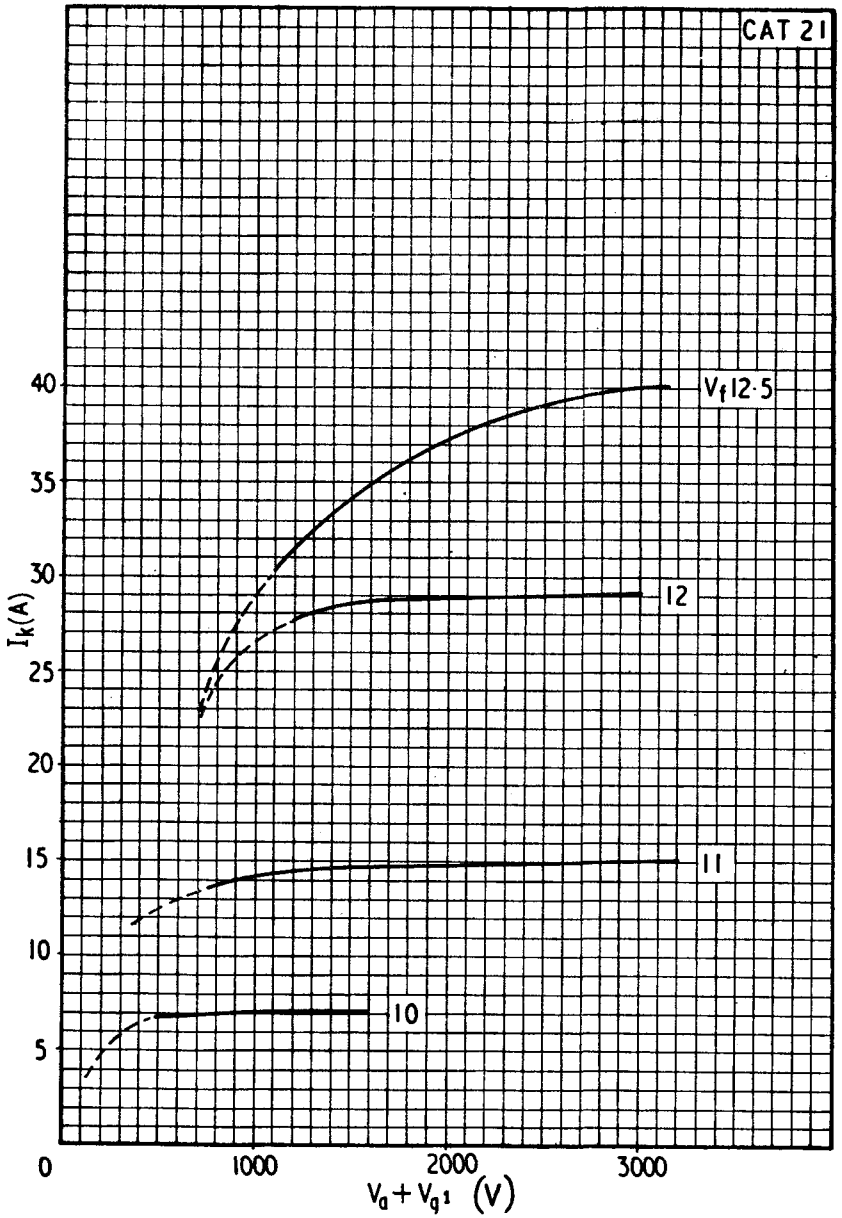

CAT 21
I_e = 25A AT 90% SATURATION
$V_a = V_{g1}$
I_a 20A
18A
16A
14A
12A
10A
1 A
2 A
4 A
6 A
8 A
V_{g1} (V)
1500
1000
500
0
-500
0
1
2
3
4
5
6
7
8
V_a (kV)

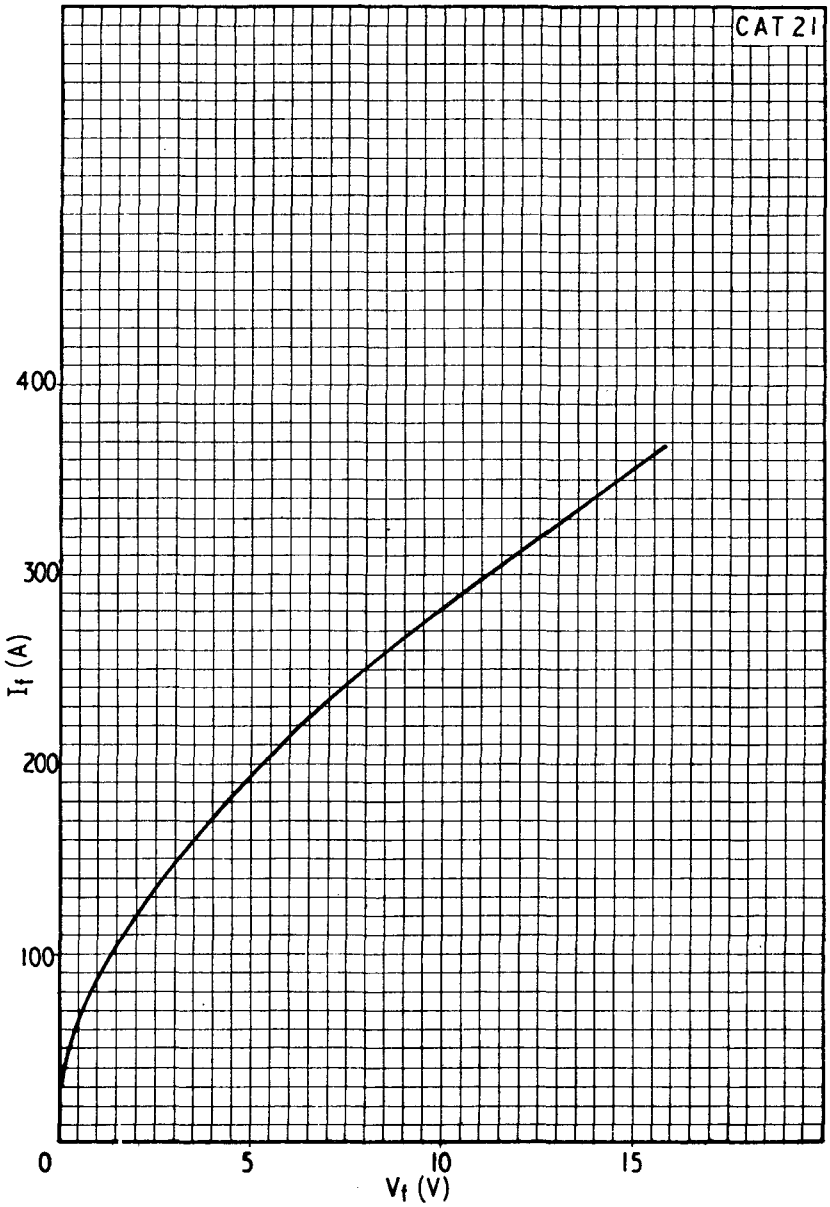

CAT 21
I_e = 36A AT 90% SATURATION
$V_a = V_{g1}$
I_a 30A
28A
26A
24A
1 A
2 A
4 A
6 A
8 A
10A
12A
14A
16A
18A
20A
22A
V_{g1} (V)
1500
1000
500
0
-500
0
1
2
3
4
5
6
7
8
V_a (kV)


CAT 21
I_e = 25A AT 90% SATURATION
I_{g1} (A)
V_a (kV)
V_{g1} +1300
+1100
+900
+700
+500
+300
+100
0
1
2
3
4
5
6
7
8
5
10


CAT 21
I_e = 36A AT 90% SATURATION
I_{g1} (A)
V_a (kV)
V_{g1} + 1500
+1300
+1100
+900
+700
+500
+300
+100
0
1
2
3
4
5
6
7
8
5
10
15


CAT 21
MARKED VOLTS ABOUT 12 VOLTS FOR 25A EMISSION
I_e AT 90% SATURATION (%)
140
130
120
110
100
90
80
70
95
96
97
98
99
100
101
102
103
V_f (MV) %


CAT 21
I_k (A)
40
35
30
25
20
15
10
5
0
1000
2000
3000
$V_a + V_{g1}$ (V)
V_f 12·5
12
11
10



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