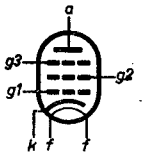
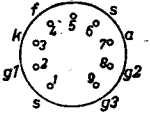
OUTPUT PENTODE for use in professional equipment (life longer than 10 000 hours)
PENTHODE DE SORTIE pour utilisation dans l'equipement professionnel (durée plus longe que 10 000 heures)
ENDPENTODE zur Verwendung in professionellen Anlagen (Lebensdauer langer als 10 000, Stunden)

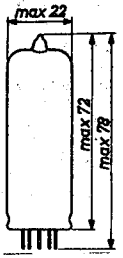
Heating : indirect by A.C. or D.C. series or parallel supply
Chauffage: indirect par C.A. ou C.C. alimentation série ou parallèle
Heizung : indirect durch Wechsel- oder Gleichstrom; Serien- oder Parallelspeisung

V_f = 6,3 V [1)]
I_f = 0,75 A [1)]

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Noval

Capacitances
Capacités
Kapazitäten

C_a	=	7,0 ± 0,5 pF
C_{g1}	=	11,5 ± 0,7 pF
C_{ag1}	<	0,1 pF
C_{g1f}	<	0,25 pF
C_{kf}	=	7,0 pF

[1)] See page 2
Voir page 2
Siehe Seite 2

SPECIAL QUALITY, LONG LIFE, SHOCK AND VIBRATION RESISTANT OUTPUT PENTODE

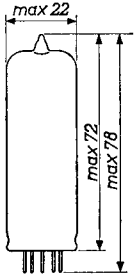
HEATING

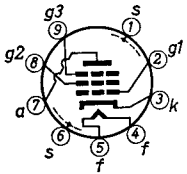
Indirect by A.C. or D.C.; series or parallel supply

Heater voltage V_f = 6.3 V

Heater current I_f = 0.7 A ←

Dimensions in mm





Base: NOVAL with gold plated pins

CHARACTERISTICS

Column I: Setting of the tube and typical (average) measuring results of new tubes
II: Characteristics range values for equipment design
III: Data indicating the end point of life

Capacitances

		I	II
Grid No.1 to all other elements except anode	C_{g_1} =	10.0	9.2-10.8 pF
Anode to all other elements except grid No.1	C_a =	6.8	6.3- 7.3 pF
Anode to grid No.1	C_{ag_1} =		< 0.15 pF
Grid No.1 to heater	C_{g_1f} =		< 0.25 pF
Cathode to heater	C_{kf} =	7.0	pF

Heater current

		I	II	III	
Heater voltage	V_f =	6.3			V
Heater current	I_f =	0.7	0.665-0.735	0.665-0.735	A

1) In order to obtain a useful tube life of 10 000 hours in the case of parallel supply, the maximum variation of V_f should be less than ± 5% (absolute limits).
In order to obtain a useful tube life of 10 000 hours in the case of series supply, the maximum variation of I_f due to voltage fluctuations and tolerances in the parts should be less than ± 1.5% (absolute limits).

Afin d'obtenir une durée du tube de 10 000 heures en cas d'alimentation – parallèle la variation max. de V_f sera de moins de ± 5% (limites absolues).
Afin d'obtenir une durée du tube de 10 000 heures en cas d'alimentation – série la variation max. de I_f par suite de fluctuations de la tension et de tolérances des accessoires sera de moins de ± 1,5% (limites absolues).

Zur Erhaltung einer nützlichen Lebensdauer der Röhre von 10 000 Stunden bei Parallelbetrieb soll die max. Schwankung von V_f weniger als ± 5% betragen (absolute Grenzen).
Zur Erhaltung einer nützlichen Lebensdauer der Röhre von 10 000 Stunden bei Serienbetrieb soll die max. Schwankung von I_f infolge Spannungsschwankungen und Streuungen der Einzelteile weniger als ± 1,5% betragen (absolute Grenzen).

2) The end point of life is reached when one or more of these characteristics have changed to the following values:

Le tube est arrivé à la fin de sa durée si une ou quelques-unes de ces caractéristiques sont changées jusqu'aux valeurs suivantes:

Das Ende der Lebensdauer ist erreicht, wenn eine oder mehrere dieser Kennwerte bis folgende Werte geändert sind:

$I_a \leq 21$ mA
$I_{g2} \leq 2{,}0$ mA
$S \leq 6{,}0$ mA/V
$-I_{g1} \geq 1$ µA

CHARACTERISTICS (continued)

Typical characteristics		I	II	III
Anode supply voltage	V_{ba} =	204.5		V
Grid No.3 voltage	V_{g3} =	0		V
Grid No.2 supply voltage	V_{bg2} =	204.5		V
Cathode resistor	R_k =	130		Ω
Anode current	I_a =	30	26.5-33.5	21 mA
Grid No.2 current	I_{g2} =	4.1	2.7- 5.5	2.0 mA
Mutual conductance	S =	9.0	7.4-10.6	6.0 mA/V

Output power		I	II	III
Anode voltage	V_a =	200		V
Grid No.3 voltage	V_{g3} =	0		V
Grid No.2 voltage	V_{g2} =	200		V
Anode current	I_a =	30		mA
Load resistance	$R_{a\sim}$ =	7		kΩ
Output power	W_o =	2.7	> 2.0	W

Negative grid current		I	II	III
Anode supply voltage	V_{ba} =	204.5		V
Grid No.3 voltage	V_{g3} =	0		V
Grid No.2 supply voltage	V_{bg2} =	204.5		V
Cathode resistor	R_k =	130		Ω
Grid No.1 resistor	R_{g1} =	0.5		MΩ
Negative grid No.1 current	$-I_{g1}$ =		< 0.5	1.0 μA

Cut-off voltage		I	II	III
Anode voltage	V_a =	200		V
Grid No.3 voltage	V_{g3} =	0		V
Grid No.2 voltage	V_{g2} =	200		V
Grid No.1 voltage	V_{g1} =	-14		V
Anode current	I_a =		< 0.2	mA

Operating characteristics for use as output tube
Caractéristiques d'utilisation comme tube de sortie
Betriebsdaten als Endröhre

V_a	=	200	250 V
V_{g3}	=	0	0 V
V_{g2}	=	200	- V
V_{bg2}	=	-	250 V
R_{g2}	=	-	1 kΩ
R_k	=	130	270 Ω
$-I_{g1}$	= max.	0,5 [2])	- µA
$I_a(V_i=0)$	=	30±3,5 [2])	24 mA
$I_{g2}(V_i=0)$	=	4,1±1,4 [2])	3,3 mA
S	=	9,0±1,6 [2])	- mA/V
R_i	=	90	- kΩ
μ_{g2g1}	=	21,5	-
W_o ($R_{a\sim}$ = 7 kΩ, d_{tot} = 10 %)	=	2,7	- W
W_o ($R_{a\sim}$ = 10 kΩ, d_{tot} = 10 %)	=	-	2,8 W
$-V_{g1}$ (I_{g1} = +0,3 µA)	= max.	1,3	- V
I_a (V_{g1} = -14 V)	= max.	0,2	- mA

Hum voltage
Tension de ronflement (R_{g1} = 1 MΩ, f = 50 c/s) V_{g1} = max. 250 µV
Brummspannung

Insulation k-f
Isolation k-f (V_{kf} = 120 V) R_{kf} = min. 5 MΩ

Shock and vibration. The tube can withstand vibrations of 2,5 g and 50 c/s lasting up to 96 hours and can likewise withstand impact accelerations of about 500 g (measured with the N.R.L. impact machine for electronic devices, lifting the hammer over an angle of 30°).
Chocs et vibrations. Le tube peut résister à des vibrations de 2,5 g et de 50 c/s pendant 96 heures et à une accélération par choc d'environ 500 g (mesurée avec la machine N.R.L. à percussion pour des dispositifs électroniques, en élevant le marteau d'un angle de 30°).
Stösse und Schwingungen. Die Röhre kann Schwingungen von 2,5 g bei 50 Hz während 96 Stunden aushalten und kann eine Stossbeschleunigung von etwa 500 g vertragen (gemessen mit der N.R.L. Stossmaschine für elektronische Vorrichtungen wobei der Hammer über einen Winkel von 30° gehoben wird).

[2]) See page 2; voir page 2; Siehe Seite 2

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CHARACTERISTICS (continued)

Hum voltage

			I	II	III	
Anode voltage	V_a	=	200			V
Grid No.3 voltage	V_{g_3}	=	0			V
Grid No.2 voltage	V_{g_2}	=	200			V
Cathode resistor	R_k	=	130			Ω
Anode resistor	R_a	=	1			kΩ
Hum voltage	$V_{g_1 hum}$	=		< 0.25		mV[1]

Insulation between heater and cathode

			I	II	III	
Voltage between heater and cathode (cathode positive)	V_{kf}(k pos.)	=	120			V
Series resistor	R	=	1			MΩ
Current from cathode to heater	I_{kf}	=		< 15	20	μA

Insulation between the electrodes

			I	II	III	
Voltage between two arbitrary electrodes	V	=	300			V [2]
Insulation resistance	R_{isol}	=		> 50	10	MΩ

LIFE EXPECTANCY: 10 000 hours under the following life-test conditions:

Heater voltage	V_f	= 6.3 V
Anode voltage	V_a	= 200 V
Grid No.3 voltage	V_{g_3}	= 0 V
Grid No.2 voltage	V_{g_2}	= 200 V
Cathode resistor	R_k	= 130 Ω
Voltage between cathode and heater (cathode positive)	V_{kf}(k pos.)	= 120 V

The data indicating the end point of life are given in column III under the heading "Characteristics".

[1]) Hum voltage referred to grid No.1, measured with straight response filter. Frequency of heater supply voltage 50 c/s. Centre tap of heater transformer grounded.

[2]) When measured between the cathode and another electrode, the cathode should be positive

Operating characteristics class AB, two tubes
Caractéristiques d'utilisation classe AB, deux tubes
Betriebsdaten Klasse AB, zwei Röhren

V_a	=	200			250			V
V_{g2}	=	200			250			V
V_{g3}	=	0			0			V
R_k	=	130			150			Ω
R_{aa}	=	9			9			kΩ
V_i	=	0	0,31	5,2	0	0,32	7,8	V_{eff}
I_a	=	2x20,6	-	2x24,6	2x23,5	-	2x29,5	mA
I_{g2}	=	2x 2,8	-	2x 4,9	2x 3,2	-	2x 6,6	mA
W_o	=	-	0,05	5,7	-	0,05	9,0	W
d_{tot}	=	-	-	3,0	-	-	4,5	%

Limiting values (absolute values)
Caractéristiques limites (valeurs absolues)
Grenzdaten (absolute Werte)

V_{a_o}	= max.	600	V
V_a	= max.	300	V
W_a	= max.	8	W
V_{g2_o}	= max.	600	V
V_{g2}	= max.	300	V
W_{g2}	= max.	2,6	W
$-V_{g1}$	= max.	100	V
$-V_{g3}$	= max.	100	V
I_k	= max.	50	mA
V_{kf}	= max.	120	V
R_{kf}	= max.	20	kΩ [3]
R_{g1}	= max.	1	MΩ [4]

Bulb temperature
Température de l'ampoule = max. 225 °C
Kolbentemperatur

[3] For stable operation it is advisable to restrict R_{kf} to values < 20 kΩ
Afin d'obtenir une opération stable il est recommendable de limiter R_{kf} à des valeurs < 20 kΩ
Zur Erhaltung einer stabilen Wirkung ist es empfehlenswert Rkf auf Werte < 20 kΩ zu beschränken

[4] With automatic grid bias
Avec polarisation automatique
Mit automatischer Gittervorspannung

CHARACTERISTICS (continued)

SHOCK RESISTANCE: about 500 g [2])

Forces as applied by the NRL impact machine for electronic devices caused by 5 blows of the hammer lifted over an angle of 30° in each of four different positions of the tube.

VIBRATION RESISTANCE: 2.5 g [2])

Vibrational forces for a period of 32 hours at a frequency of 50 c/s in each of three directions

OPERATING CHARACTERISTICS for use as output tube

Anode voltage	V_a	=	200	250	V
Grid No.3 voltage	V_{g3}	=	0	0	V
→ Grid No.2 voltage	V_{g2}	=	200	250	V
Grid No.2 resistor	R_{g2}	=	-	1	kΩ
Cathode resistor	R_k	=	130	270	Ω
Anode current	I_a	=	30	24	mA
Grid No.2 current	I_{g2}	=	4.1	3.3	mA
Mutual conductance	S	=	9	-	mA/V
→ Internal resistance	R_i	=	52	-	kΩ
Amplification factor of grid No.2 with respect to grid No.1	$\mu_{g_2g_1}$	=	21.5	-	
Load resistance	$R_{a\sim}$	=	7	10	kΩ
Output power	W_o	=	2.7	2.8	W
Total distortion	d_{tot}	=	10	10	%

OPERATING CHARACTERISTICS class AB, two tubes

Anode voltage	V_a	=		200		V
Grid No.3 voltage	V_{g3}	=		0		V
Grid No.2 voltage	V_{g2}	=		200		V
Cathode resistor	R_k	=		130		Ω
Load resistance	$R_{aa\sim}$	=		9		kΩ
Input voltage	V_i	=	0	0.31	5.2	V(RMS)
Anode current	I_a	=	2x20.6	-	2x24.6	mA
Grid No.2 current	I_{g2}	=	2x 2.8	-	2x 4.9	mA
Output power	W_o	=	0	0.05	5.7	W
Total distortion	d_{tot}	=	-	-	3.0	%

[2]) See page 3

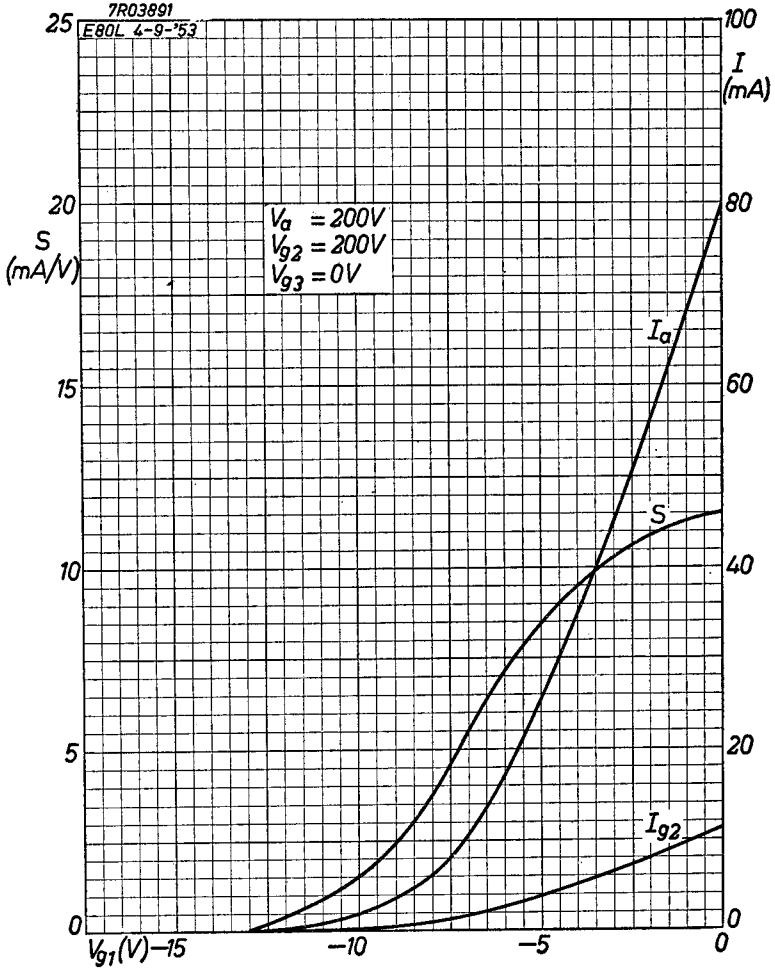
OPERATING CHARACTERISTICS class AB, two tubes (continued)						
Anode voltage	V_a	=		250		V
Grid No.3 voltage	V_{g3}	=		0		V
Grid No.2 voltage	V_{g2}	=		250		V
Cathode resistor	R_k	=		150		Ω
Load resistance	$R_{aa\sim}$	=		9		kΩ
Input voltage	V_i	=	0	0.32	7.8	V(RMS)
Anode current	I_a	=	2x23.5	-	2x29.5	mA
Grid No.2 current	I_{g2}	=	2x 3.2	-	2x 6.6	mA
Output power	W_o	=	0	0.05	9.0	W
Total distortion	d_{tot}	=	-	-	4.5	%

LIMITING VALUES (Absolute limits)				
Anode voltage in cold condition	V_{a_o}	= max.	600	V
Anode voltage	V_a	= max.	300	V
Anode dissipation	W_a	= max.	8	W
Negative grid No.3 voltage	$-V_{g_3}$	= max.	100	V
Grid No.2 voltage in cold condition	V_{g2o}	= max.	600	V
Grid No.2 voltage	V_{g_2}	= max.	300	V
Grid No.2 dissipation	W_{g_2}	= max.	2.6	W
Negative grid No.1 voltage	$-V_{g_1}$	= max.	100	V
Cathode current	I_k	= max.	50	mA
Voltage between heater and cathode	V_{kf}	= max.	120	V
Heater voltage in case of parallel supply	V_f	=	6.3 V ± 5	%
Heater current in case of series supply	I_f	=	0.7 A ± 1.5	%
Bulb temperature	t_{bulb}	=	225	°C

LIMITING VALUES FOR CIRCUIT DESIGN				
Grid No.1 circuit resistance in case of automatic bias	R_{g_1}	= max.	1	MΩ
Circuit resistance between cathode and heater	R_{kf}	= max.	20	kΩ

[1]) These test conditions are only given for evaluation of the ruggedness of the tube and should by no means be interpreted as suitable operating conditions

SQ **PHILIPS** **E 80 L**



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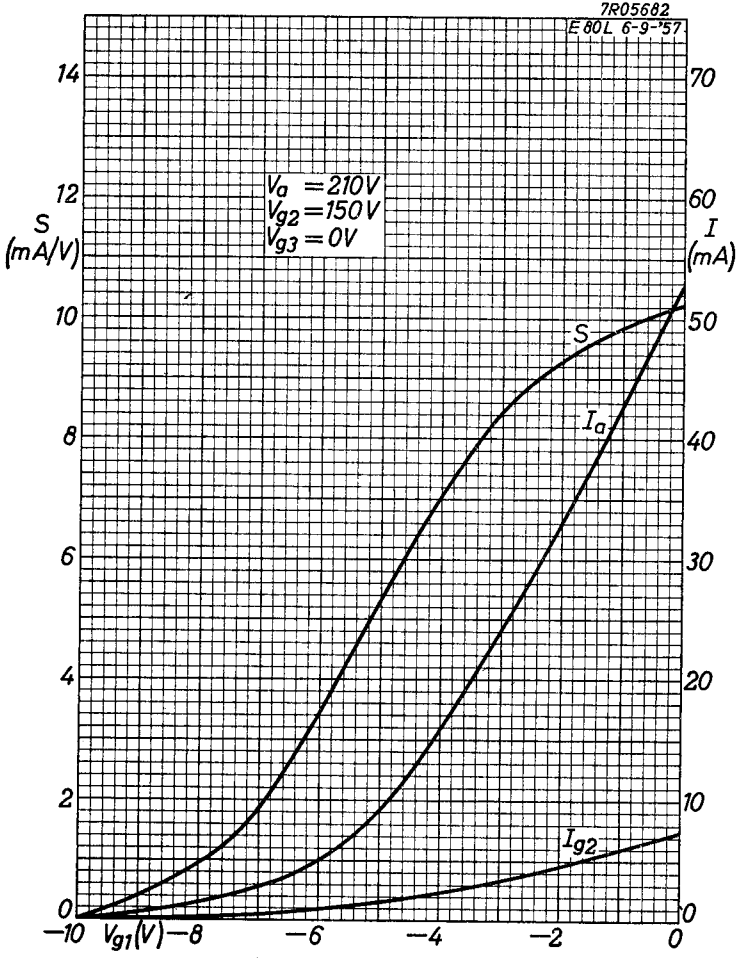
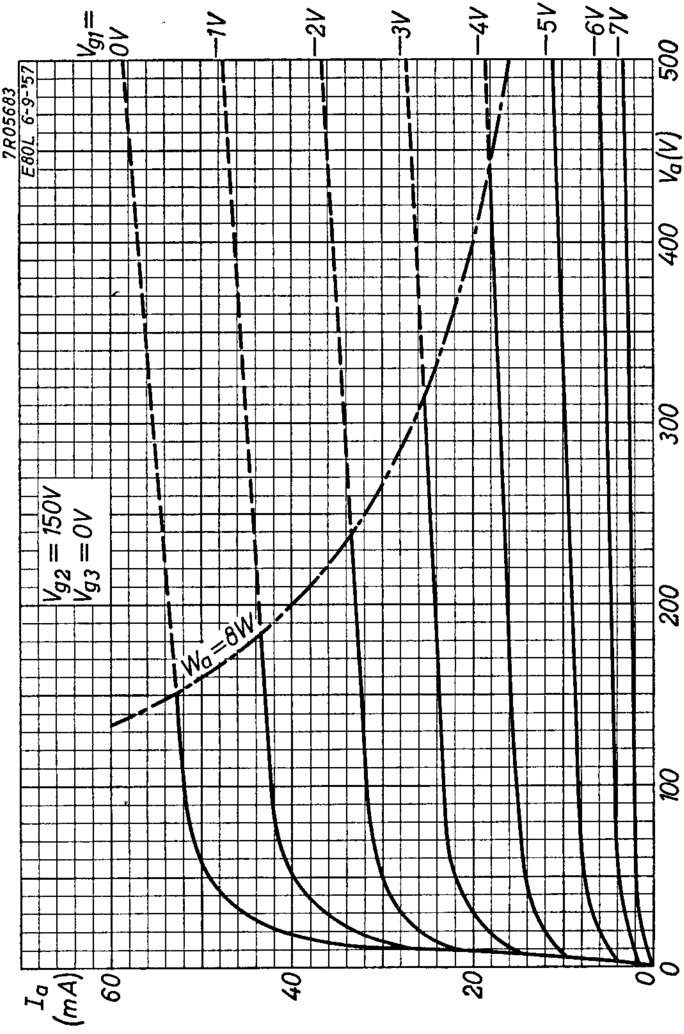
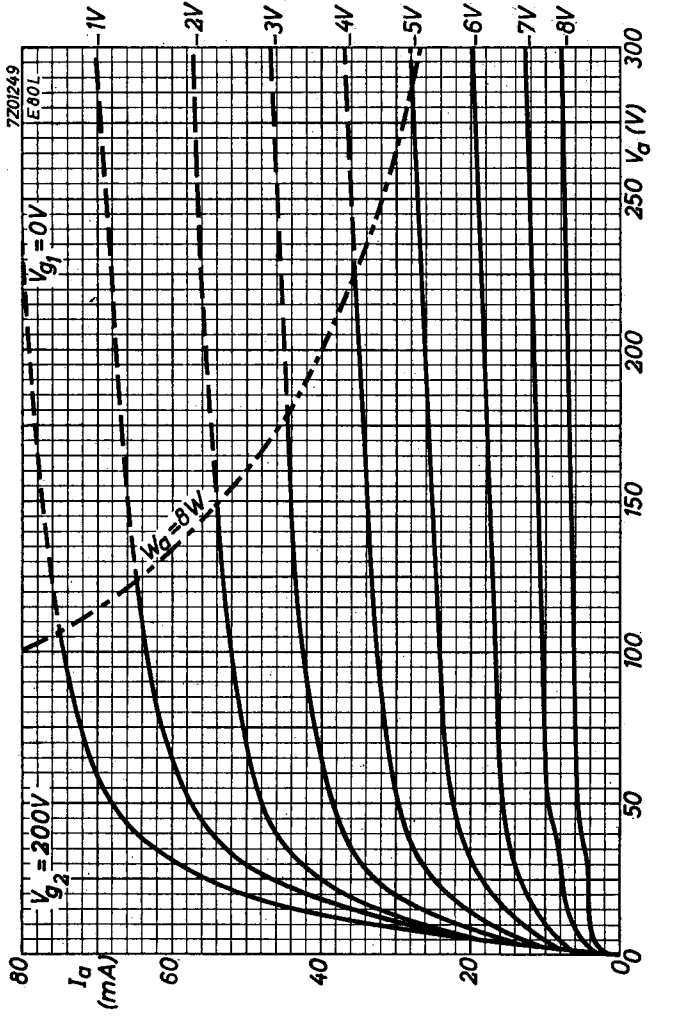
A


7R05682
E80L 6-9-'57
V_a = 210V
V_{g2} = 150V
V_{g3} = 0V
S
(mA/V)
I
(mA)
S
I_a
I_{g2}
V_{g1}(V)
14
12
10
8
6
4
2
0
70
60
50
40
30
20
10
0
−10
−8
−6
−4
−2
0


7R05683
E80L 6-9-'57
Vg1=
0V
-1V
-2V
-3V
-4V
-5V
-6V
-7V
Vg2 = 150V
Vg3 = 0V
Wa=8W
Ia (mA)
60
40
20
0
Va(V)
0
100
200
300
400
500

SQ **PHILIPS** **E80L**



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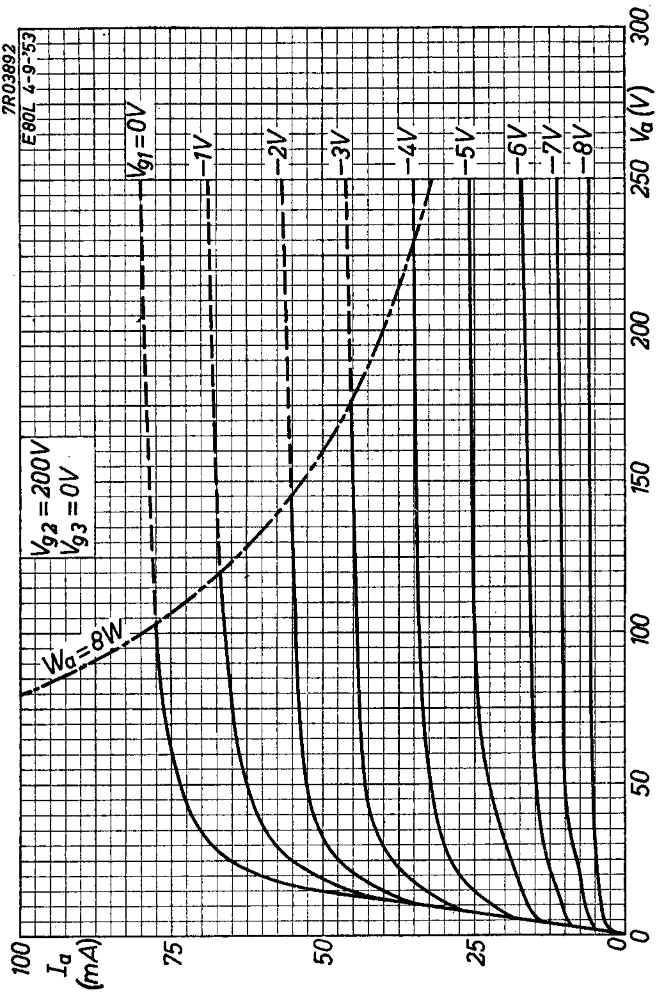
C

E 80 L PHILIPS SQ



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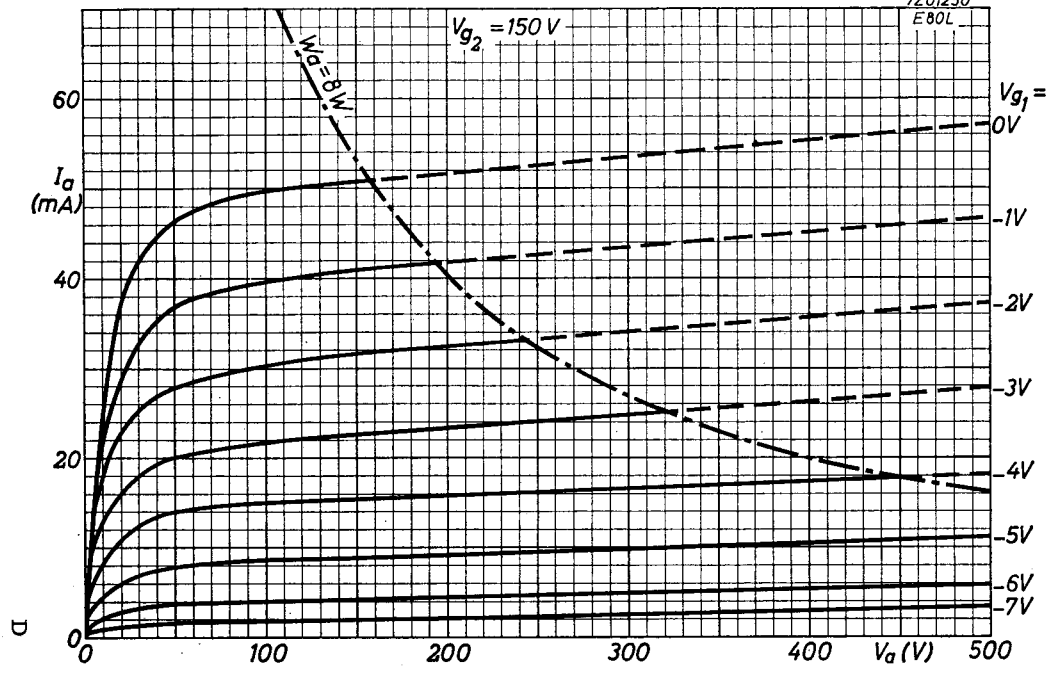
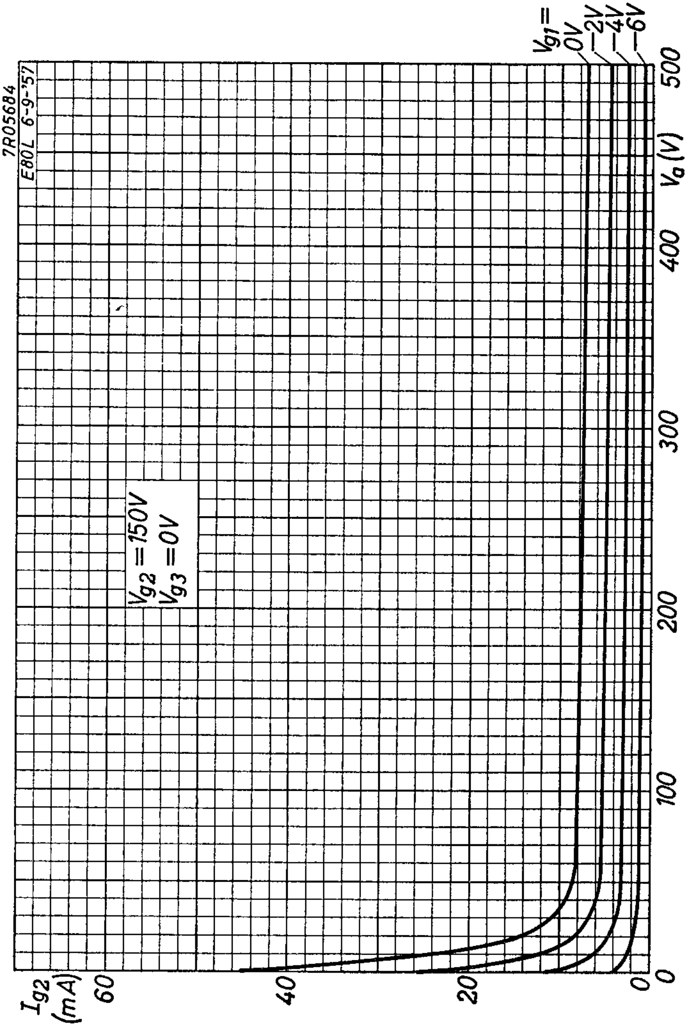

7Z01250
E80L
V_{g_2} = 150 V
W_a = 8 W
V_{g_1} =
0V
-1V
-2V
-3V
-4V
-5V
-6V
-7V
I_a (mA)
60
40
20
0
0
100
200
300
400
500
V_a (V)

D

SQ **PHILIPS** **E 80 L**



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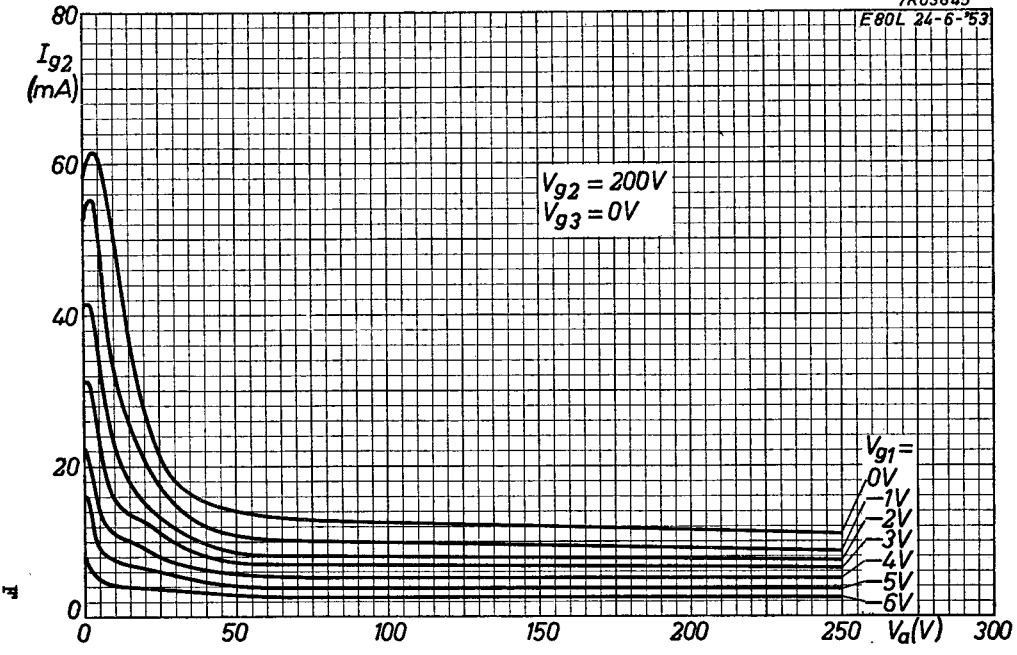
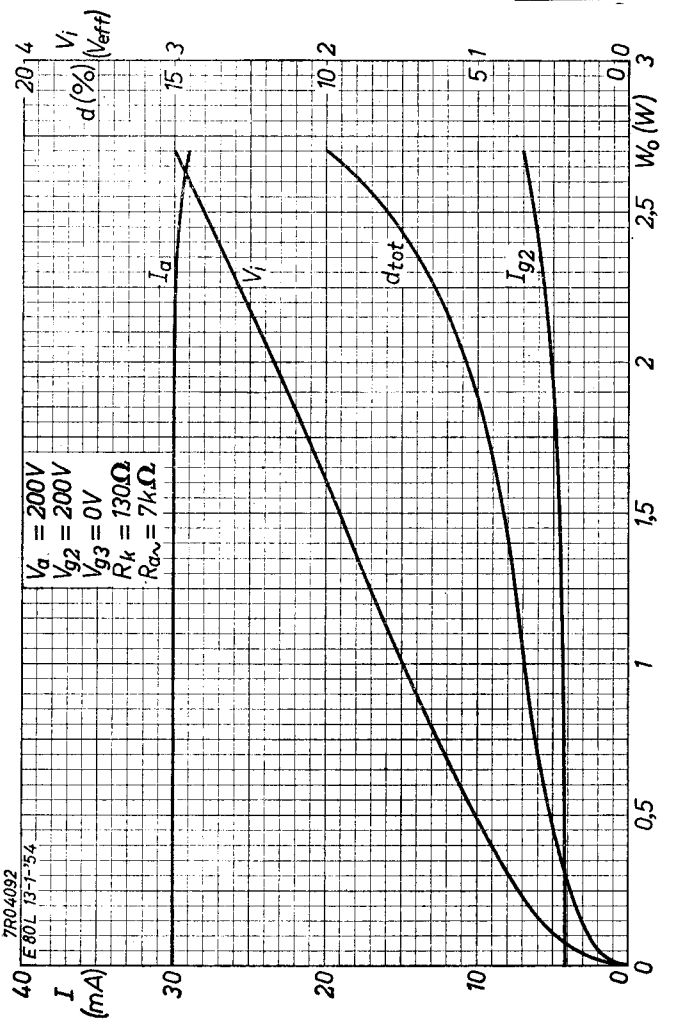
E



E80L

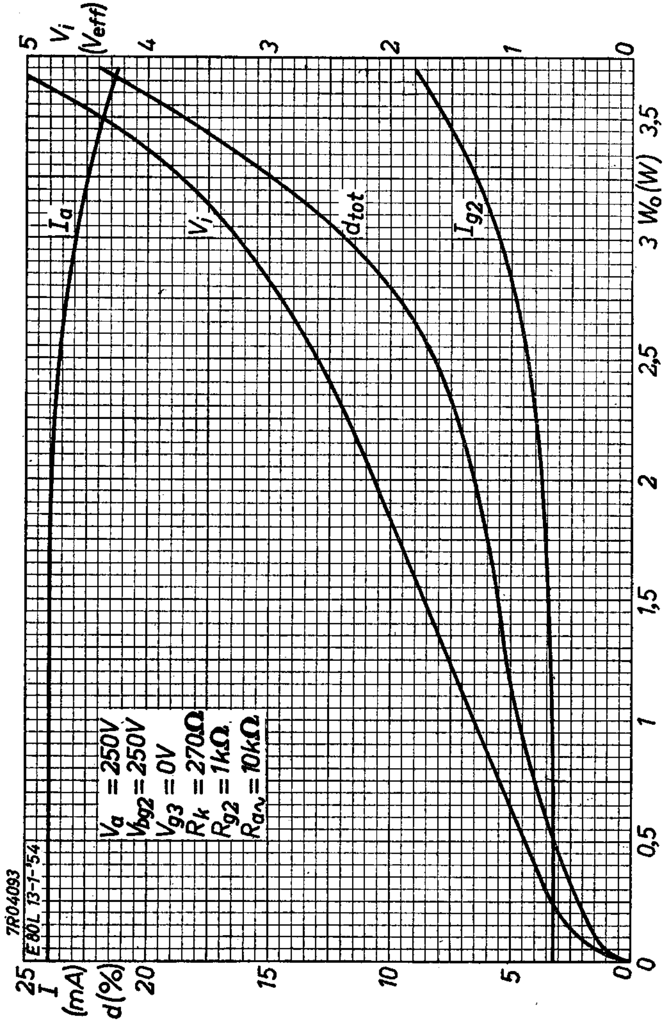
PHILIPS SQ


7R04092
E80L 13-1-'54
I (mA)
40
30
20
10
0
V_a = 200V
V_{g2} = 200V
V_{g3} = 0V
R_k = 130Ω
$R_{a\sim}$ = 7kΩ
I_a
V_i
d_{tot}
I_{g2}
V_i (Veff)
d (%)
20 15 10 5 0
4 3 2 1 0
W_o (W)
0 0,5 1 1,5 2 2,5 3

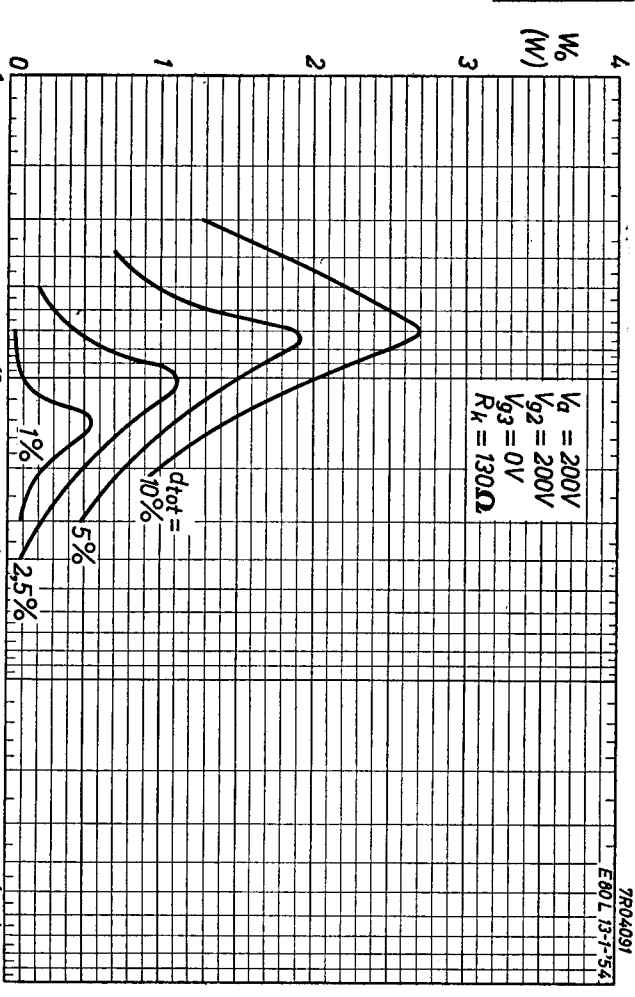
E80L

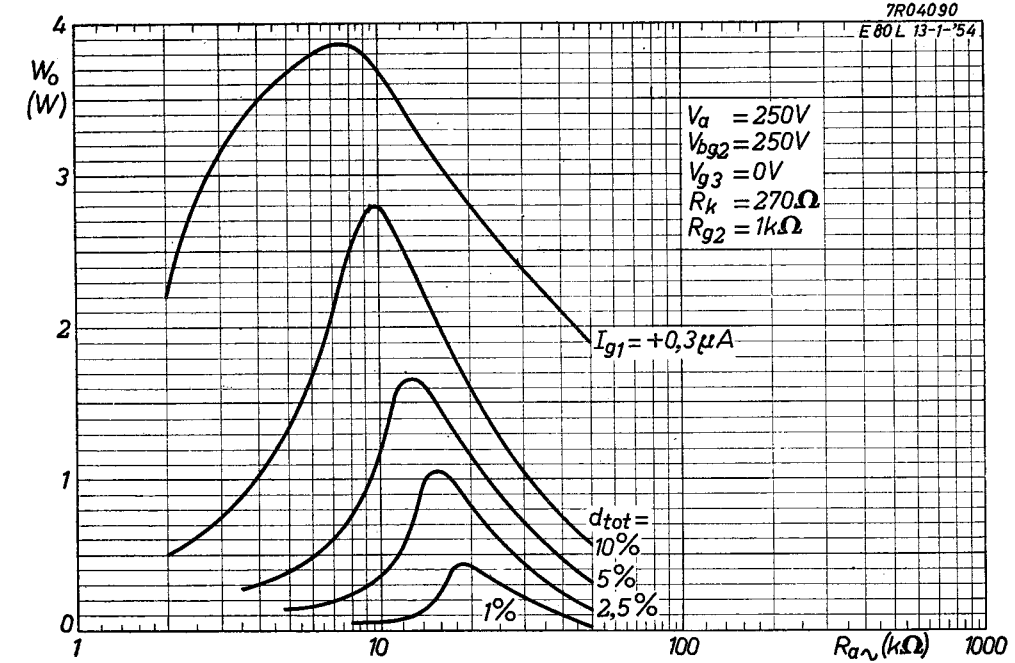
PHILIPS

SQ

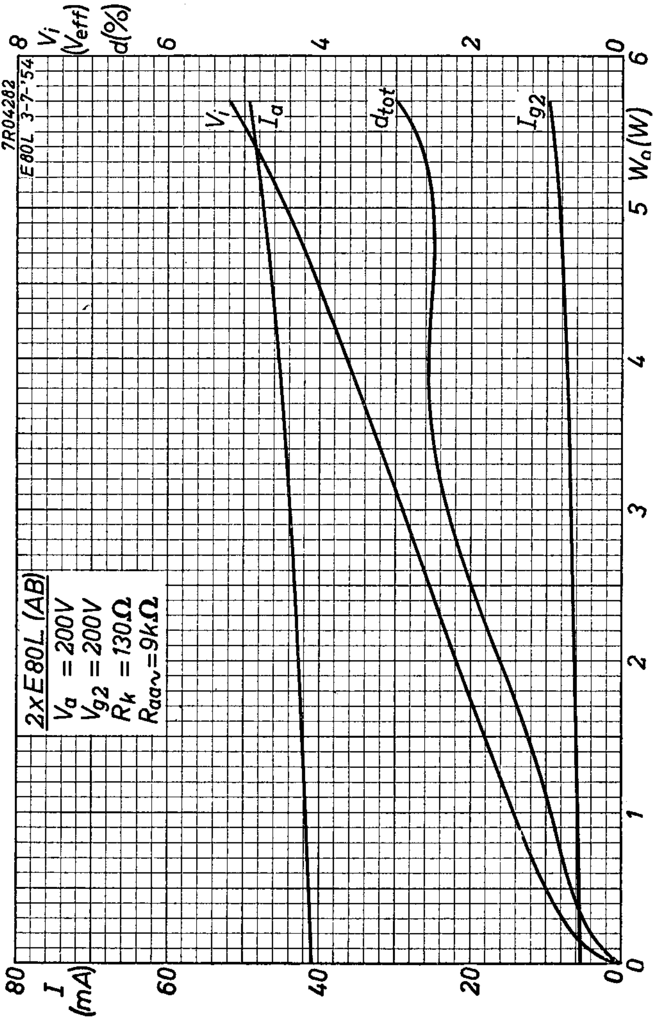


H


W_o (W)
0
1
2
3
4
V_a = 200V
V_{g2} = 200V
V_{g3} = 0V
R_k = 130Ω
d_{tot} =
10%
5%
2,5%
1%
1
10
100
1000
$R_{a\sim}$ (kΩ)
7R04091
E80L 13-1-'54.

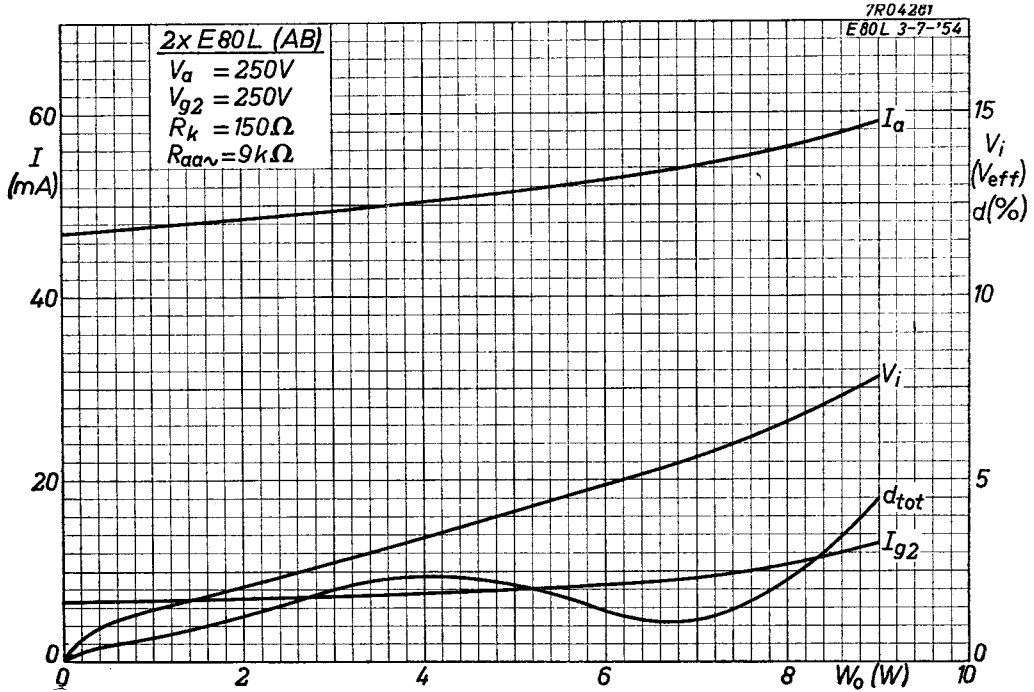

7R04090
E 80 L 13-1-'54
W_o (W)
4
3
2
1
0
1
10
100
1000
$R_{a\sim}$ (kΩ)
V_a = 250V
V_{bg2} = 250V
V_{g3} = 0V
R_k = 270Ω
R_{g2} = 1kΩ
I_{g1} = +0,3μA
d_{tot} =
10%
5%
2,5%
1%

SQ **PHILIPS** **E80L**

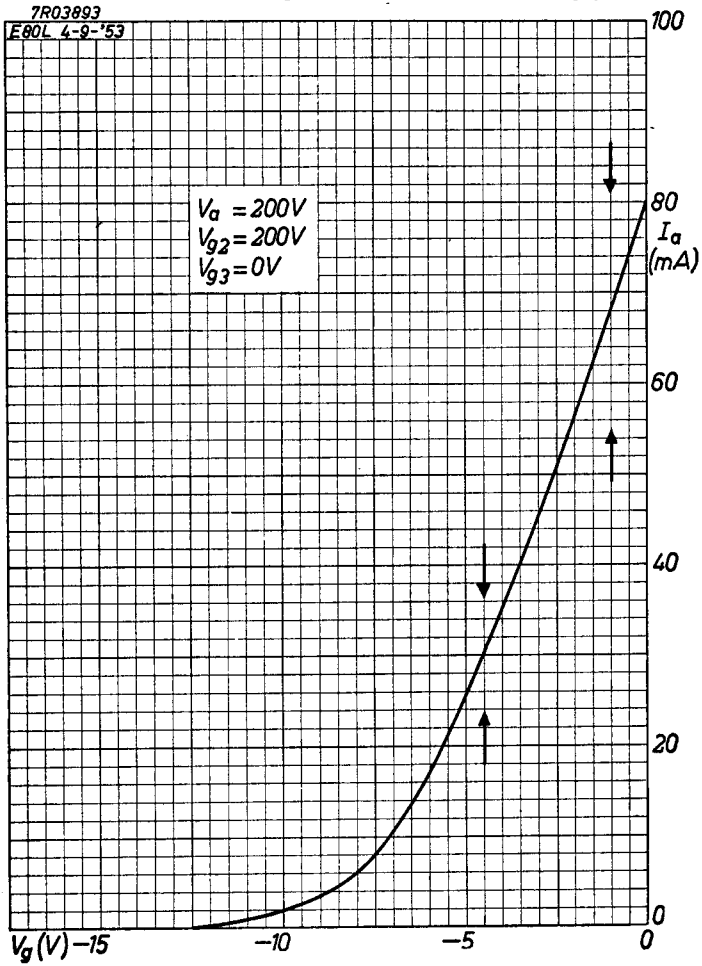


9.9.1957

K


7R04261
E80L 3-7-'54
2x E80L (AB)
V_a = 250V
V_{g2} = 250V
R_k = 150Ω
$R_{aa\sim}$ = 9kΩ
I (mA)
60
40
20
0
I_a
V_i
d_{tot}
I_{g2}
15
10
5
0
V_i (V_{eff})
d(%)
0
2
4
6
8
10
W_o (W)

Upper and lower current limits are indicated by arrows
Les limites supérieures et inférieures du courant sont indiquées par des flèches
Die oberen und unteren Stromgrenzen sind mittels Pfeile angegeben



E80L

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9	5	1962.09.09
10	A	1957.09.09
11	B	1957.09.09
12	C	1957.09.09
13	C	1962.09.09
14	D	1957.09.09
15	D	1962.09.09
16	E	1957.09.09
17	F	1957.09.09
18	G	1957.09.09
19	H	1957.09.09

20	I	1957.09.09
21	J	1957.09.09
22	K	1957.09.09
23	L	1957.09.09
24	M	1957.09.09
25, 26	FP	1999.06.11