



Erklärungen der bei den Tungstramröhren verwendeten Bezeichnungen.

A) BEZEICHNUNG DER ELEKTRODEN:

Heizfaden, resp. direkt geheizte Kathode	.....	f
Indirekt geheizte Kathode	.....	k
Gitter	.....	g
(bei Mehrgitterröhren: g1, g2, usw. gezählt von der Kathode aus)		
Metallisierung	.....	m
Anode	.....	a
Dioden-Anode	.....	d
(bei Doppel- oder Mehrfach-Dioden: d1, d2, usw.)		

Wenn bei einer Röhre mit zwei gleichen Anoden (Dioden-Anoden) es durch keinen Index bezeichnet ist auf welche der beiden sich die betreffende Angabe bezieht, so ist sie für beide gleichermassen gültig.

B) BEZEICHNUNGEN FÜR ELEKTRISCHE WERTE:

SPANNUNG

Heizfadenspannung	.....	Vf
Spannung zwischen Heizfaden und Kathode	.....	Vfk
Gitterspannung	.....	Vg
(bei mehreren Gittern: Vg1, Vg2, usw.)		
Effektivwert der Wechselfspannung am Eingangs-, bzw. Oszillatorgitter	.....	Vgeff
Gitterspannung in kaltem Zustande ($I_g = 0$)	.....	Vgo
Anodenspannung	.....	Va
Anodenspannung in kaltem Zustande ($I_a = 0$)	.....	Vao
Diodenspannung (Scheitelwert)	.....	Vd
(bei mehreren Dioden: Vd1, Vd2, usw.)		
Effektivwert der Transformatorspannung bei Gleichrichtern	.....	Vtr

STROM

Heizstrom	.....	If
Gitterstrom	.....	Ig
(bei mehreren Gittern: Ig1, Ig2, usw.)		
Anodenstrom	.....	Ia
Diodenstrom (Mittelwert)	.....	Id
(bei mehreren Dioden: Id1, Id2, usw.)		
Kathodenstrom ($I_a + I_{g1} + I_{g2}$ usw.)	.....	Ik
Gleichgerichteter Strom	.....	Ig1

LEISTUNG

Anodenbelastung	.....	Wa
Gitterbelastung	.....	Wg
(bei mehreren Gittern: Wg1, Wg2, usw.)		
Ausgangsleistung	.....	Wo



WIDERSTAND

Innerer Widerstand	Ri
Ausserer Widerstand (Im Anodenkreis)	Ra
Widerstand in der Kathodenleitung zur Erzeugung der Gittervorspannung	Rk
Widerstand der Schaltelemente zwischen Heizfaden und Kathode	Rfk
Widerstand im Gitterkreis bei selbsttätig eingestellter Vorspannung (bei mehreren Gittern: Rg1a, Rg2a, usw.)	Rga
Widerstand im Gitterkreis bei fester Gittervorspannung	Rgf
Widerstand des Wechselstromkreises bei Gleichrichtern	R

KAPAZITÄT

Anode — alle anderen Elektroden	C(a)
Gitter — alle anderen Elektroden (bei mehreren Gittern: C(g1), C(g2), usw.)	C(g)
Anode — Gitter 1	C(a/g1)
Gitter 1 — Gitter 3	C(g1/g3)
Gitter 1 — Gitter 4	C(g1/g4)
Gitter 2 — Gitter 4	C(g2/g4)
Diodenanode — alle anderen Elektroden	C(d)
Diodenanode — Steuergitter des Verstärkerteiles	C(d/g1)
Eine Diodenanode — andere Diodenanode	C(d/k)
Diodenanode — Kathode	C(d1 d2)

ARBEITSWERTE

Verstärkungsfaktor	G
Steilheit	S
Transponierungsteilheit	Sc
Klirrfaktor	K



Indications for TUNGSRAM Tubes.

A) THE INDICATION OF ELECTRODES :

Filament resp. directly heated cathode	f
Indirectly heated cathode	k
Grid	g
(For multiple grid valves g_1, g_2 etc., beginning from the cathode)	
Metallisation	m
Anode	a
Diode — anode	d
(For multiple diodes d_1, d_2 etc., beginning from the cathode)	
If for a valve with two anodes (diode — anodes) no index indicates which of both electrodes is meant the data relate to both electrodes equally.	

B) THE INDICATION OF ELECTRIC QUANTITIES.

VOLTAGE

Filament voltage	V _f
Voltage between filament and cathode	V _{fk}
Grid voltage	V _g
(For multiple grid tubes g_1, g_2 etc.)	
Effective value of a. c. voltage of input or oscillator grid	V _{geff}
Grid voltage in a cold condition ($I_g = 0$)	V _{go}
Anode voltage	V _a
Anode voltage in a cold condition ($I_a = 0$)	V _{ao}
Diode voltage (peak value)	V _d
(By multiple diode valves V_{d1}, V_{d2} etc.)	
Effective value of transformer voltage for rectifiers	V _{tr}

CURRENT

Heating current	I _f
Grid current	I _g
(For multiple grid valves I_{g1}, I_{g2} etc.)	
Anode current	I _a
Diode current (mean value)	I _d
(For multiple diodes I_{d1}, I_{d2} etc.)	
Cathode current ($I_a + I_{g1} + I_{g2} + \text{etc.}$)	I _k
Rectified current	I _{g1}

POWER

Anode dissipation	W _a
Grid dissipation	W _g
(For multiple grid valves W_{g1}, W_{g2} etc.)	
Output	W _o



RESISTANCE

Internal resistance	R _i
Load resistance	R _a
Resistance in the cathode lead	R _k
Resistance between filament and cathode	R _{fk}
Resistance in the grid circuit at automatically controlled bias (For multiple grid valves R _{g1a} , R _{g2a} etc.)	R _{ga}
Resistance in the grid circuit at fixed grid voltage	R _{gf}
Resistance of the a. c. circuit for rectifiers	R

CAPACITY

Anode — all other electrodes	C(a)
Grid — all other electrodes (By multiple grid valves C _{g1} , C _{g2})	C(g)
Anode — grid 1	C(a/g ₁)
Grid 1 — grid 3	C(g ₁ /g ₃)
Grid 1 — grid 4	C(g ₁ /g ₄)
Grid 2 — grid 4	C(g ₂ /g ₄)
Diode-anode — all other electrodes	C(d)
Diode-anode — grid	C(d/g ₁)
Diode-anode — cathode	C(d/k)
Between two diode-anodes	C(d ₁ /d ₂)

OPERATION VALUES

Amplification factor	G
Slope	S
Conversion slope	S _c
Distortion factor	K



Signification des désignations utilisées pour les lampes Tungsramp.

A) DÉSIGNATION DES ÉLECTRODES

Filament ou cathode à chauffage direct	f
Cathode à chauffage indirect	k
Grille	g
(pour les lampes multigrilles, on désigne les grilles par g1, g2, etc. à partir de la cathode)	
Métallisation	m
Anode	a
Anode d'une diode	d
(pour les duo-diodes ou diodes multiples, on désigne les anodes par d1, d2, etc.)	
Dans le cas d'une lampe munie de deux anodes de diode, si l'on n'indique pas spécialement à l'aide d'un index à quelle électrode se rapporte l'indication, elle sera valable indifféremment pour l'une et pour l'autre.	

B) DÉSIGNATION DES VALEURS ÉLECTRIQUES

TENSION

Tension de chauffage du filament	Vf
Tension entre le filament de la cathode	Vfk
Tension de grille	Vg
(Si l'on a affaire à plusieurs grilles : Vg1, Vg2, etc.)	
Tension alternative efficace à l'entrée ou à la grille de l'hétérodyne	Vgeff
Tension de grille à froid ($I_g = 0$)	Vgo
Tension anodique	Va
Tension anodique à froid ($I_a = 0$)	Vao
Tension appliquée à la diode (tension de pointe)	Vd
(lorsqu'il y a plusieurs éléments : Vd1, Vd2, etc.)	
Valeur effective de la tension du transformateur employé avec les redresseurs	Vtr

COURANT

Courant de chauffage	If
Courant de grille	Ig
(lorsqu'il y a plusieurs grilles : Ig1, Ig2, etc.)	
Courant anodique	Ia
Valeur moyenne du courant de la diode	Id
(au cas où l'on emploie plusieurs diodes : Id1, Id2, etc.)	
Courant cathodique ($I_a + I_{g1} + I_{g2}$ etc.)	Ik
Courant redressé	Ig1

PUISSANCE

Puissance dissipée par l'anode	Wa
Puissance dissipée par la grille	Wg
(si l'on a plusieurs grilles : Wg1, Wg2, etc.)	
Puissance de sortie	Wo



RÉSISTANCE

Résistance intérieure	Ri
Résistance extérieure du circuit anodique	Ra
Résistance de cathode nécessaire à l'obtention de la polarisation	Rk
Résistance des éléments de montage entre le filament de chauffage et la cathode	Rfk
Résistance de grille dans le cas d'une polarisation automatique (s'il y a plusieurs grilles: Rg1a, Rg2a, etc.)	Rga
Résistance de grille dans le cas d'une polarisation fixe	Rgf
Résistance de circuit à courant alternatif d'un redresseur	R

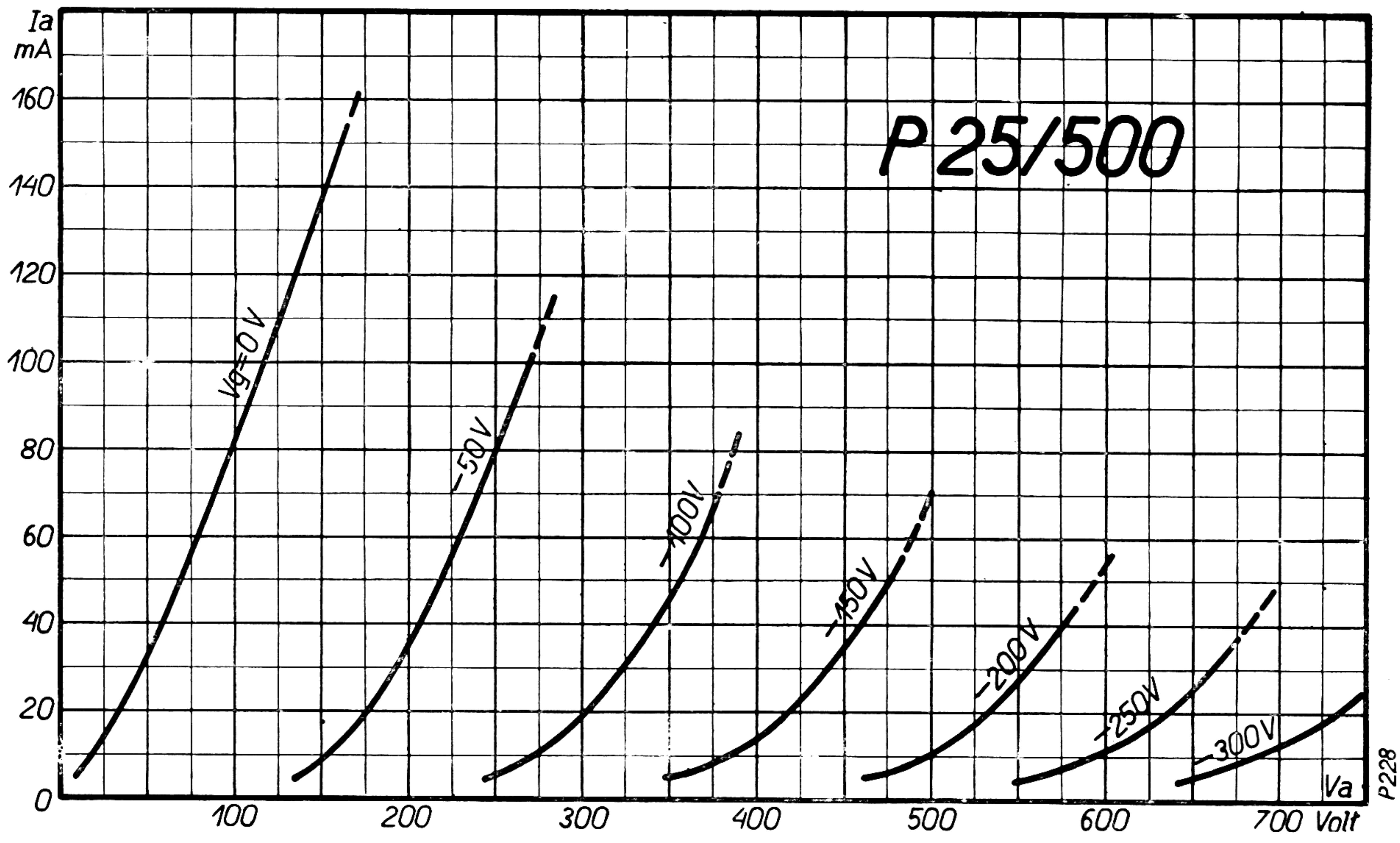
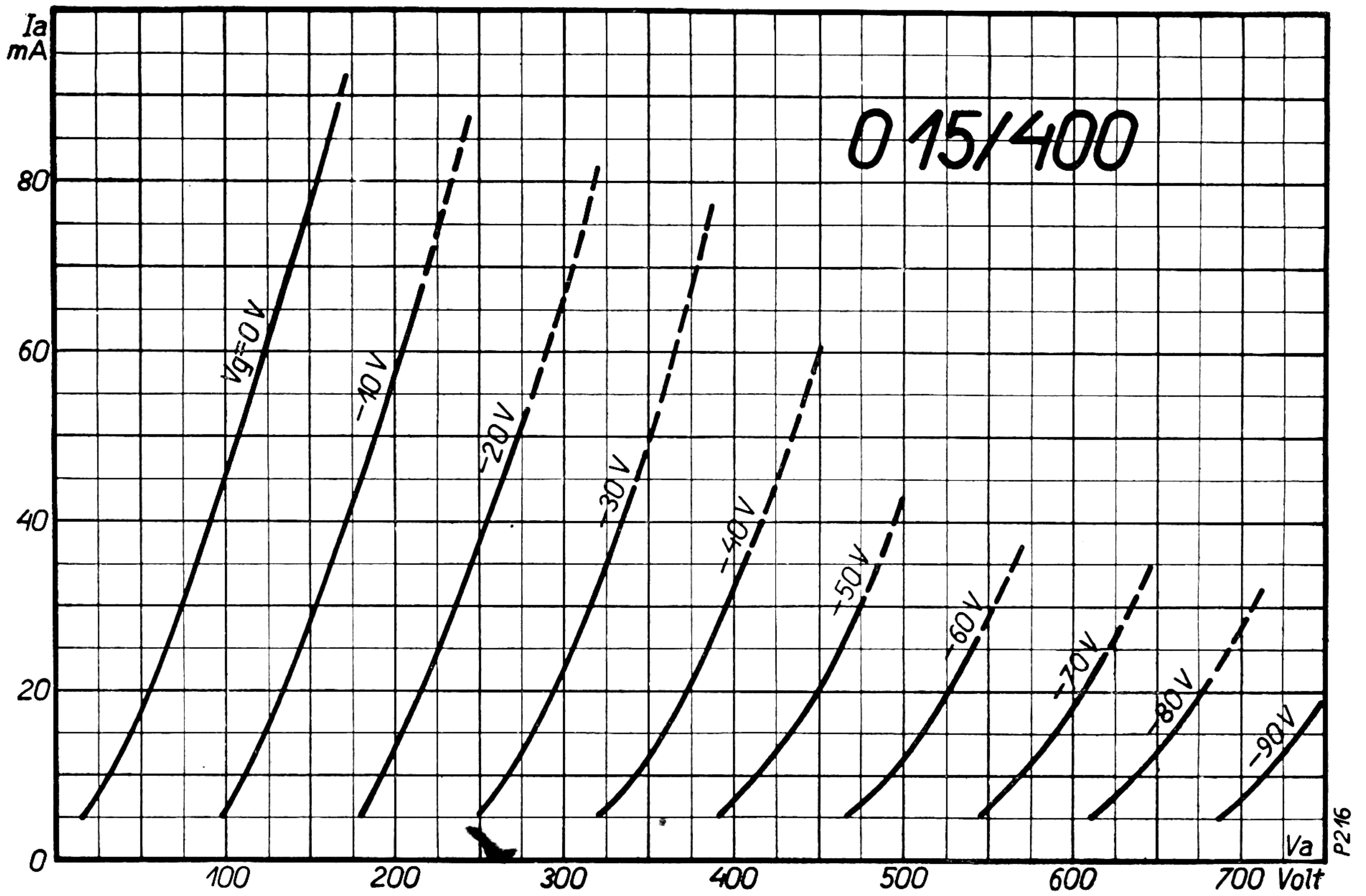
CAPACITÉ

Entre l'anode et toutes les autres électrodes	C(a)
Entre la grille et toutes les autres électrodes (s'il y a plusieurs grilles: C(g1), C(g2), etc.)	C(g)
Entre l'anode et la 1 ^{ère} grille	C(a/g1)
Entre la grille 1 et la grille 3	C(g1/g3)
Entre la grille 1 et la grille 4	C(g1/g4)
Entre la grille 2 et la grille 4	C(g2/g4)
Entre la plaque de la diode et les autres électrodes	C(d)
Entre la plaque de la diode et la grille de commande de l'amplificateur	C(d/g)
Entre la plaque d'une diode et celle de l'autre diode	C(d1/d2)
Entre la plaque d'une diode et la cathode	C(d/k)

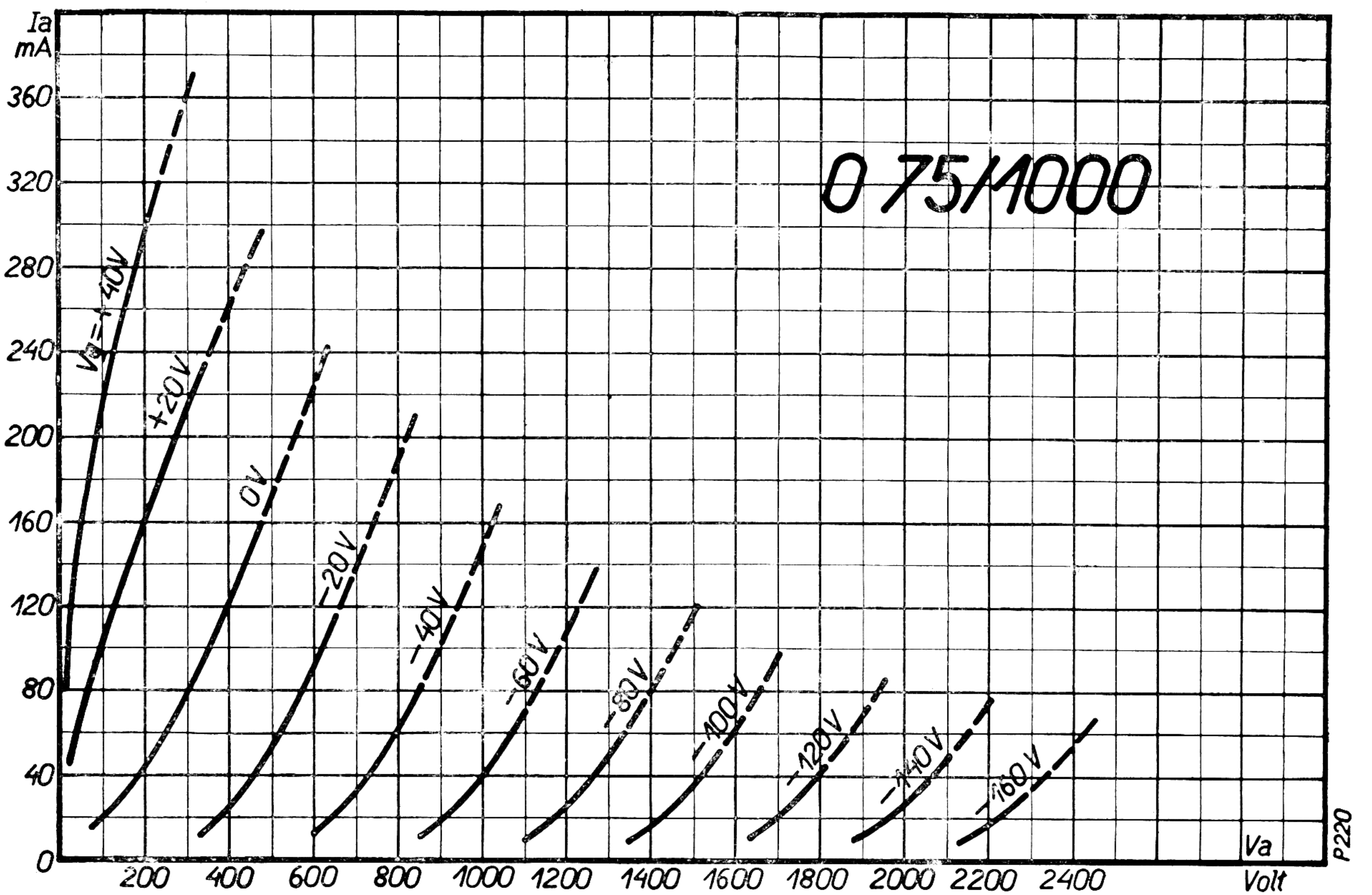
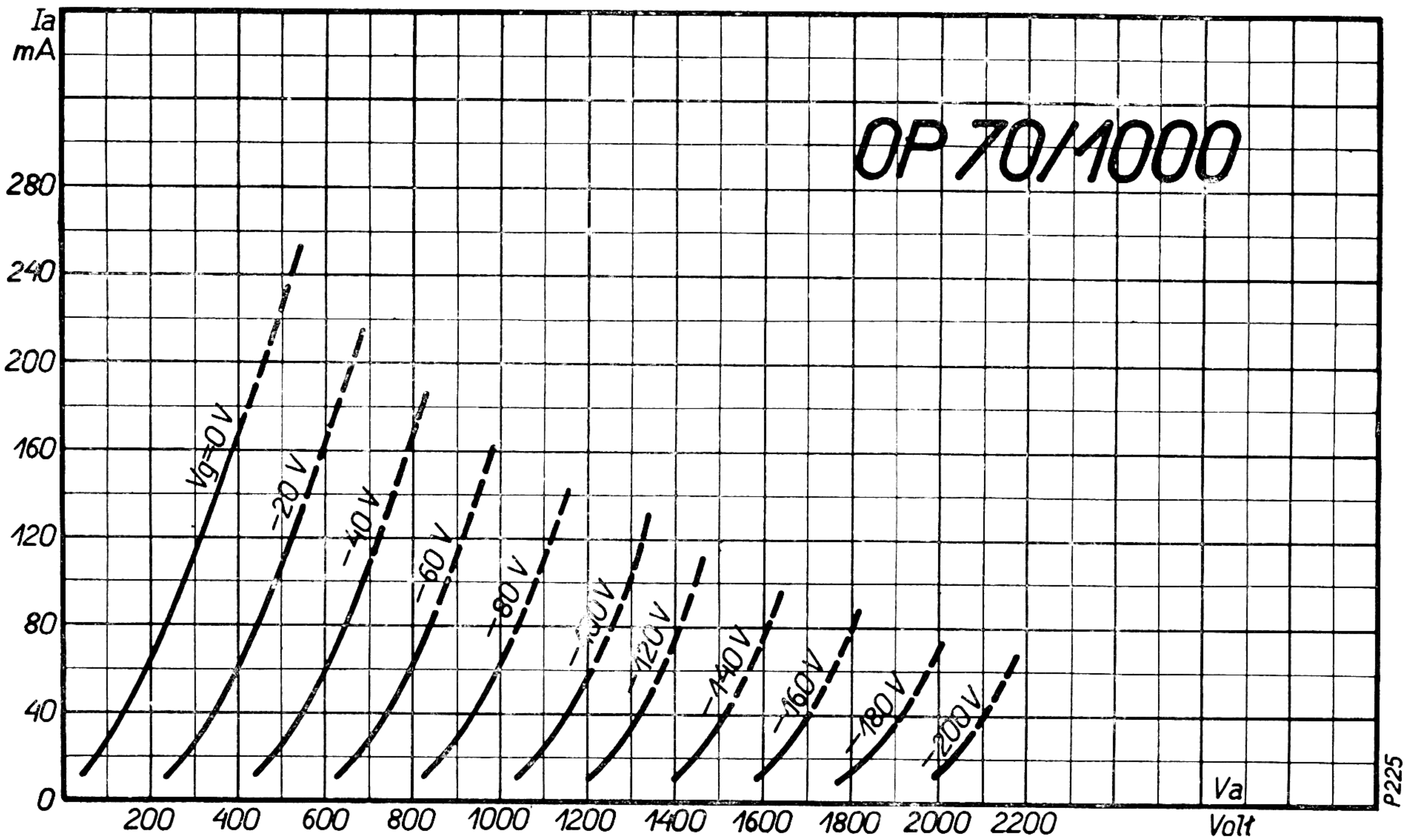
COEFFICIENTS de travail

Facteur d'amplification	G
Pente	S
Pente de conversion	Sc
Facteur de distorsion	K

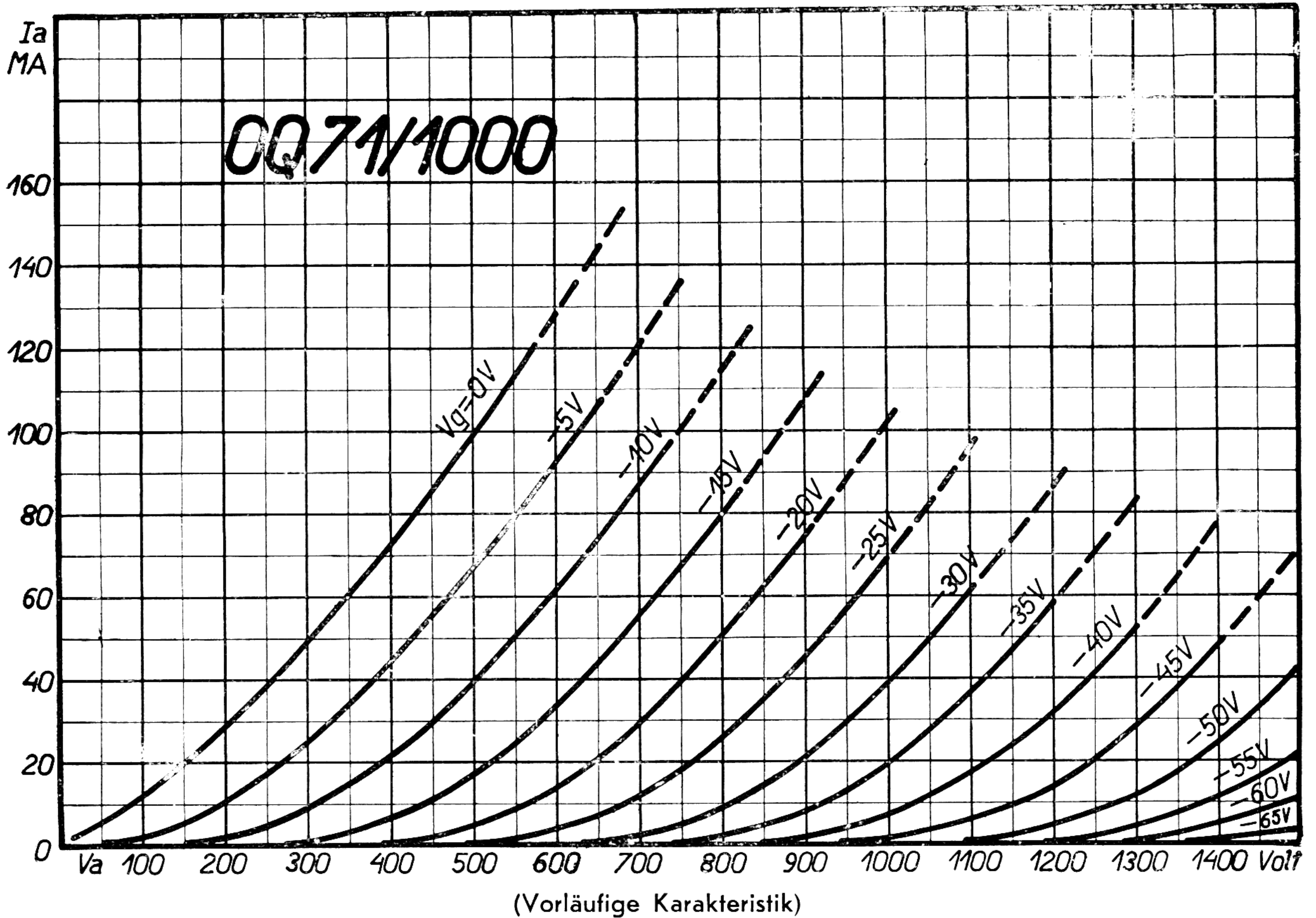
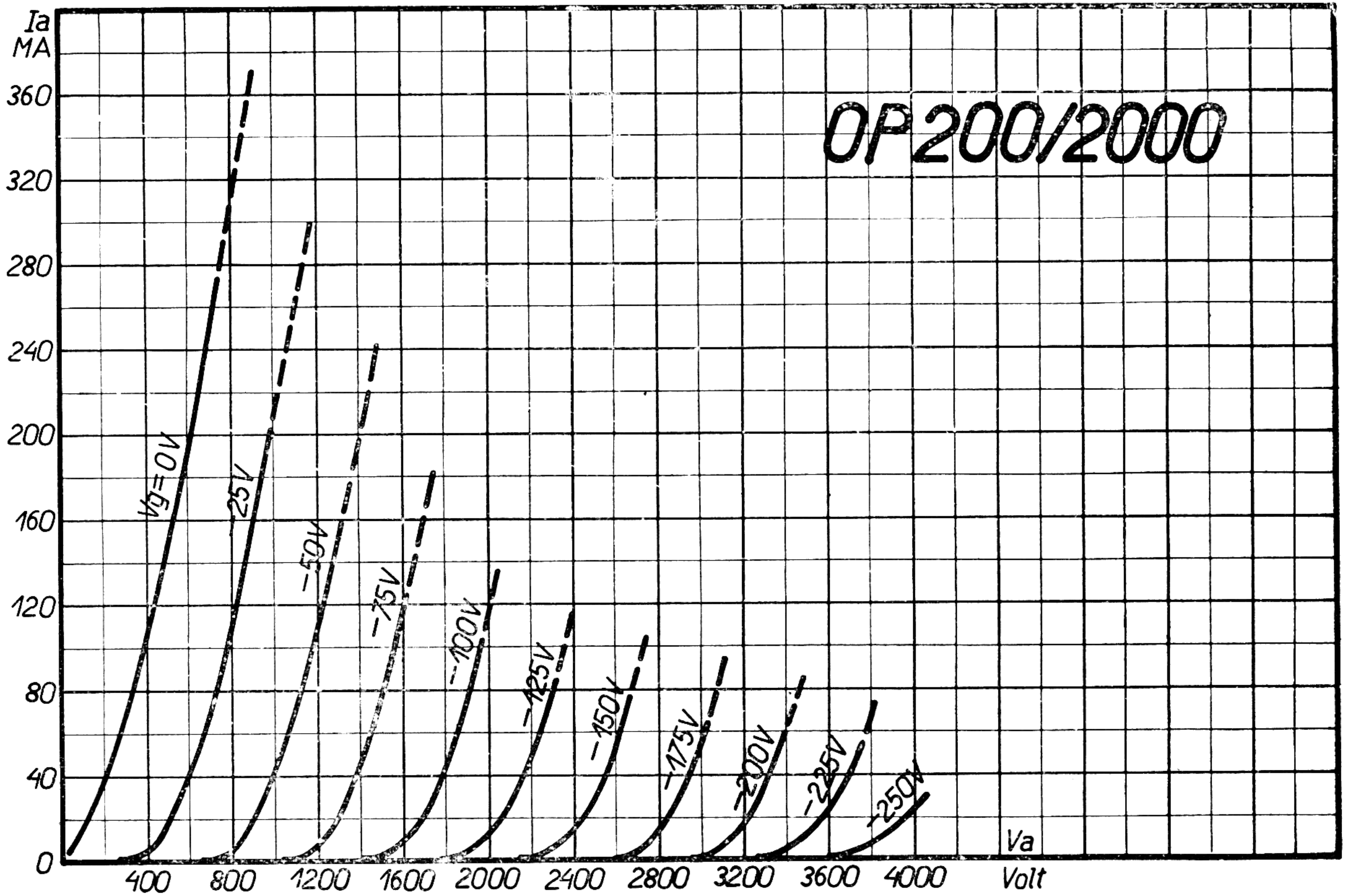
TUNGSRAM RADIO



TUNGSRAM RADIO

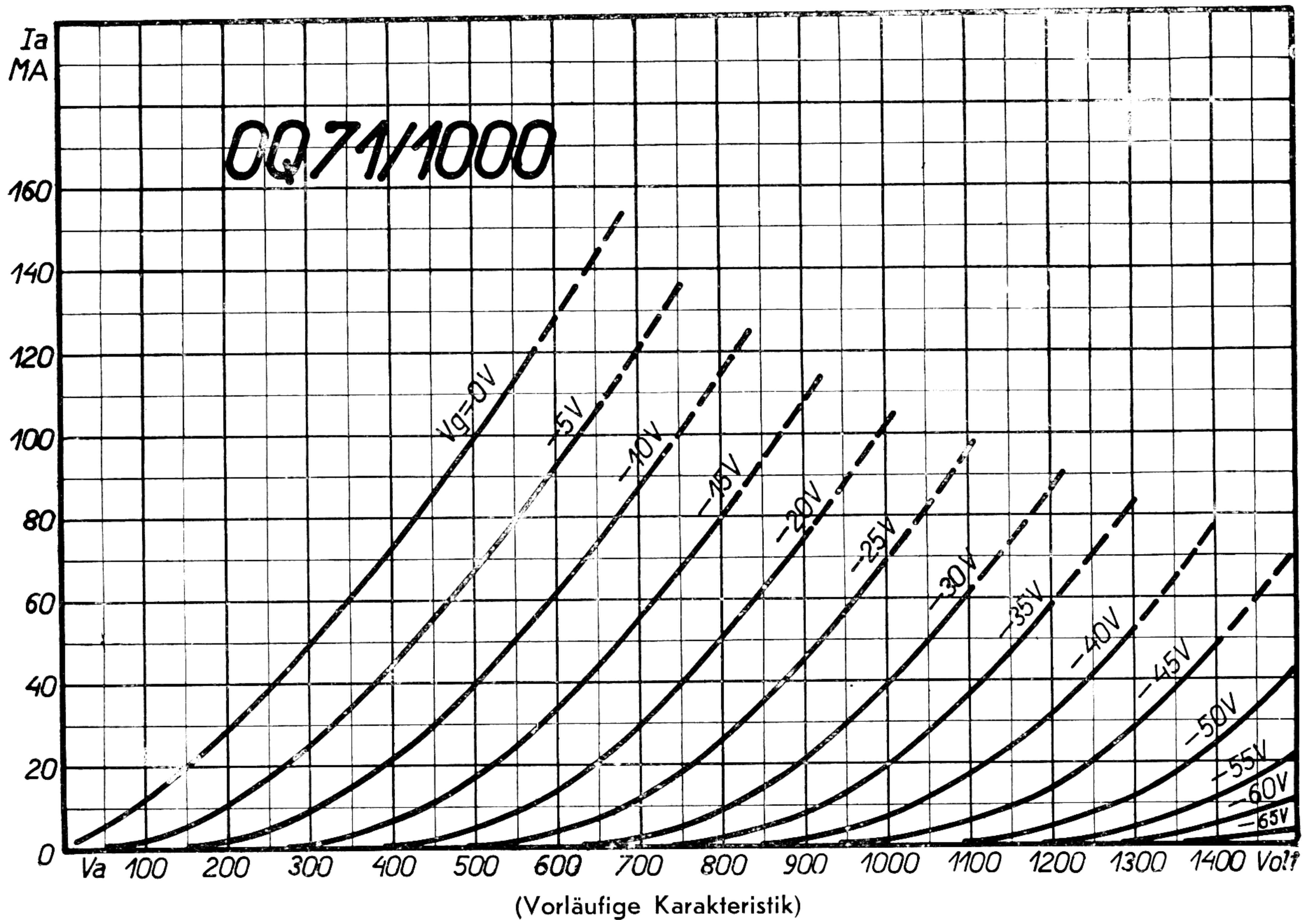
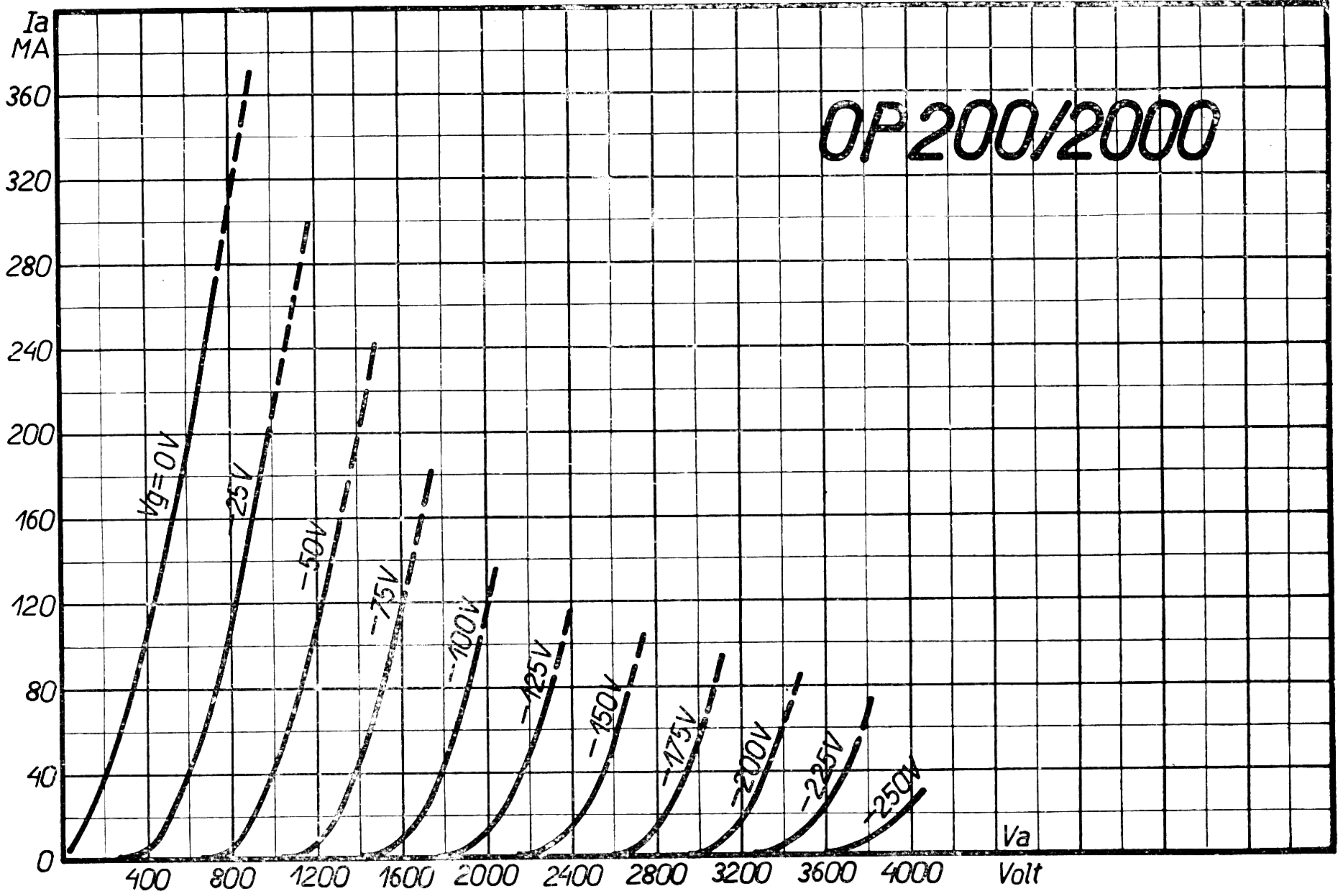


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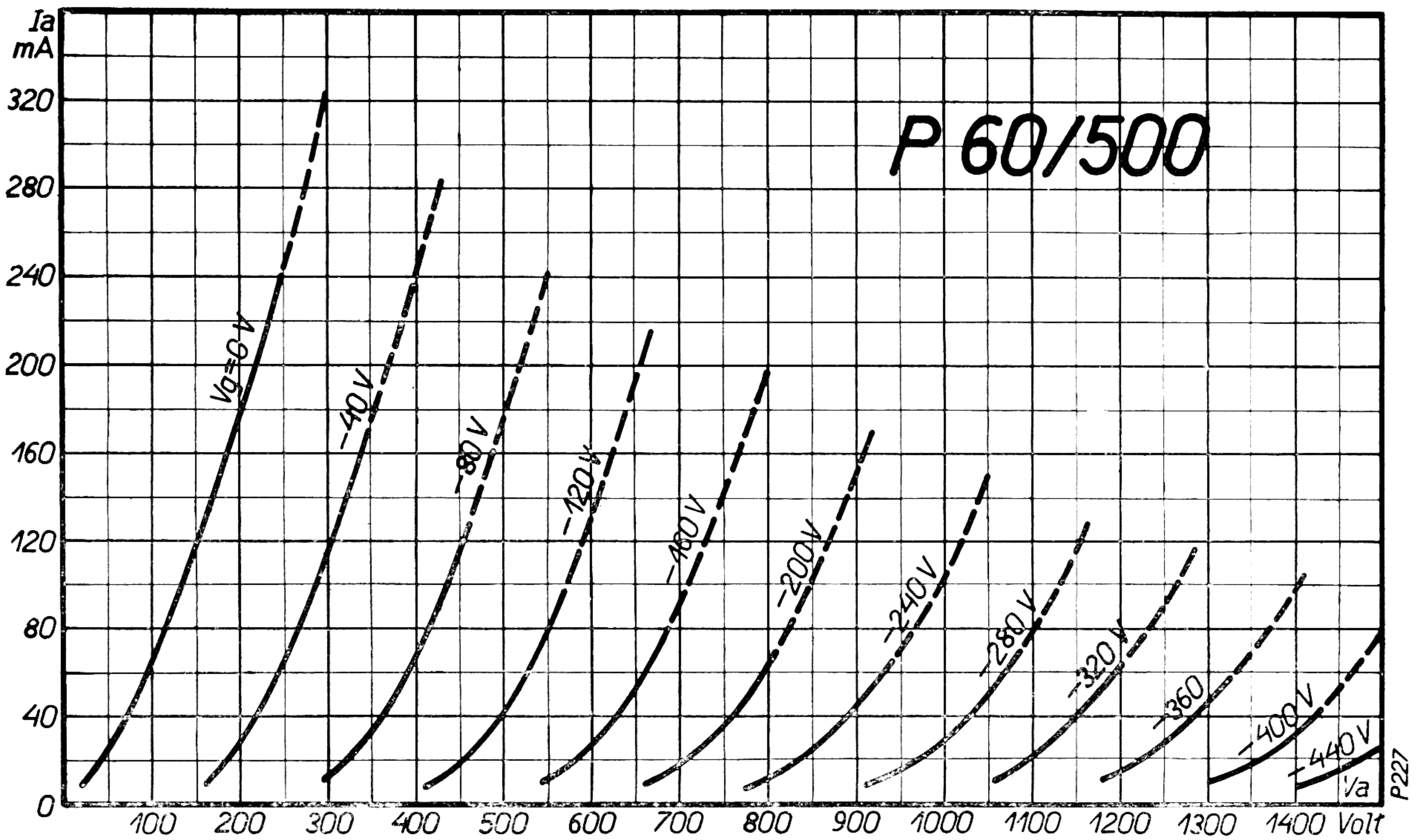
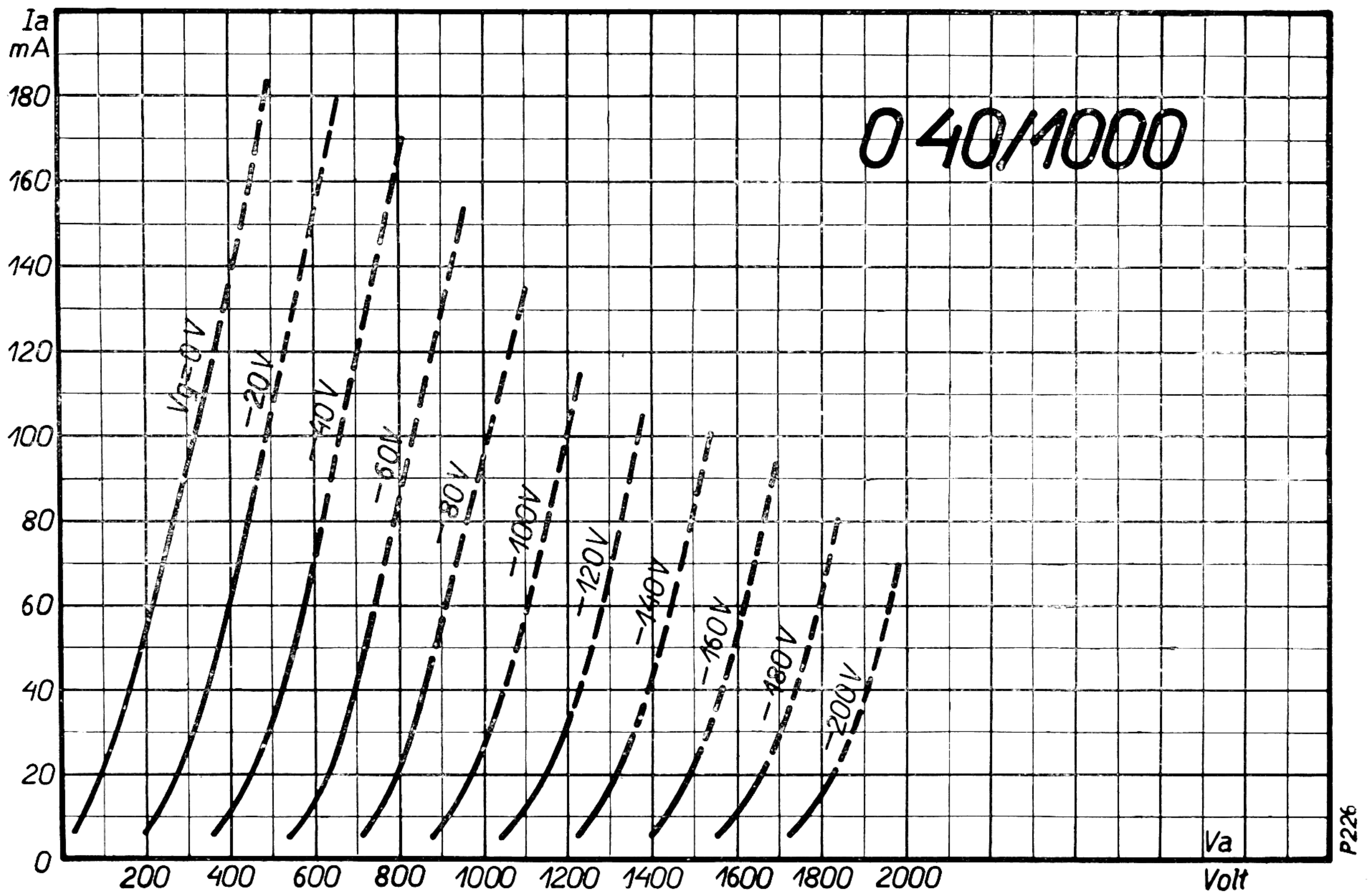
Sept. 1937.

TUNGSRAM RADIO



Sept. 1937.

TUNGSRAM RADIO

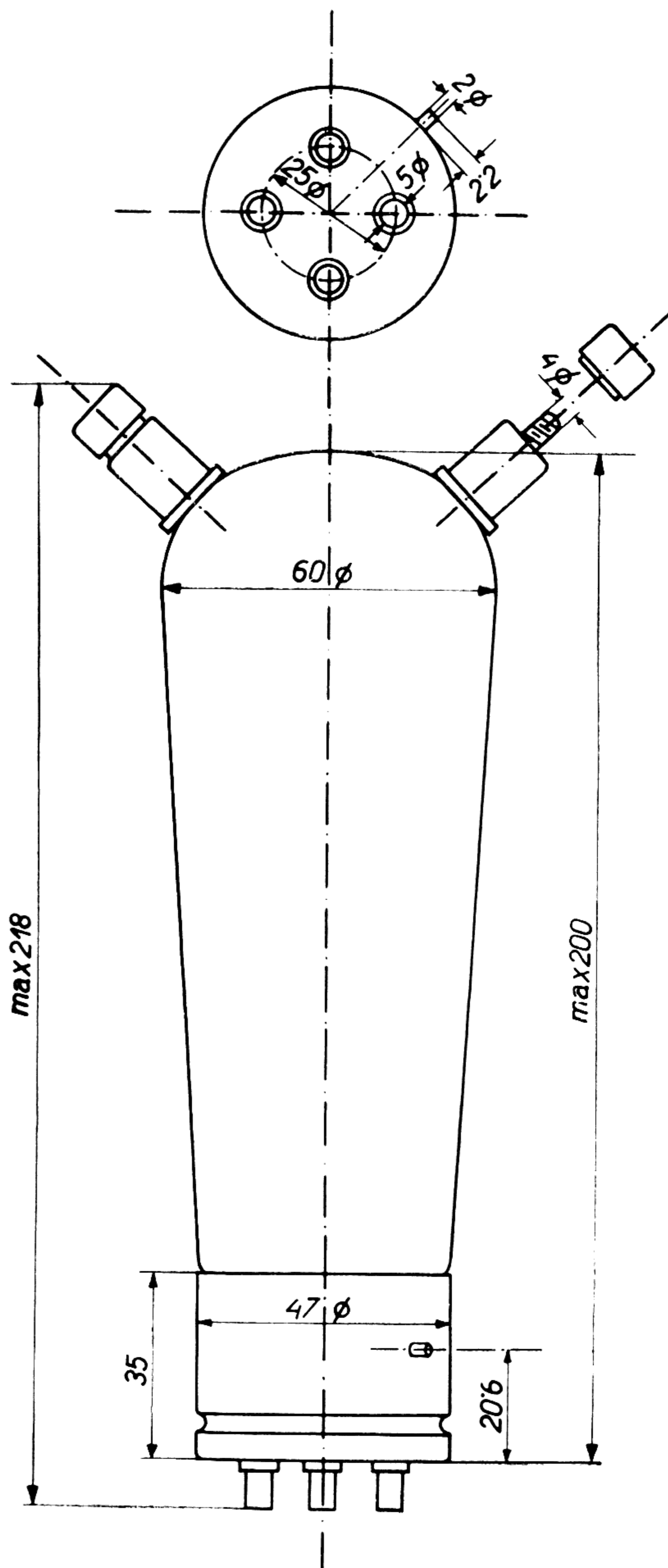
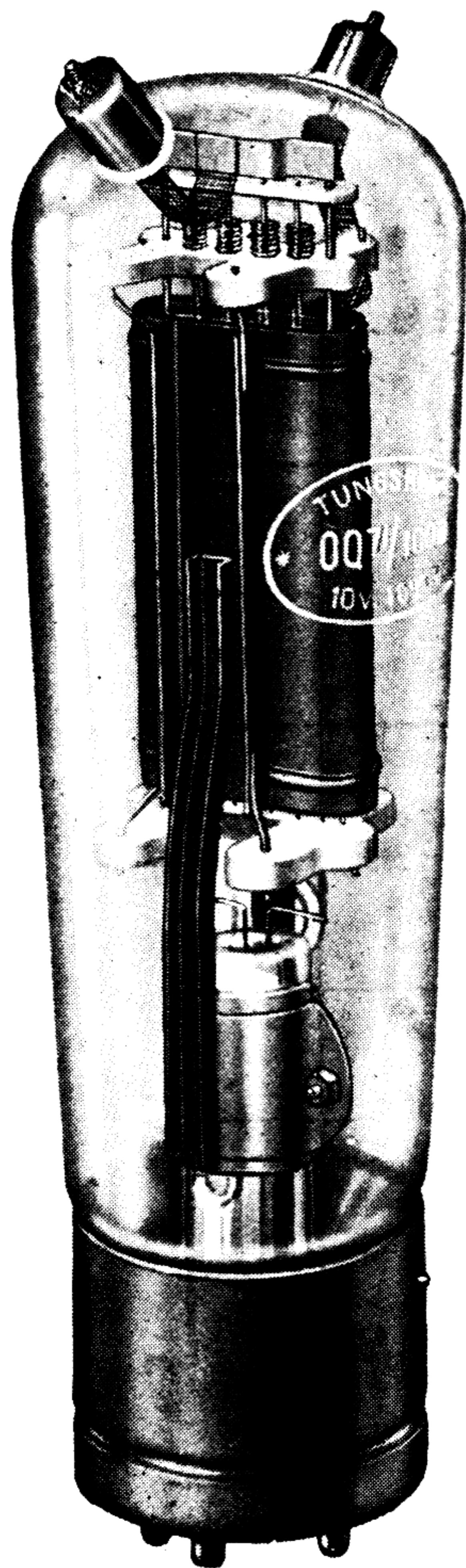


TUNGSRAM RADIO

Senderöhre mit Oxydheizfaden

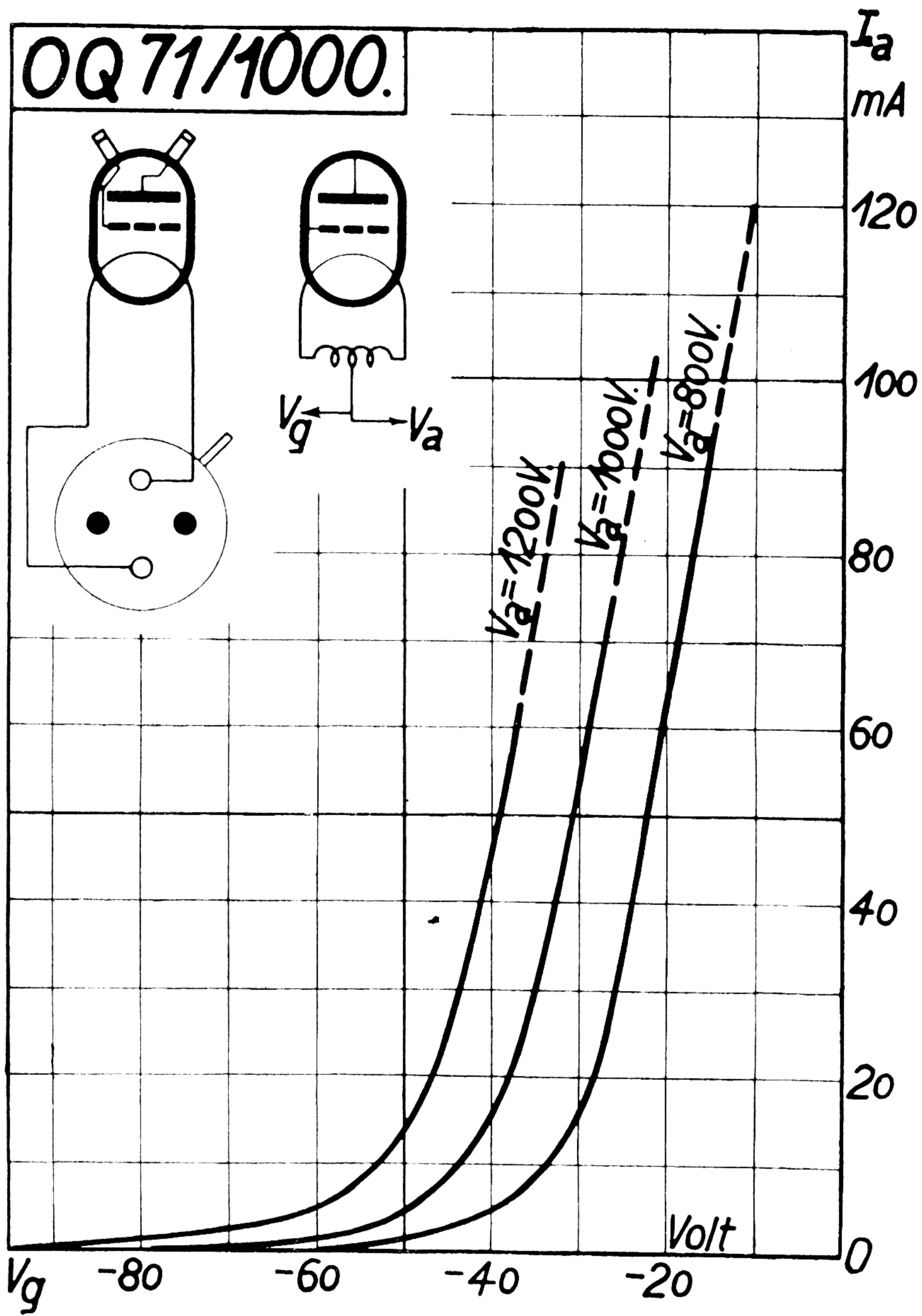
Gewicht cca 230 g.

OQ 71/1000



Sockel: F 46

TUNGSRAM RADIO



V_f — 10 Volt
 I_f — 1.25 Amp.
 $V_{a \max}$ — 1000 Volt
 S — 5 mA/V
 g — 23
 R_i — 4600 Ohm
 $W_{a \max}$ — 75 Watt

C_{ga} — 10 μF
 C_{gk} — 9.5 "
 C_{ak} — 4.5 "
 λ_{\min} — 2.55 m

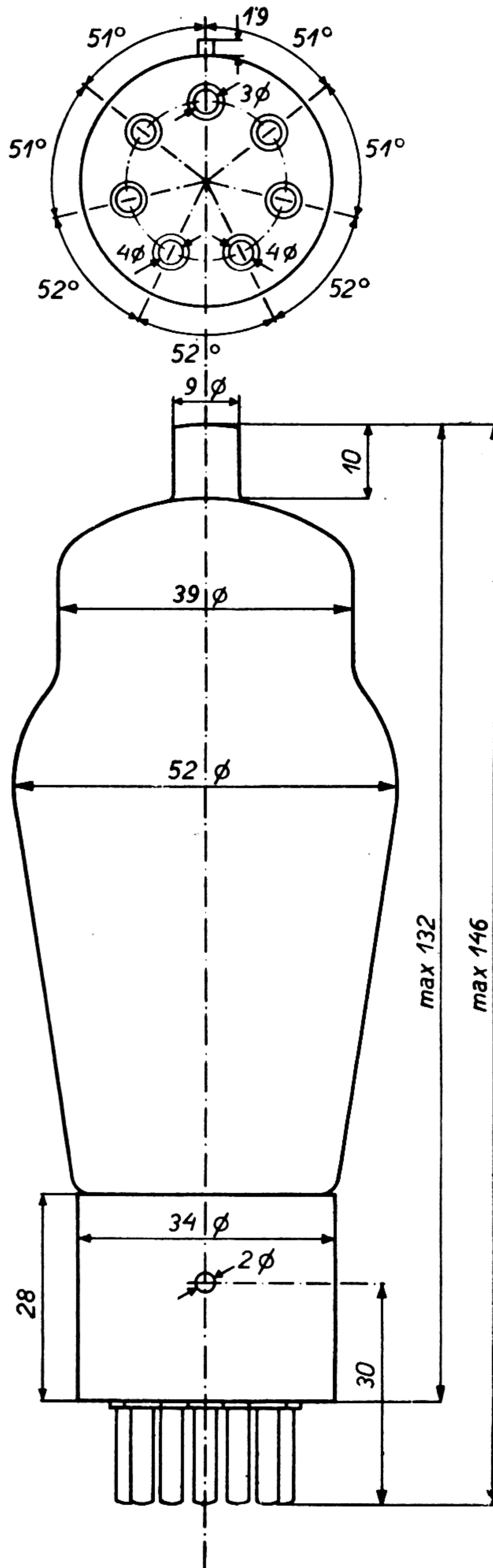
Vorläufige Daten

TUNGSRAM RADIO

Sendepenthode mit indirekt geheizter Kathode

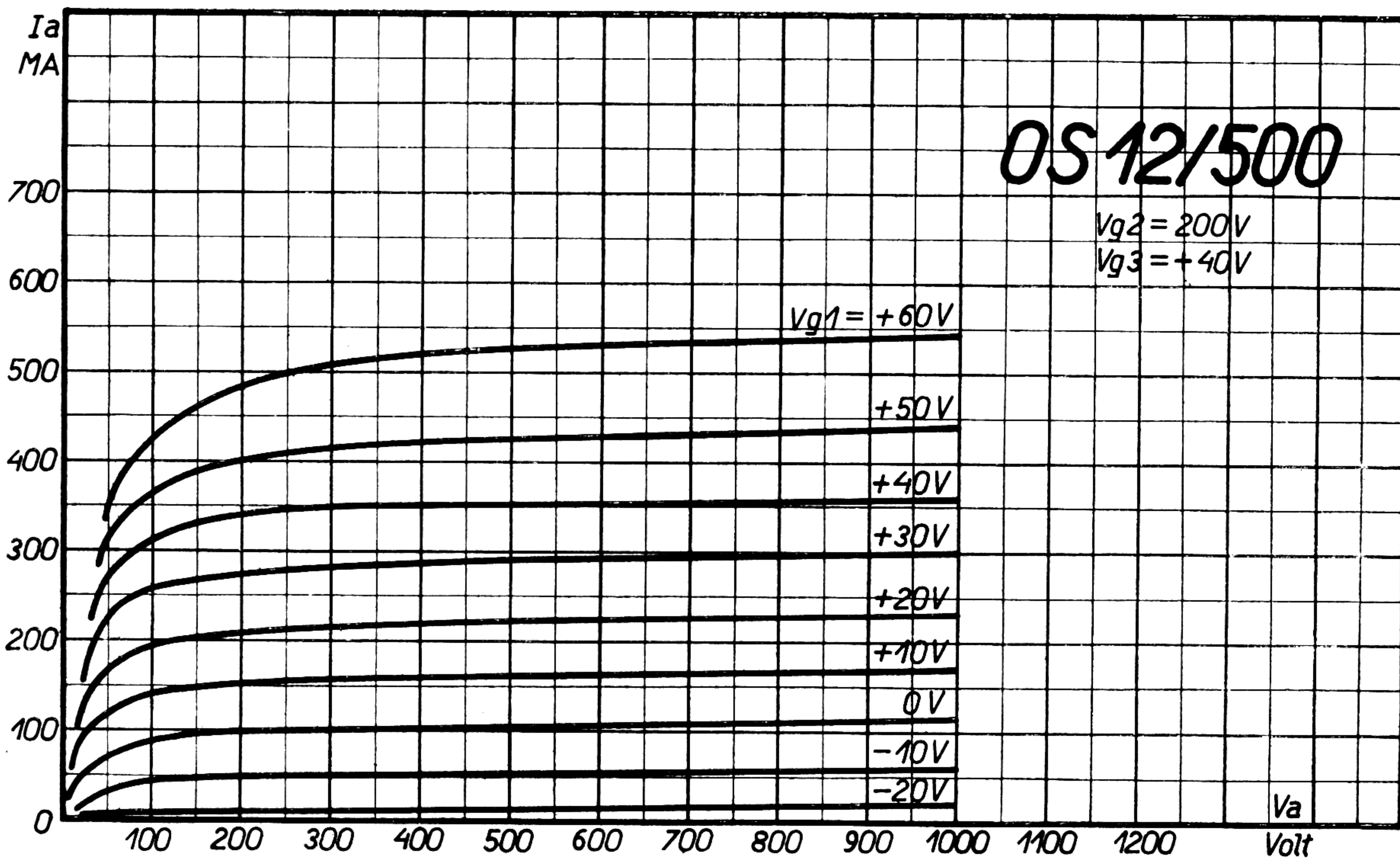
Gewicht cca 100 g

OS 12/500



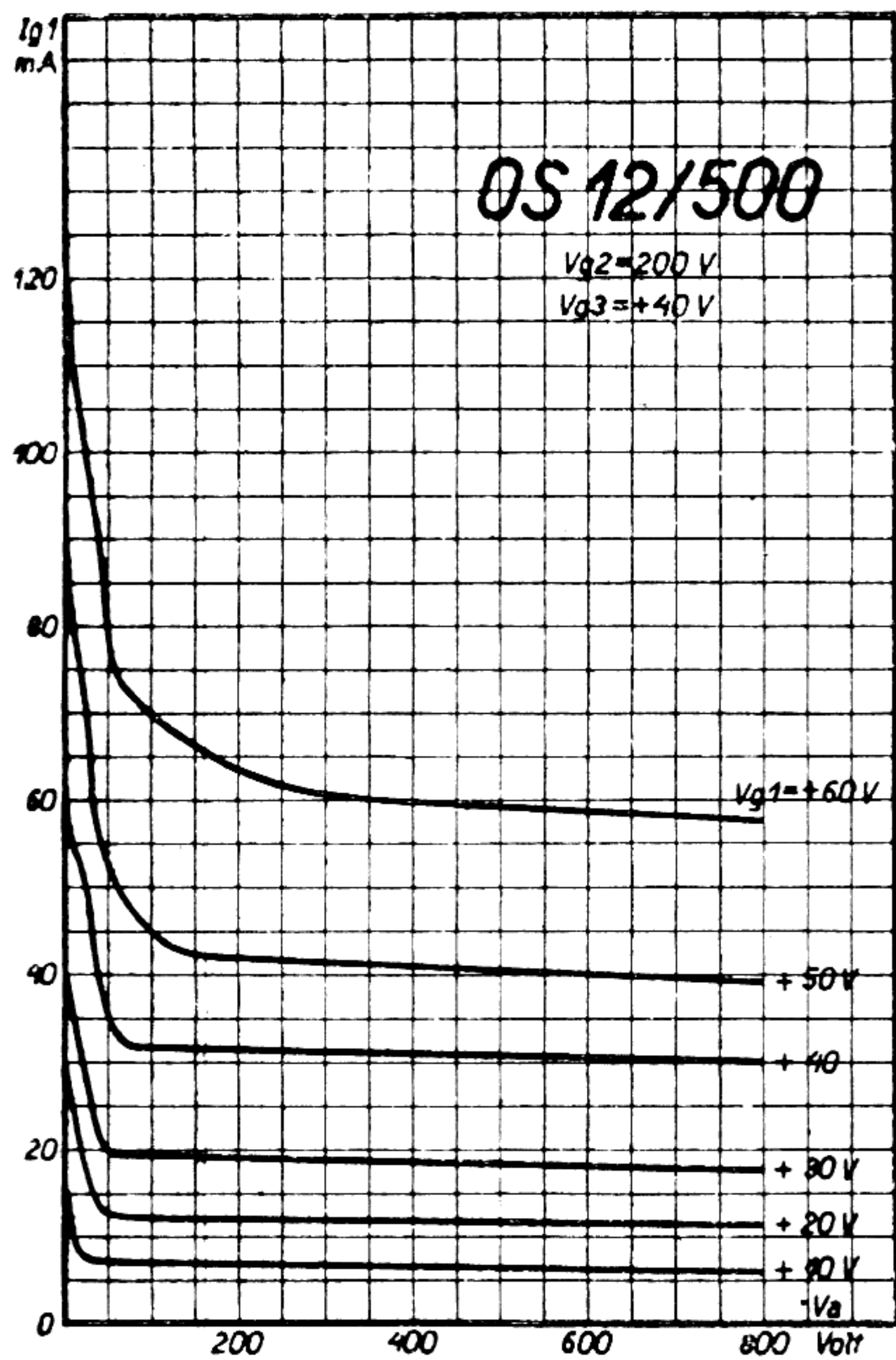
Sockel: F 7 L

TUNGSRAM RADIO

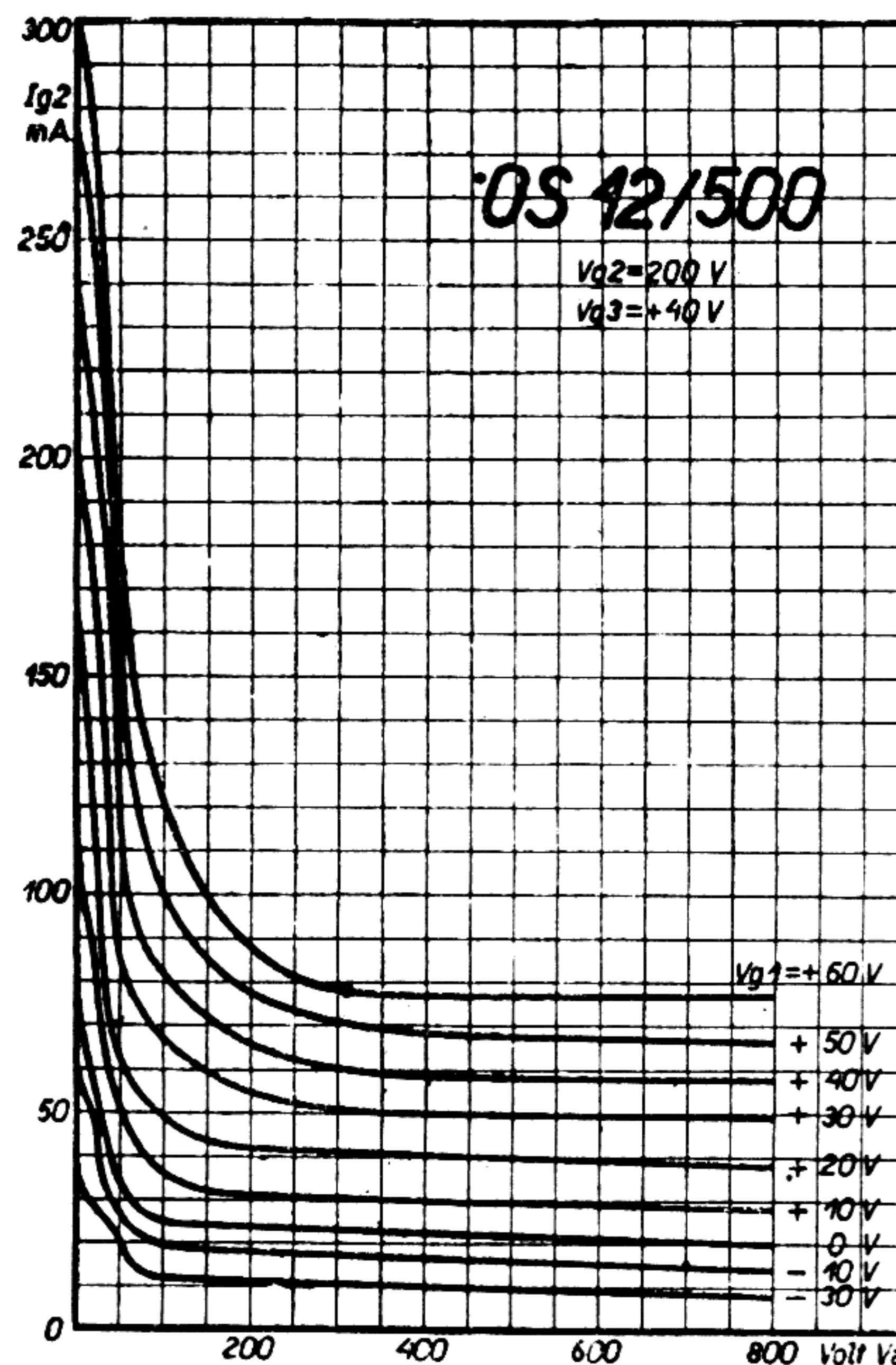


$V_f = 12,6$ Volt
 $I_f = 0,7$ Amp.
 $V_a \text{ max} = 500$ Volt
 $V_{g2} \text{ max} = 200$ Volt
 $V_{g3} \text{ max} = 50$ Volt
 $S = 3,4$ mA/V
 (bei $I_a = 24$ mA)
 $W_a \text{ max} = 12$ Watt

$C_{ga} = 0,2 \mu\mu F$
 $C_g = 16 \mu\mu F$
 $C_a = 10 \mu\mu F$
 $\lambda \text{ min} = 2,40$ m



Steuergitterstrom



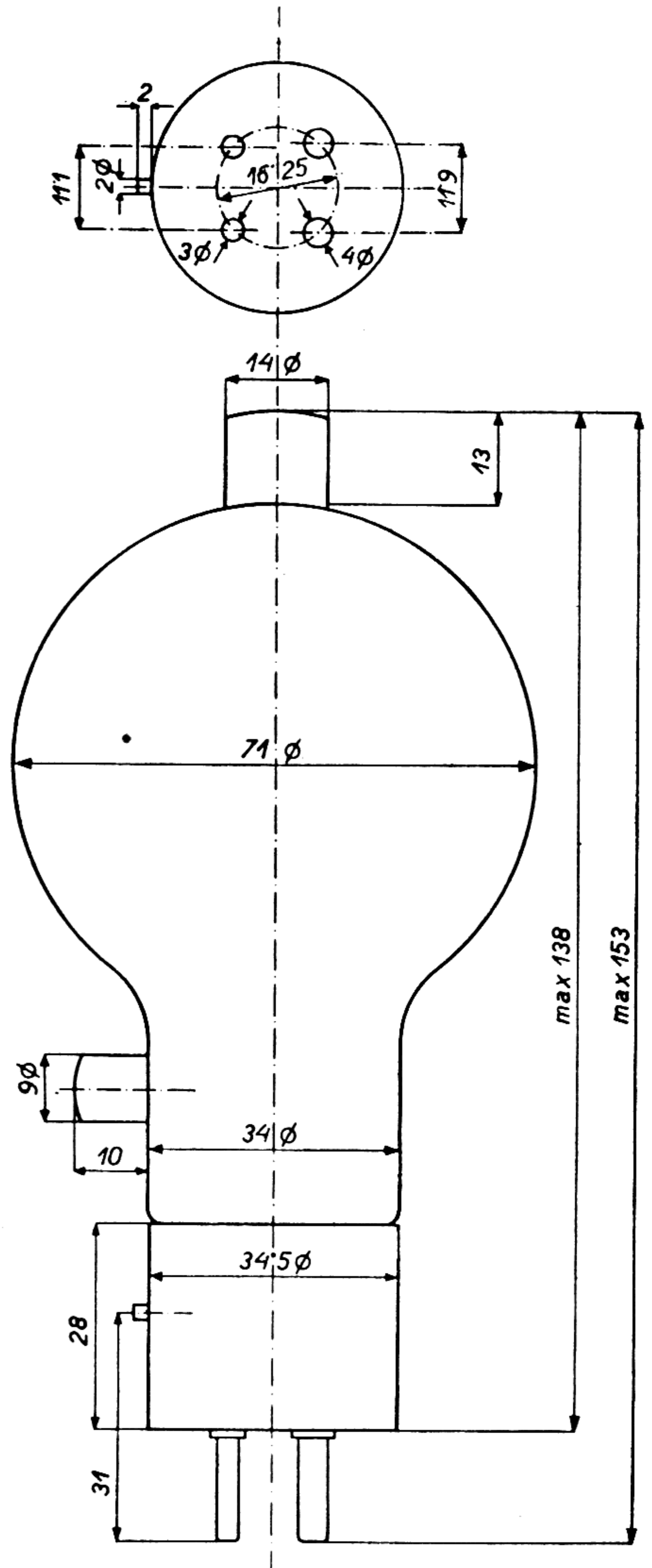
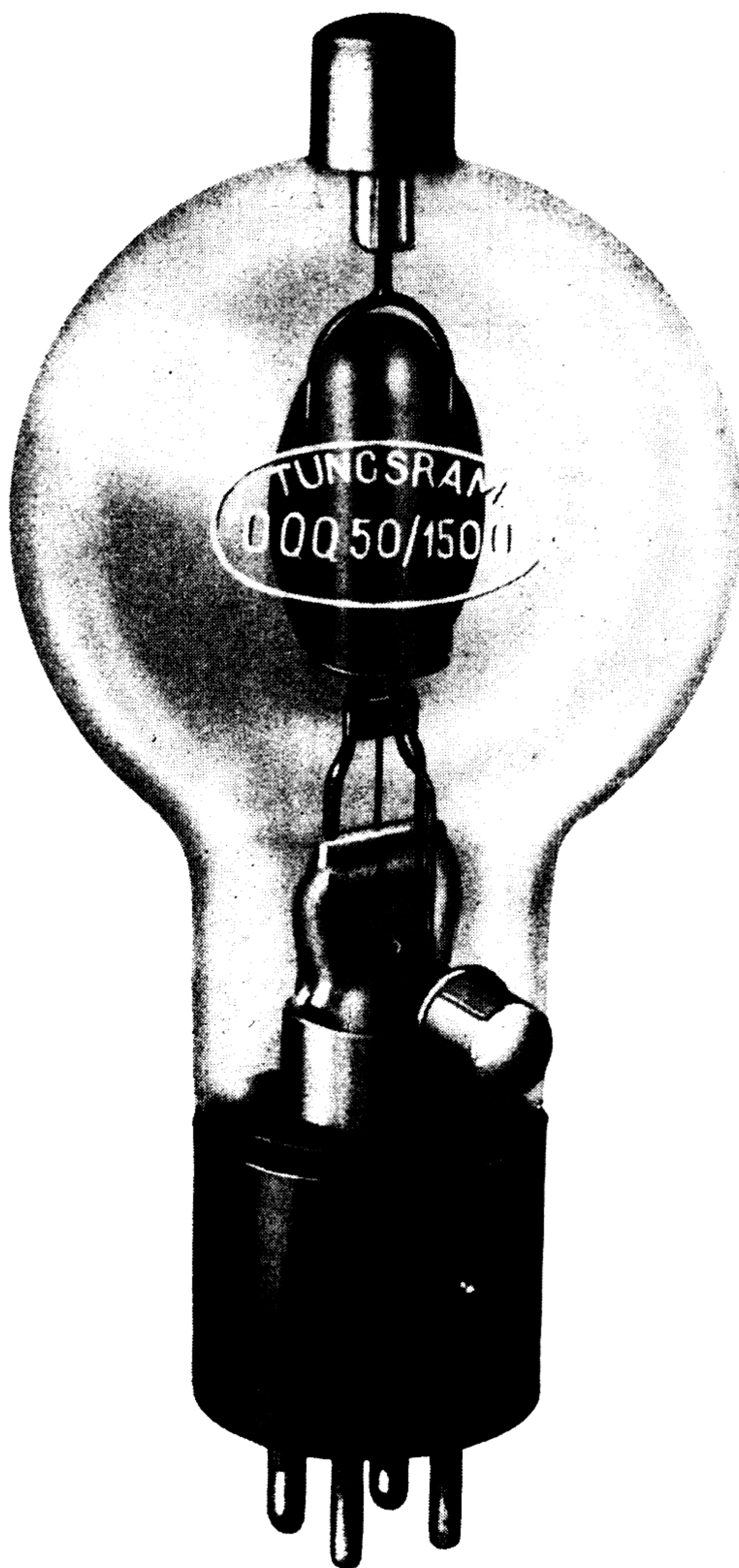
Schirmgitterstrom

TUNGSRAM RADIO

Kurzwellensenderöhre mit thoriertem Heizfaden

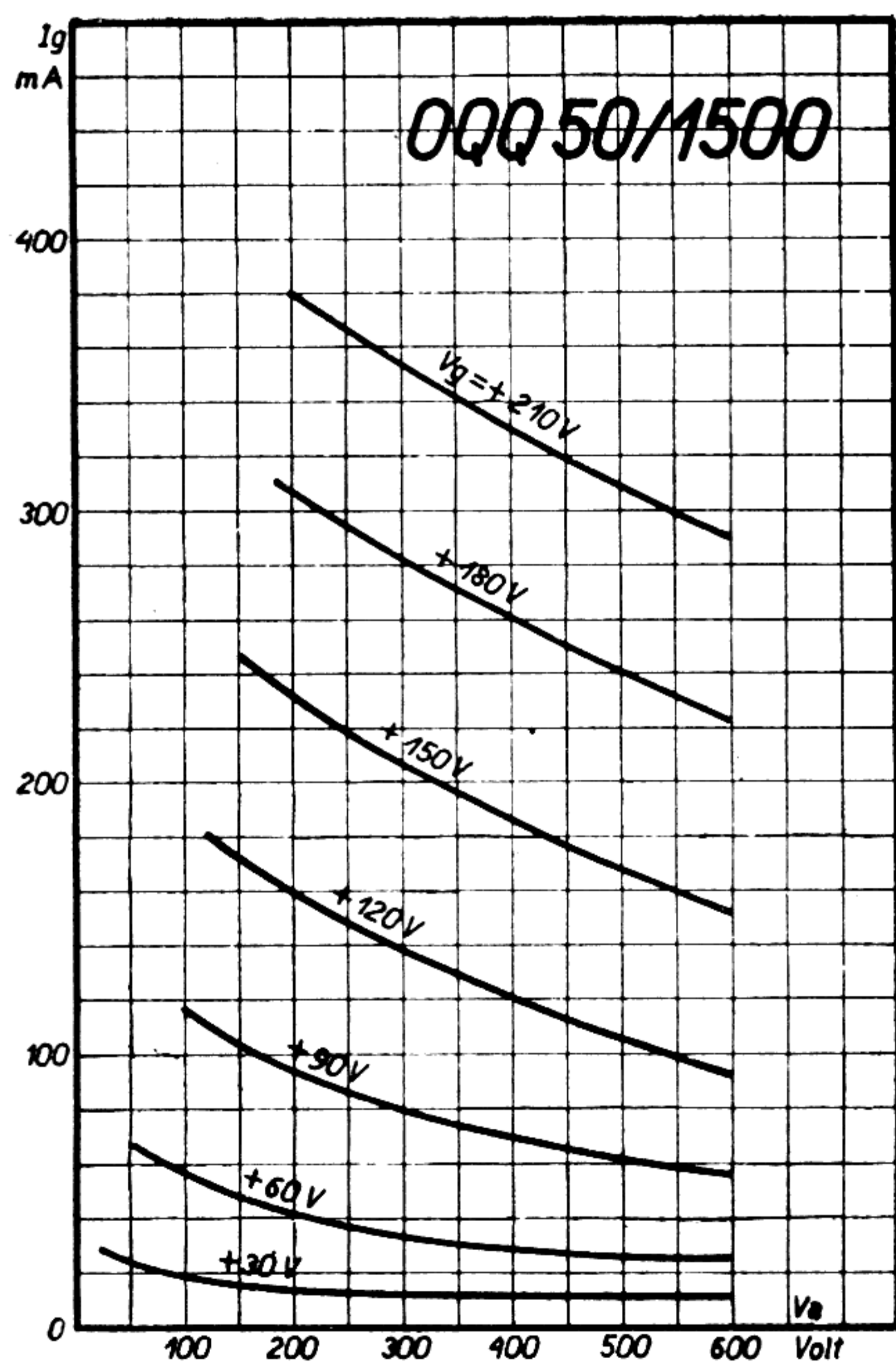
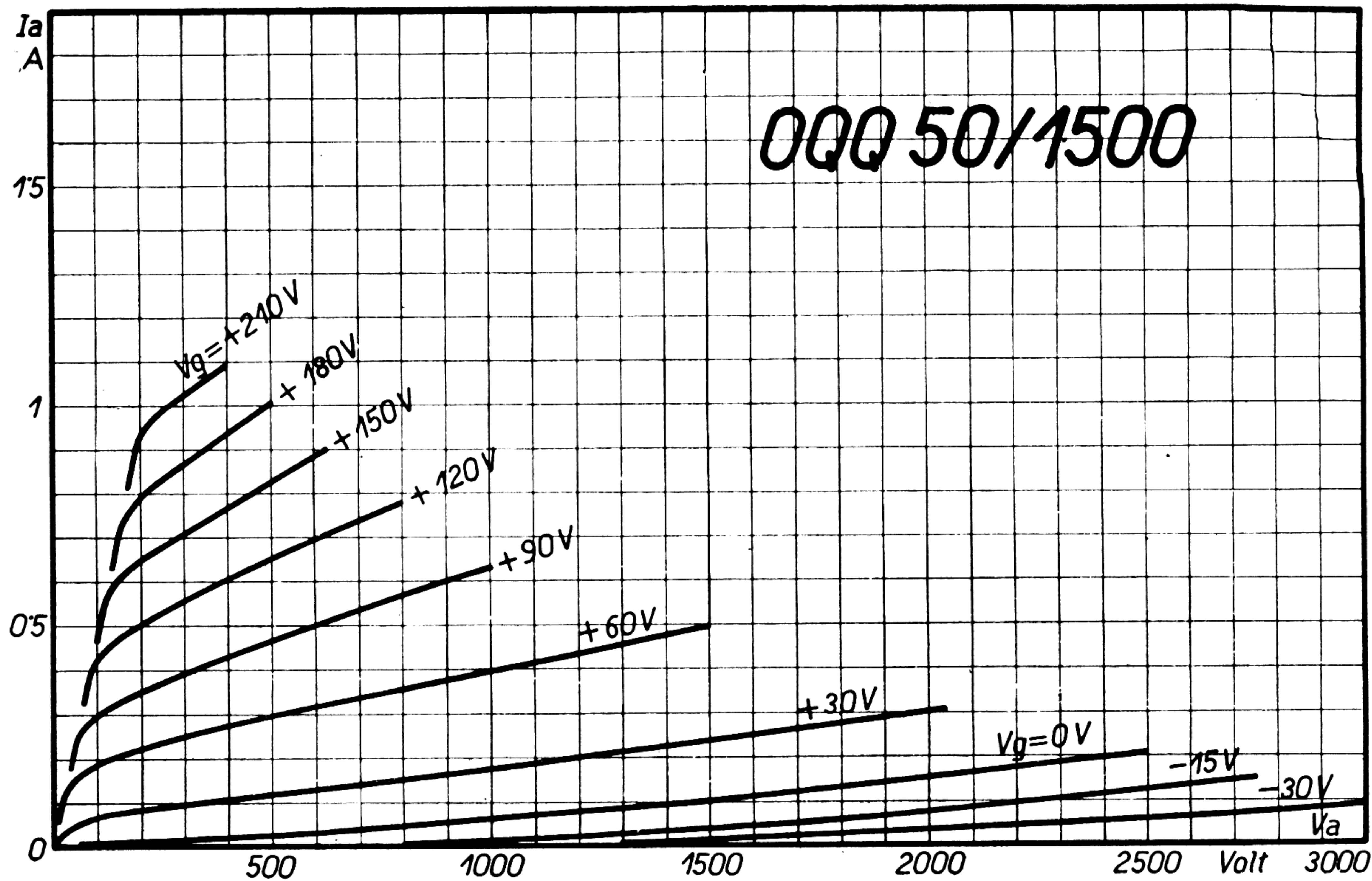
OQQ 50/1500

Gewicht cca 75 g



Sockel: F 48

TUNGSRAM RADIO



Gitterstromkennlinien

- $V_f = 7,5 \text{ Volt}$
- $I_f = 4 \text{ Amp.}$
- $V_a \text{ max} = 1500 \text{ Volt}$
- $S = 3,6 \text{ mA/V}$
(bei $I_a = 50 \text{ mA}$)
- $g = 47$
- $R_i = 13000 \text{ Ohm}$
- $W_a = 50 \text{ Watt}$

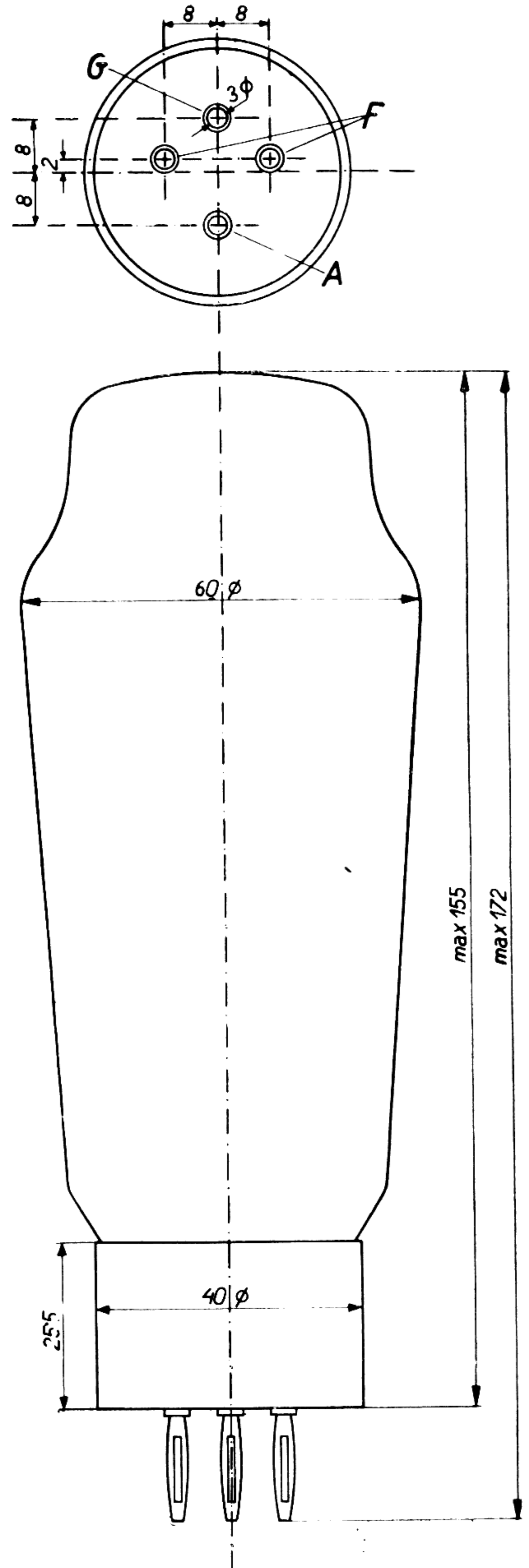
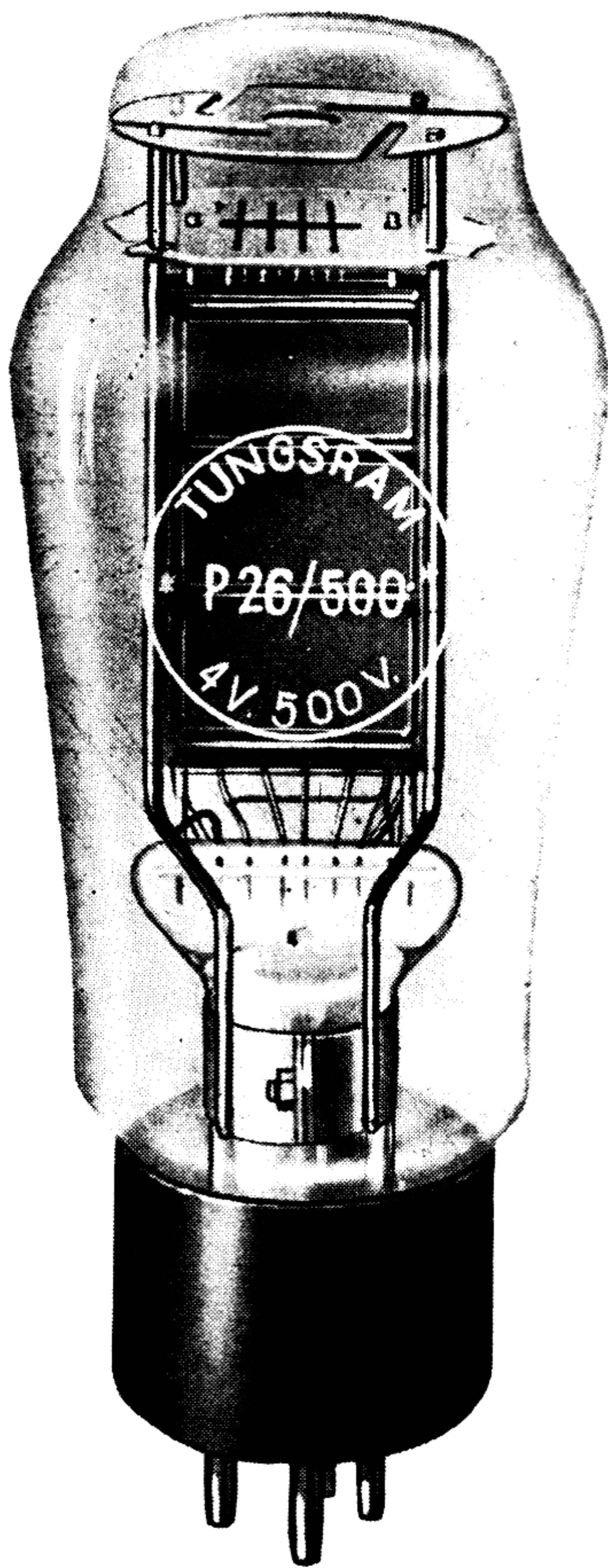
- $C_{ga} = 3 \mu\mu\text{F}$
- $C_{gk} = 2 \mu\mu\text{F}$
- $C_{ak} = 0,2 \mu\mu\text{F}$
- $\lambda \text{ min} = 1,1 \text{ m}$

TUNGSRAM RADIO

Kraftverstärkerröhre mit Oxydheizfaden

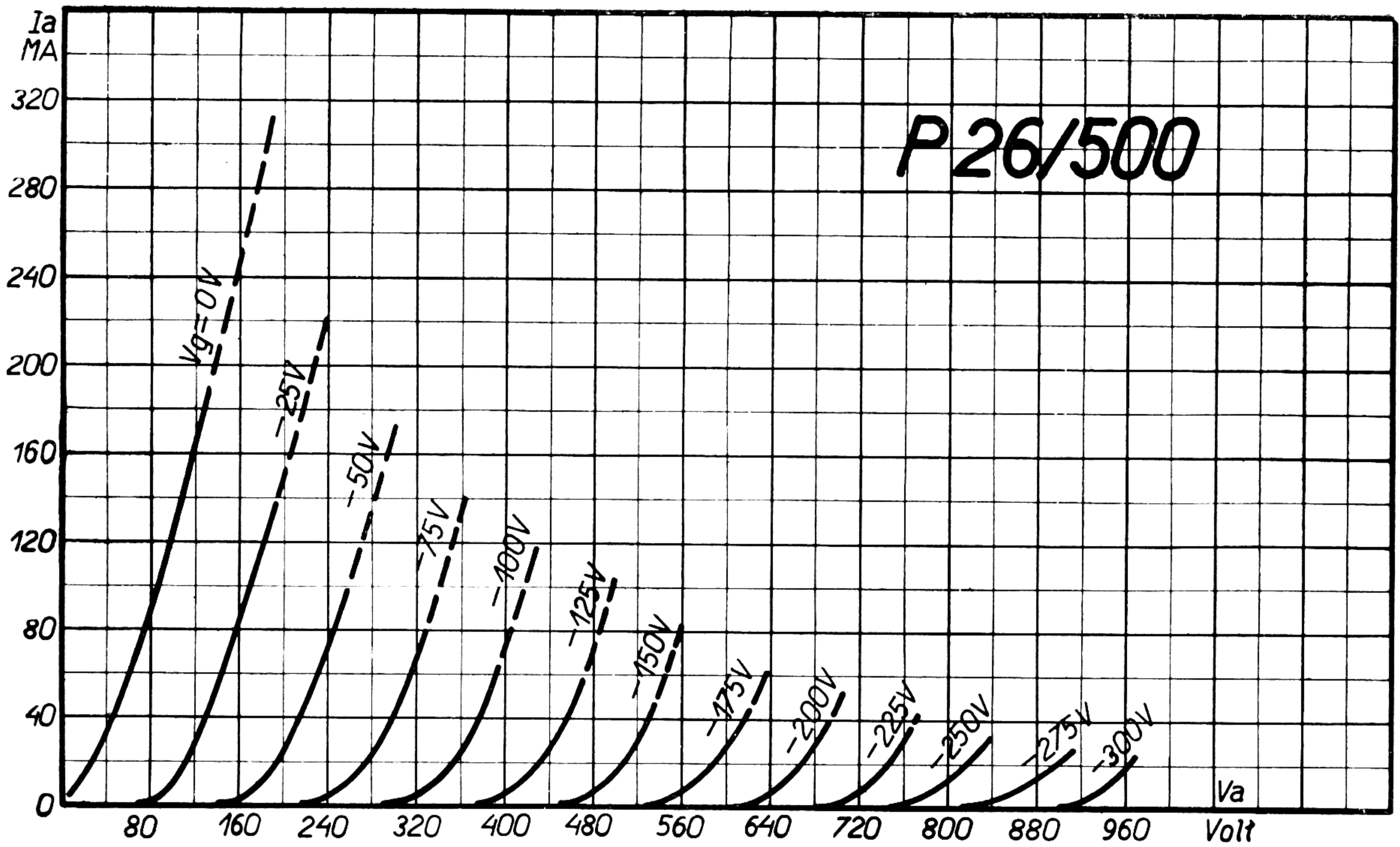
Gewicht cca 100 g.

P 26/500



Sockel: F 44

TUNGSRAM RADIO



V_f — 4 Volt
 I_f — 2.0 Amp.
 $V_{a \max}$ — 500 Volt
 S — 4.2 mA/V
 g — 3.2
 R_i — 760 Ohm
 $W_{a \max}$ — 25 Watt

C_{ga} — 14 μ F
 C_{gk} — 7 "
 C_{ak} — 6 "

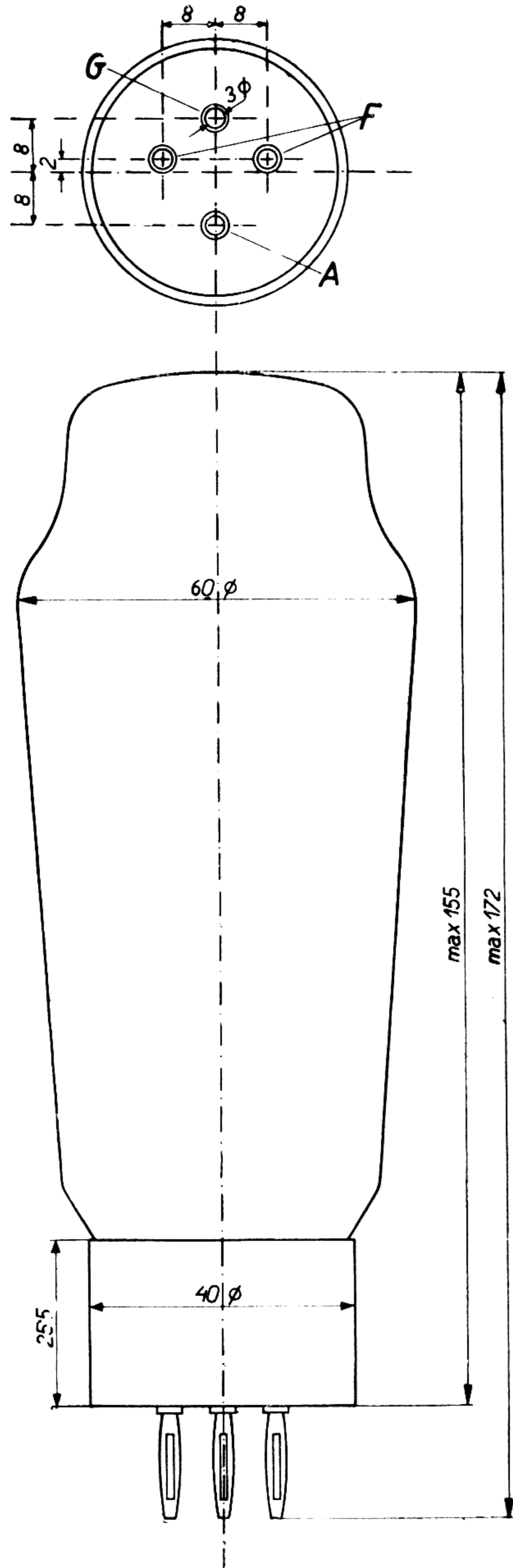
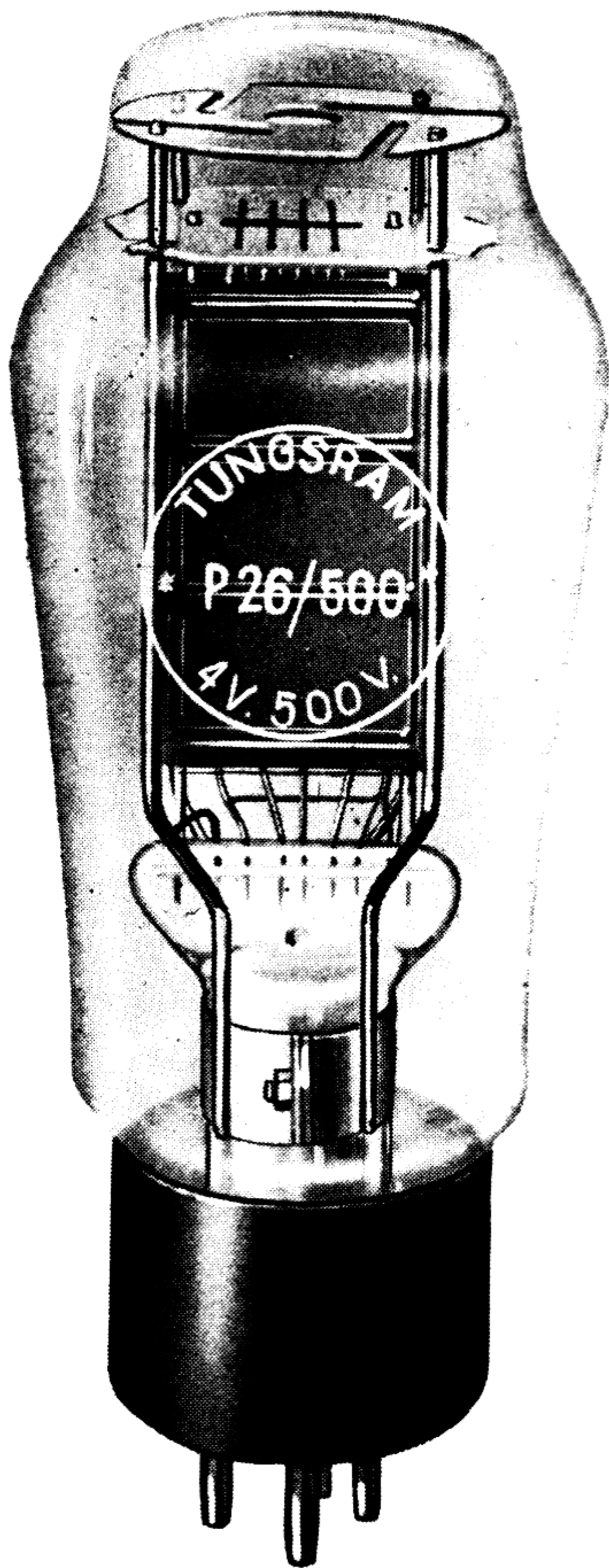
Maximaler Gitterabteilungswiderstand: $R_{g \max}$ 10,000 Ohm

TUNGSRAM RADIO

Kraftverstärkerröhre mit Oxydheizfaden

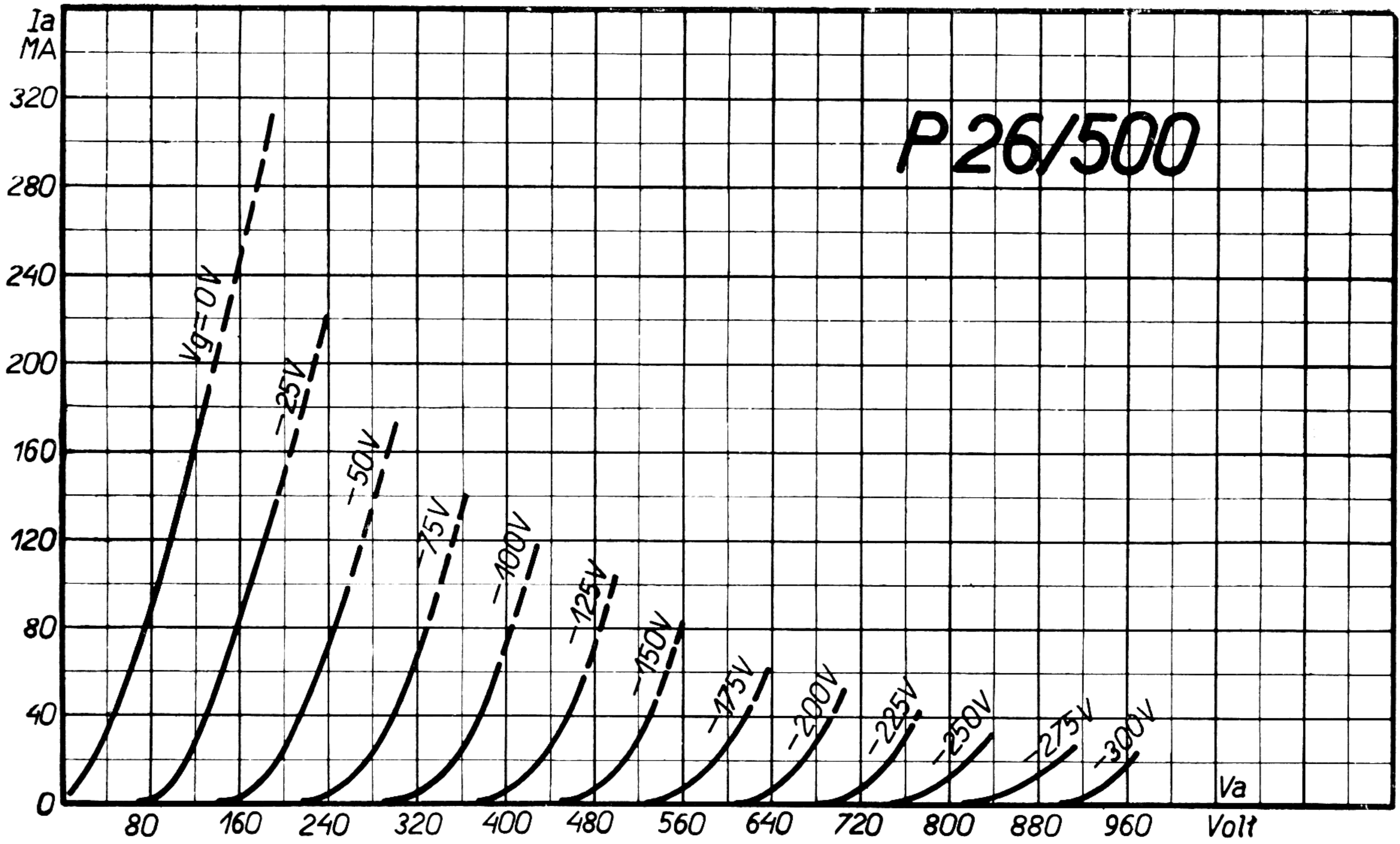
Gewicht cca 100 g.

P 26/500



Sockel: F 44

TUNGSRAM RADIO



V_f — 4 Volt
 I_f — 2.0 Amp.
 $V_{a \max}$ — 500 Volt
 S — 4.2 mA/V
 g — 3.2
 R_i — 760 Ohm
 $W_{a \max}$ — 25 Watt

C_{ga} — 14 μ F
 C_{gk} — 7 "
 C_{ak} — 6 "

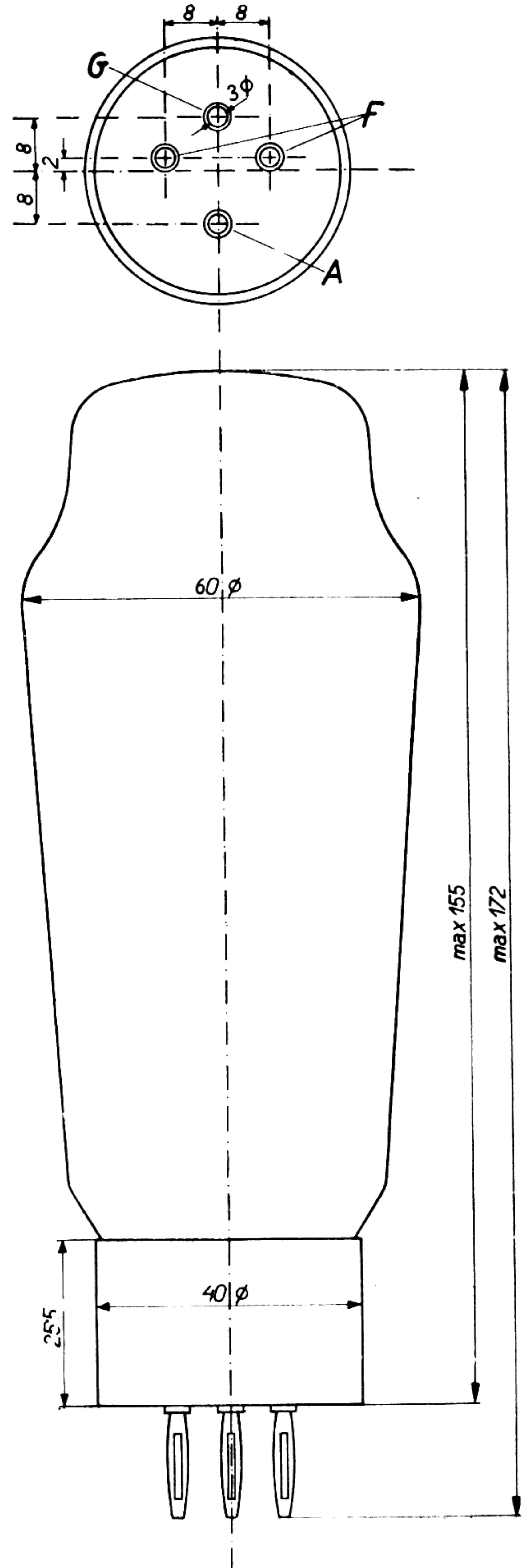
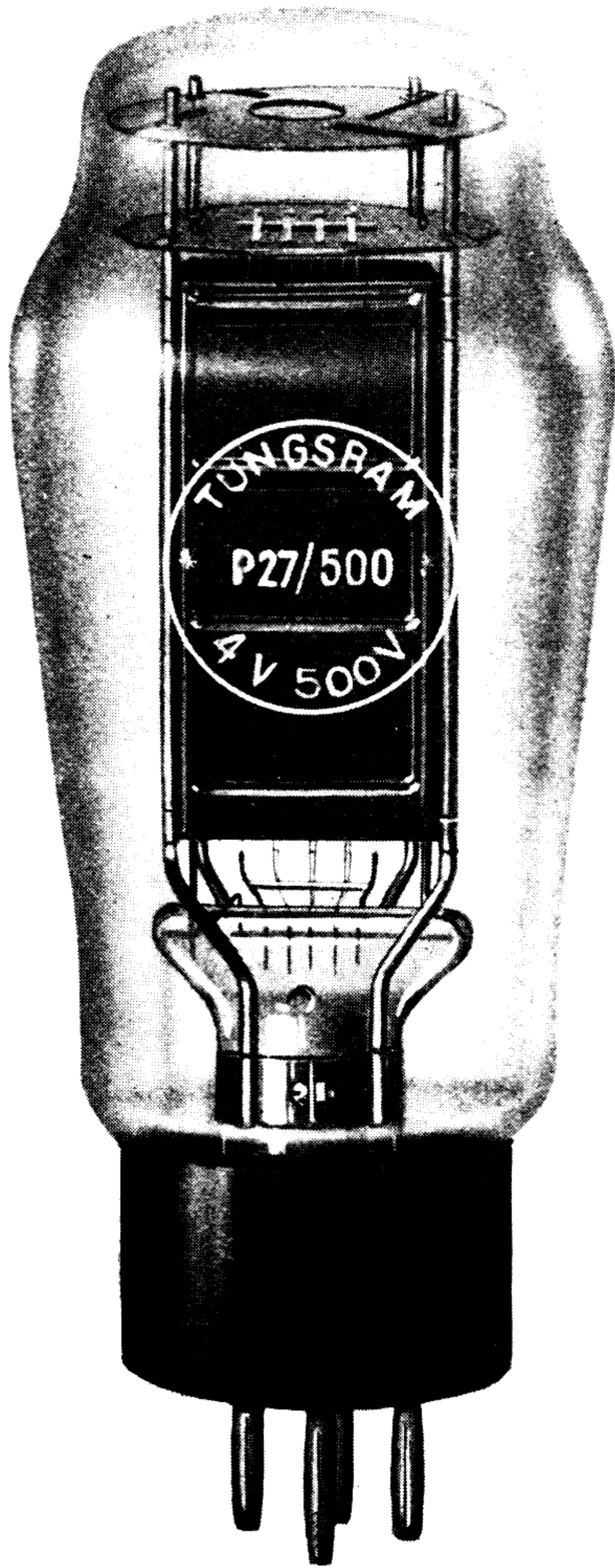
Maximaler Gitterabteilungswiderstand: $R_{g \max}$ — 10,000 Ohm

TUNGSRAM RADIO

Kraftverstärkerröhre mit Oxydheizfaden

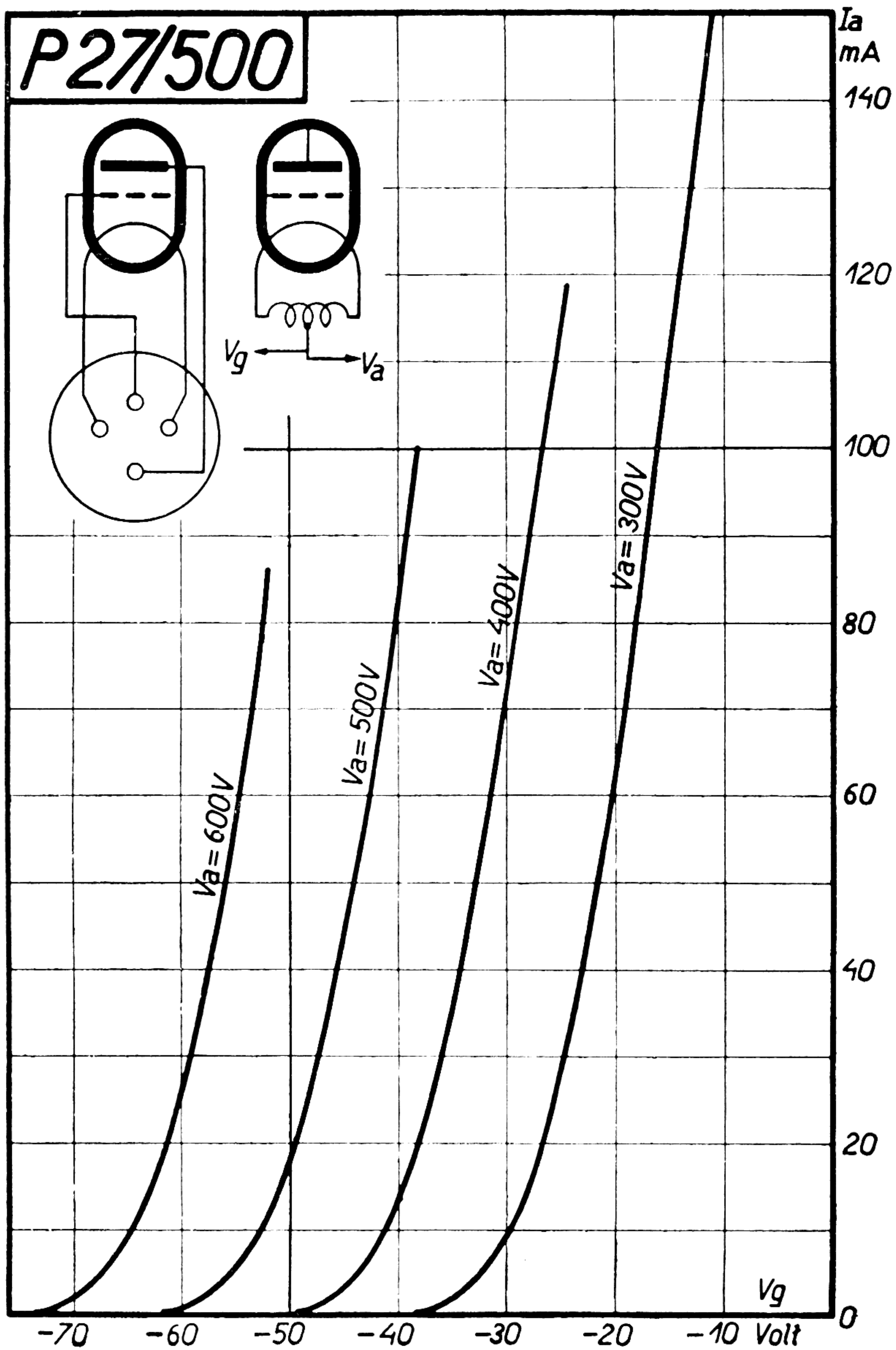
Gewicht cca 100 g.

P 27/500



Sockel: F 44

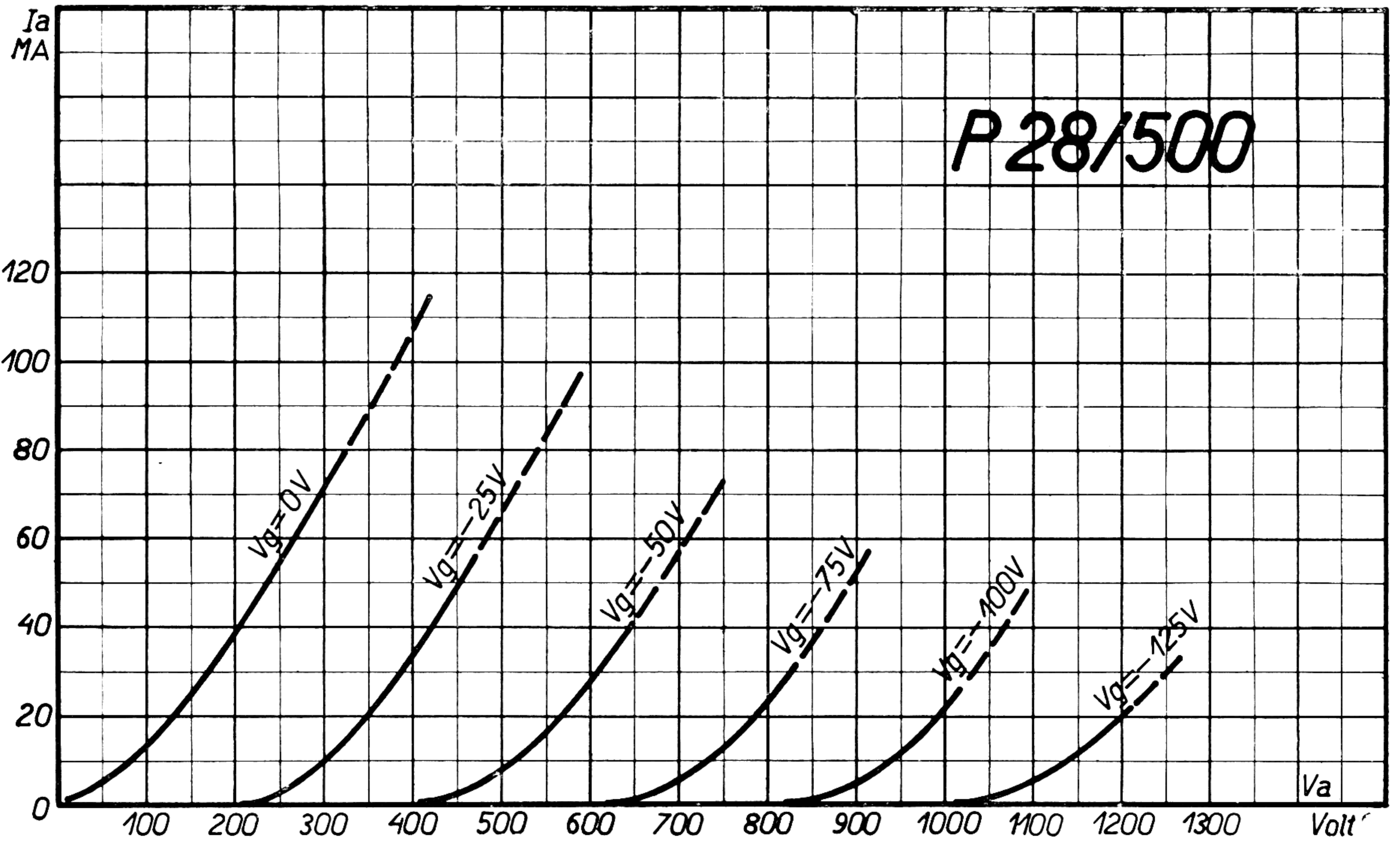
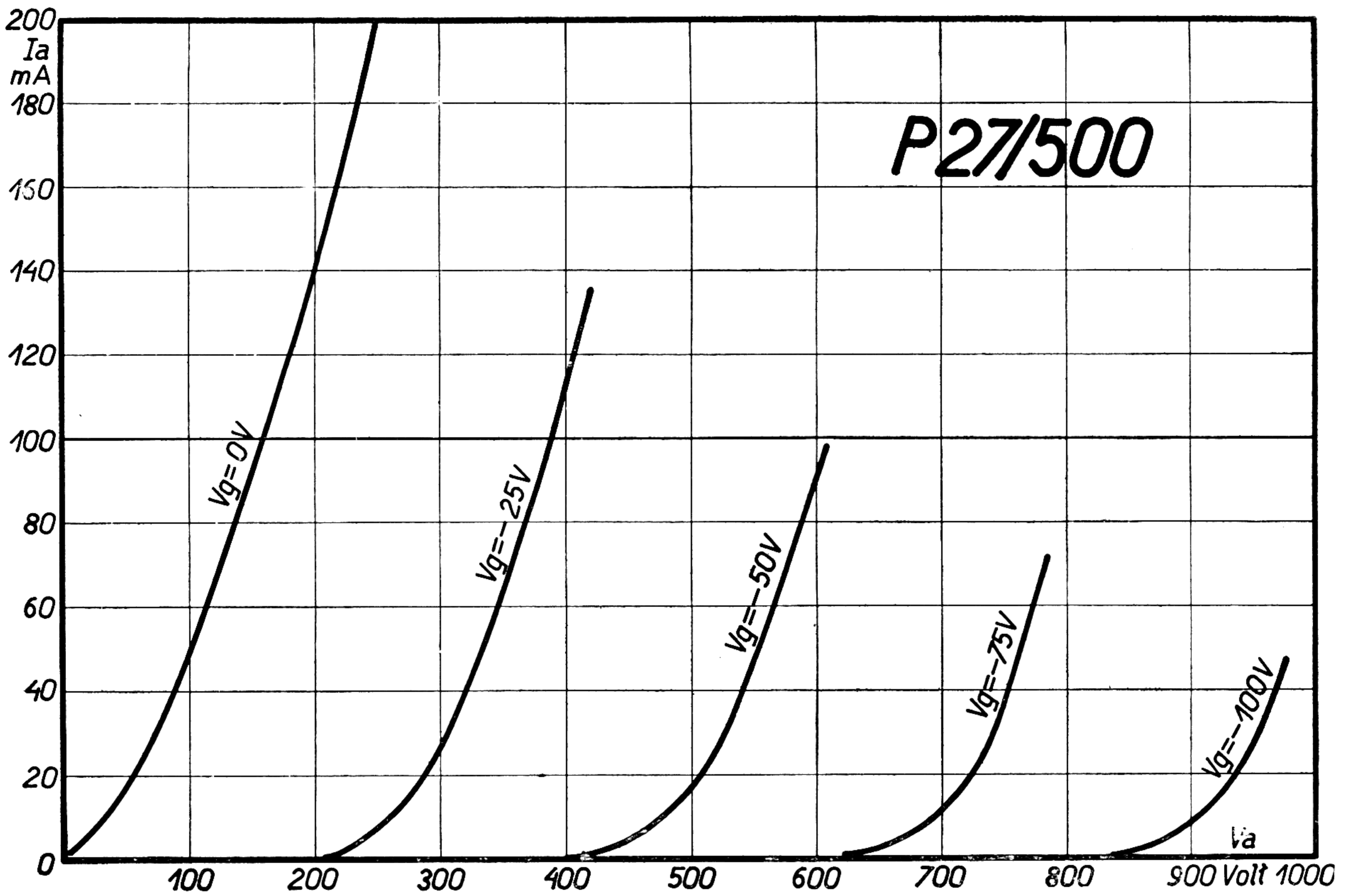
TUNGSRAM RADIO



$V_f = 4$ Volt
 $I_f = 2$ Amp.
 $V_{a \max} = 500$ Volt
 $S = 7.5$ mA/V
 $g = 9$
 $R_i = 1200$ Ohm
 $W_{a \max} = 25$ Watt

$C_{ga} = 16$ μ F
 $C_{gk} = 8.5$ "
 $C_{ak} = 5$ "

TUNGSRAM RADIO

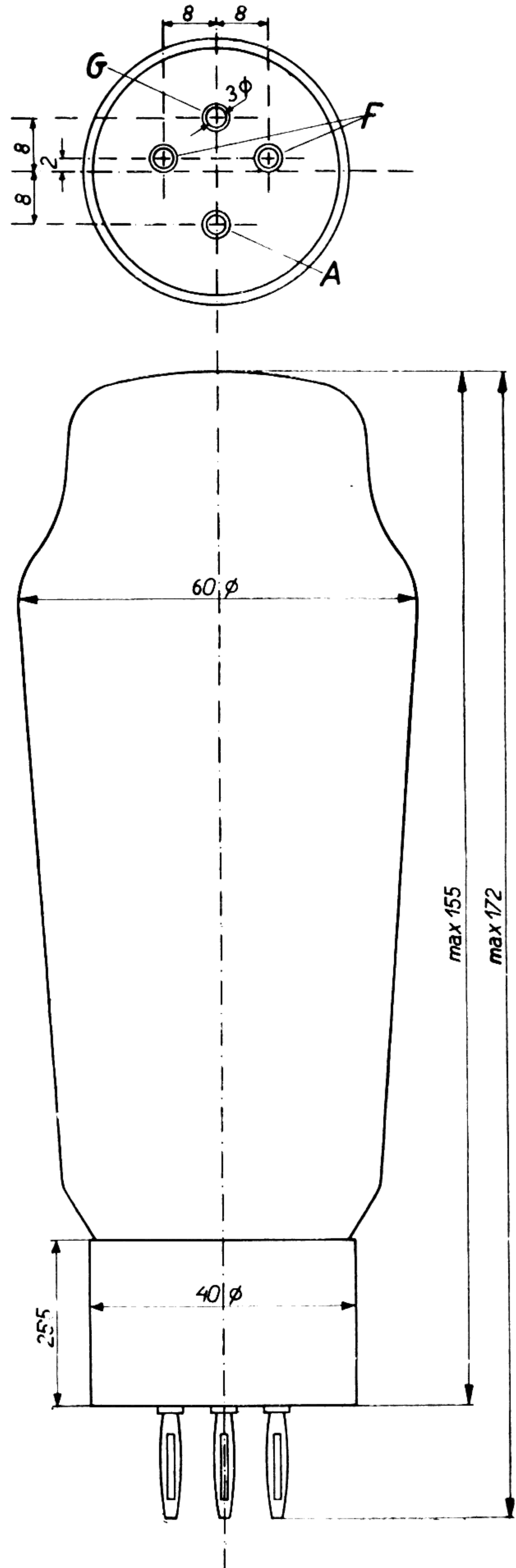


TUNGSRAM RADIO

Kraftverstärkerröhre mit Oxydheizfaden

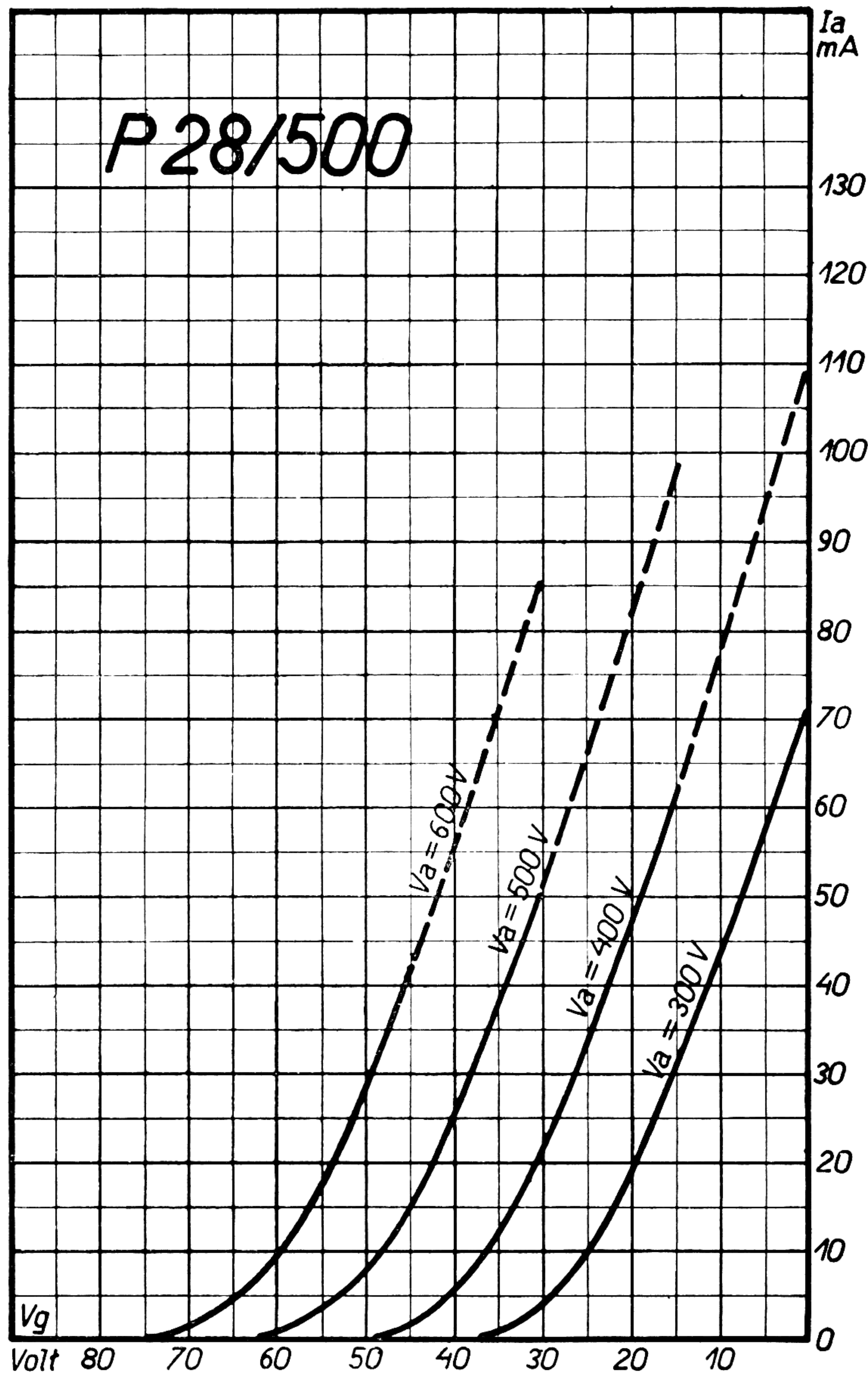
Gewicht cca 100 g.

P 28/500



Sockel: F 44

TUNGSRAM RADIO



$V_f = 7.5$ Volt

$I_f = 1.25$ Amp.

$V_{a\max} = 600$ Volt

$S = 3$ mA/V

$g = 9$

$R_i = 3000$ Ohm

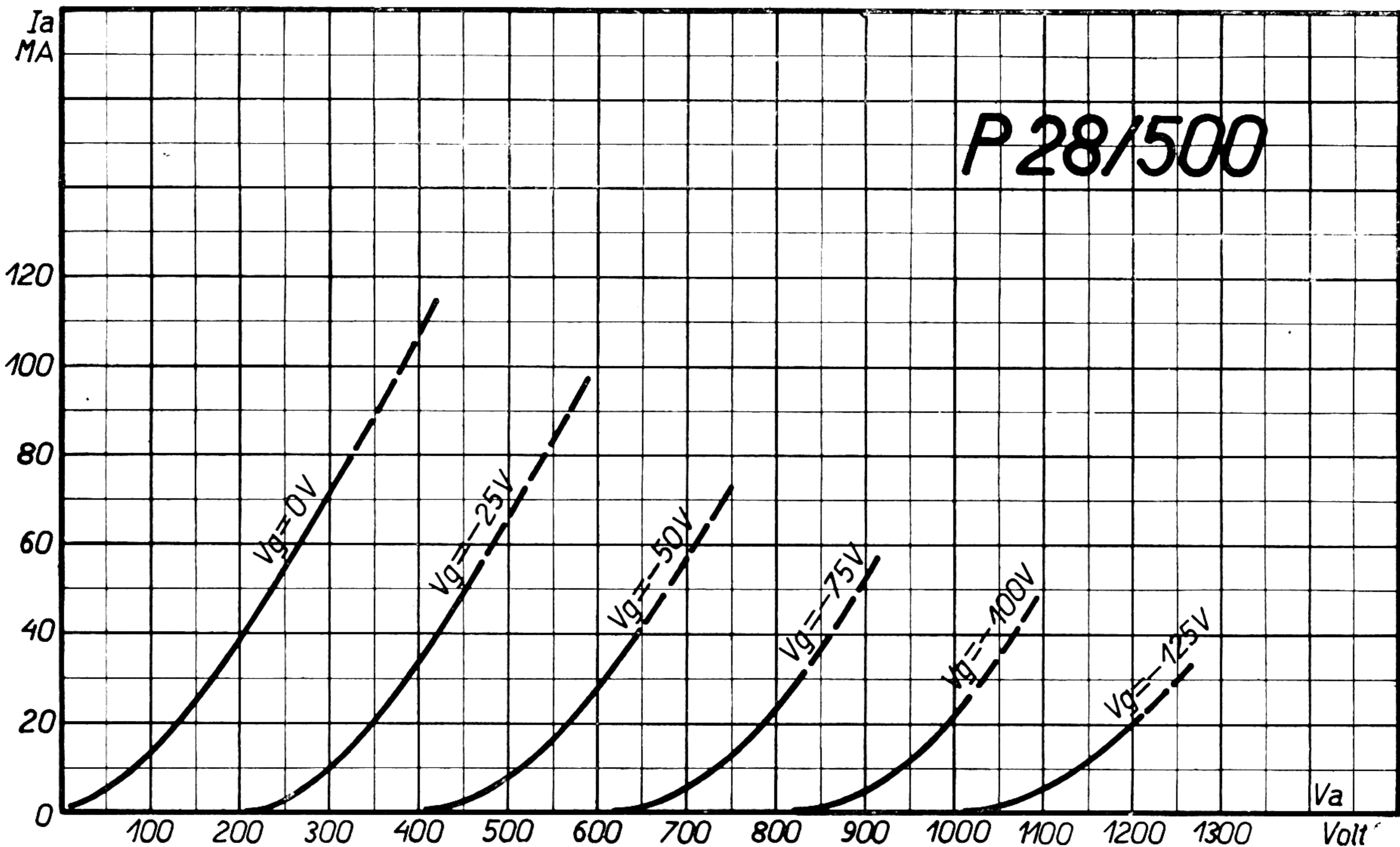
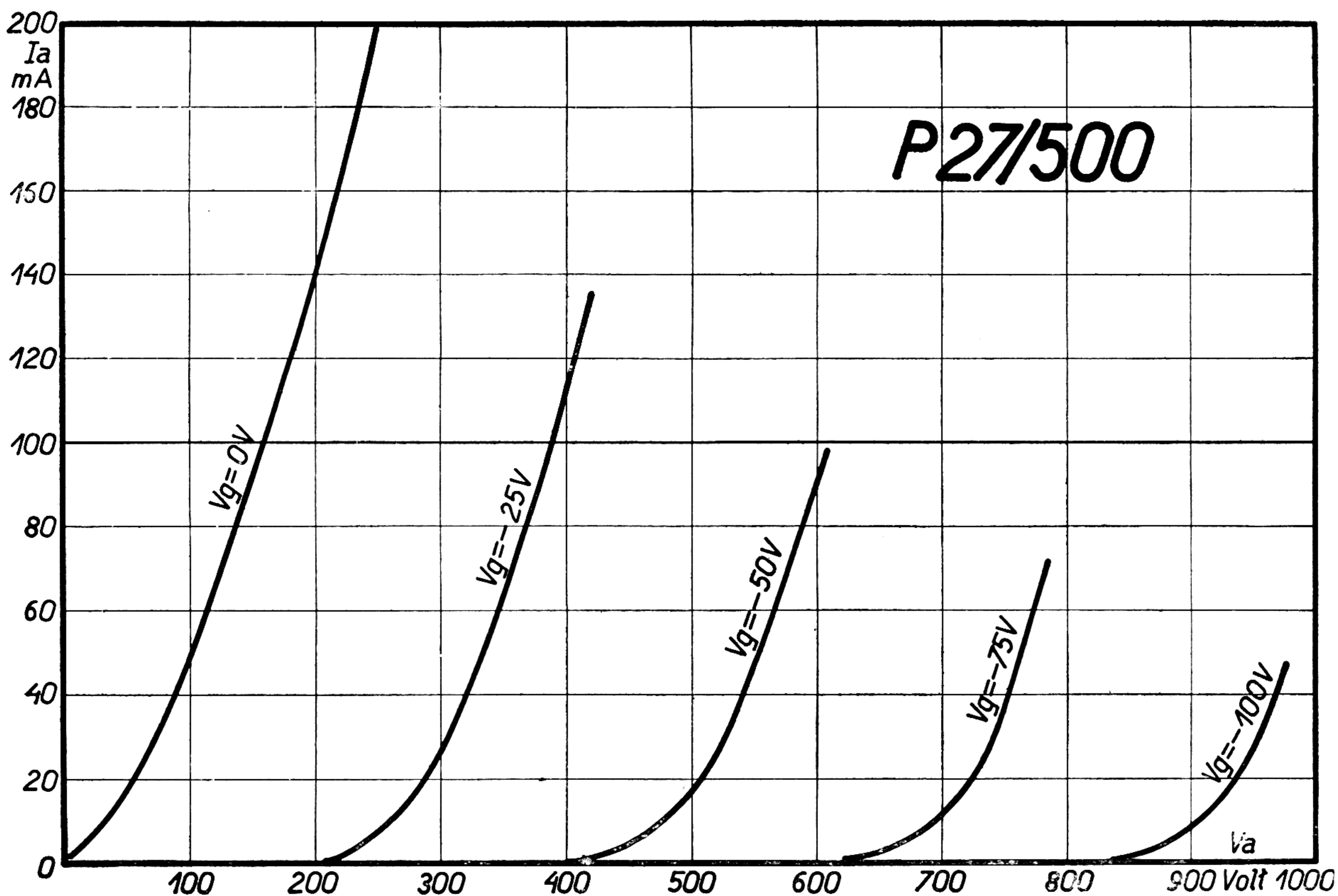
$W_{a\max} = 35$ Watt

$C_{ga} = 12.5$ μ F

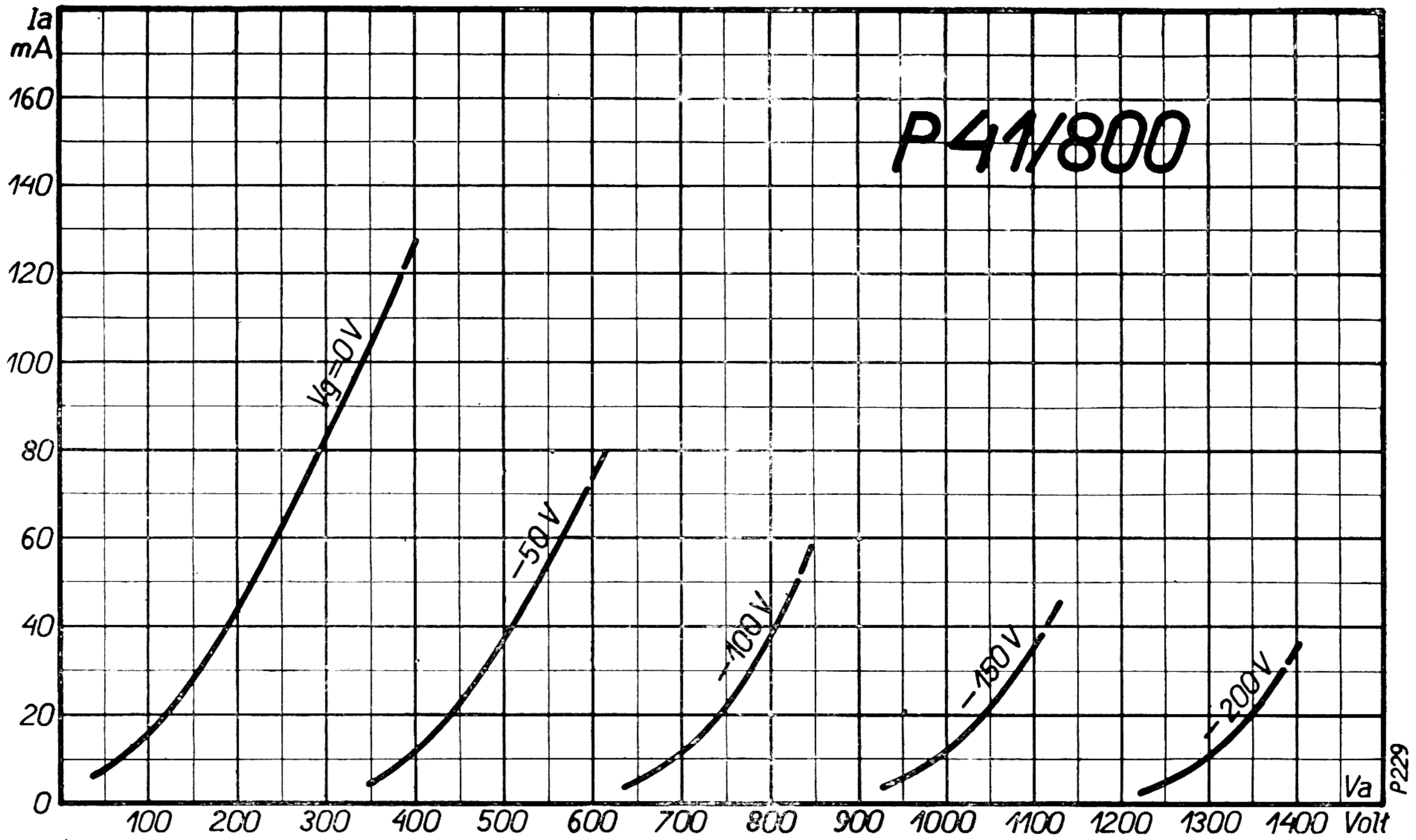
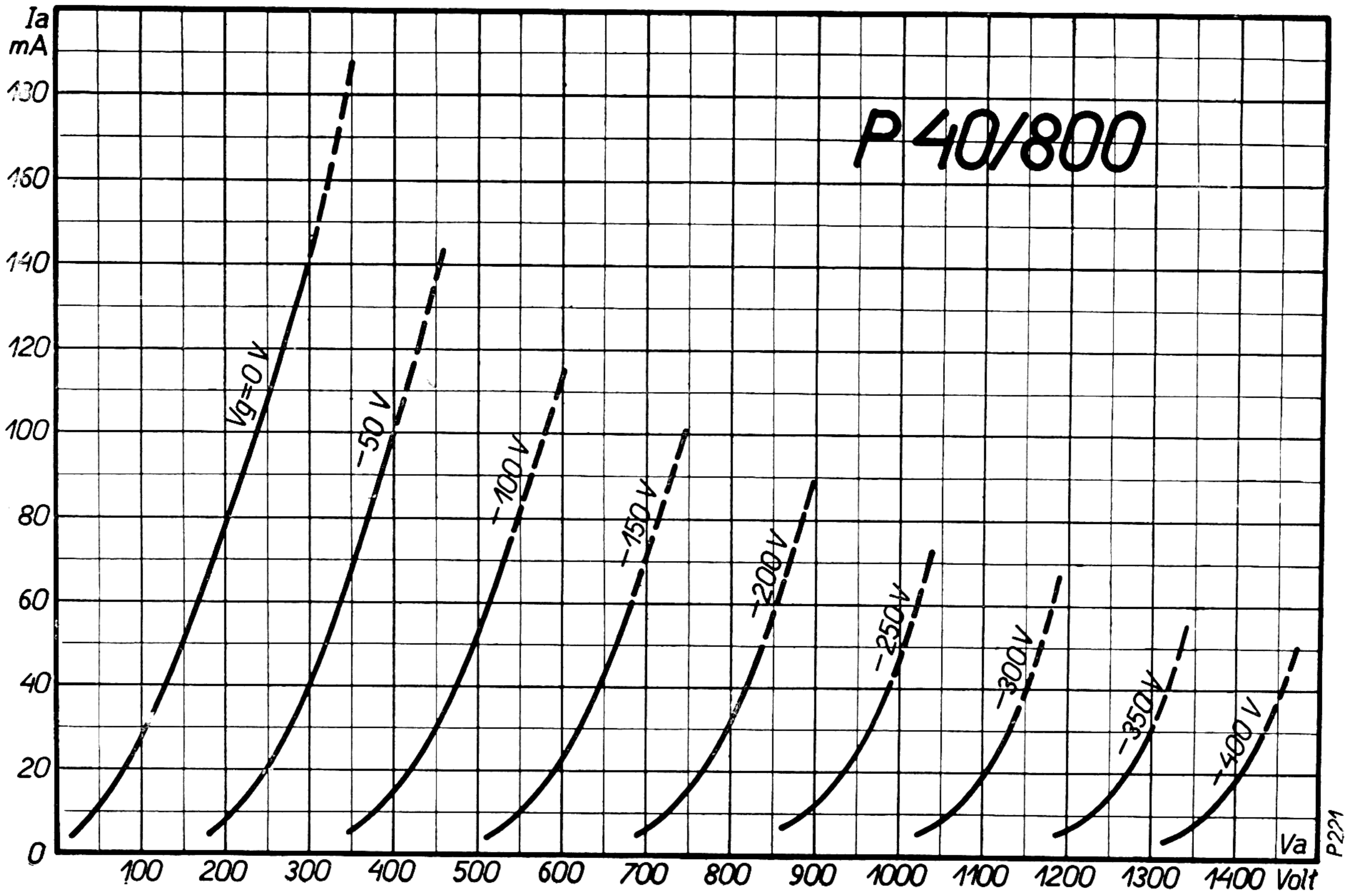
$C_{gk} = 4.5$ "

$C_{ak} = 4$ "

TUNGSRAM RADIO



TUNGSRAM RADIO

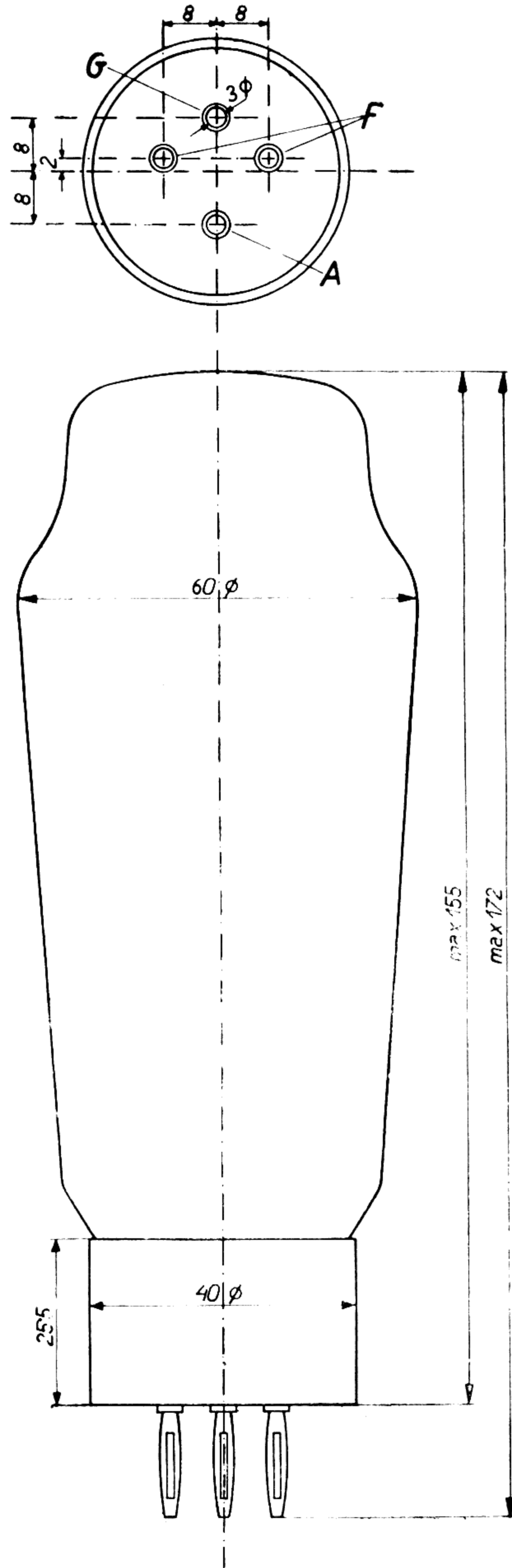
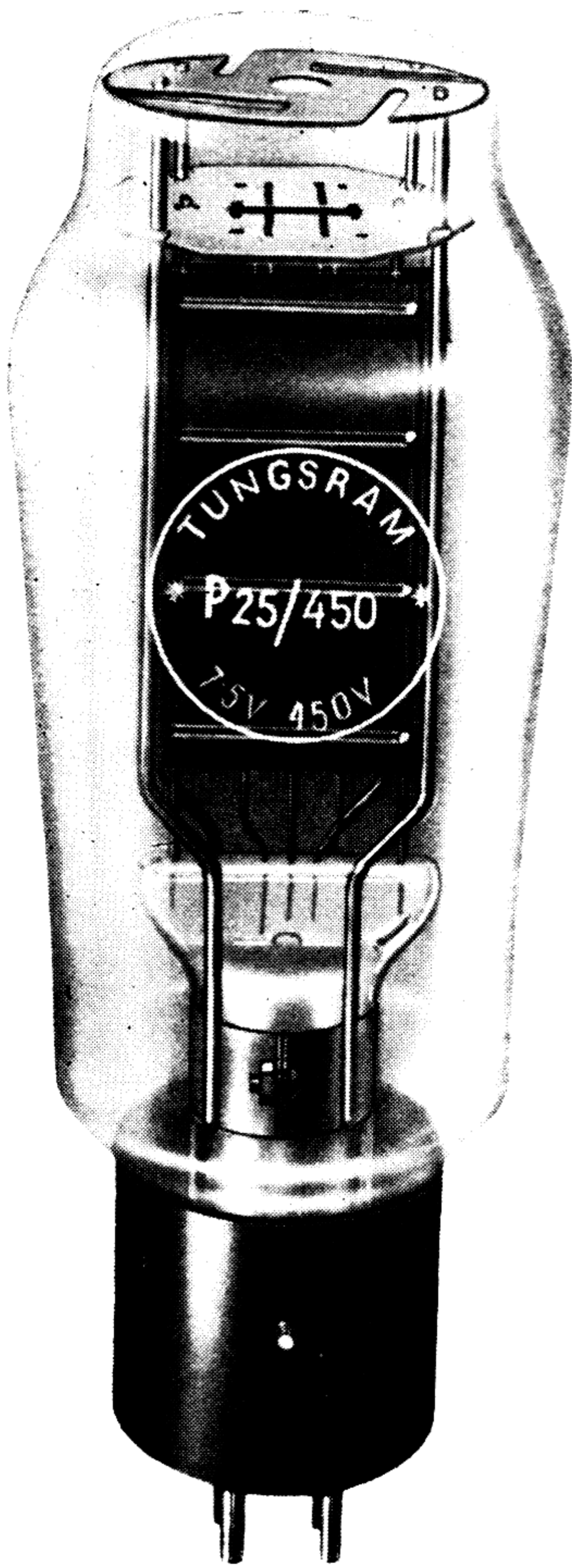


TUNGSRAM RADIO

Kraftverstärkerröhre mit Oxydheizfaden

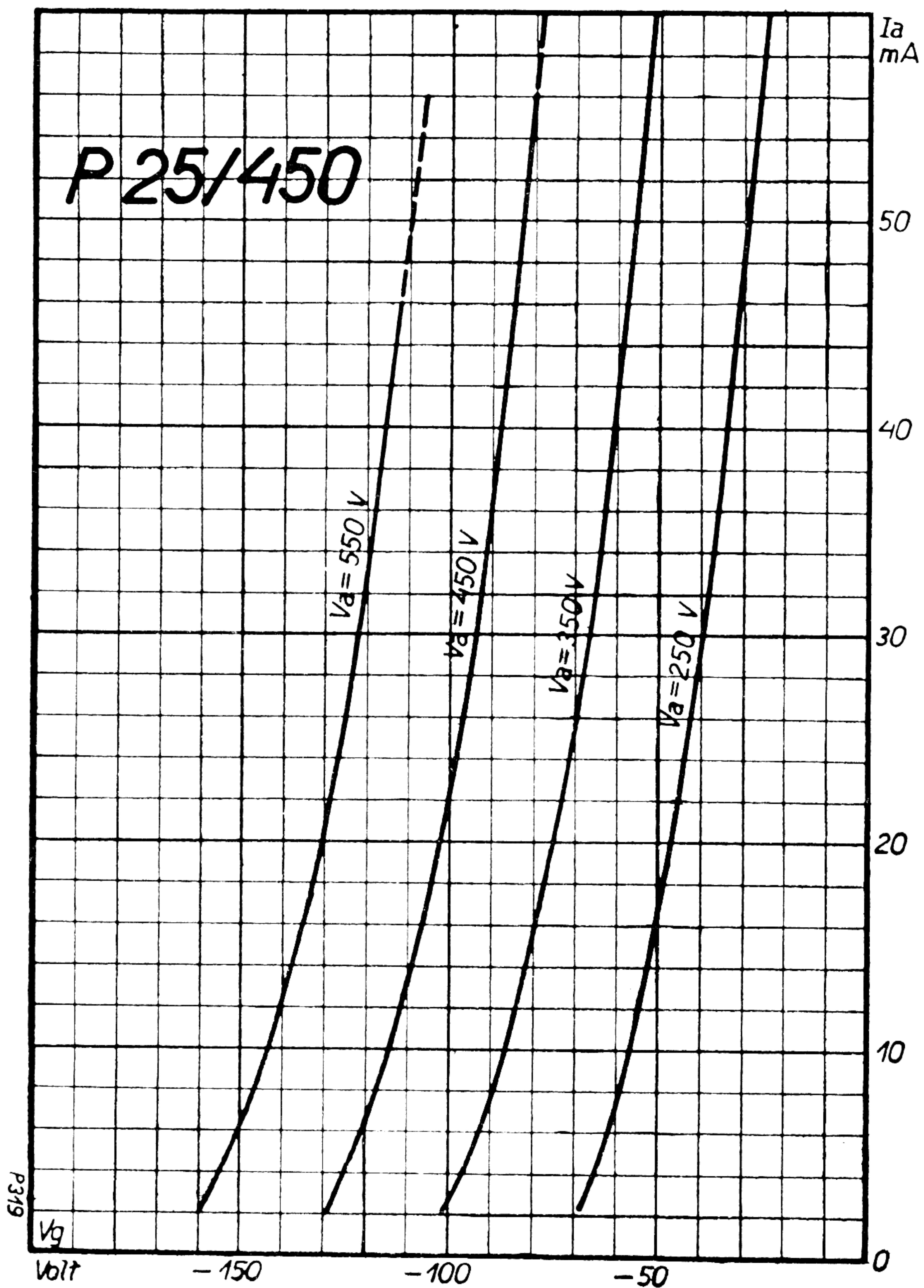
Gewicht cca 100 g

P 25/450



Sockel: F 48 (Abb. links)
lieferbar auch mit Sockel F 44 (Abb. rechts)

TUNGSRAM RADIO



V_f — 7.5 Volt
 I_f — 1.25 Amp.
 $V_{a \max}$ — 600 Volt
 S — 2.1 mA/V
 g — 3.8
 R_i — 2000 Ohm
 $W_{a \max}$ — 25 Watt

C_{ga} — 10.5 μ F
 C_{gk} — 4.5 "
 C_{ak} — 4.5 "

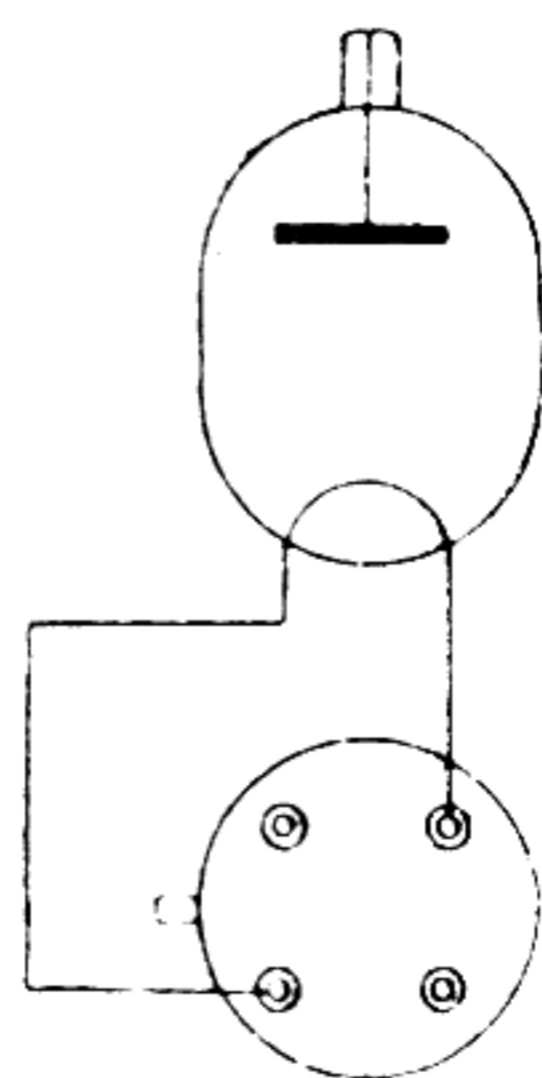
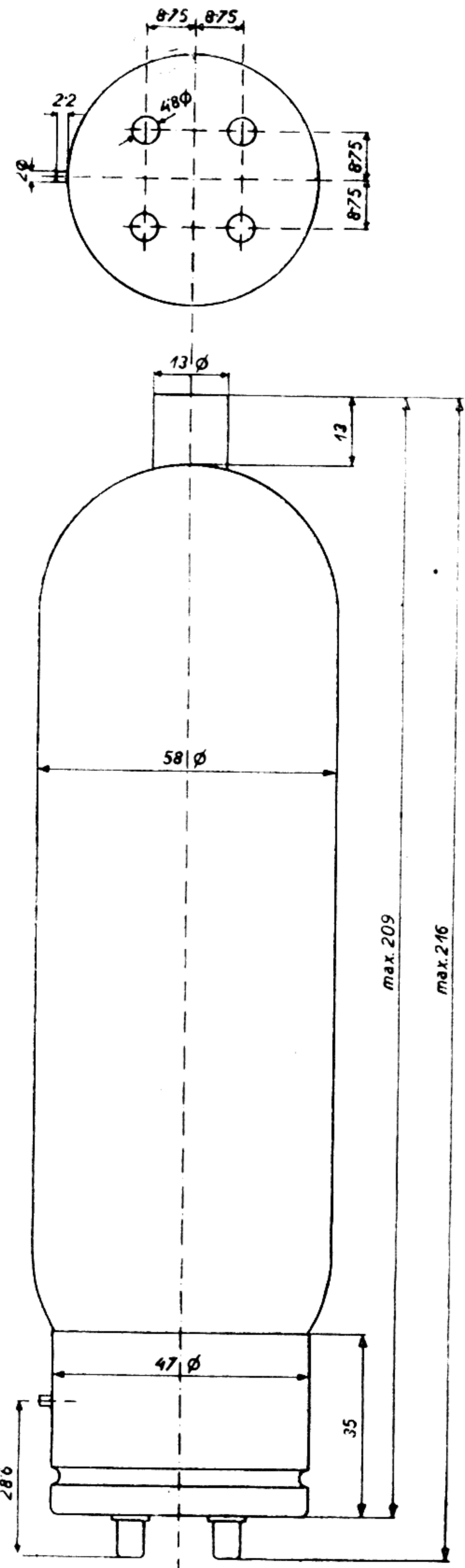
Maximaler Gitterableitungswiderstand 10,000 Ohm.

TUNGSRAM RADIO

Quecksilberdampf-
Einweggleichrichter
mit Oxydheizfaden

RG 1000/3000

Gewicht cca 220 g



Die Umgebungstemperatur
soll zwischen 15° und 60° Celsius liegen.

Die Röhre darf nur in vertikaler Lage
verwendet werden.

Sockel: F 46

TUNGSRAM RADIO

Beim Inbetriebsetzen einer Röhre nach Versand, oder wenn das Quecksilber durch andere Erschütterungen auf den Wänden verspritzt worden ist, muss der Heizfaden vorerst 15 Minuten lang erhitzt werden bevor Anodenspannung angelegt wird. Im normalen Betrieb muss die Heizfadenspannung wenigstens 30 Sekunden vor der Anodenspannung angelegt werden und darf vor Abschaltung der Letzteren nicht ausgeschaltet werden.

Hochfrequente und Hochspannungsfelder können ein Rückzünden der Röhre verursachen. Deshalb ist die Röhre vor etwaigen äusseren Feldern abzuschirmen und vor Hochfrequenzspannungen im Netz durch Siebelemente zu schützen.

Da der Anodenspannungsabfall der Röhre, unabhängig vom Anodenstrom ist (etwa 10 V), muss der Anodenstrom immer durch äussere Elemente begrenzt werden.

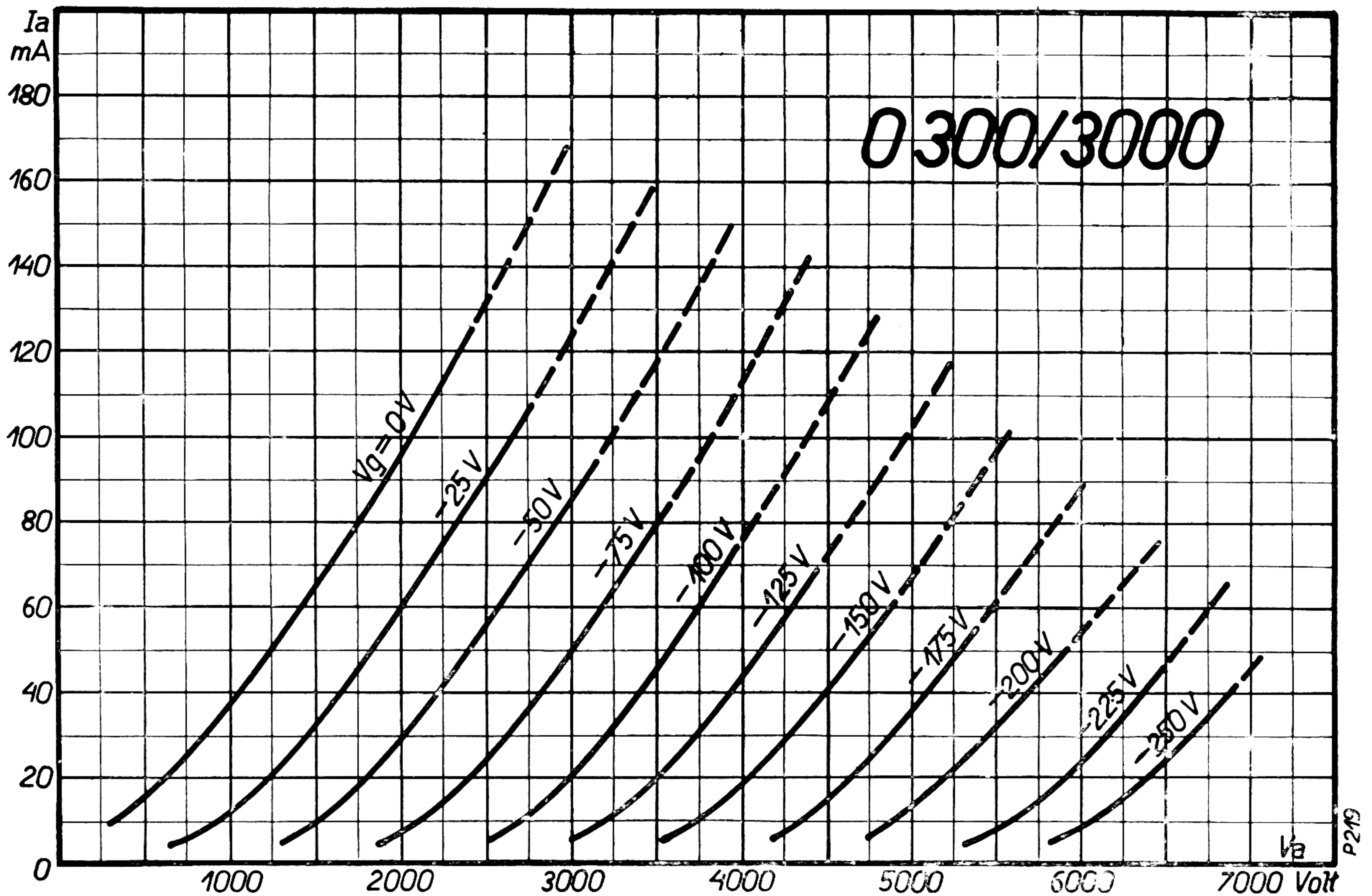
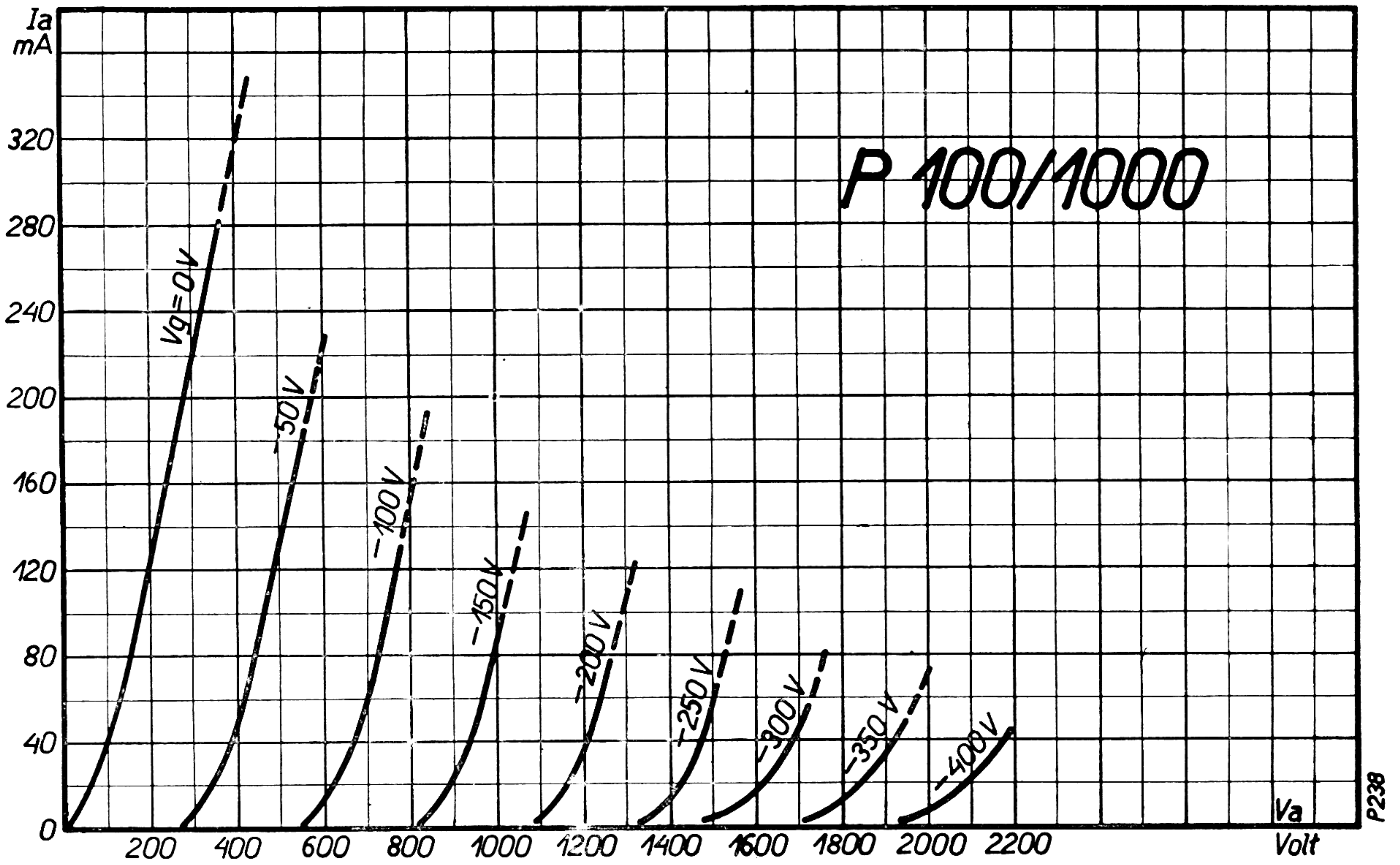
Der Glättungssiebkreis muss so bemessen sein, dass der Scheitelwert des Stromes auch beim Einschalten die zugelassenen 5 Amp. nicht überschreitet. Man achte darauf, dass die beiden Siebelemente keine Serienresonanz für die Pulsationsfrequenz ergeben.

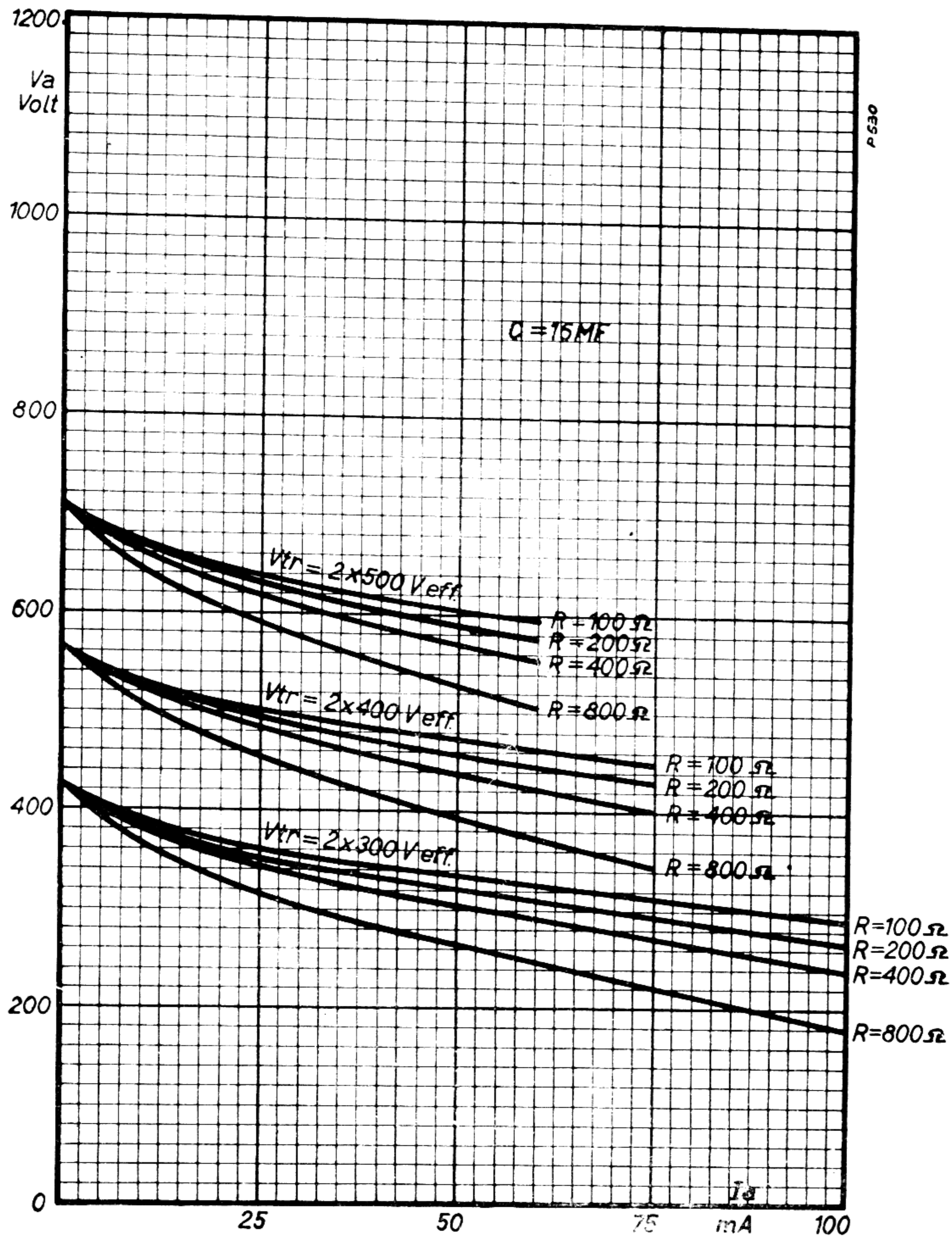
Heizspannung	..	---	---	---	---	---	---	---	---	---	Vf = 5 V. (zulässige Tol. \pm 5%)
Heizstrom	---	---	---	---	---	---	---	---	---	---	If = 6,75 Amp.
Spannungsabfall der Anodenstrecke	---	---	---	---	---	---	---	---	---	---	Vp = cca 10 V

Zulässige Beanspruchung im Betrieb:

Scheitelwert des Anodenstromes	---	---	---	---	---	---	---	---	---	---	I _{pmax.} = 5 Amp. pro Röhre
Entnehmbarer Gleichstrom (Durchschnittswert des Anodenstromes)	---	---	---	---	---	---	---	---	---	---	I _{glmax.} = 1,25 Amp. pro Röhre
Scheitelwert der Spannung in der Sperrichtung											
bei 50° C. Umgebungstemperatur	..	---	---	---	---	---	---	---	---	---	V _{peak} = 10.000 Volt
Bei 60° C. Umgebungstemperatur	---	---	---	---	---	---	---	---	---	---	V _{peak} = 5.000 Volt

TUNGSRAM RADIO





$$R = R_{sec} + m^2 R_{Pr.}$$

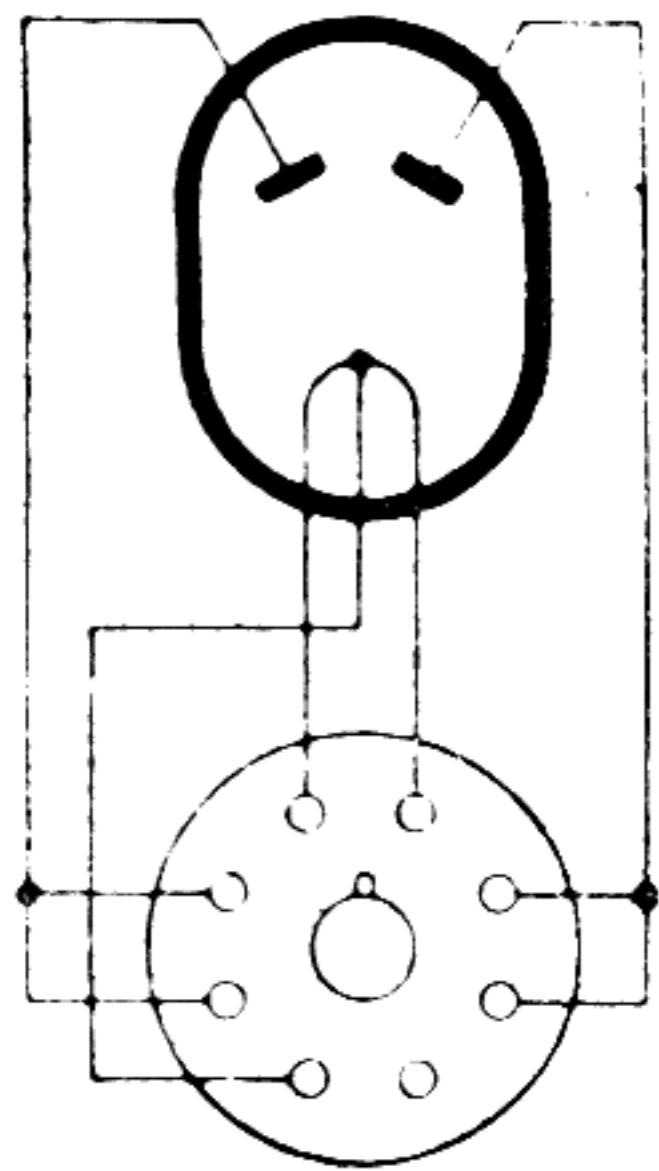


AZ 21

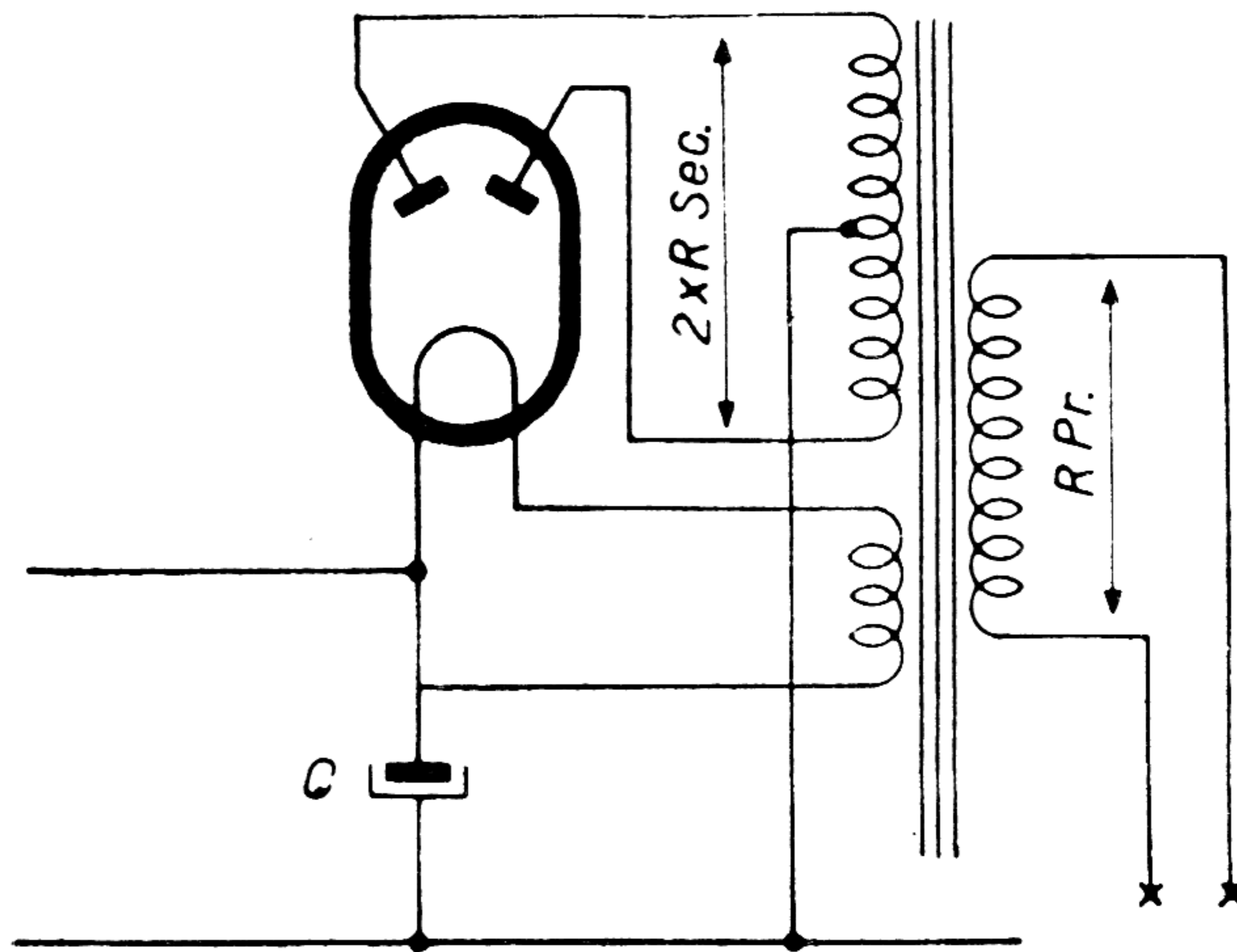
GLEICHRICHTER — RECTIFIER — REDRESSEUR

Heizung
Heating
Chauffage

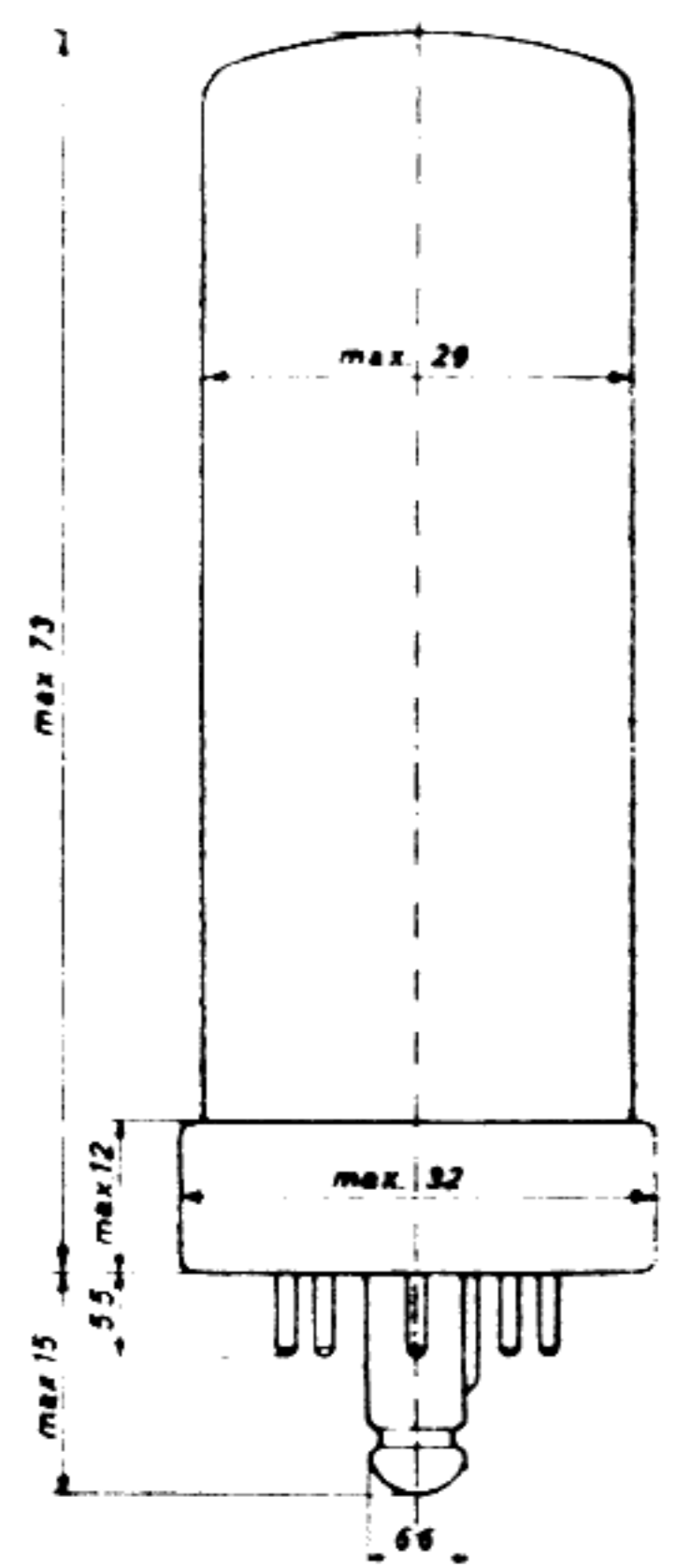
V _f	4 V	I _f	1 A
V _{tr sec}	2 × 300 V _{eff}	2 × 400 V _{eff}	2 × 500 V _{eff}
I _{gl max}	120 mA	90 mA	70 mA
C max	60 μF		



Sockelschaltung
Base connections
Connexions du culot

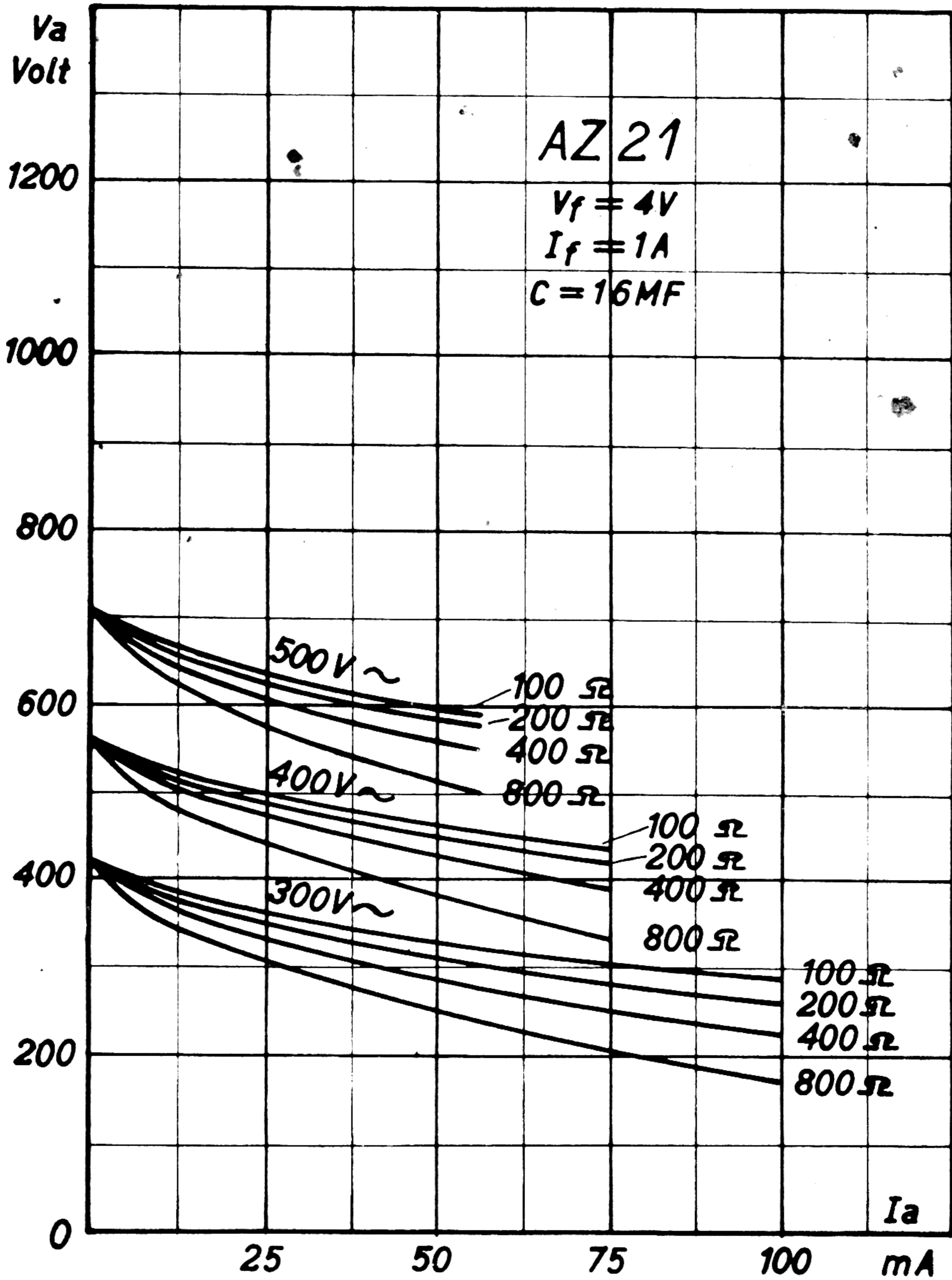


Schaltungsbeispiel
Circuit diagram
Schema de principe



Abmessungen
Dimensions

$$R = R_{sec} + \left(\frac{n_1}{n_2}\right)^2 R_{pr}$$





EAB 1

DREIFACHDIODE — TRIPLE DIODE

Heizung
Heating
Chauffage

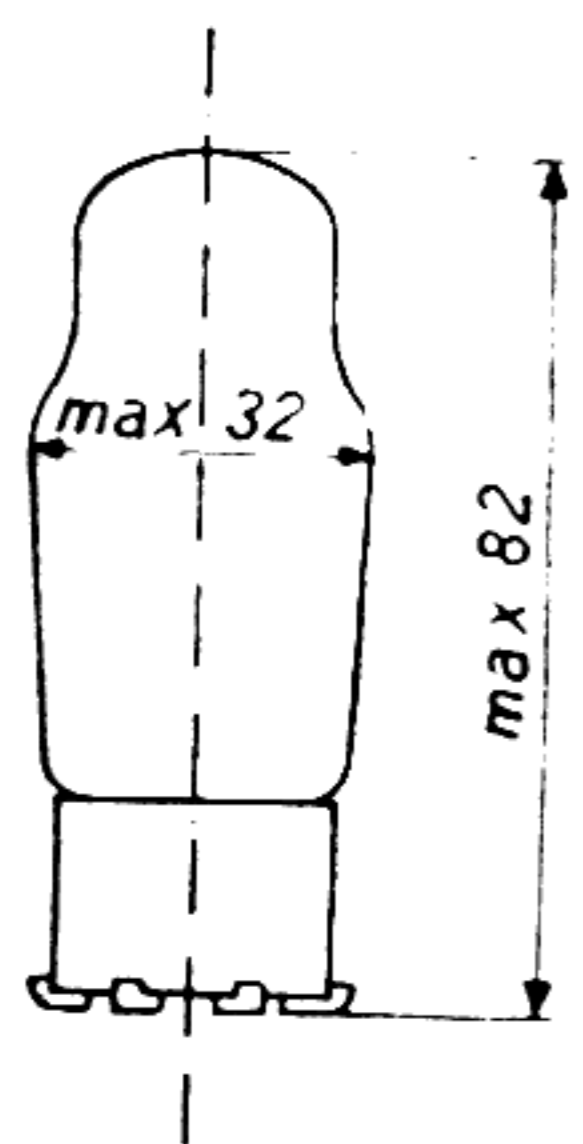
V_f **6,3 V (i)** I_f **0,2 A**

Grenzdaten
Limit ratings
Limites fixées

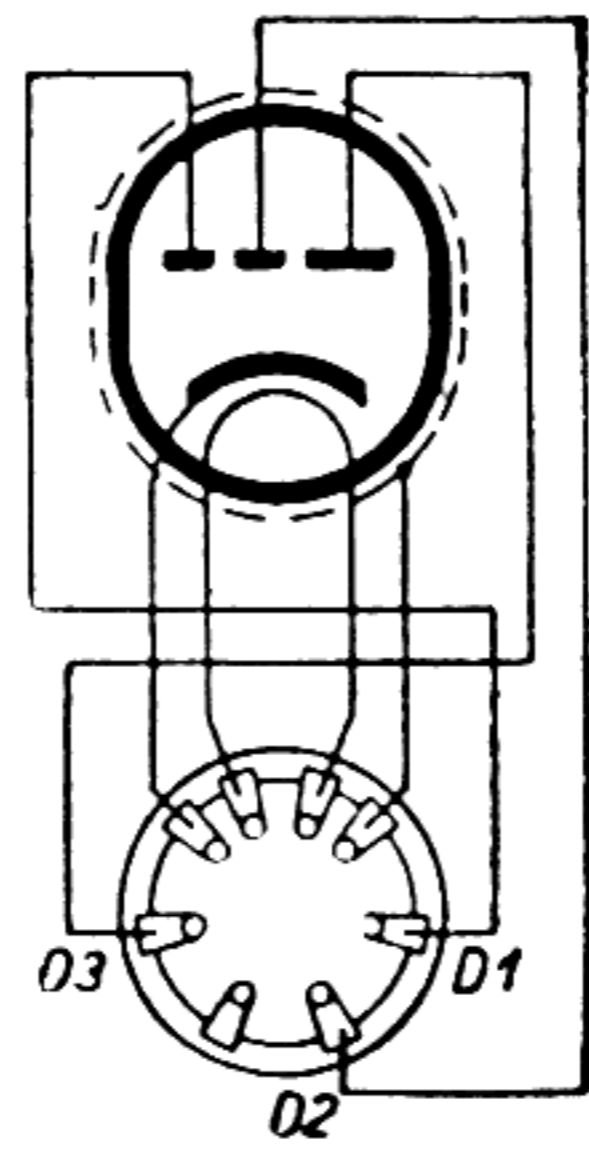
V_d max **200 V** I_d max **0,8 mA**
 V_{fk} max **100 V** R_{fk} max **20.000 Ω**

Kapazitäten
Capacities
Capacités

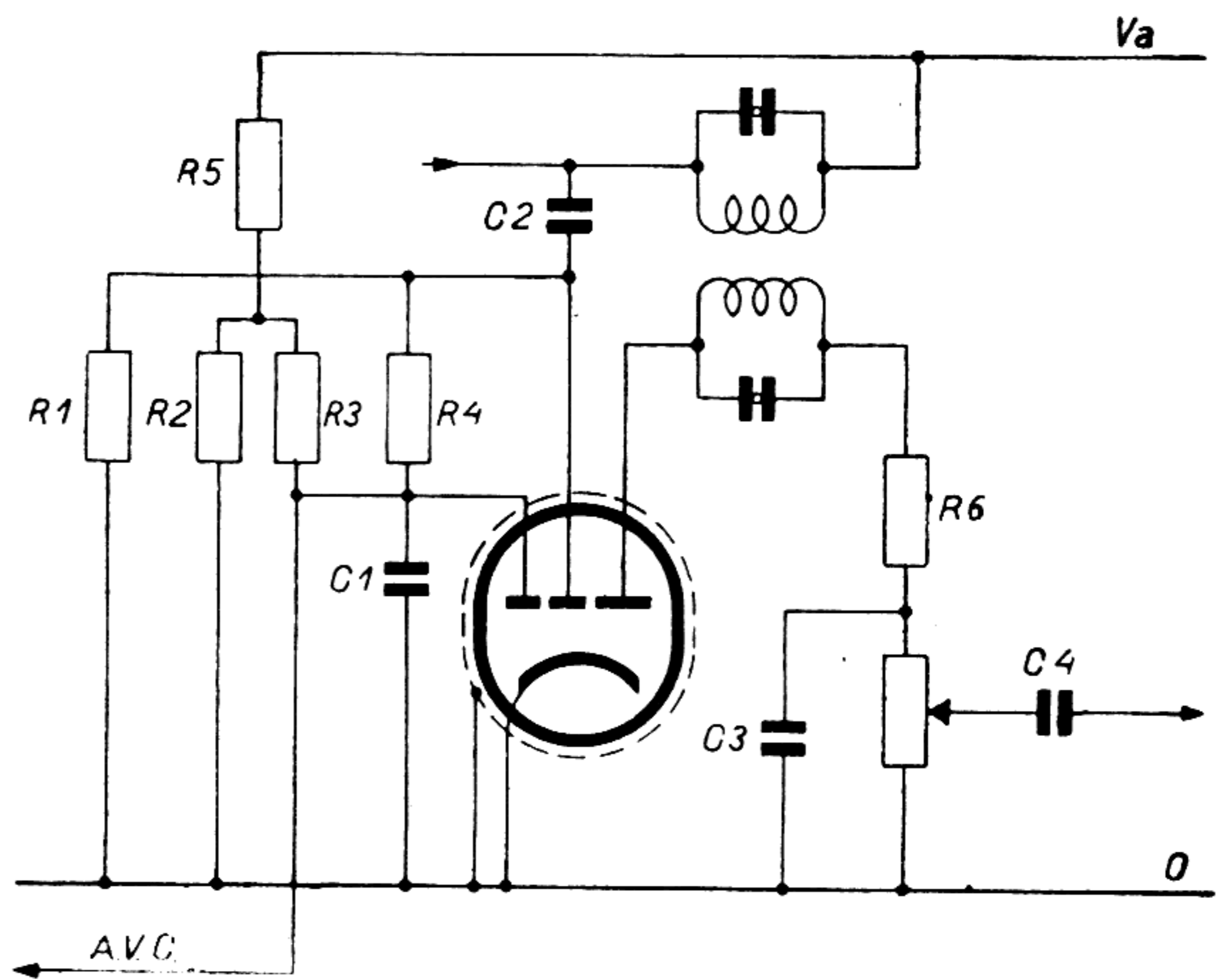
$C (d1/d2)$ **< 0,65 pF** $C (d1/d3)$ **< 0,08 pF** $C (d2/d3)$ **< 0,4 pF**
 $C (d1/k)$ **= 1 pF** $C (d2/k)$ **1,45 pF** $C (d3/k)$ **= 2,25 pF**



Abmessungen
Dimensions



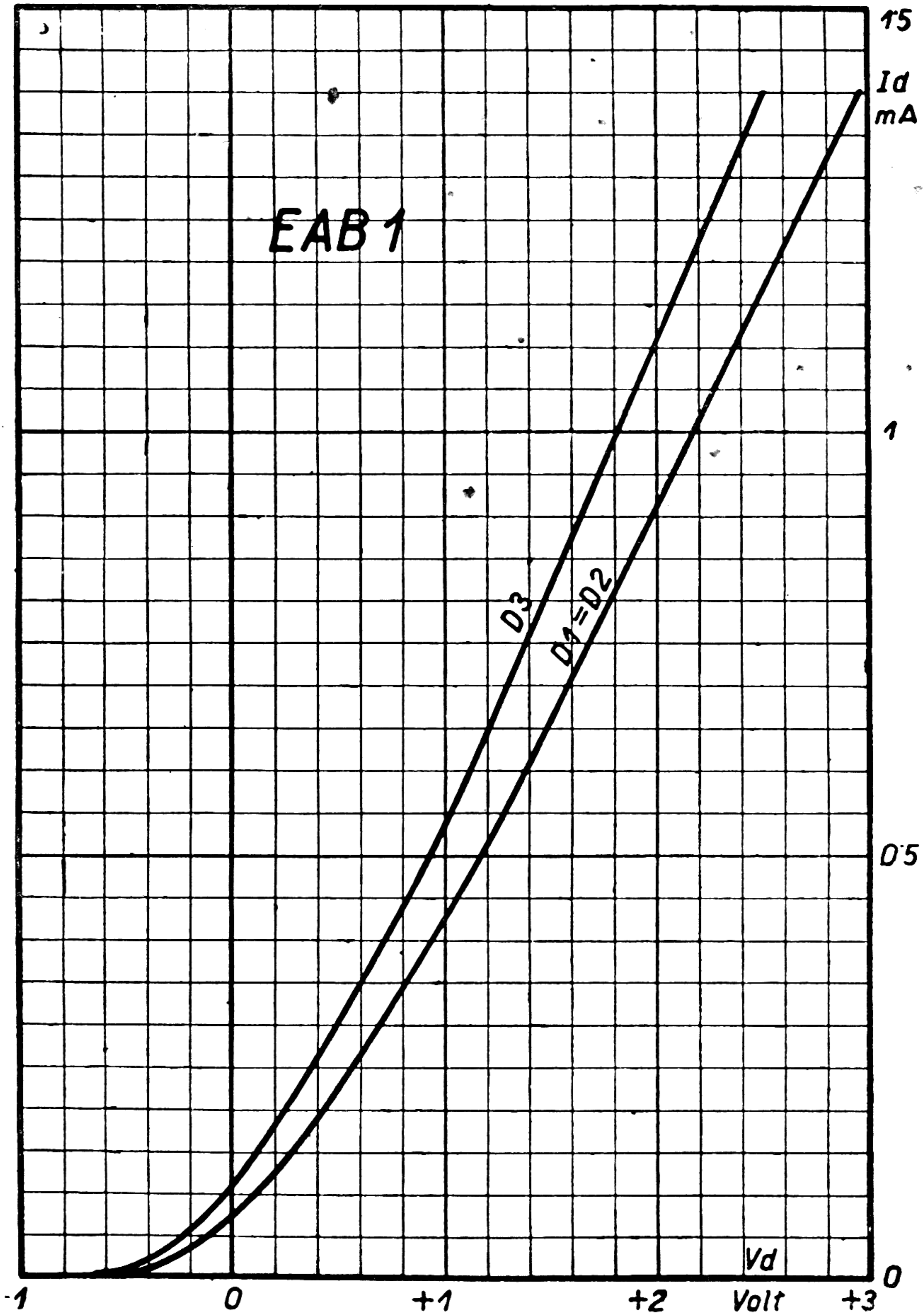
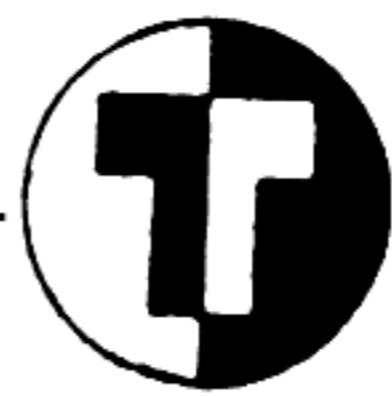
Sockelschaltung
Base connections
Connexions du culot



Schaltungsbeispiel
Circuit diagram
Schema de principe

R_1	=	1	$M\Omega$	C_1	=	0,1	μF
R_3	=	10	$M\Omega$	C_2	=	20	pF
R_4	=	1	$M\Omega$	C_3	=	100	pF
R_6	=	0,1	$M\Omega$	C_4	=	0,01	pF
				C_5	=	100	μF

$$\frac{R_2 + R_5}{R_2} = \frac{V_a}{10 V_d}$$





EB' 4 DUODIODE

Heizung
Heating
Chauffage

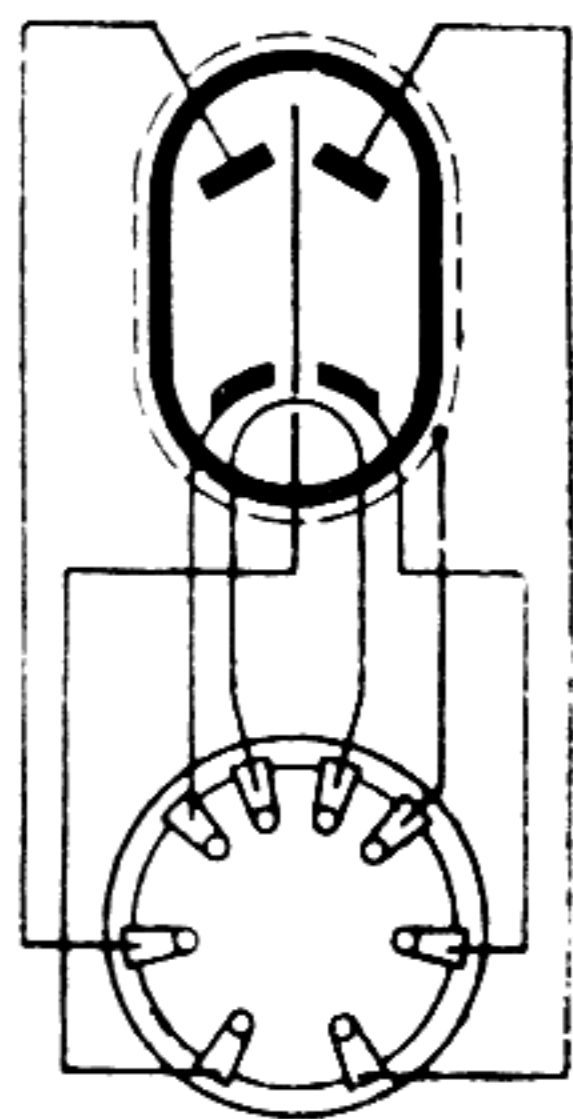
Vf **6,3 V (i)** If **0,2 Amp**

Grenzdaten
Limit ratings
Limites fixées

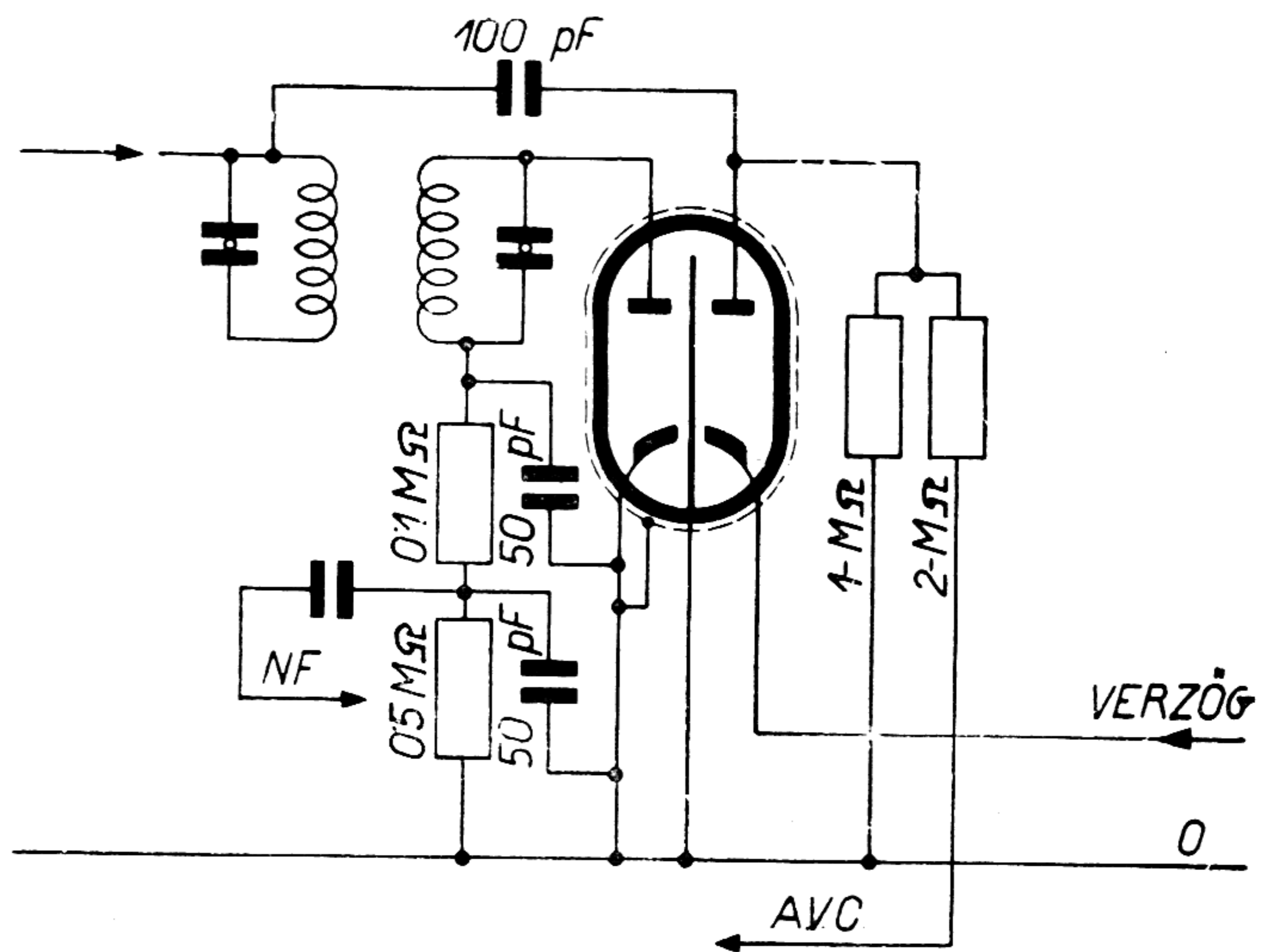
Vd max	200 V	Id max	0,8 mA
Vfk max	75 V	Rfk max	20.000 Ω
Vk1k2 max	125 V		

Kapazitäten
Capacities
Capacités

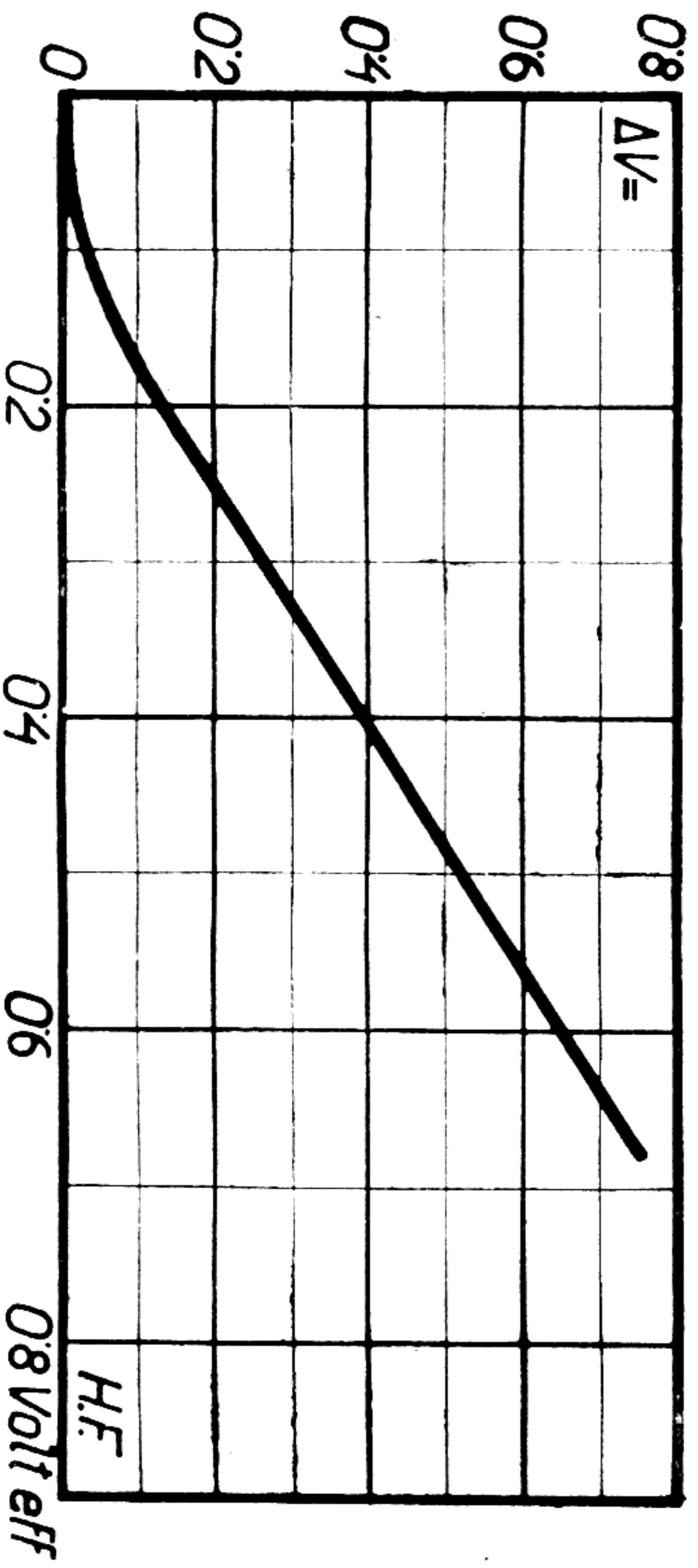
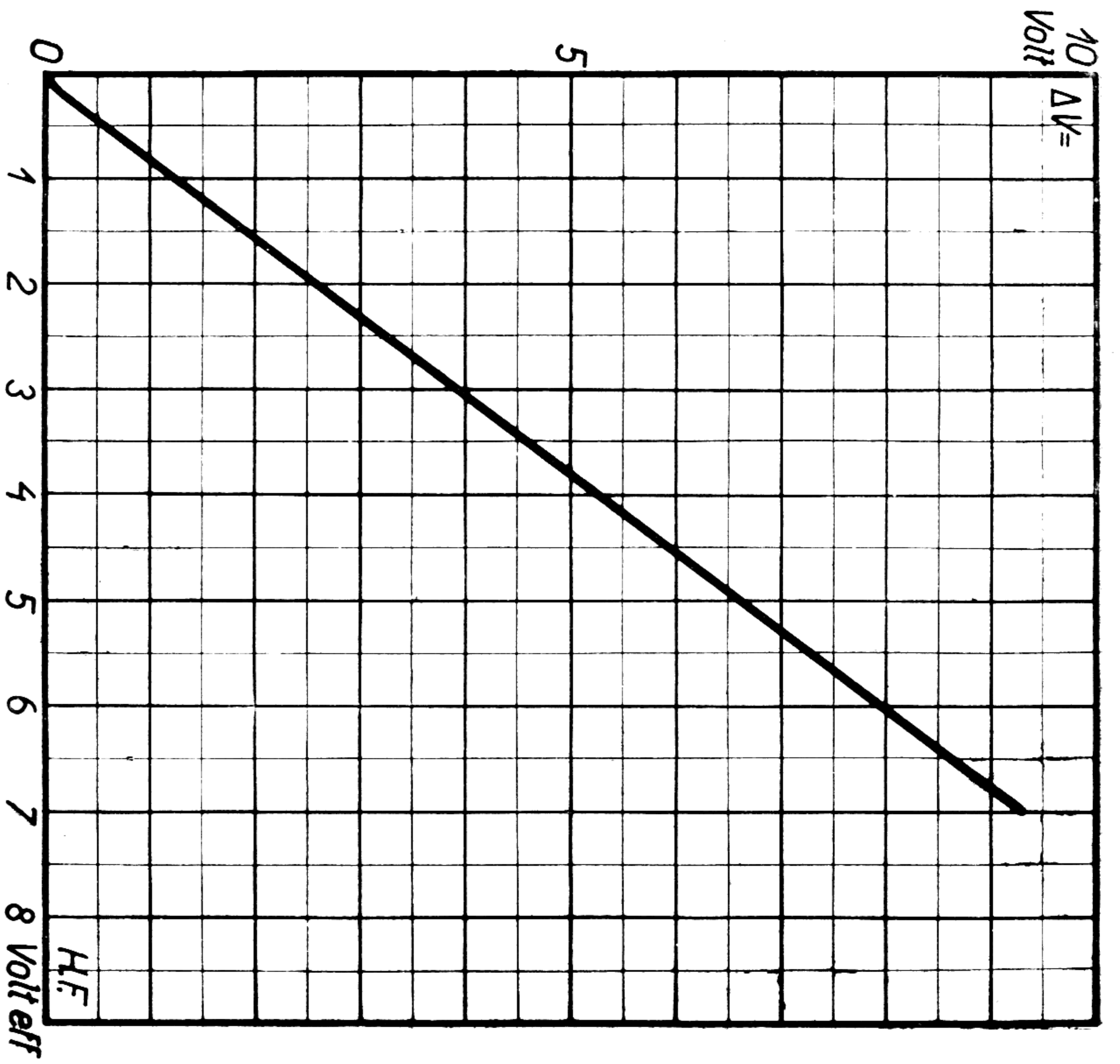
C (d1/d2)	0,2 pF	C (d1 k1)	1,2 pF	C (d2/k2)	1,2 pF
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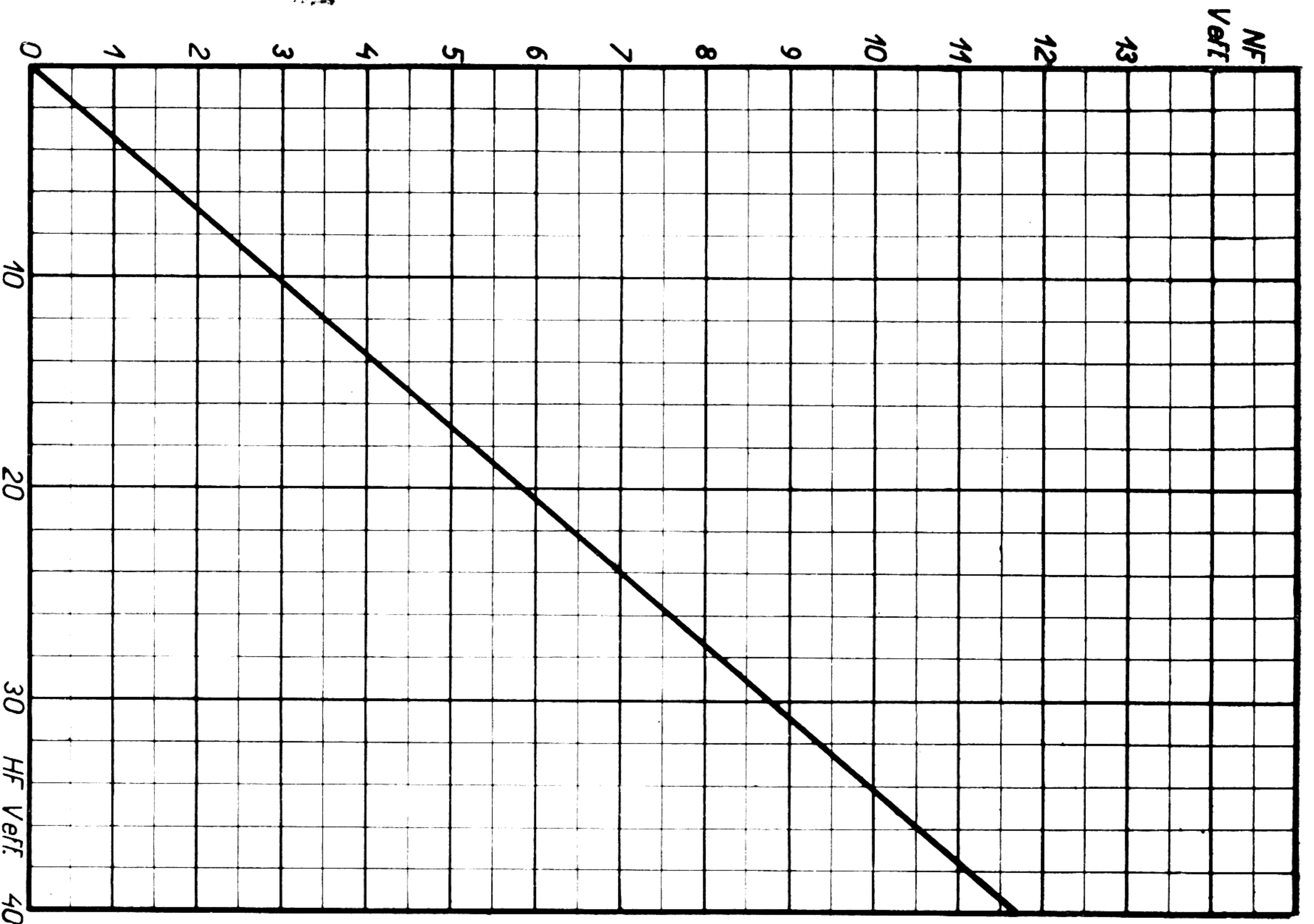
Sockelschaltung
Base connections
Connexions du culot



Schaltungsbeispiel
Circuit diagram
Schema de principe



Gleichrichtung — Rectification — Detection.



N. F. als Funktion der H. F. — L. F. as function of H. F.
 B. F. comme fonction de H. F. — Modulation 300/0.

EB 4. Duodiode.



EBC 3

DUODIODE-TRIODE

Heizung
Heating
Chauffage

V_f **6,3 V (i)** I_f **0,2 A**

Einstellung
Adjustment
Utilisation

V_a	100 V	200	250 V
V_g	— 2,1	— 4,3	— 4,5 V
I_a	2	4	5 mA

Betriebsdaten
Operating Conditions
Caracteristiques de service

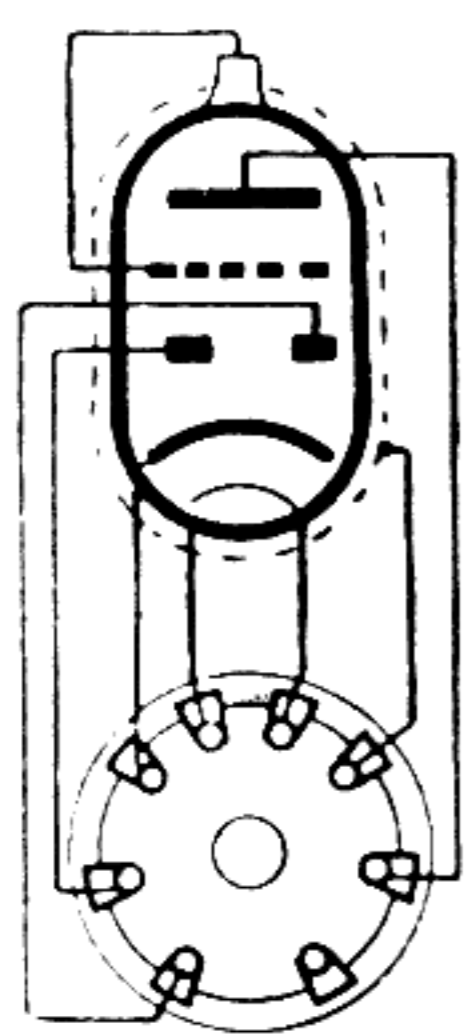
g **30** S 2 mA/V R_i **15,500 Ω**

Grenzdaten
Limit ratings
Limites fixées

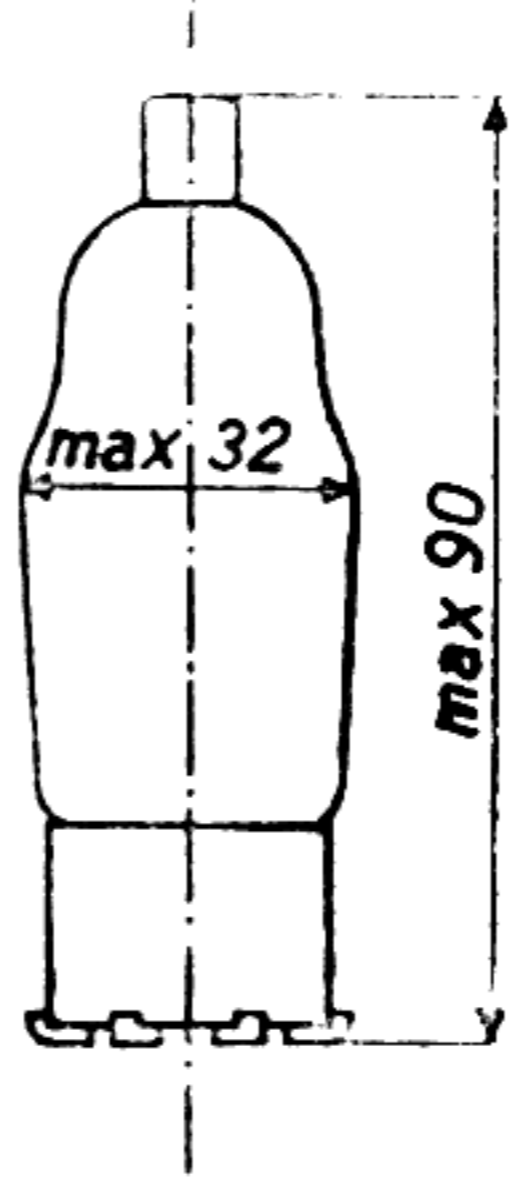
$V_{ao \text{ max}}$	550 V	$V_a \text{ max}$	300 V	$W_a \text{ max}$	1,5 Watt
$I_k \text{ max}$	10 mA	$R_g \text{ max}$	3 $M\Omega$		
$V_d \text{ max}$	200 V	$I_d \text{ max}$	0,8 mA		
$R_{fk \text{ max}}$	20.000 Ω	$V_{fk \text{ max}}$	100 V		

Kapazitäten
Capacities
Capacités

$C (k/d1)$	= 2,3 pF	$C (k/d2)$	= 2,9 pF	$C (d1/d2)$	< 0,6 pF
$C (d1/g)$	< 0,001 pF	$C (d2/g)$	< 0,005 pF		

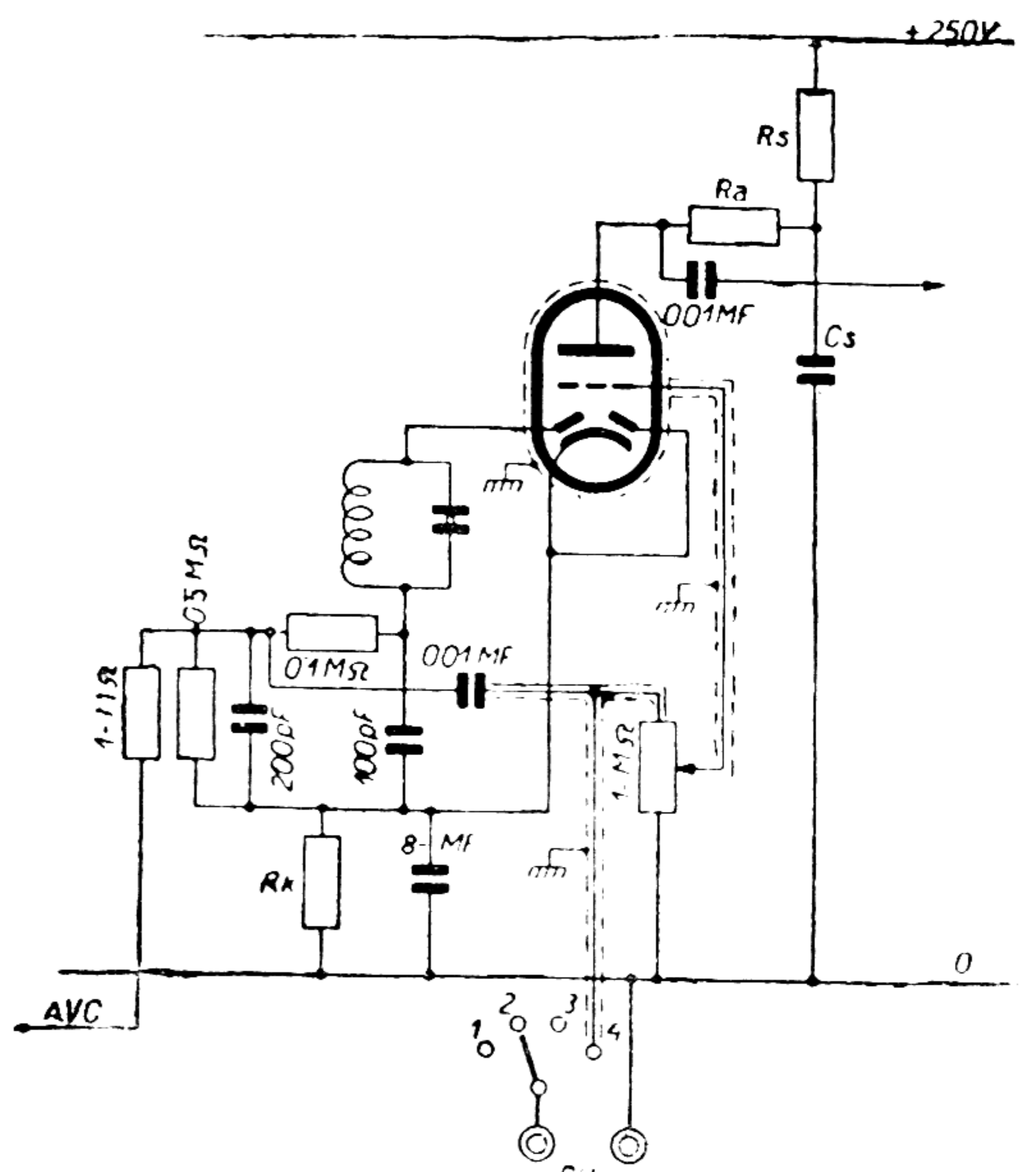


Sockelschaltung
Base connections
Connexions de culot

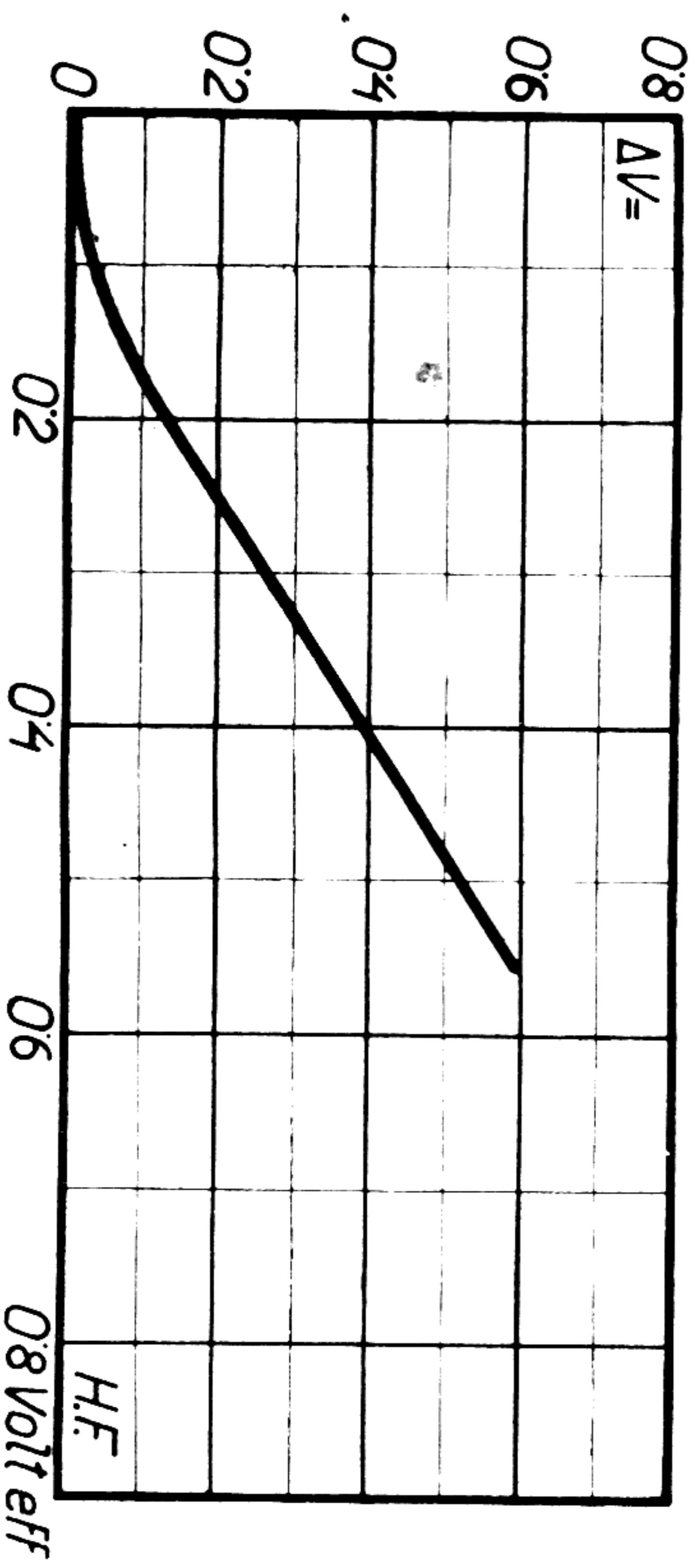
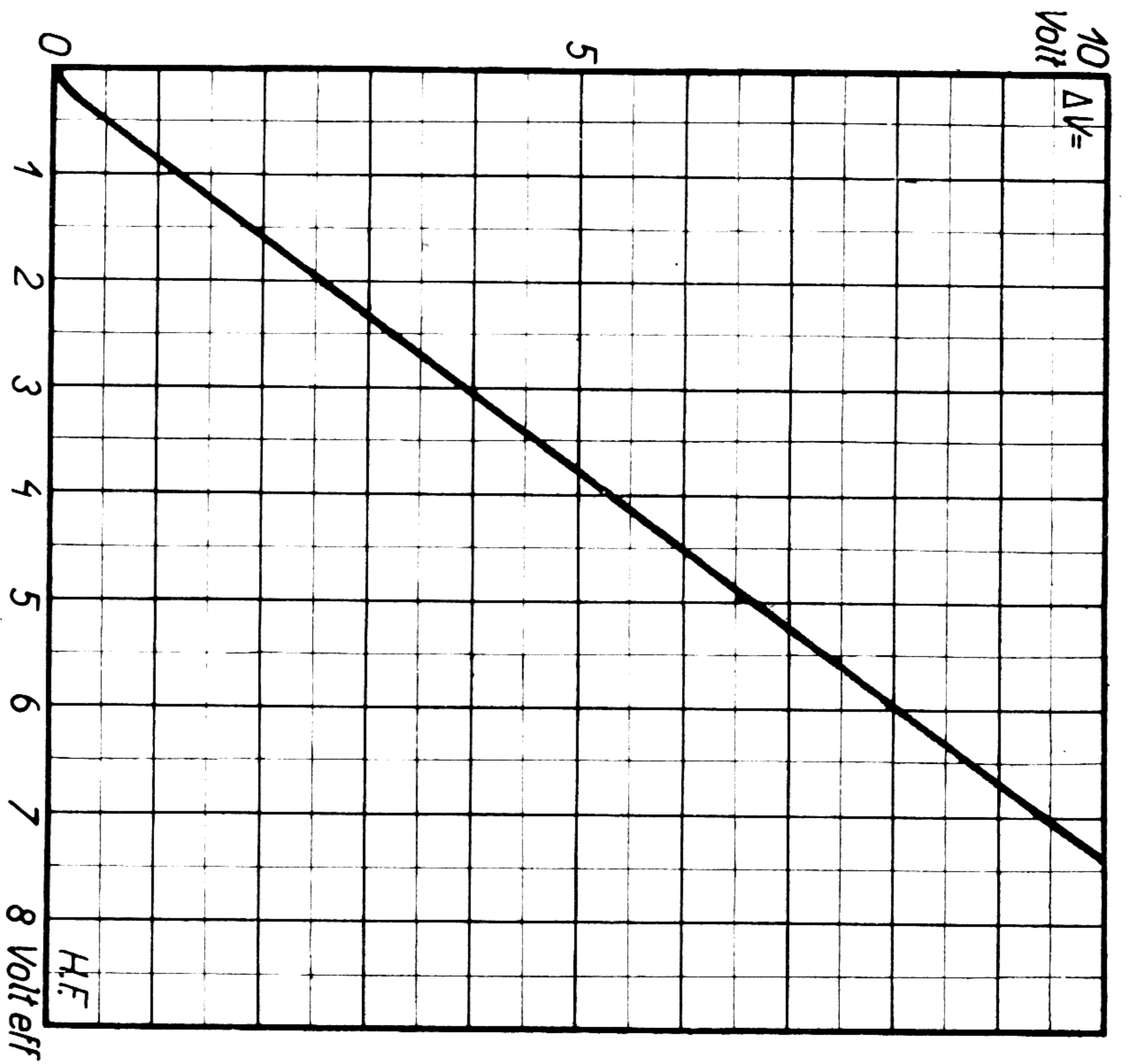


Abmessungen
Dimensions

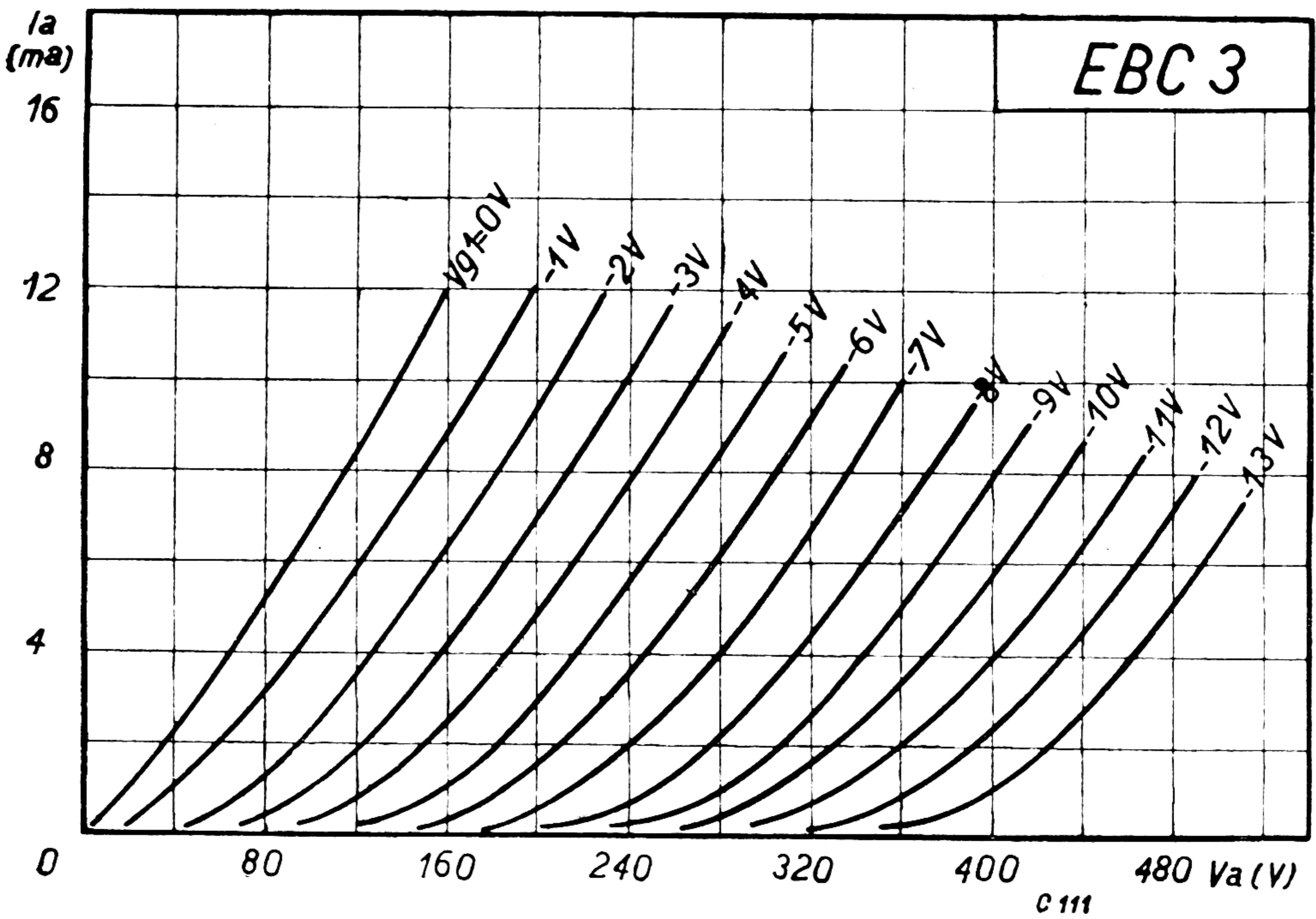
$(V_a \text{ 250 V})$	R_k	6000 Ω ,	R_a	0,25 $M\Omega$
$(V_a \text{ 200 V})$		6000 Ω ,		0,25 $M\Omega$
$(V_a \text{ 100—250 V})$		12.500 Ω ,		0,2 $M\Omega$
C_s			R_s	
0,1	2 MF	0,02	0,1 $M\Omega$	



Schaltungsbeispiel
Circuit diagram
Schema de principe



EBC 3. — Diode.



EBC 3. Triode.

C 111



EBF 2

DUODIODE-PENTHODE

Heizung Heating Chauffage

Vf **6,3** V (i)

If **0,2** A

Einstellung Adjustment Utilisation

	a)		b)		c)	
Va	250	V	200	V	100	V
Vg2	250	V — (95.000 Ω × Ig2)	200	V — (60.000 Ω × Ig2)	100	V
Vg1	— 2	V	— 2	V	— 2	V
Ia2	5	mA	5	mA	5	mA
Ig2	1,6	mA	1,6	mA	1,6	mA

Betriebsdaten Operating Conditions Caracteristiques de service

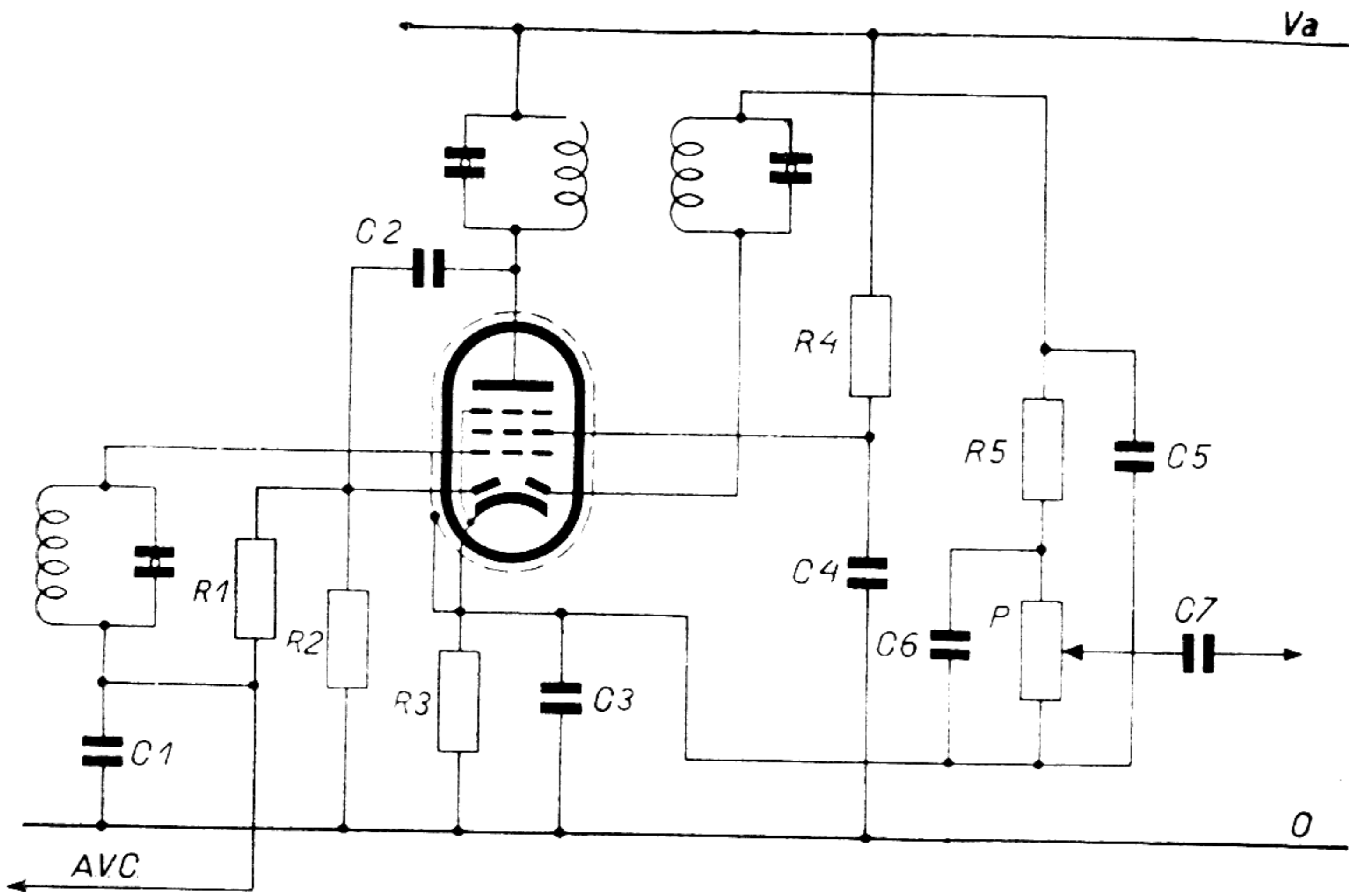
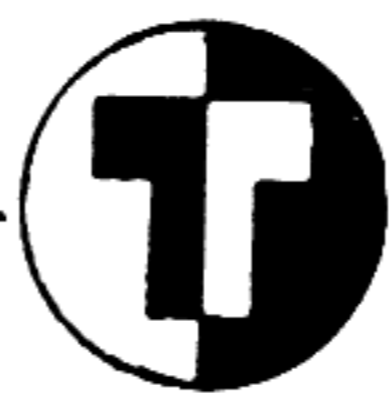
a) Vg1	— 2	V	— 38,5	V
S	1,8	mA/V	0,0018	mA/V
Ri	1,3	MΩ	> 10	MΩ
b) Vg1	— 2	V	— 32,5	V
S	1,8	mA/V	0,0018	mA/V
Ri	1	MΩ	> 10	MΩ
c) Vg1	— 2	V	— 16,5	V
S	1,8	mA/V	0,0018	mA/V
Ri	0,4	MΩ	> 10	MΩ

Grenzdaten Limit ratings Limites fixées

Vao max	550 V	Va max	300 V	Wa max	1,5	Watt
Vg2o max	550 V	Vg2 max	125 V (Ia = 5 mA) 300 V (Ia < 2 mA)	Wg2 max	0,3	Watt
Ik max	12 mA	Rg1 max	2,5 MΩ			
Vd max	200 V	Id max	0,8 mA			
Vfk max	100 V	Rfk max	20.000 Ω			

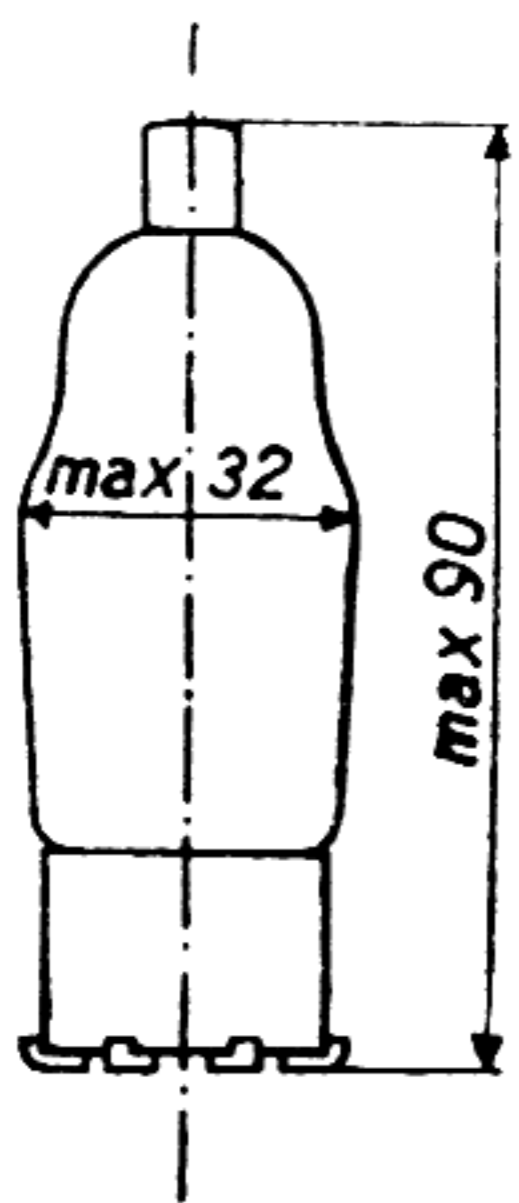
Kapazitäten Capacities Capacités

C (d1/a)	< 0,3	pF	C (d2 a)	< 0,25	pF	C (d/g1)	< 0,0005	pF
C (a/g1)	< 0,002	pF	C (g1)	4,3	pF	C (a)	8,6	pF
C (d1 d2)	< 0,3	pF						

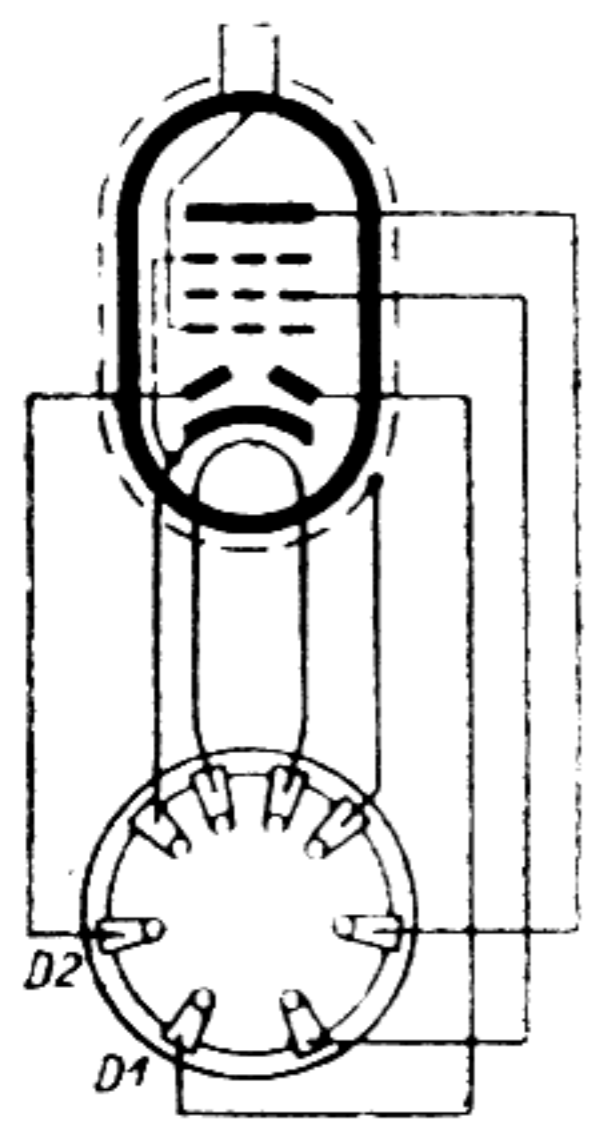


Schaltungsbeispiel
Circuit diagram
Schema de principe

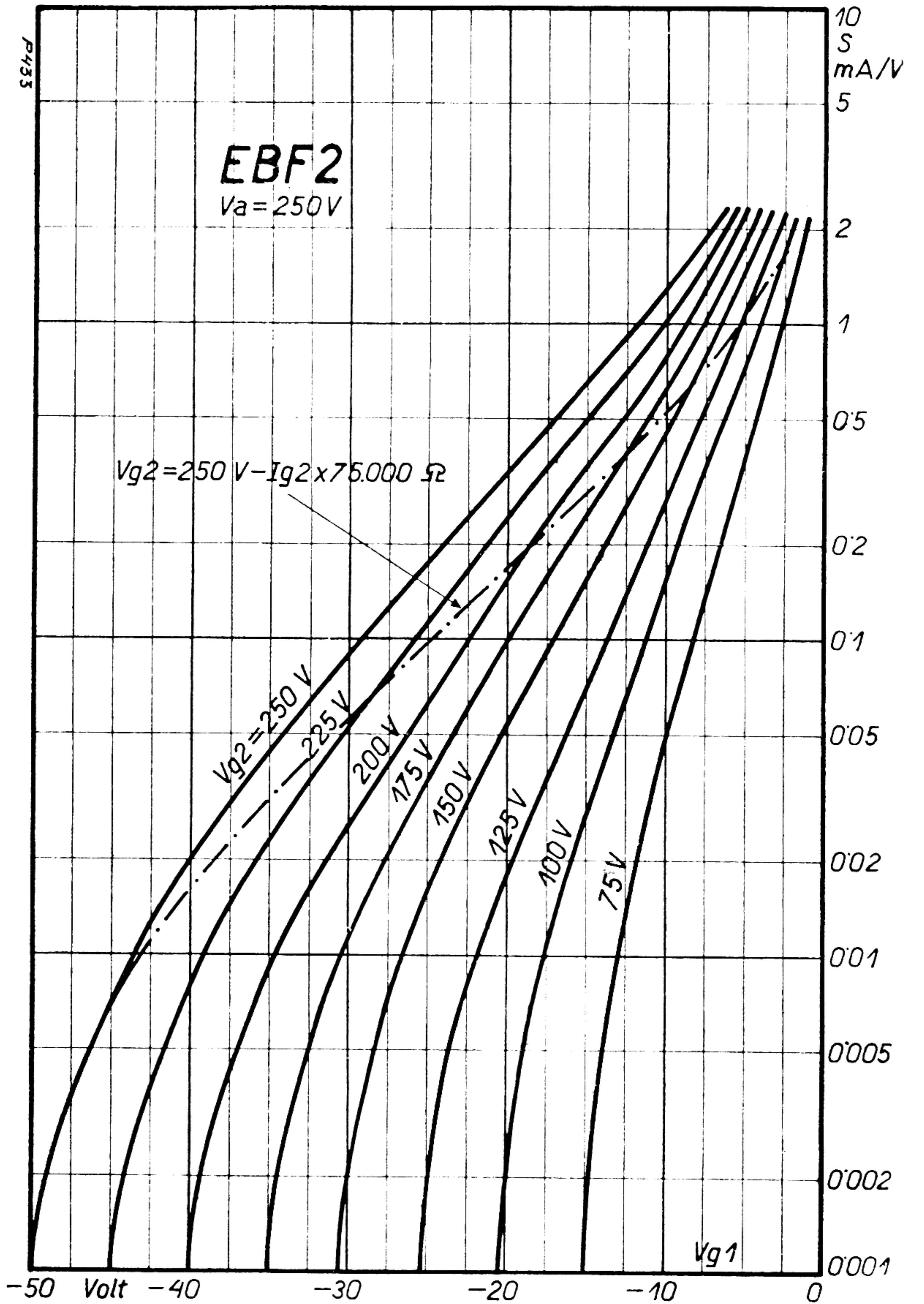
R ₁	1 MΩ	C ₁	0.1 μF
R ₂	1 MΩ	C ₂	20 pF
R ₃	300 Ω	C ₃	0.1 μF
R ₅	0.1 MΩ	C ₅	100 pF
P	0.5 MΩ	C ₆	100 pF
		C ₇	0.01 μF
R ₄		C ₄	
250 V	95.000 Ω	0.1 μF	
200 V	60.000 Ω	0.1 μF	
100 V	—		

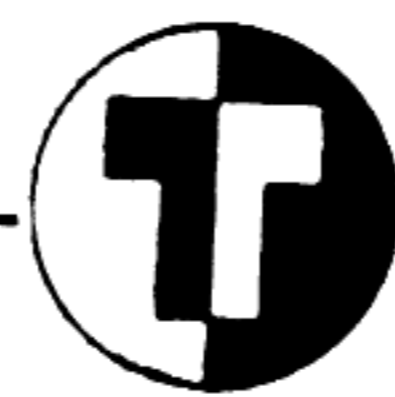


Abmessungen
Dimensions



Sockelschaltung
Base connections
Connexions du culot





EBF 11

DUODIODE - PENTHODE

Heizung
Heating
Chauffage

V_f **6,3** V (i) I_f = **0,2** Amp.

Einstellung
Adjustment
Utilisation

V_a	250 V	I_a	5 mA
V_{g2}	100 V	I_{g2}	1,8 mA
V_{g1}	- 2 V	R_k	300 Ω

Betriebsdaten
Operating Conditions
Caracteristiques de service

a) V_{g2}	fest fixed fixe	V_{g1}	- 2	V_{g2}	100 V	I_a	- 16 V
		S	1,8				0,0018 mA/V
		R_i	2				> 10 M Ω

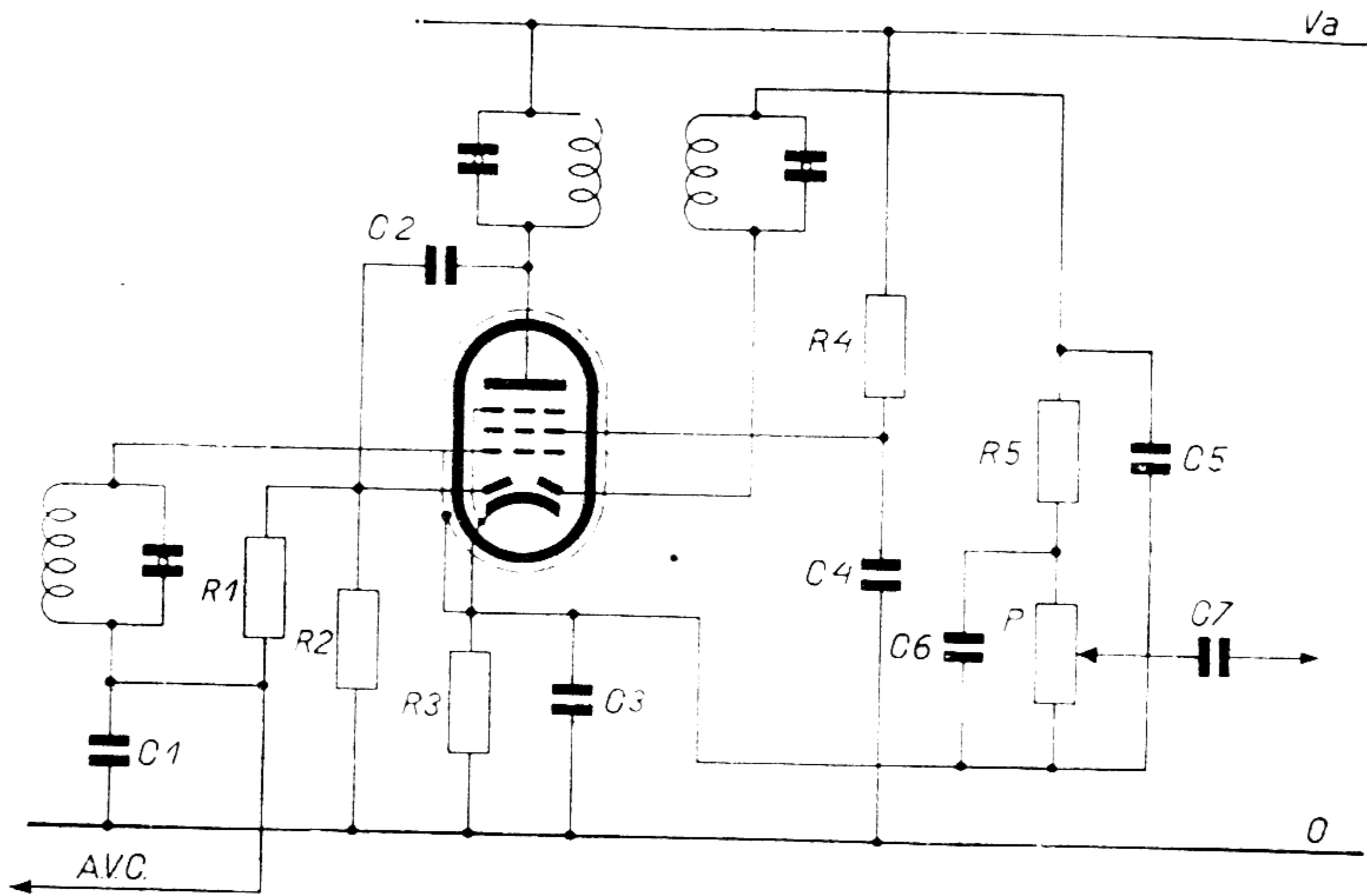
b) V_{g2}	gleitend sliding glissante	V_{g2}	250 V	I_{g2}	$\times 85,000$ Ω
		V_{g1}	- 2		- 41 V
		S	1,8		0,0018 mA/V
		R_i	2		> 10 M Ω

Grenzdaten
Limit ratings
Limites fixées

V_{ao} max	550 V	V_a max	300 V	W_a max	1,5 Watt
V_{g2o} max	550 V	V_{g2} max	125 V ($I_a = 5$ mA) 300 V ($I_a < 2$ mA)	W_{g2} max	0,3 Watt
V_{fk} max	100 V	R_{fk} max	20.000 Ω		
V_d max	200 V	I_d max	0,8 mA		
I_k max	10 mA	R_{g1} max	3 M Ω		

Kapazitäten
Capacities
Capacités

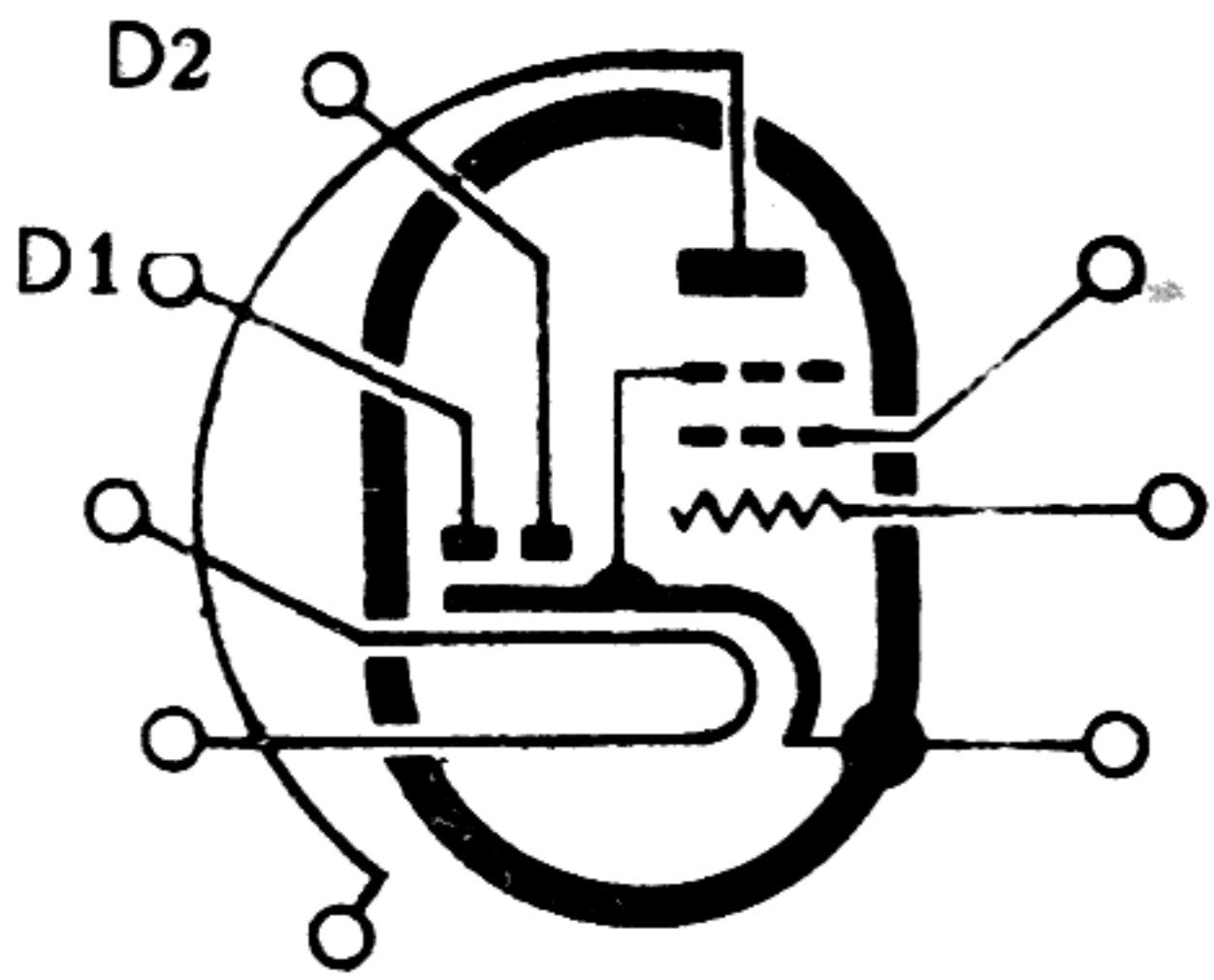
C (g1)	5,2 pF	C (d1/d2)	< 0,5 pF	C (g1/a)	< 0,002 pF
C (a)	6,2 pF	C (a/d1)	< 0,015 pF	C (g1/d1)	< 0,001 pF
C (d1/k)	2,3 pF	C (a/d2)	< 0,015 pF	C (g1/d2)	< 0,001 pF
C (d2/k)	2,7 pF	C (a/d1 + d2)	< 0,015 pF	C (g1/d1 + d2)	< 0,001 pF
				C (g1/f)	< 0,001 pF



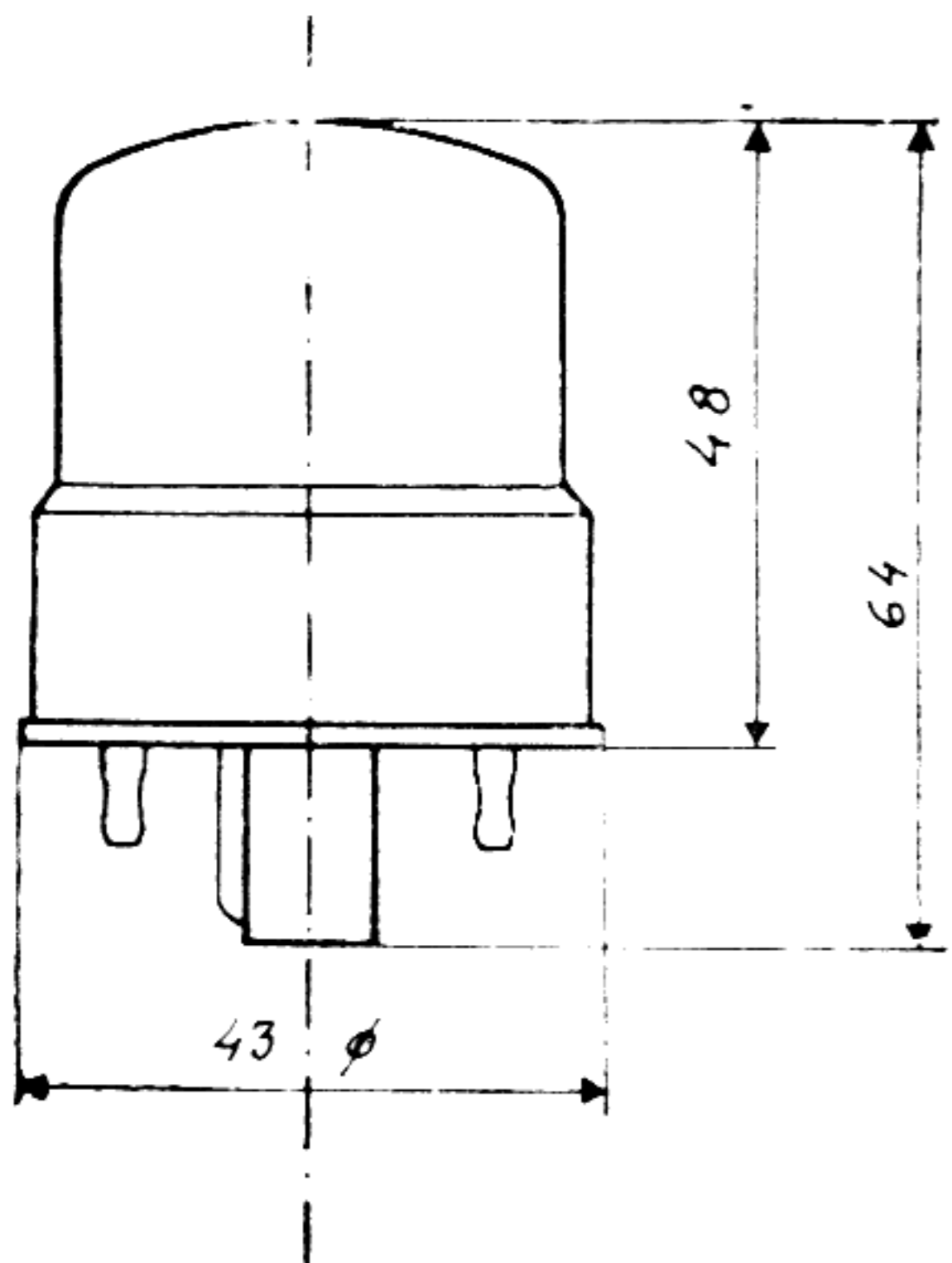
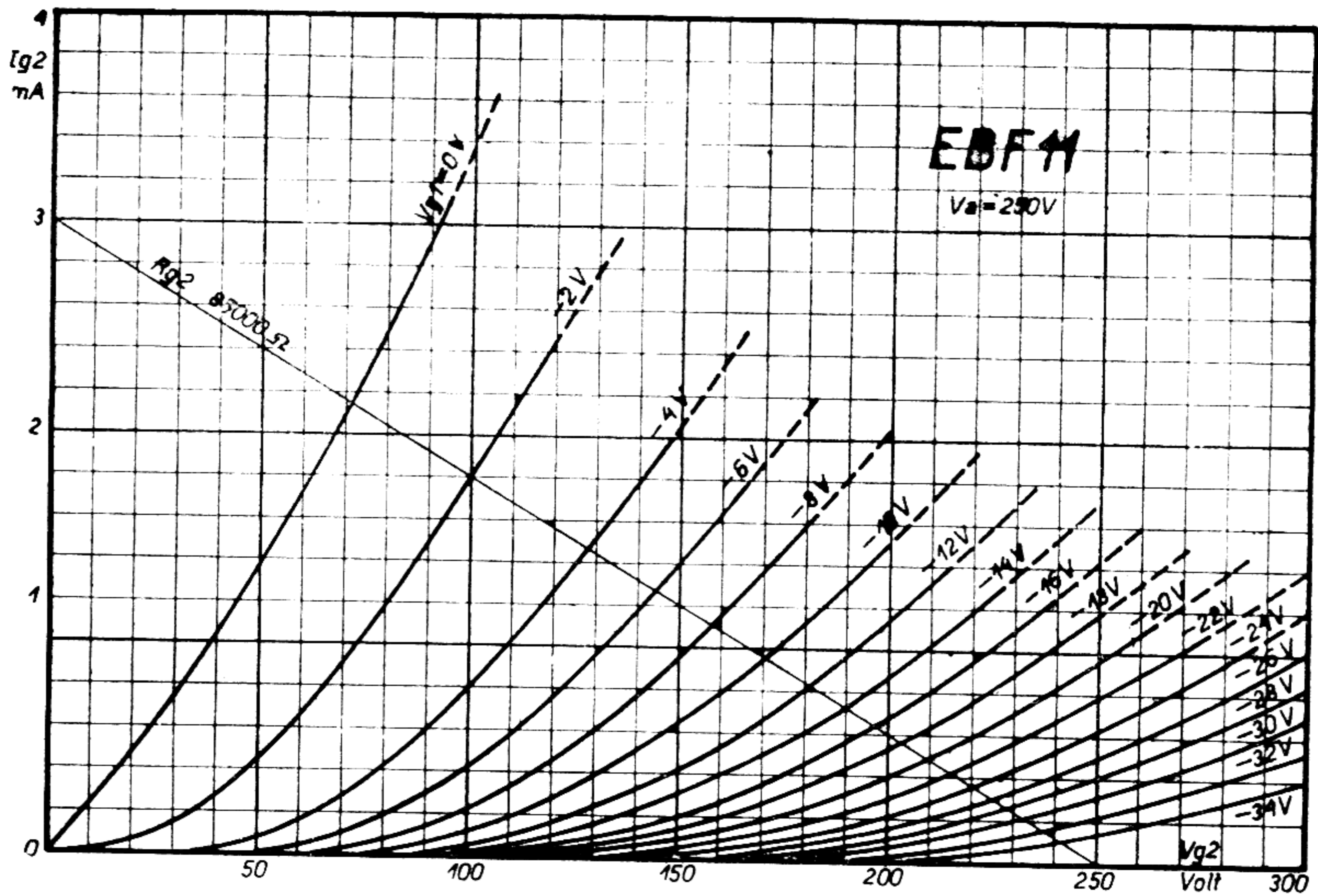
R4 = 85 kΩ
 R5 = 0.1 MΩ
 P = 0.5 MΩ

C1 = 0.1 μF
 C2 = 20 pF
 C3 = 0.1 μF

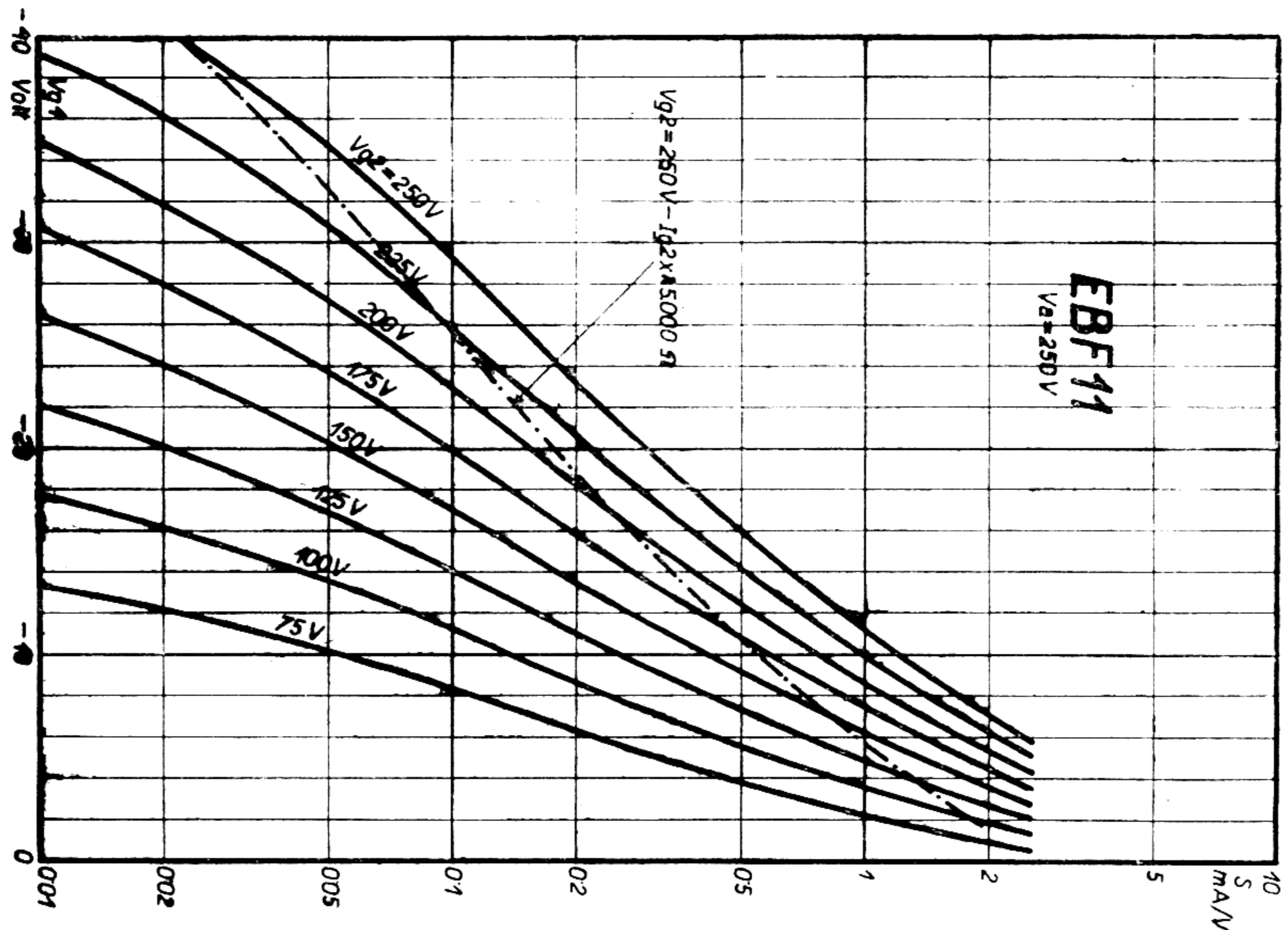
C4 = 0.5 μF
 C5 = 100 pF
 C6 = 100 pF
 C7 = 0.01 μF



Sockelschaltung
 Base connections
 Connexions du culot



Abmessungen
 Dimensions





EBL 1

DUODIODE-PENTHODE

Heizung
Heating
Chauffage

Vf **6,3** V (i) If **0,9** Amp.

Einstellung
Adjustment
Utilisation

Va	250 V	Ia	36 mA
Vg2	250 V	Ig2	5 mA
Vg1	— 6 V		

Betriebsdaten
Operating Conditions
Caracteristiques de service

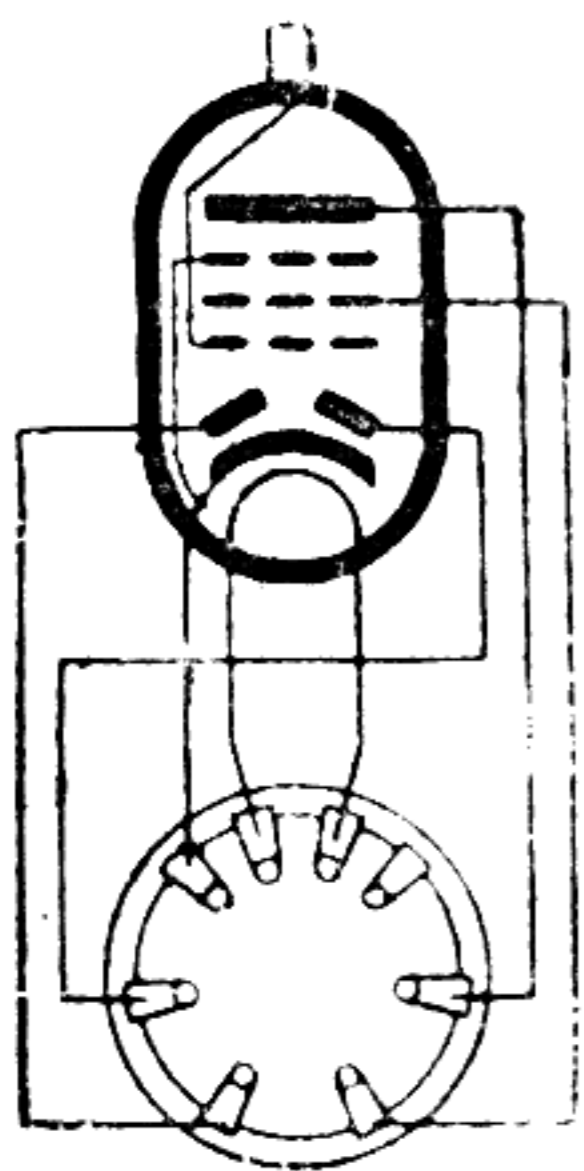
S	9,5 mA/V	Ri	30.000 Ω
Wo	4,3 Watt (k ± 10%)	Ra	7.000 Ω
Vieff	0,35 V (Wo ± 0,05 W)		

Grenzdaten
Limit ratings
Limites fixées

Vao max	550 V	Va max	250 V	Wa max	9 Watt
Vg2o max	550 V	Vg2 max	250 V	Wg2 max	1,5 Watt
Dk max	55 mA	Rfk max	5000 Ω	Vfk max	50 V
Rg1 max	1 MΩ				
Vd max	200 V	Id max	0,8 mA		

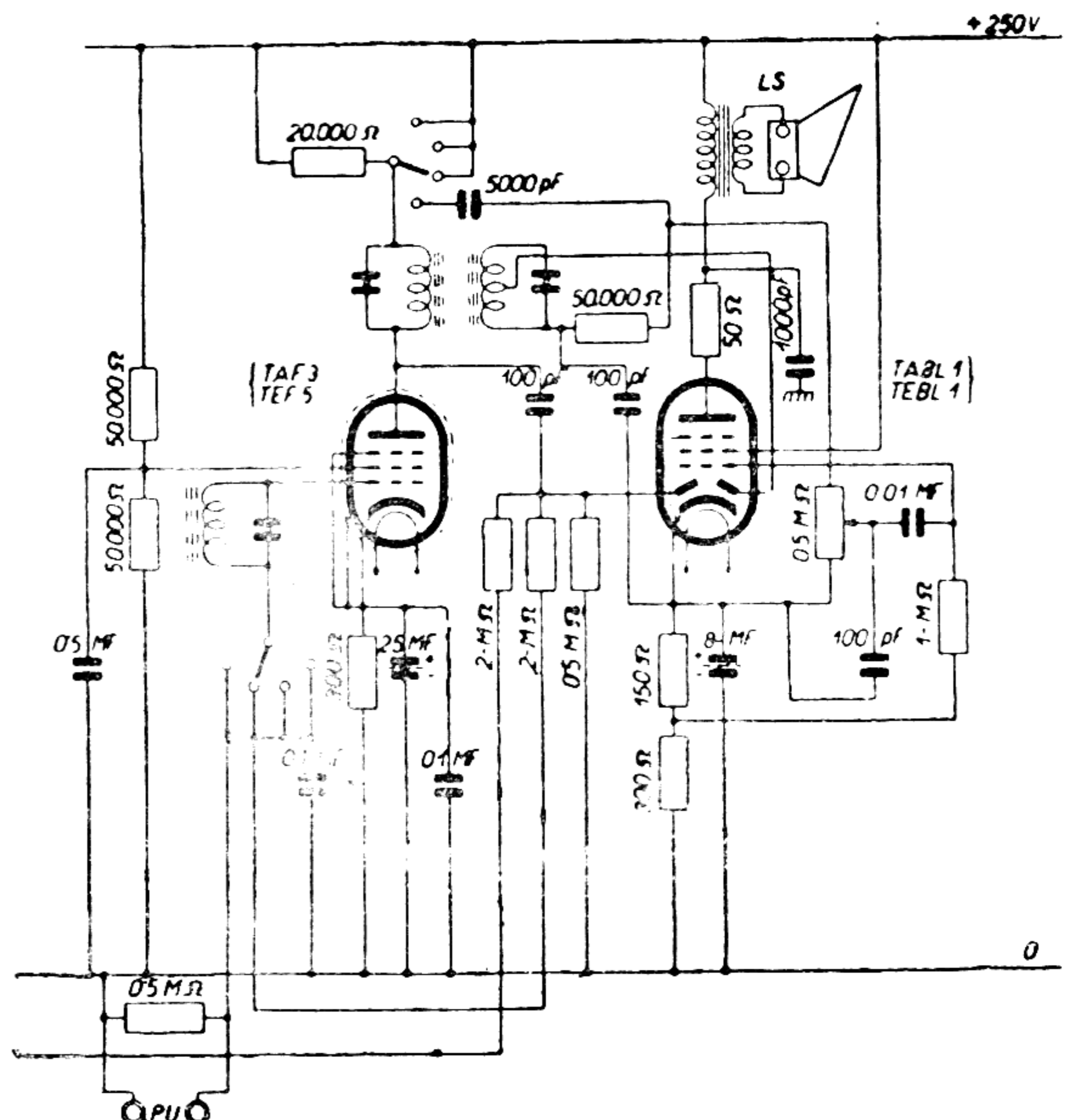
Kapazitäten
Capacities
Capacités

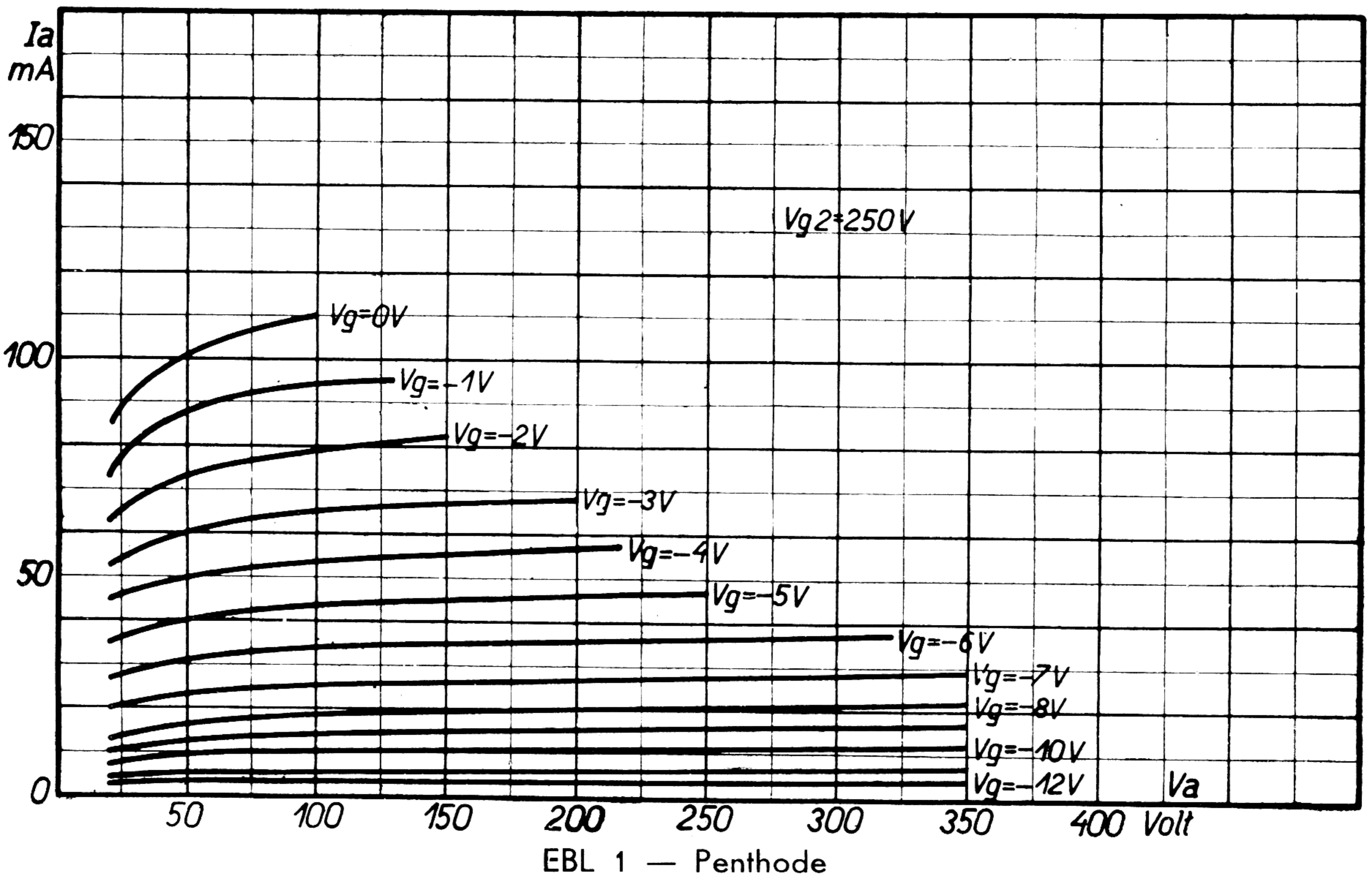
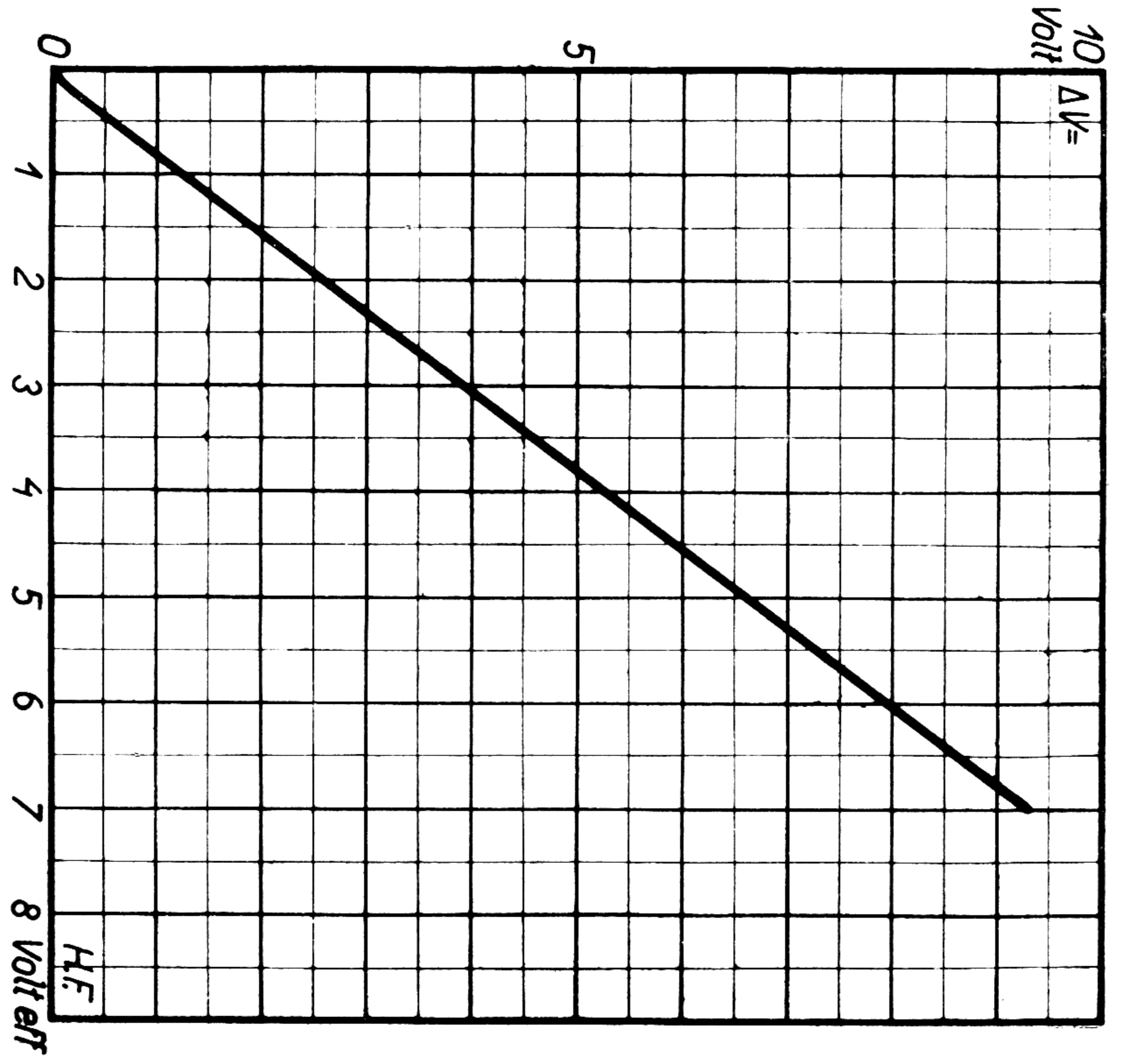
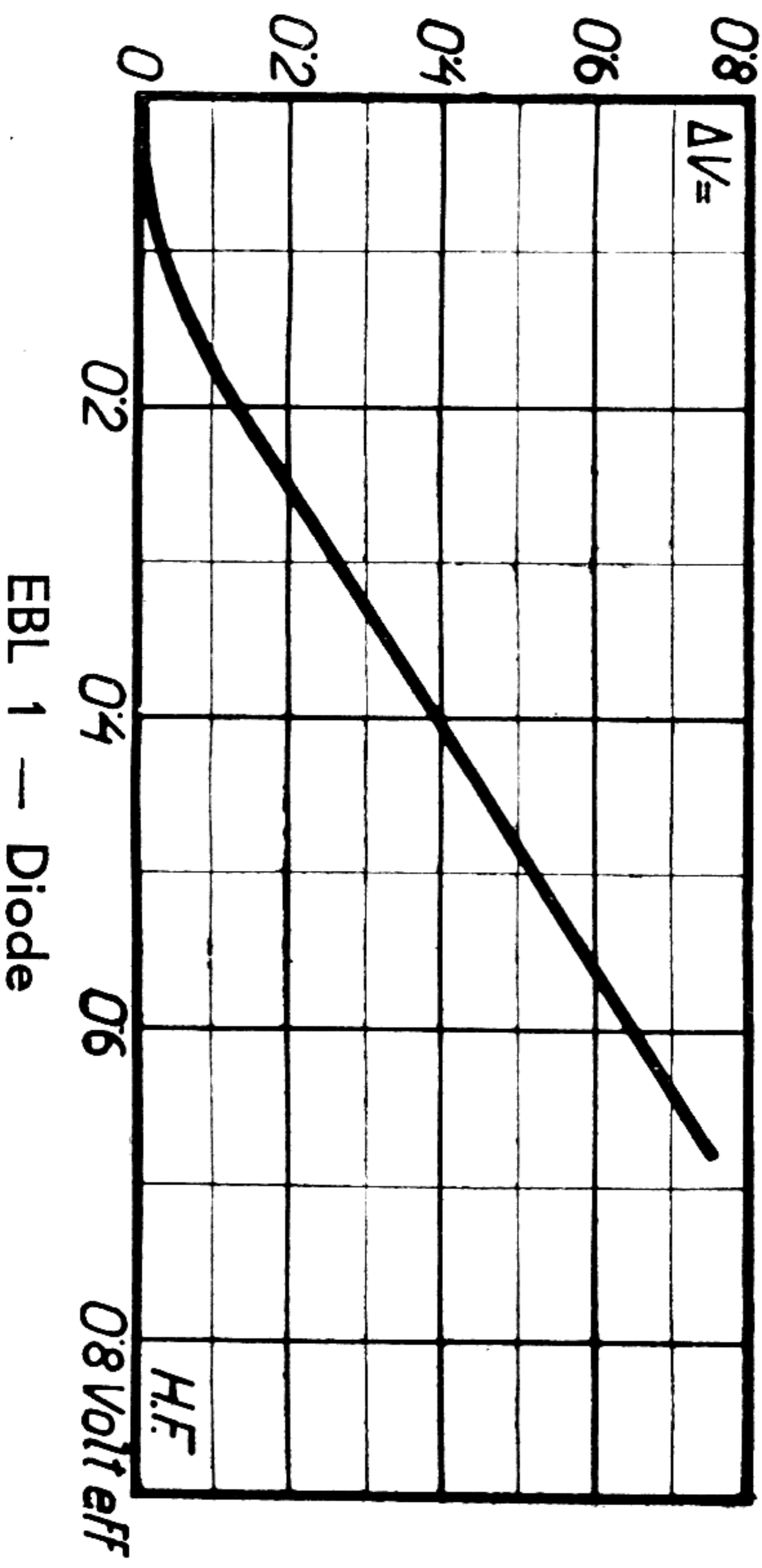
C (d/k)	3 pF	C (d1/d2)	< 0,25 pF
C (d/g1)	0,08 pF	C (d/a)	0,2 pF

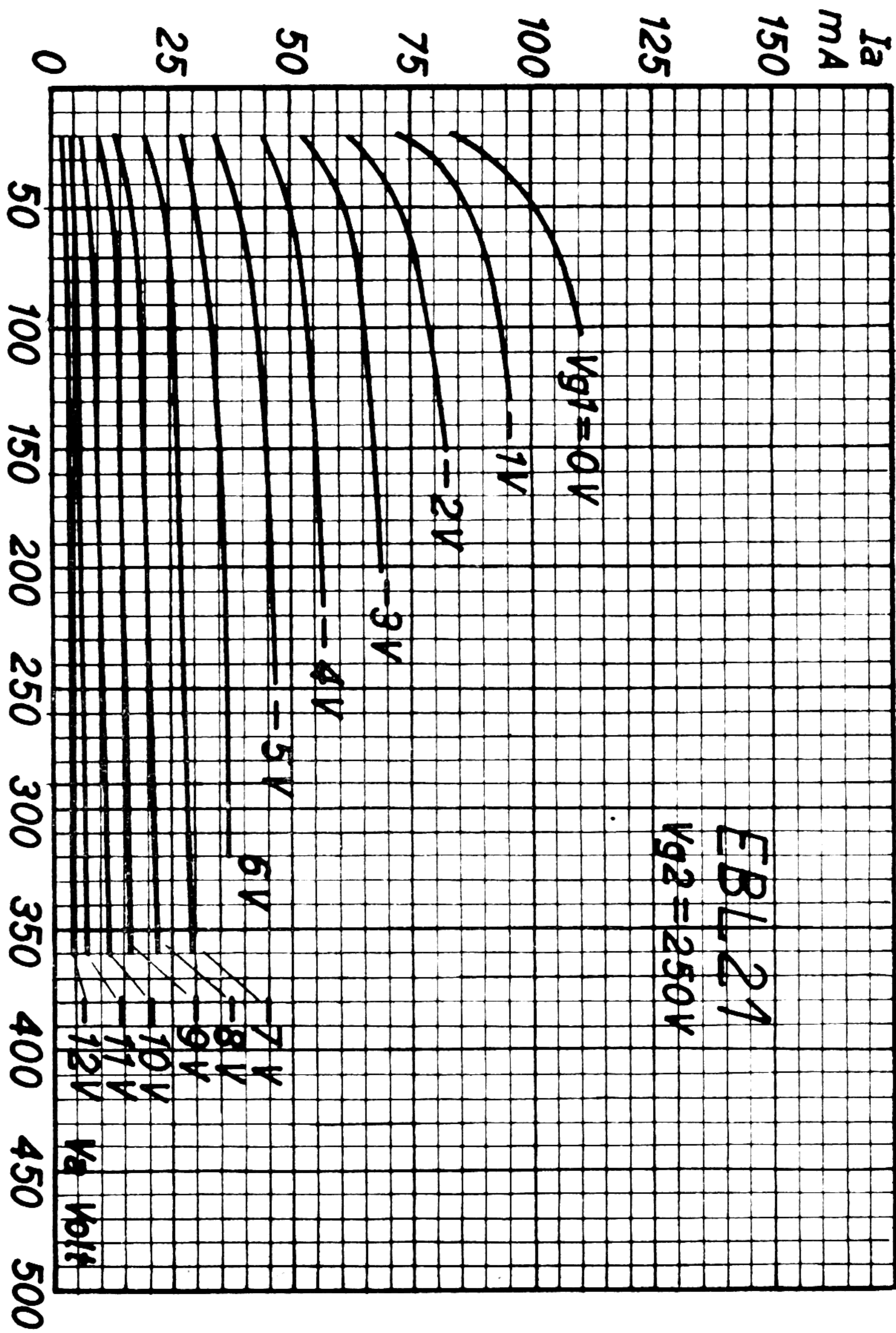


Sockelschaltung
Base connections
Connexions du culot

Schaltungsbeispiel
Circuit diagram
Schema de principe









ECH 2

TRIODE-HEXODE

**Heizung
Heating
Chauffage**

V_f **6,3 V (i)** I_f **0,9 Amp.**

**Einstellung
Adjustment
Utilisation**

	HEXODE: V _a	250 V			I _a	3,25 mA
	V _g (2,4)	100 V			I _g (2,4)	6 mA
	V _{g1}	— 2,5 V			I _{g3}	200 μA
	V _{g3osc}	8 V _{eff.}				
	R _{g3}	50.000 Ω				
	TRIODE: V _a	100 V			I _a	9,5 mA

**Betriebsdaten
Operating conditions
Caracteristiques de service**

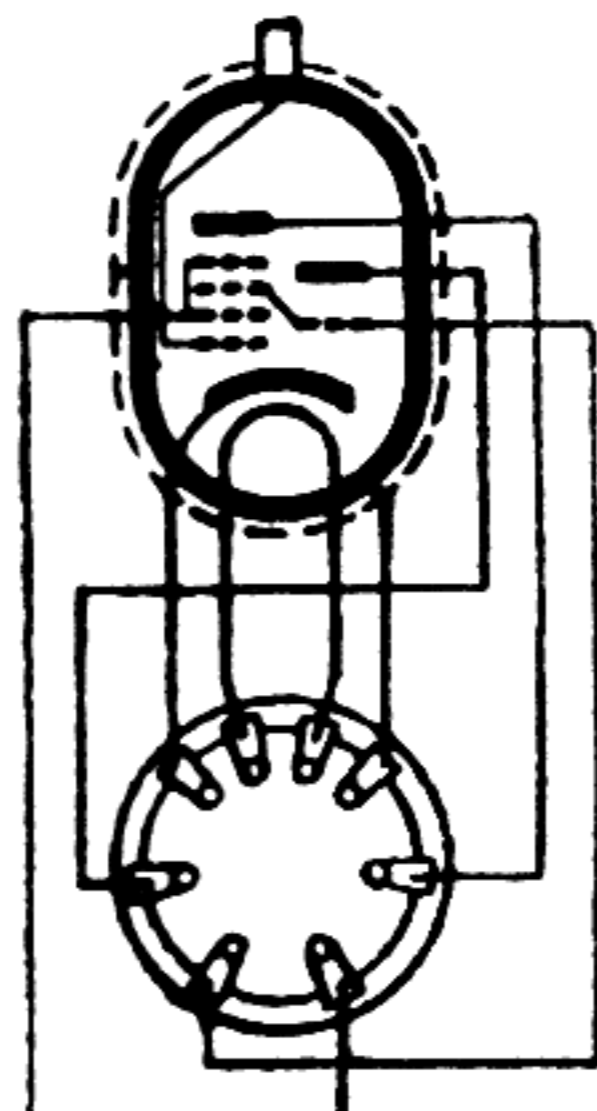
	HEXODE: V _{g1}	— 2,5 V	— 25 V	— 34 V
	Sc	0,75 mA/V	0,0075 mA/V	0,002 mA/V
	R _i	1,5 MΩ	> 10 MΩ	> 10 MΩ
	TRIODE: V _{g1}	0 V	Str = 5,5 mA/V	g = 17,5

**Grenzdaten
Limit ratings
Limites fixées**

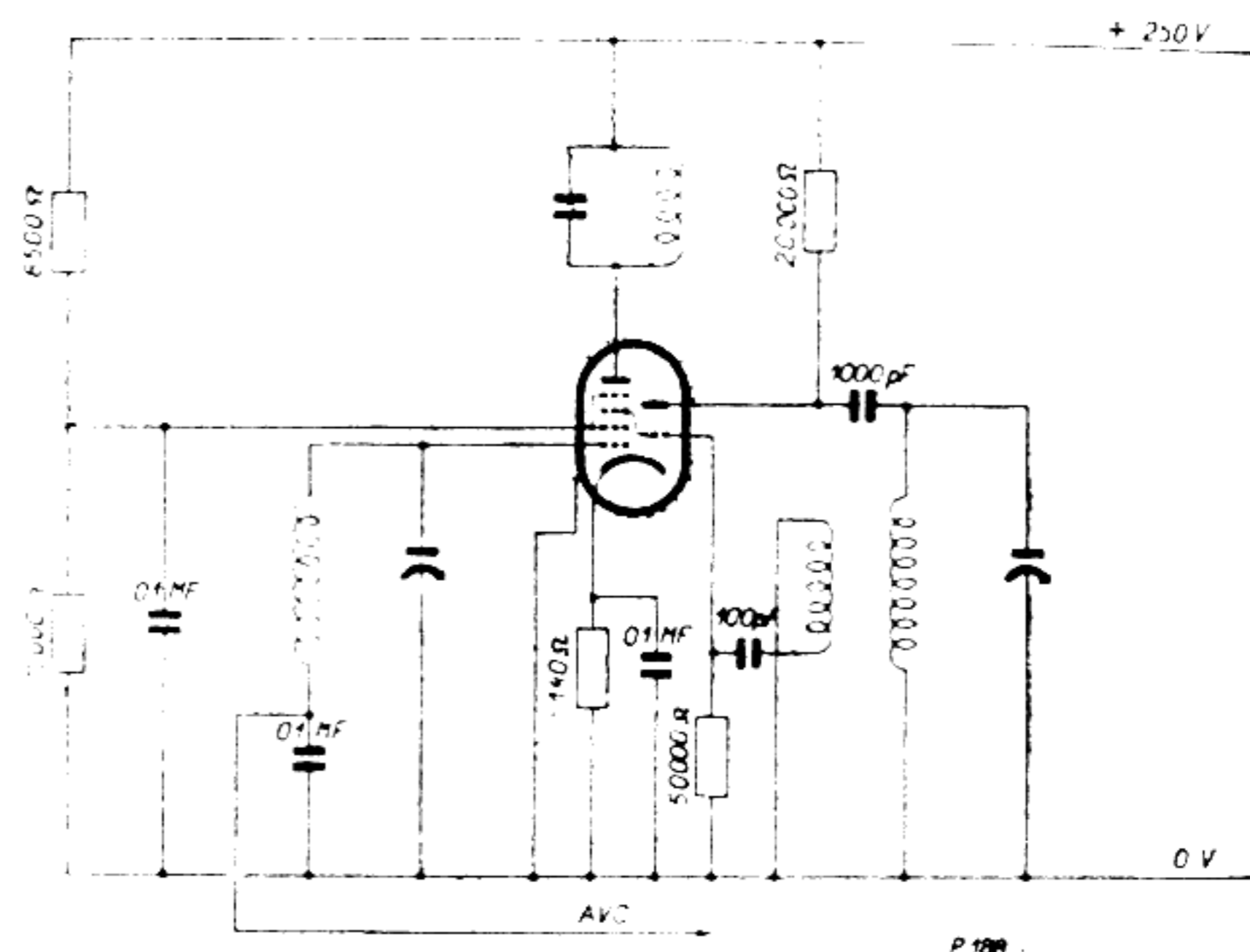
V _{ao} max	550 V	V _a max	300 V	W _a max	1 Watt
V _g (2,4) 0 max	550 V	V _g 2,4 max	125 V	W _g 2,4 max	0,6 Watt
V _{fk} max	50 V	R _{fk} max	50.000 Ω		
I _k max	20 mA	R _{g1} max	3 MΩ		
V _{atro} max	550 V	V _{atr} max	125 V	W _{atr} max	1 Watt

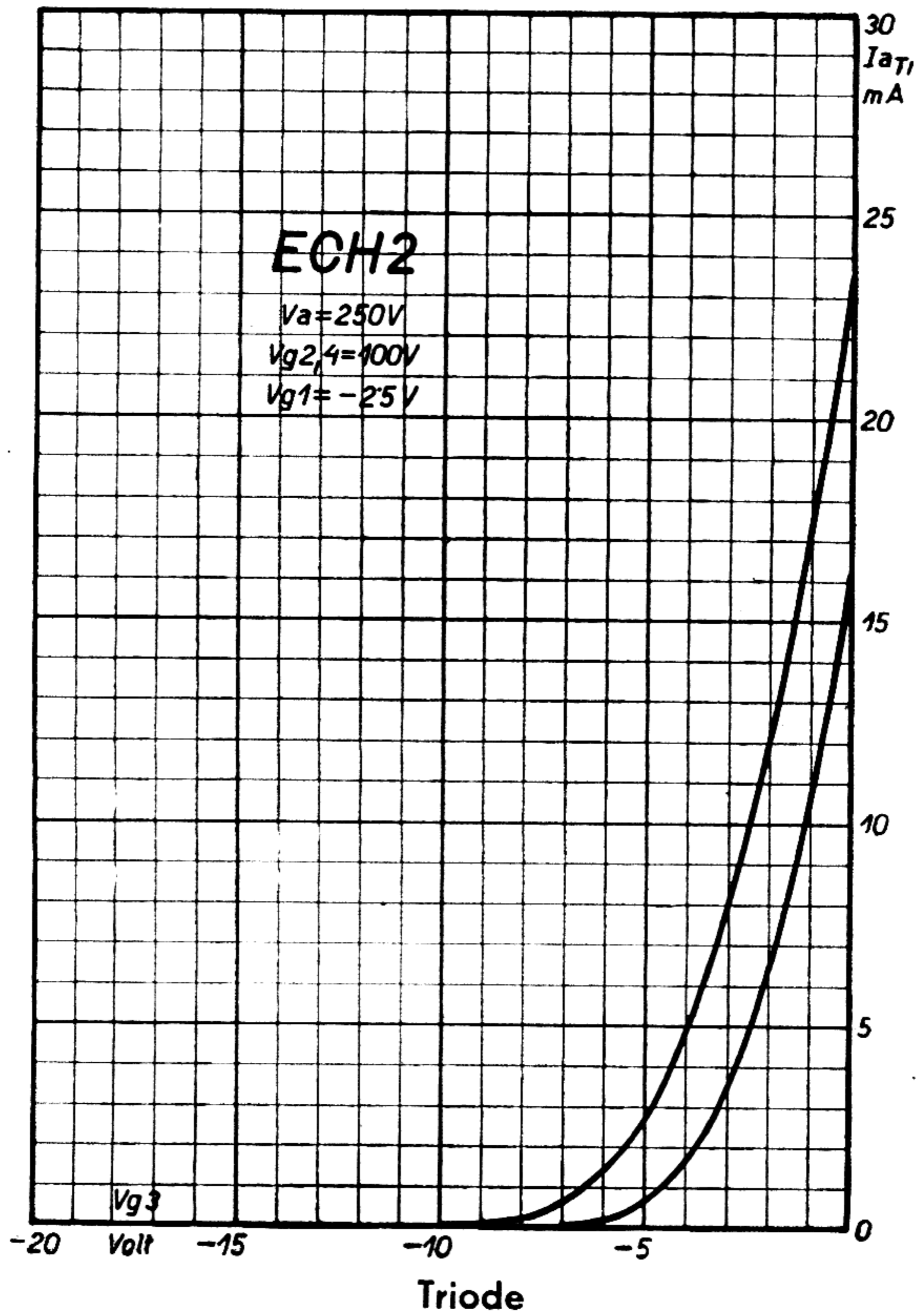
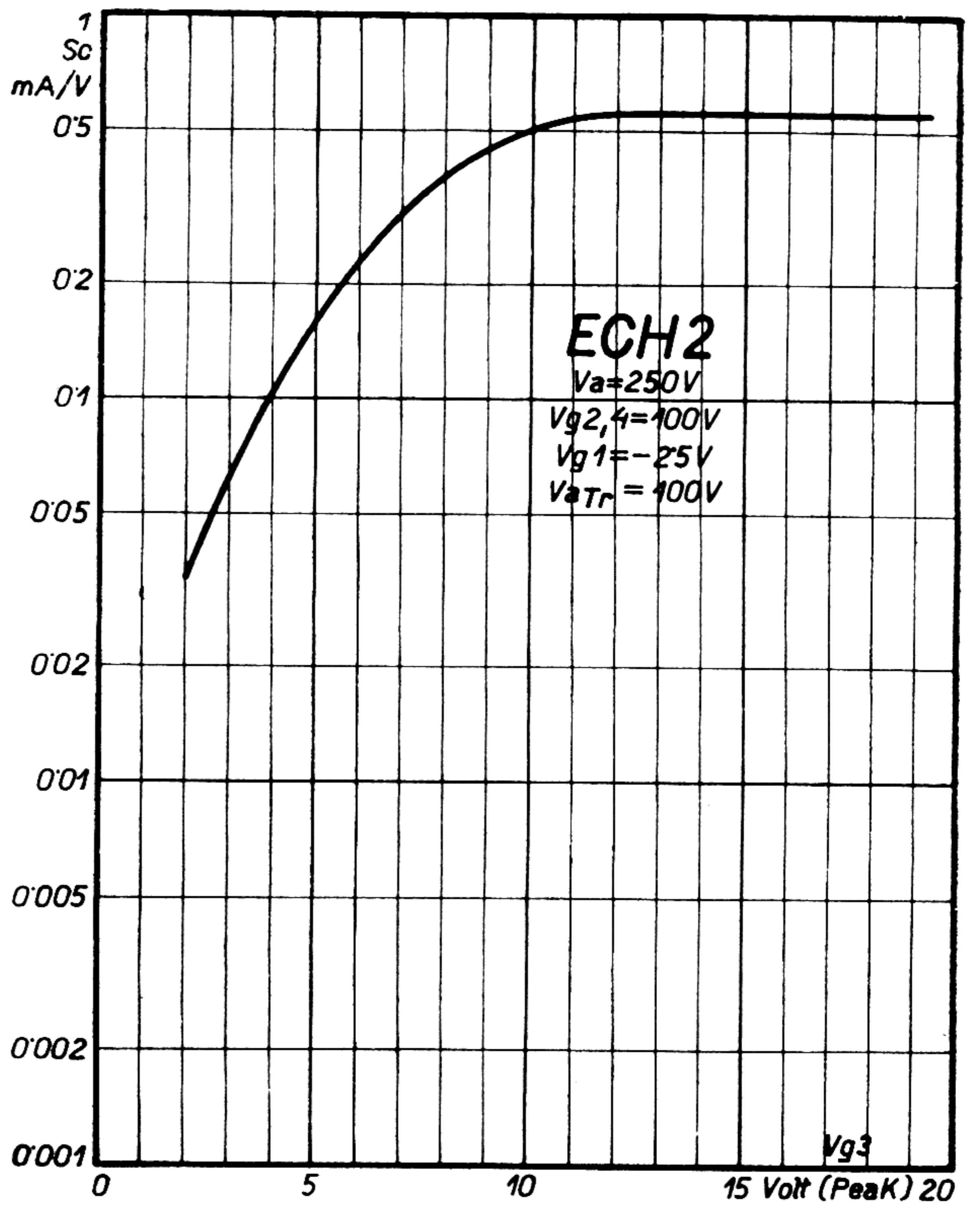
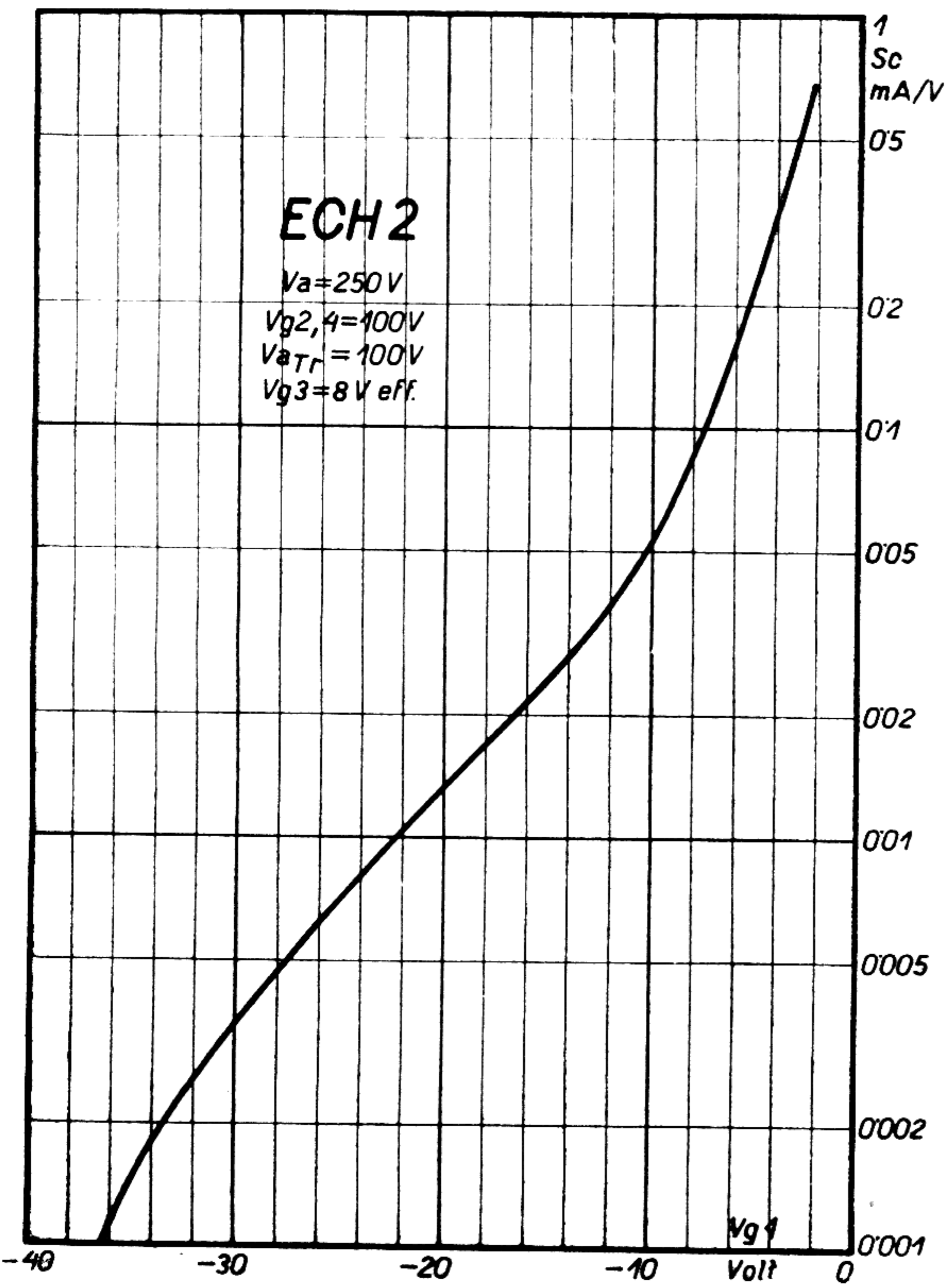
**Kapazitäten
Capacities
Capacités**

C (atr/g1)	< 0,06 pF	C (atr/a)	0,9 pF	C (gtr/g1)	= 0,06 pF
C (g1)	= 8,4 pF	C (a)	= 13,8 pF	C (a/g1)	< 0,015 pF
C (gtr)	= 17 pF	C (atr/k)	= 3,3 pF	C (atr/gtr)	= 3,4 pF



Sockelschaltung
Base connections
Connexions du culot







ECH 3

TRIODE-HEXODE

Heizung

Heating

Chauffage

 $V_f = 6,3 \text{ V (i)}$
 $I_f = 0,2 \text{ Amp.}$

Einstellung und Betriebsdaten

Adjustment and operating conditions

Utilisation et caractéristiques de service

a) Feste Schirmgitterspannung

Fixed screen-grid voltage

Tension de grille-ecran fixé

V_a	250	V			I_a	3	mA
$V_g(2,4)$	100	V			$I_g(2,4)$	3	mA
V_{g1}	— 2	V	S_c	0,650	mA/V	R_i	1,3 ΩM
V_{g1}	— 17	V	S_c	0,0065	mA/V	R_i	5 $M\Omega$
V_{g1}	— 23	V	S_c	0,0015	mA/V	R_i	6 $M\Omega$

b) Normale Schaltung

Normal conditions

Conditions normales

V_a	250	V			I_a	3	mA
$R_g(2,4) a$	24	$K\Omega$	$R_g(2,4) b$	33	$K\Omega$	$I_g(2,4)$	3 mA
V_{g1}	— 2	V	S_c	0,650	mA/V	R_i	1,3 $M\Omega$
V_{g1}	— 23,5	V	S_c	0,0065	mA/V	R_i	3 $M\Omega$
V_{g1}	— 31	V	S_c	0,0015	mA/V	R_i	4 $M\Omega$

c) Rauscharme Schaltung

Anti-noise circuit

Montage anti-soufle

V_a	250	V			I_a	1,5	mA
$R_g(2,4) a$	47	$K\Omega$	$R_g(2,4) b$	33	$K\Omega$	$I_g(2,4)$	1,5 mA
V_{g1}	— 2	V	S_c	0,450	mA/V	R_i	2 $M\Omega$
V_{g1}	— 19	V	S_c	0,0045	mA/V	R_i	5 $M\Omega$
V_{g1}	— 23	V	S_c	0,0015	mA/V	R_i	6 $M\Omega$

d) Schaltung bei 100 V

Operation at 100 V

Montage a 100 V

V_a	100	V			I_a	1	mA
$R_g(2,4) a$	19	$K\Omega$	$R_g(2,4) b$	54	$K\Omega$	$I_g(2,4)$	1,4 mA
V_{g1}	— 1,25	V	S_c	0,450	mA/V	R_i	1,3 $M\Omega$
V_{g1}	— 13,5	V	S_c	0,0045	mA/V	R_i	4 $M\Omega$
V_{g1}	— 16,5	V	S_c	0,0015	mA/V	R_i	5 $M\Omega$



TRIODE

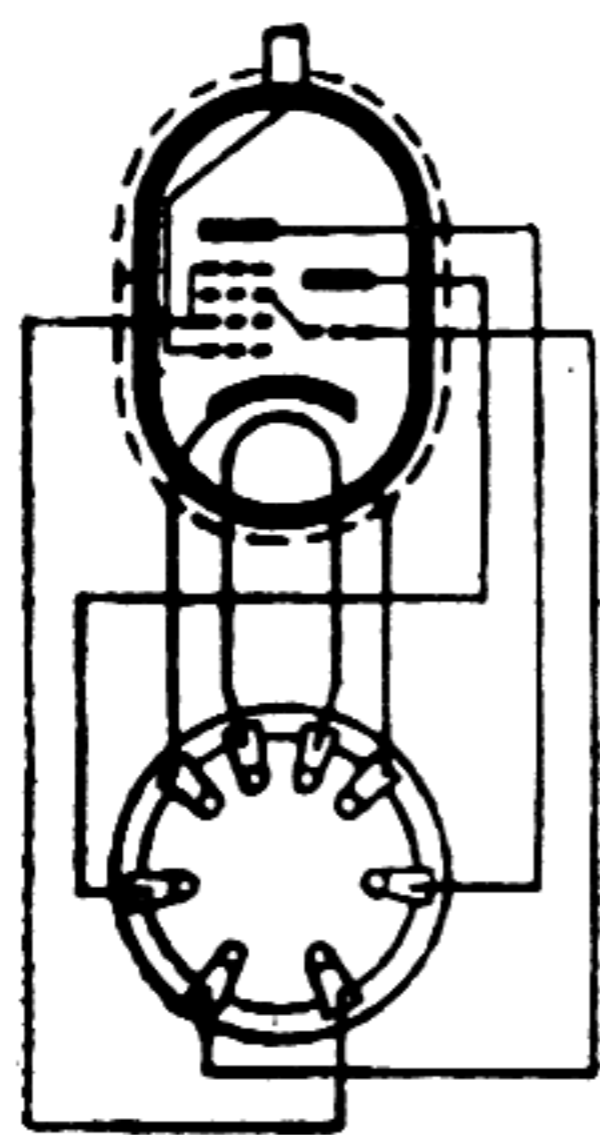
Va	100 V (250 V — $I_a \times 45 \text{ K}\Omega$)	Ia	3,3 mA
Rg3	50 K Ω	Ig3 Osc.	— 0,2 mA
D	4 ‰		

Grenzdaten
Limit ratings
Limites fixées

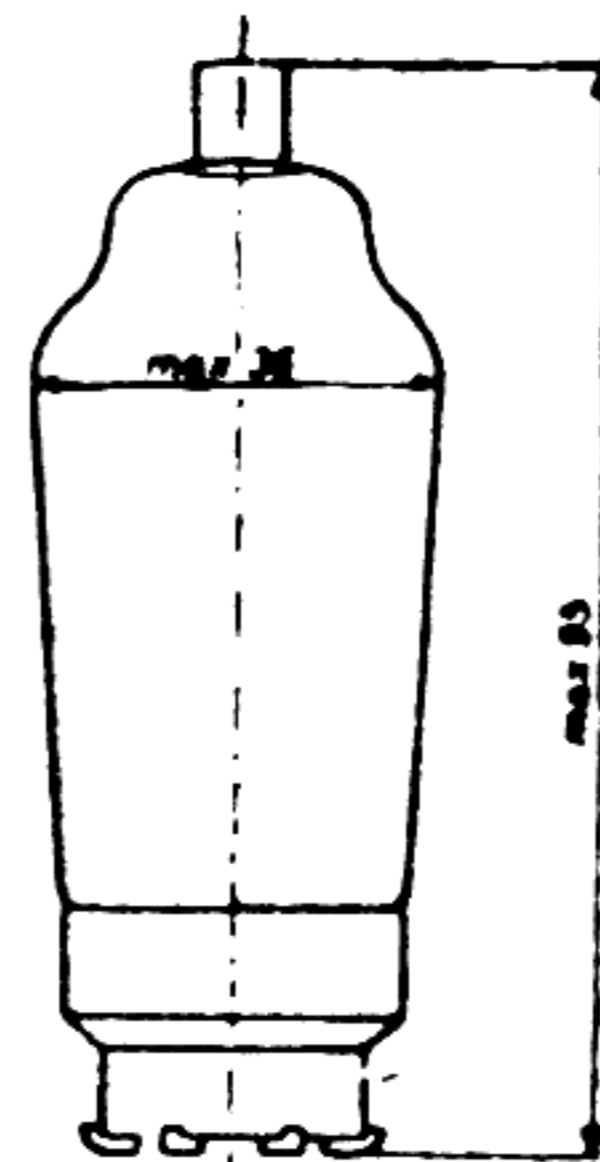
Vao max	550 V	Va max	300 V	Wa max	1,2 Watt
Vg 2,4 0 max	550 V	Vg 2,4 max	125 V	Wg 2,4 max	0,6 Watt
Rg1 max	3 M Ω	Vfk max	100 V	Rfk max	20.000 Ω
VaTro max	550 V	VaTr max	150 V	WaTr max	1,0 Watt
Ik max	15 mA				

Kapazitäten
Capacities
Capacités

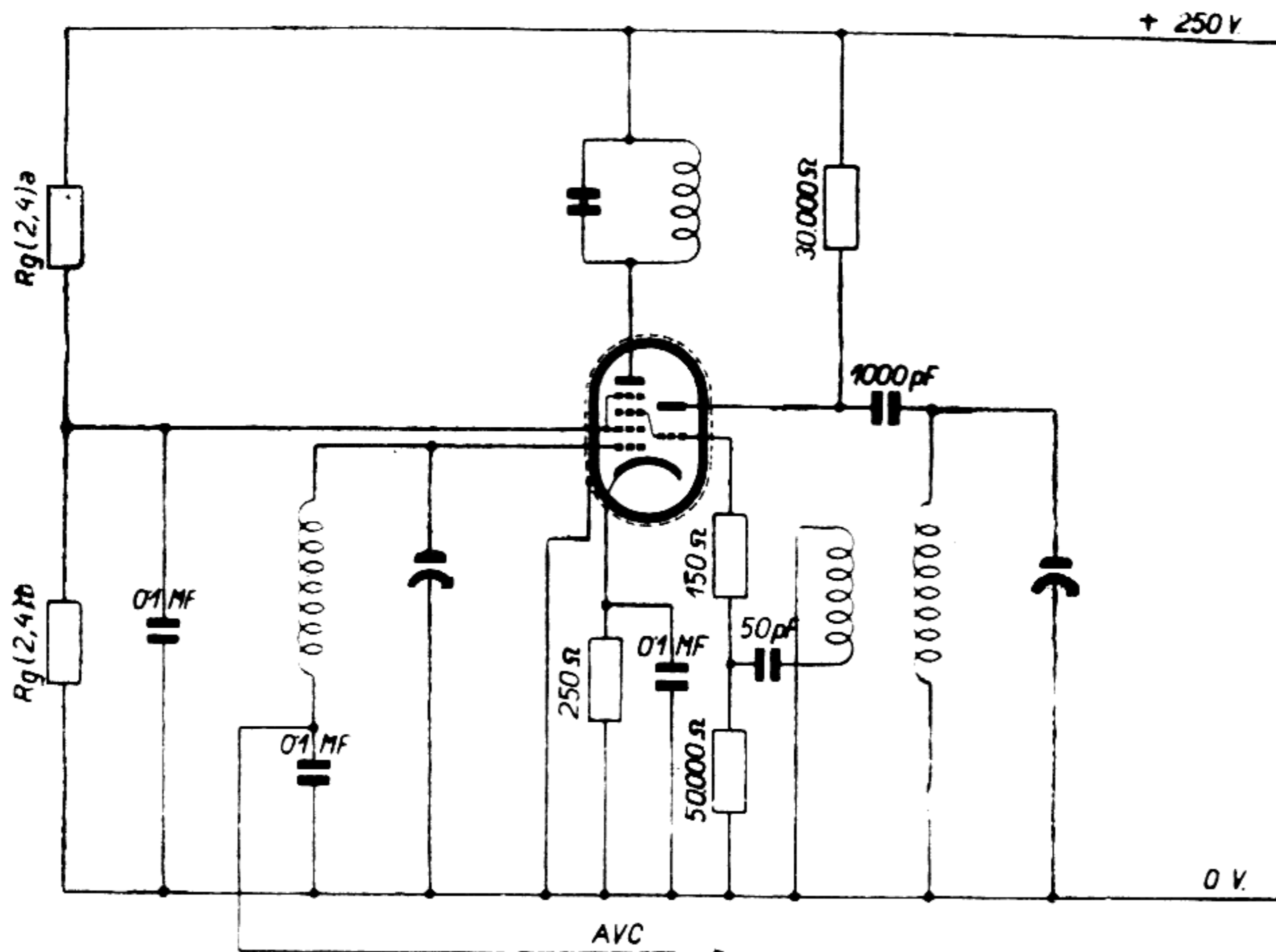
C (g1)	4,9 pF	C (g1/a)	< 0,003 pF
C (a)	9,0 pF	C (g1/f)	< 0,001 pF
C (g3)	8,8 pF	C (g1/g3)	< 0,3 pF
C (aTr)	4,4 pF	C (g3/aTr)	1,4 pF



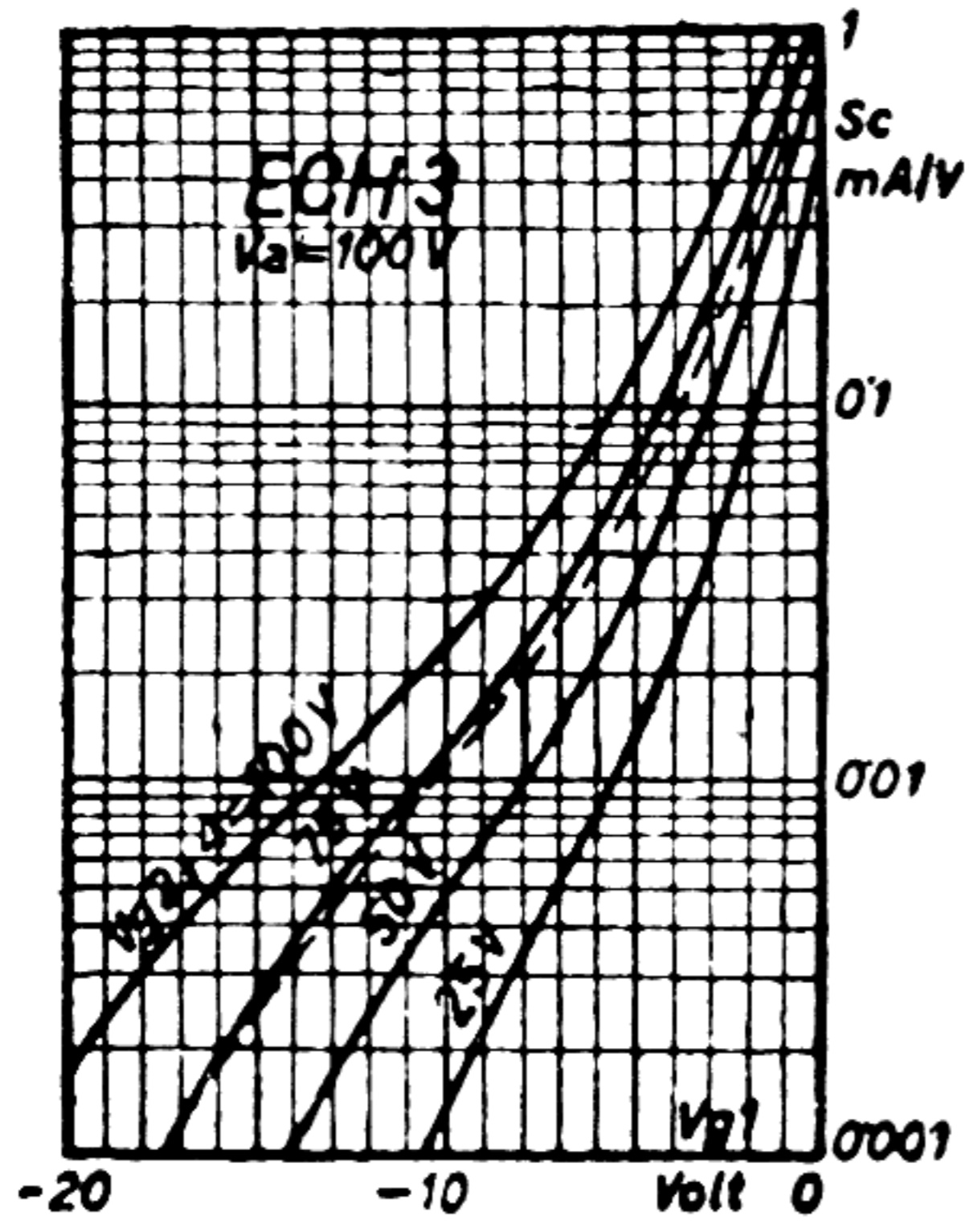
Sockelschaltung
 Base connections
 Connexions de culot



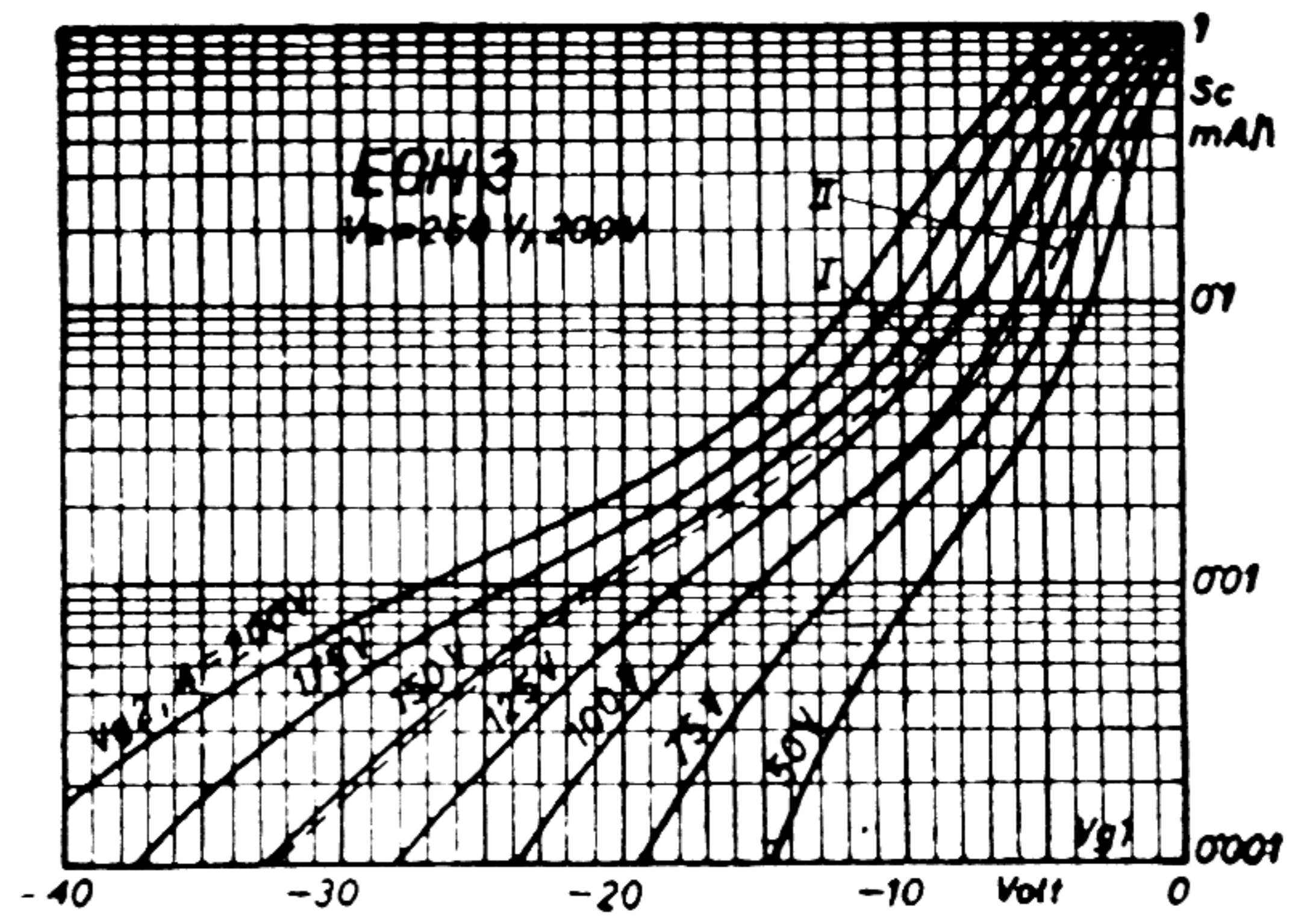
Abmessungen
 Dimensions



Schaltungsbeispiel
 Circuit diagram
 Schema de principe

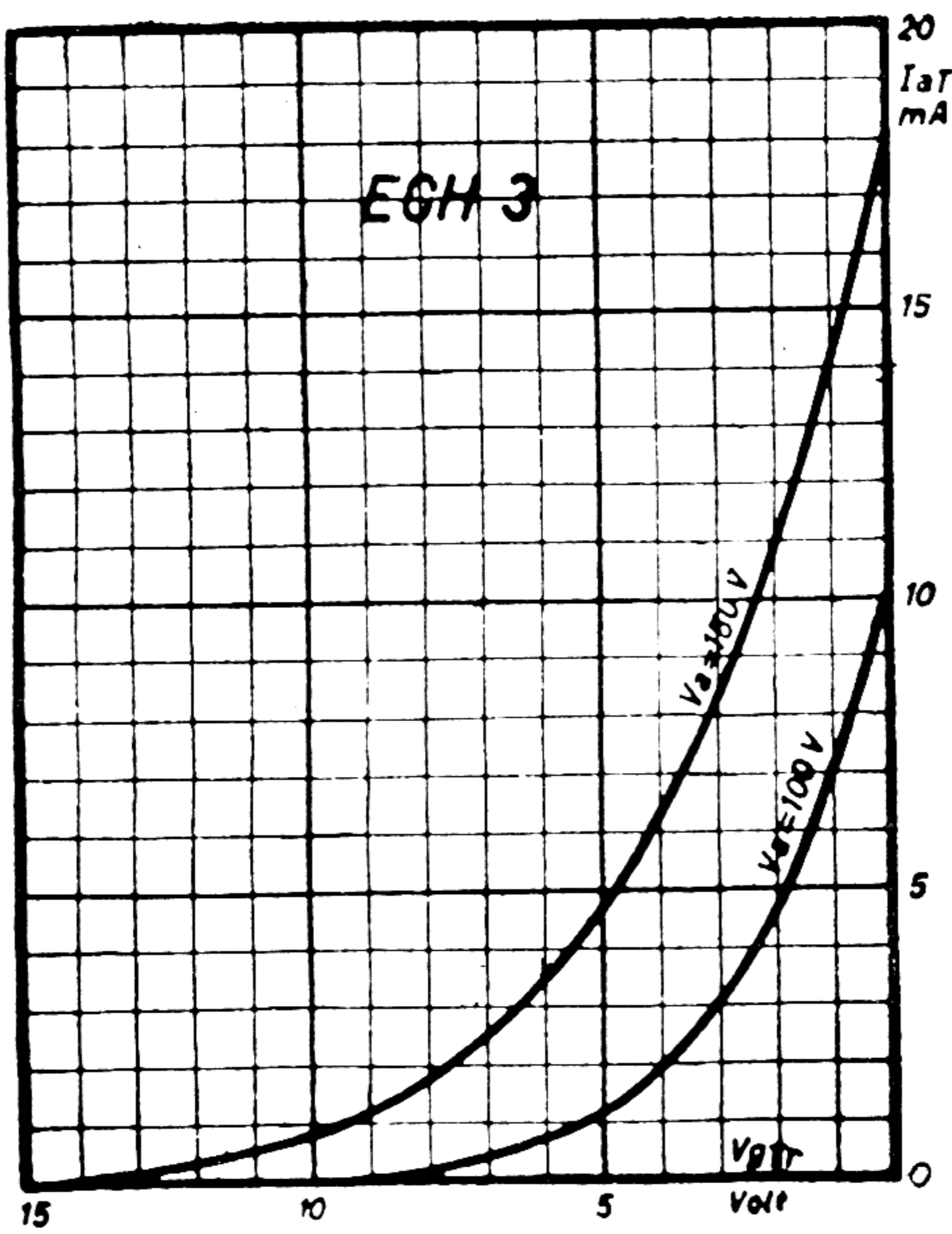


--- d)

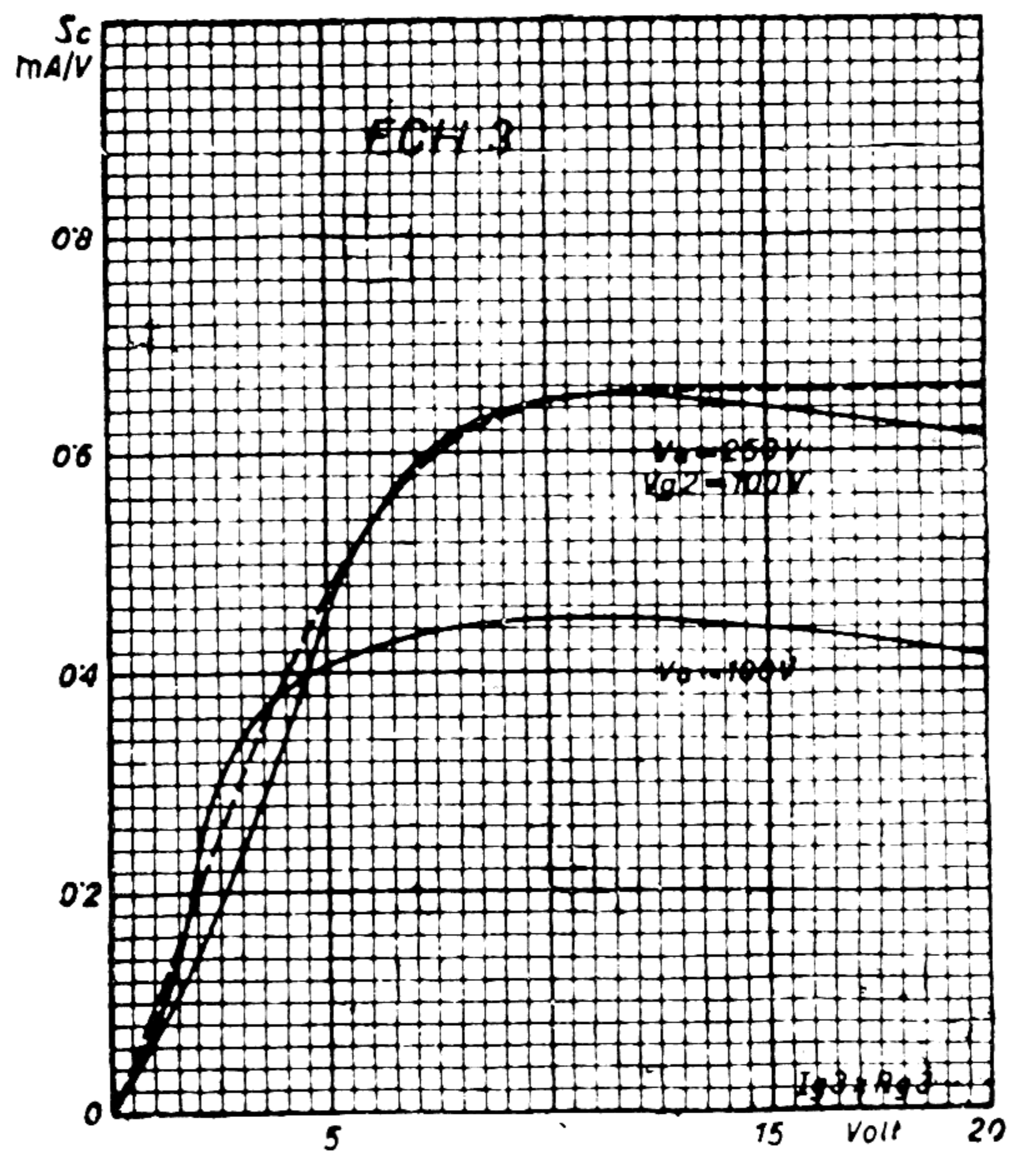


I. --- b)

II. --- c)



Triode



--- a)
--- b)



ECH 4

TRIODE-HEPTODE

Heizung
Heating
Chauffage

6,3 V (i)

0,35 A

Einstellung
Adjustment
Utilisation

I. Mischung. — Frequency conversion. — Changement de frequence.

a) HEPTODE

Va	250	V	la	3	mA
Vg (2,4)	250	V — lg (2,4) × 24.000 Ω	lg (2,4)	6,2	mA
	100	V			
Vg1	— 2	V			

b) TRIODE

VaTr	250	V — laTr × 43.000 Ω	laTr	3,5	mA
	100	V			
RgTr	50.000	Ω	lgTr	190	μA

II. Verstärkung. — Amplification.

a) HEPTODE

Va	250	V	la	5,3	mA
Vg (2,4)	250	V — lg (2,4) × 45.000 Ω	lg (2,4)	3,5	mA
Vg1	— 2	V			
Vg3	0	V			

b) TRIODE

VaTr	250	V	la	2	mA
Ra	0,1	MΩ			
Vg	— 2	V			

Betriebsdaten

Operating conditions

Caracteristiques de service

I. Mischung. — Frequency conversion. — Changement de frequence.

a) HEPTODE

Vg1	— 2	V	Sc	0,750	mA/V	Ri	1,4	MΩ
Vg1	— 24,5	V	Sc	0,0075	mA/V	Ri	> 10	MΩ



b) TRIODE

Vg	0	V	S	3,2	mA/V	g	22
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II. Verstärkung. Amplification.

HEPTODE

Vg1	— 2	V	S	2,2	mA/V	Ri	0,9	MΩ
Vg1	— 36	V	S	0,022	mA/V	Ri	> 10	MΩ
Vg1	— 44	V	S	0,002	mA/V	Ri	> 10	MΩ

Grenzdaten

Limit ratings

Limites fixées

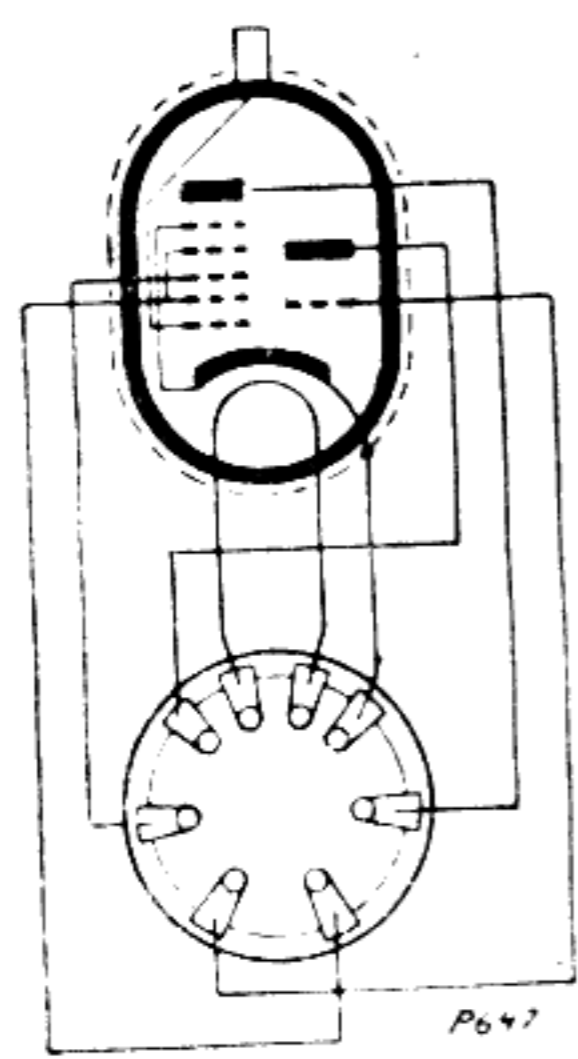
Vao max	550 V	Va max	300 V	Wa max	1,5 Watt
Vg (2,4) 0 max	550 V	Vg (2,4) max	100 V (Ia < 3mA) 300 V (Ia < 1mA)	Wg (2,4) max	1 Watt
VaTro max	550 V	VaTr max	150 V	Wa	0,5 Watt
Vfk max	50 V			Rfk max	20.000 Ω
Ik max	15 mA	Rg1 max	3 MΩ	Rg3 max	3 MΩ

Kapazitäten

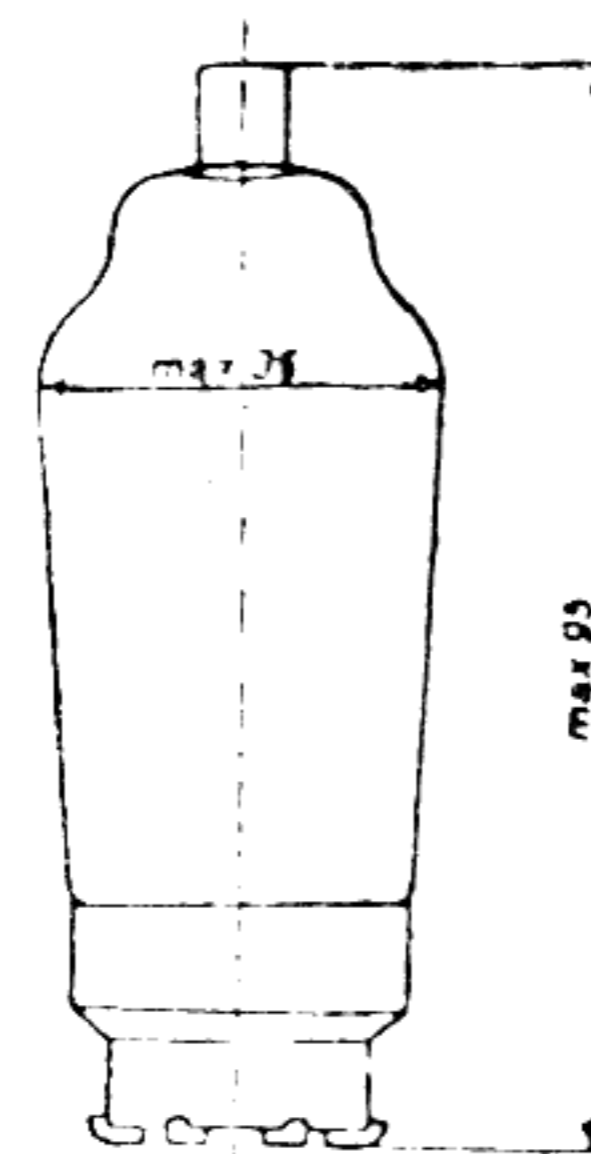
Capacities

Capacités

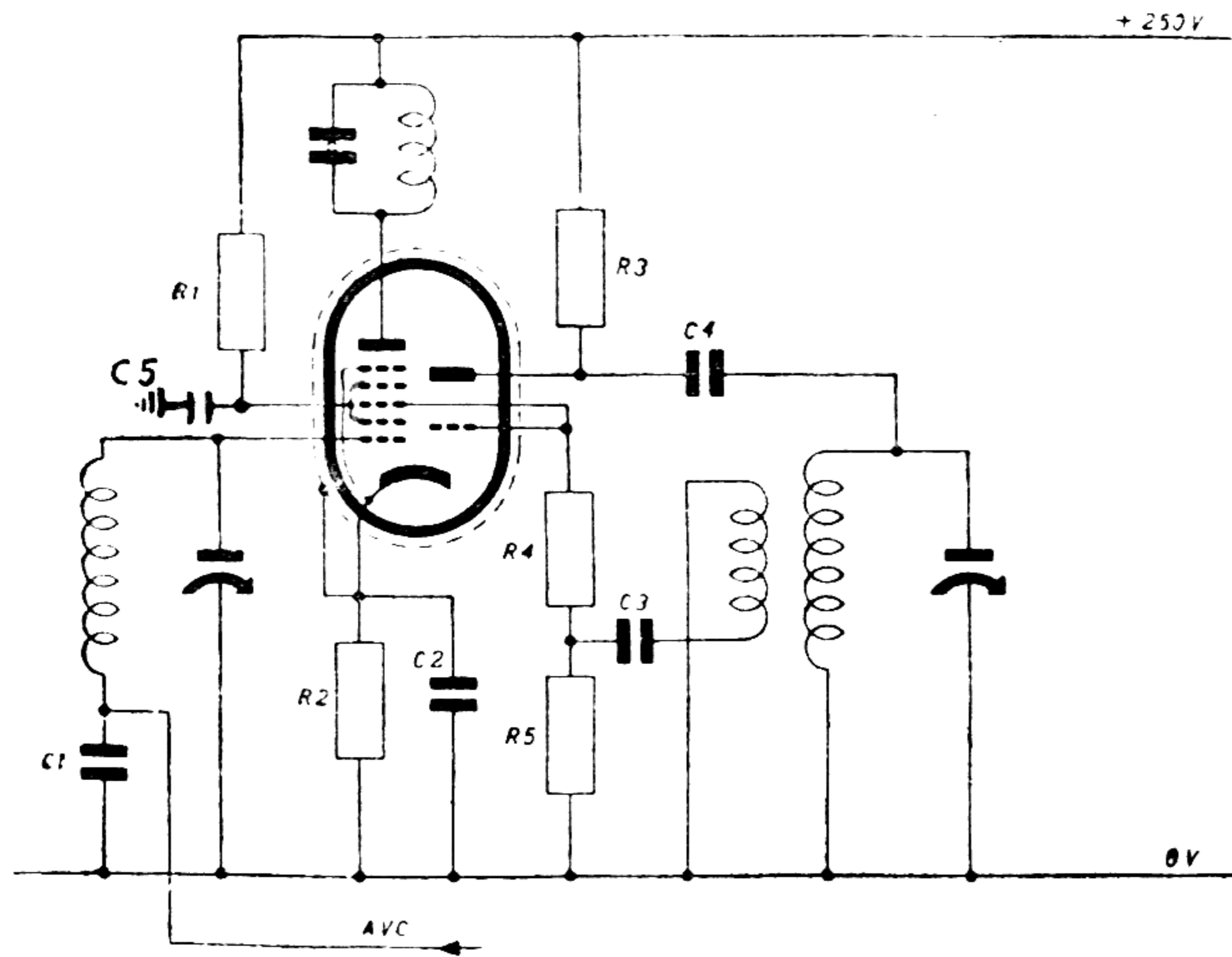
C (g1)	5,6	pF	C (a)	9,2	pF	C (g3)	8,9	pF
C (a/g1)	< 0,002	pF	C (g1/g3)	< 0,2	pF	C (g1/f)	< 0,001	pF
C (atr)	5,4	pF	C (gtr)	6	pF	C (gtr/f)	< 0,3	pF
C (gtr/k)	3,0	pF	C (atr/ktr)	2,5	pF	C (atr/gtr)	2,1	pF
C (gtr/g1)	< 0,1	pF						



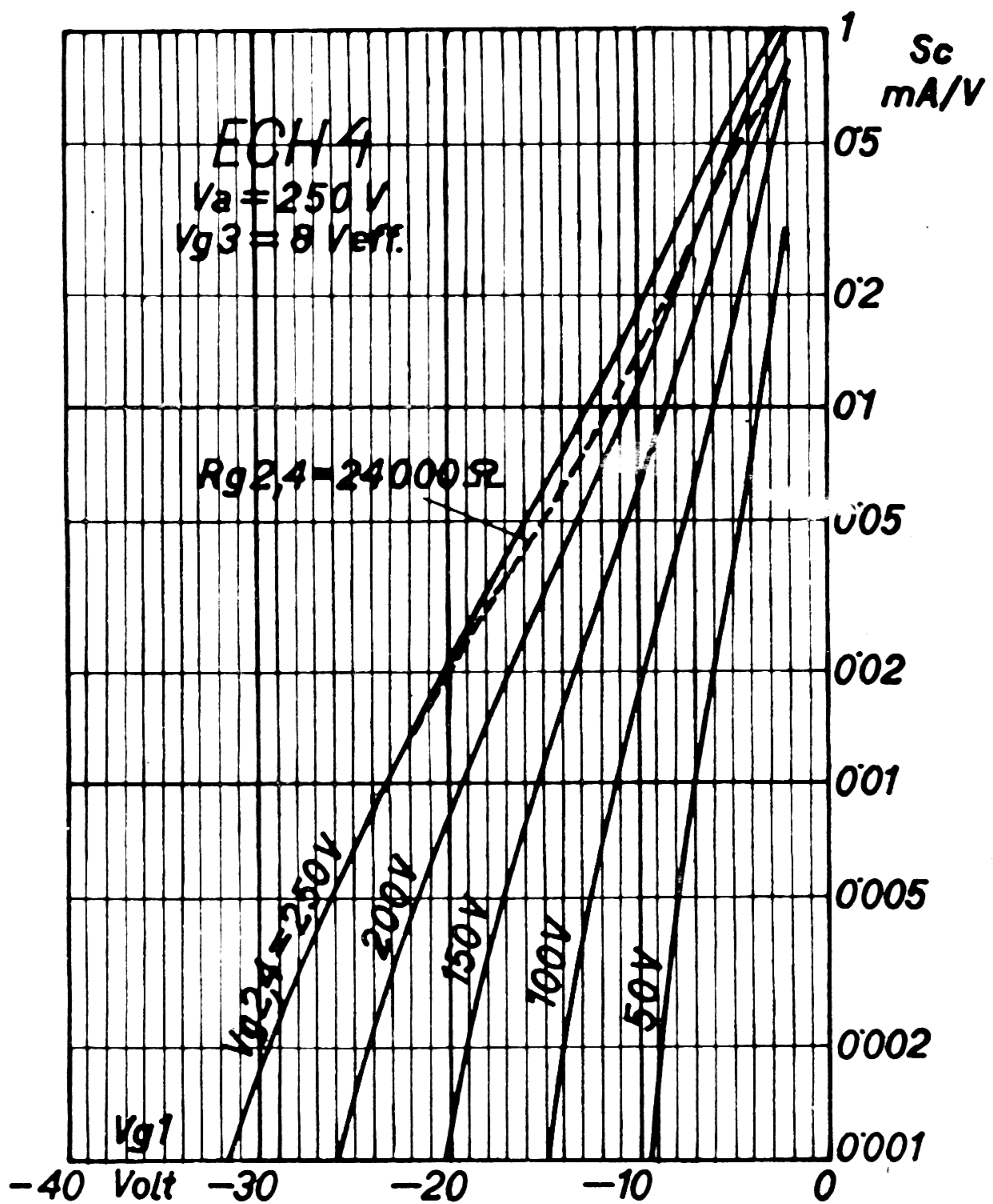
Sockelschaltung
Base connections
Connexions du culot

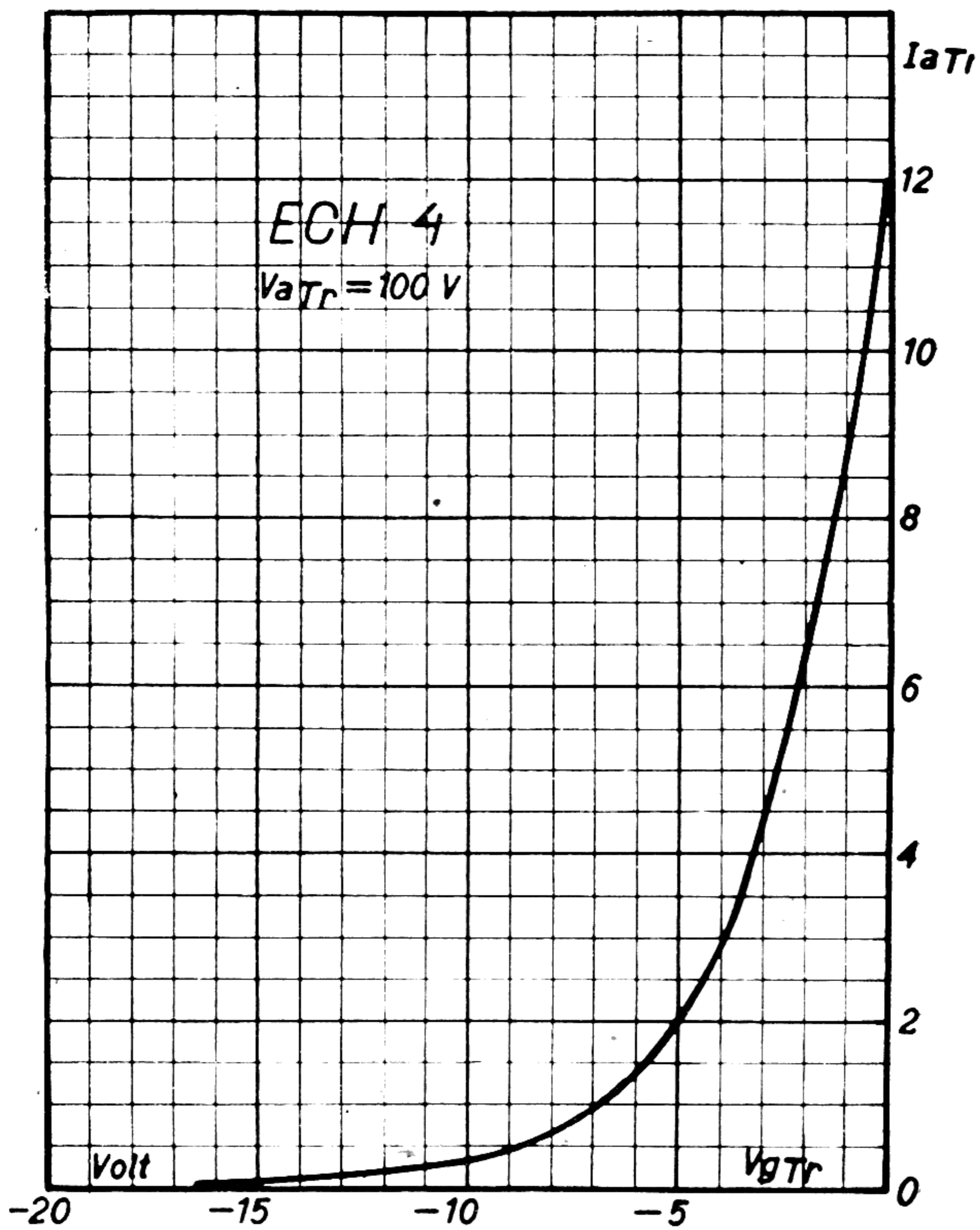
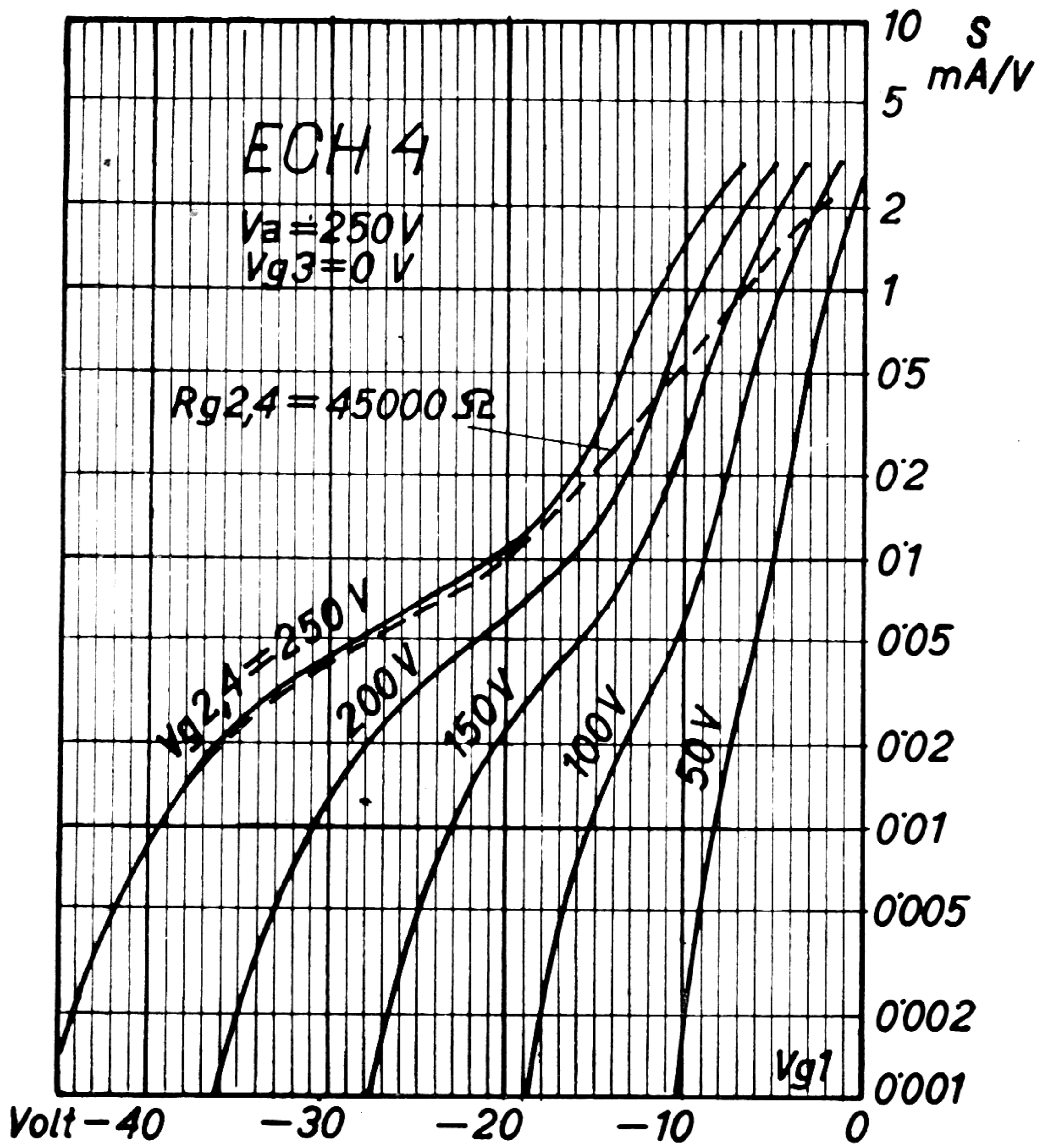


Abmessungen
Dimensions



Schaltungsbeispiel
 Circuit diagram
 Schema de principe







ECH 11

TRIODE-HEXODE

Heizung
Heating
Chauffage

Vf **6,3 V (i)**

If **0,2 Amp.**

Einstellung
Adjustment
Utilisation

Hexode
Va **250 V**
Vg 2,4 **100 V**
Vg1 — **2 V**

la **2,3 mA**
lg 2,4 **3 mA**
Rk **250 Ω**

Triode
Va **250 V — Ra × Ia**
Ra **50.000 Ω**
Rg **50.000 Ω**
Vg osc. **8 V (eff)**

la **3,3 mA**
lg osc. **0,2 mA**

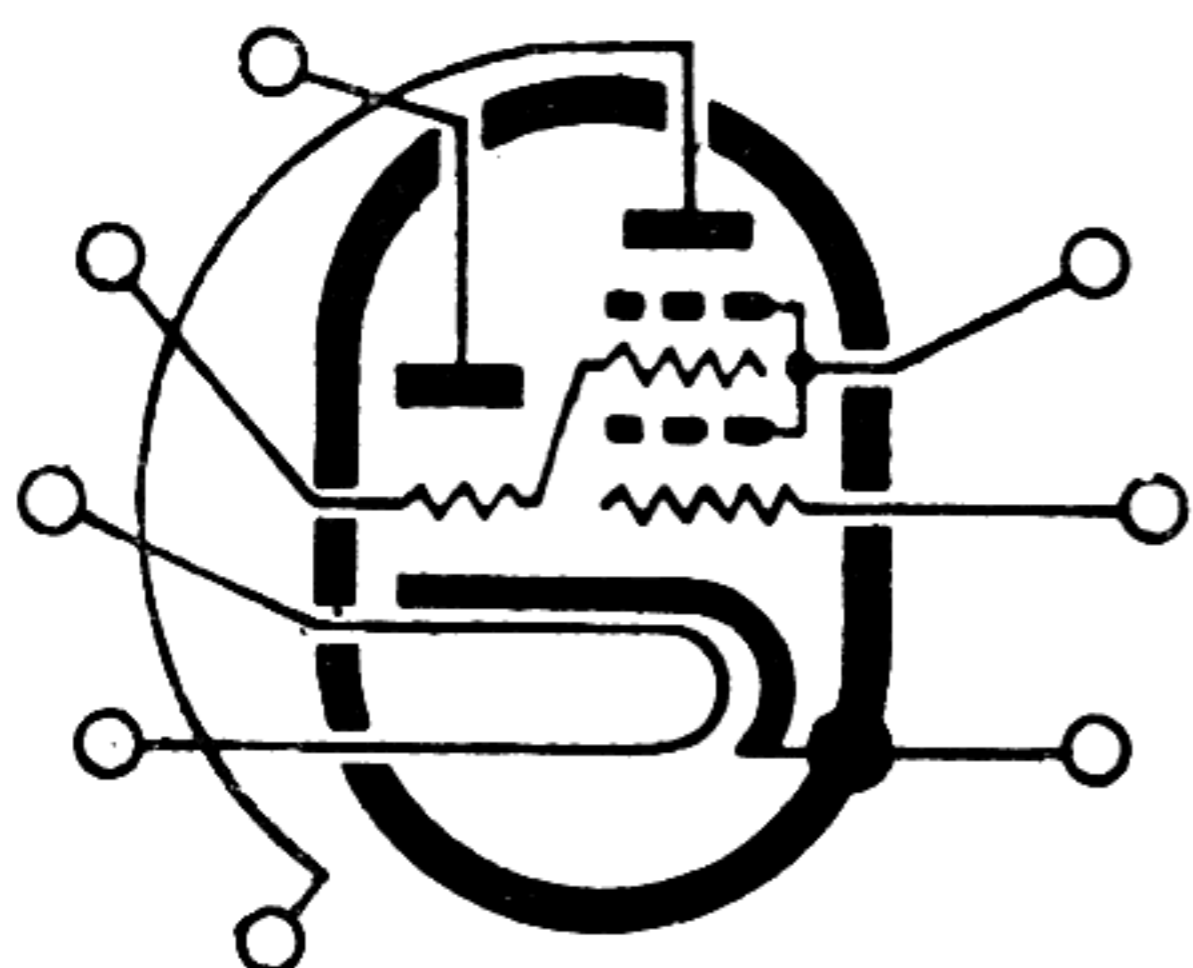
Betriebsdaten
Operating Conditions
Caracteristiques de service

a) Vg 2,4	fest fixed fixe	Vg1	— 2	— 12	— 13 V
		Sc	650	6,5	3,25 μA/V
		Ri	1,4	> 10	> 10 MΩ
b) Vg 2,4	gleited sliding glissante	Vg1	— 2	— 16,5	— 21 V
		Sc	650	6,5	1,6 μA/V
		Ri	1,4	> 10	> 10 MΩ
Triode		D	50/6	S (Vg = 0)	28 mA/V

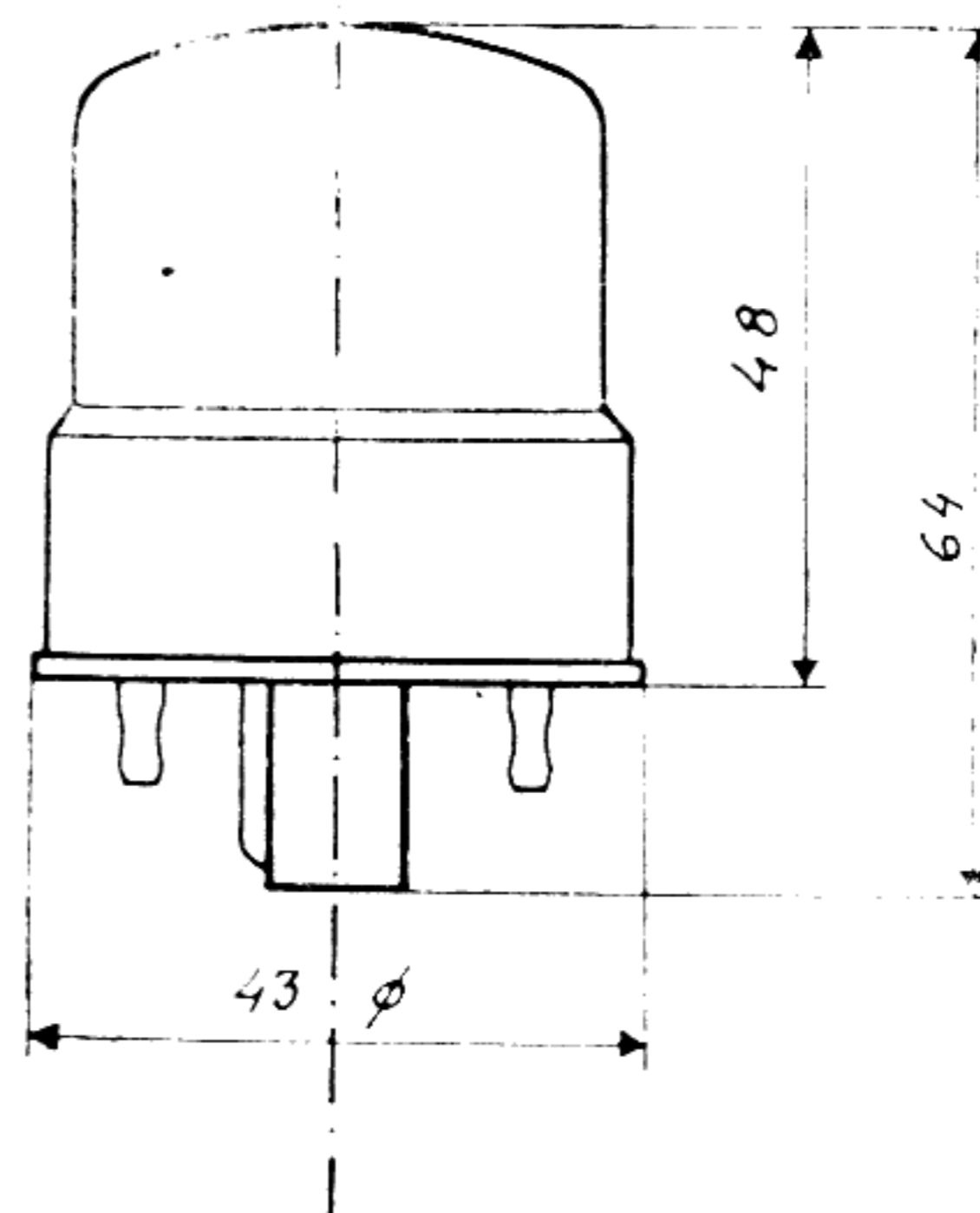
Grenzdaten
Limit ratings
Limites fixées

Vao max	550 V	Va max	300 V	Wa max	1,5 Watt
Vg 2,4 0 max	550 V	Vg 2,4 max	100 V (Ia 2,3 mA)	Wg 2,4 max	0,5 Watt
		Vg 2,4 max	250 V (Ia 1 mA)		
Rg1 max	3 MΩ	Vfk max	100 V	Rfk max	20.000 Ω
VaTro max	550 V	VaTr max	150 V	Watr max	1 Watt
Ik max	15 mA				

Kapazitäten	C (g1)	5,3 pF	C (g1 a)	<	0,001 pF
Capacities	C (a)	9,1 pF	C (g1f)	<	0,001 pF
Capacités	C (g3/k)	4,3 pF	C (g1/g3)	<	0,2 pF
	C (aTr/k)	2,5 pF	C (g3/aTr)	<	1,5 pF



Sockelschaltung
Base connections
Connexions du culot



Abmessungen
Dimensions



ECH 21

TRIODE-HEPTODE

Heizung
Heating
Chauffage

V_f = 6,3 V I_f = 0,33 A

Einstellung und Betriebsdaten
Adjustment and Operating Conditions
Utilisation et caractéristiques de service

Heptode als Mischröhre
Heptode as mixer
Heptode comme modulatrice

V_a	=	250 V	I_a	=	3 mA
$V_{g2,4}$	=	250 V — $I_{g2,4} \times 24.000 \Omega$	$I_{g2,4}$	=	6,2 mA
$R (g_3 + g_T)$	=	50.000 Ω	$I (g_3 + g_T)$	=	190 μA
V_{g1}	=	— 2 V	R_i	=	1,4 $M\Omega$
V_{g1}	=	— 24,5 V	R_i	<	3 $M\Omega$
			S_c	=	0,750 mA/V
			S_c	=	0,0075 mA/V

Triode als Oszillator
Triode as oscillator
Triode comme oscillatrice

V_a = 250 V — $I_a \times 43.000 \Omega$ I_a = 3,5 mA

Heptode als Z. F. Verstärker
Heptode as Z. F. amplifier
Heptode comme amplificatrice M. F.

V_a	=	250 V	I_a	=	5,3 mA
$V_{g2,4}$	=	250 V — $I_{g2,4} \times 45.000 \Omega$	$I_{g2,4}$	=	3,5 mA
V_{g3}	=	0 V			
V_{g1}	=	— 2 V	R_i	=	0,9 $M\Omega$
V_{g1}	=	— 36 V	R_i	>	10 $M\Omega$
V_{g1}	=	— 44 V	R_i	>	10 $M\Omega$
			S	=	2,2 mA/V
			S	=	0,022 mA/V
			S	=	0,0022 mA/V

Triode als N. F. Verstärker
Triode as L. F. amplifier
Triode comme amplificatrice B. F.

V_a = 250 V I_a = 1 mA
 V_{g1} = — 2 V R_a = 0,2 $M\Omega$

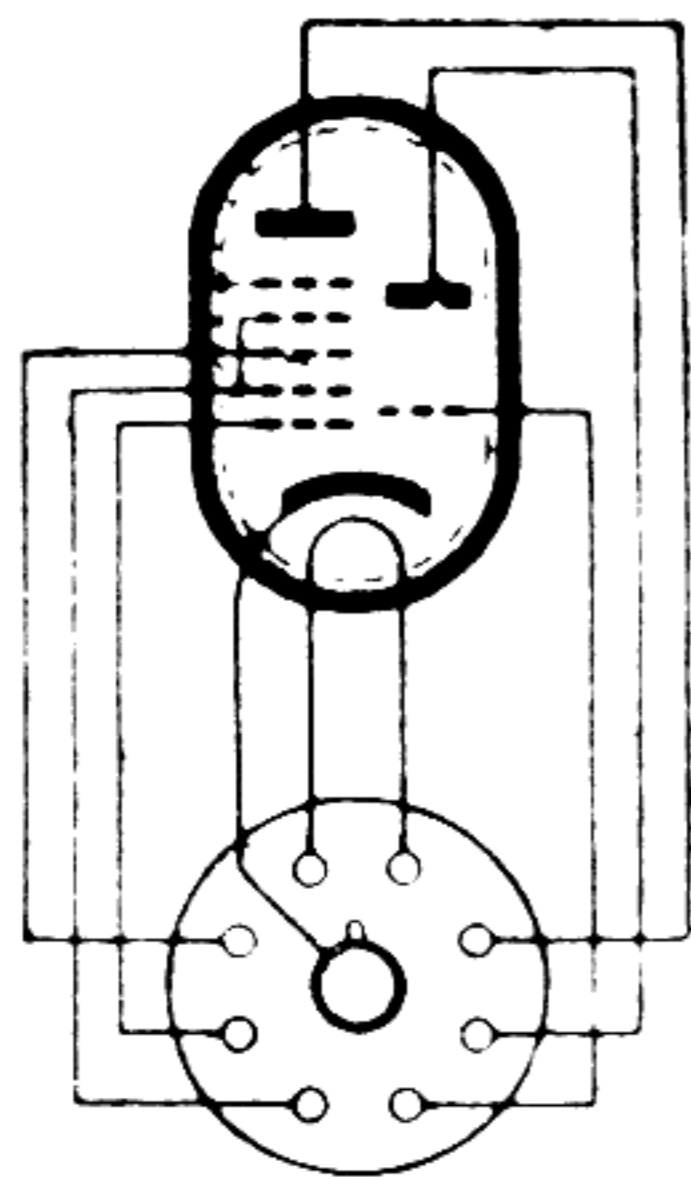


Grenzdaten
Limit ratings
Limites fixées

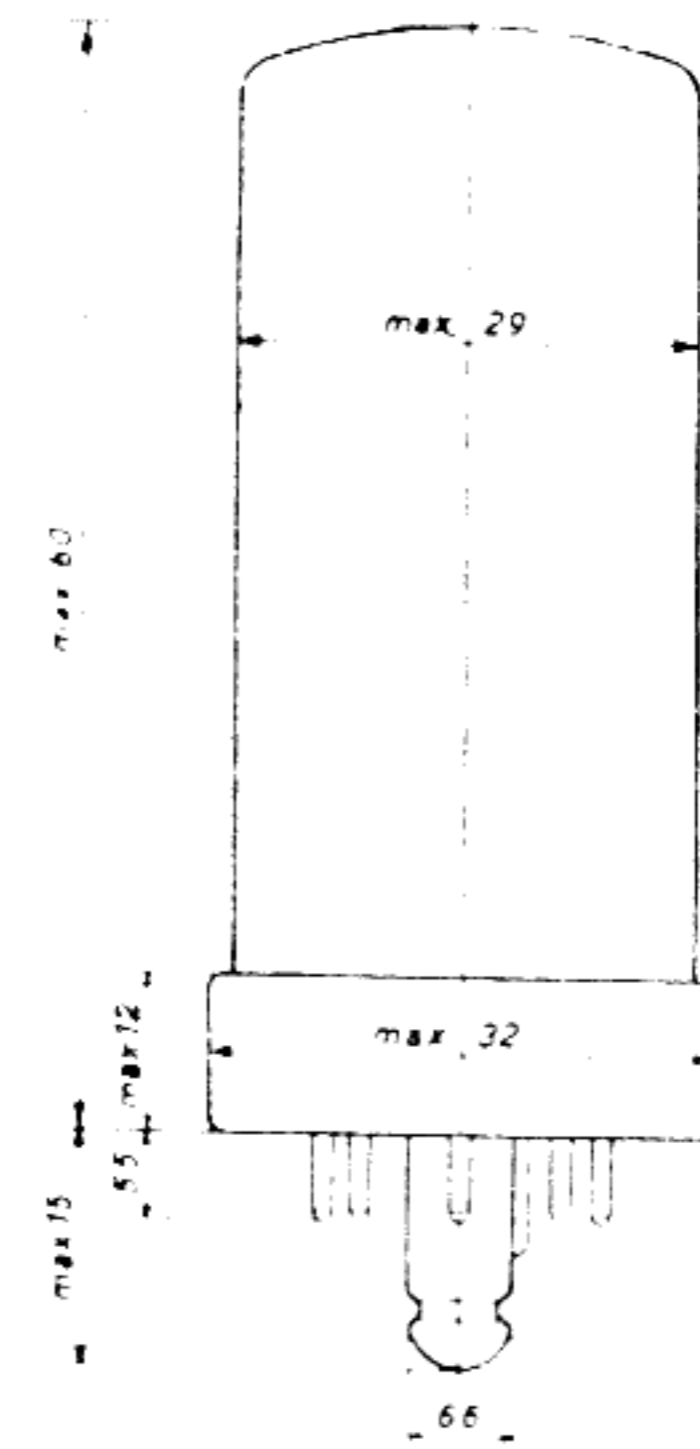
V _{ao} max	= 550 V	V _a max	= 250 V	W _a max	= 1,5 W
V _{g2,4 0} max	= 550 V	V _{g2,4} max	= 100 V (I _a < 3mA) 300 V (I _a < 1mA)	W _{g2,4} max	= 1 W
R _{gk} max	= 3 MΩ	R _{g3k} max	= 3 MΩ	R _{fk} max	= 20.000 Ω
I _k max	= 15 mA	V _{fk} max	= 50 V	W _{aT} max	= 0,8 W
V _{aTo} max	= 550 V	V _{aT} max	= 175 V		

Kapazitäten
Capacities
Capacités

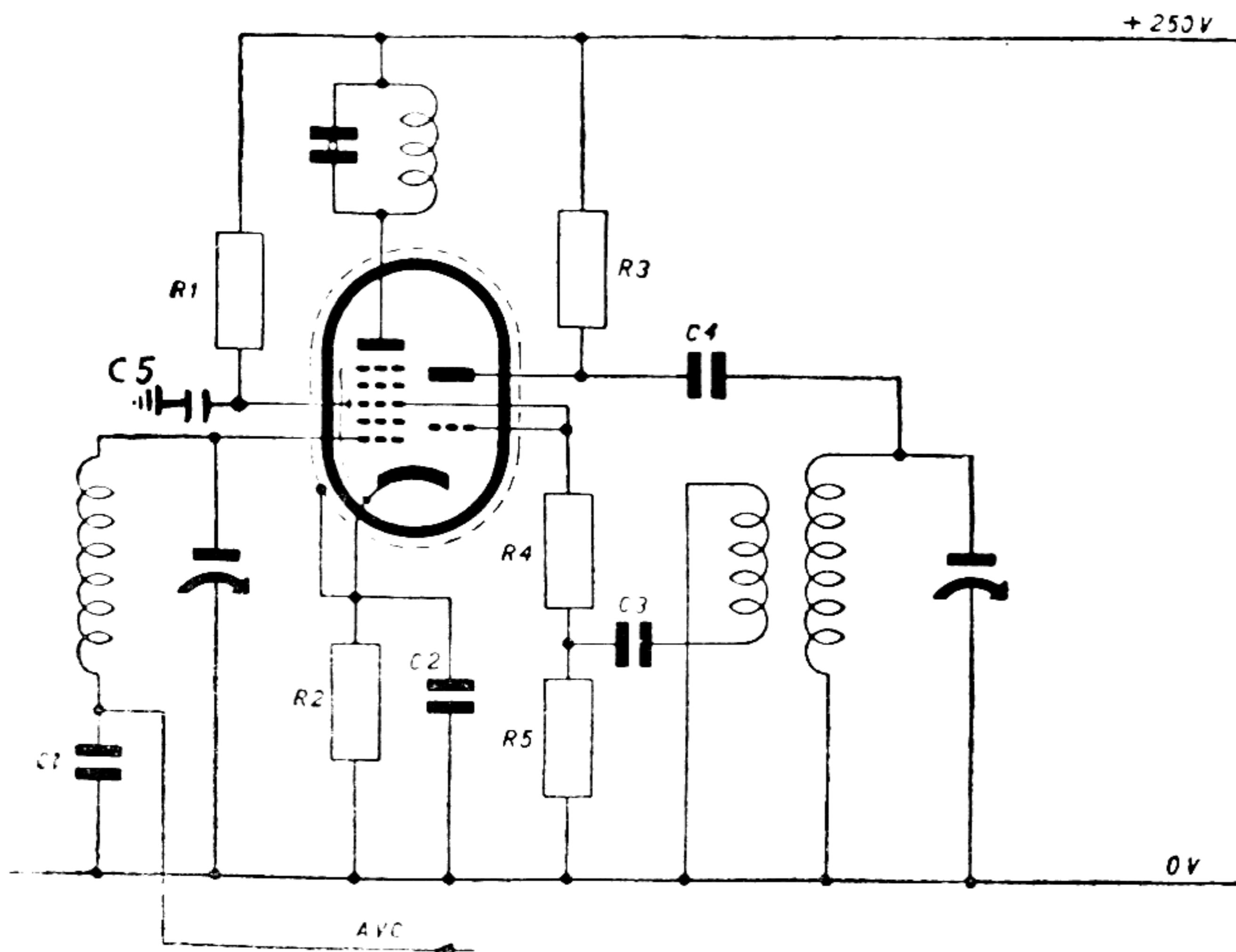
C (g1)	= 6,8 pF	C (g3)	= 8 pF	C (a)	= 9,5 pF
C (aT)	= 3,5 pF	C (gT)	= 4,1 pF	C (g1/a)	< 0,002 pF
C (g1/f)	< 0,005 pF	C (g1/g3)	< 0,3 pF	C (gT/g1)	< 0,25 pF
C (gT + g3/g1)	< 0,4 pF	C (gT + g3/a)	< 0,08 pF	C (aT/gT)	= 1,1 pF
C (aT/k)	= 2 pF	C (gT/k)	= 3 pF	C (gT/f)	< 0,05 pF



Sockelschaltung
Base connections
Connexions du culot

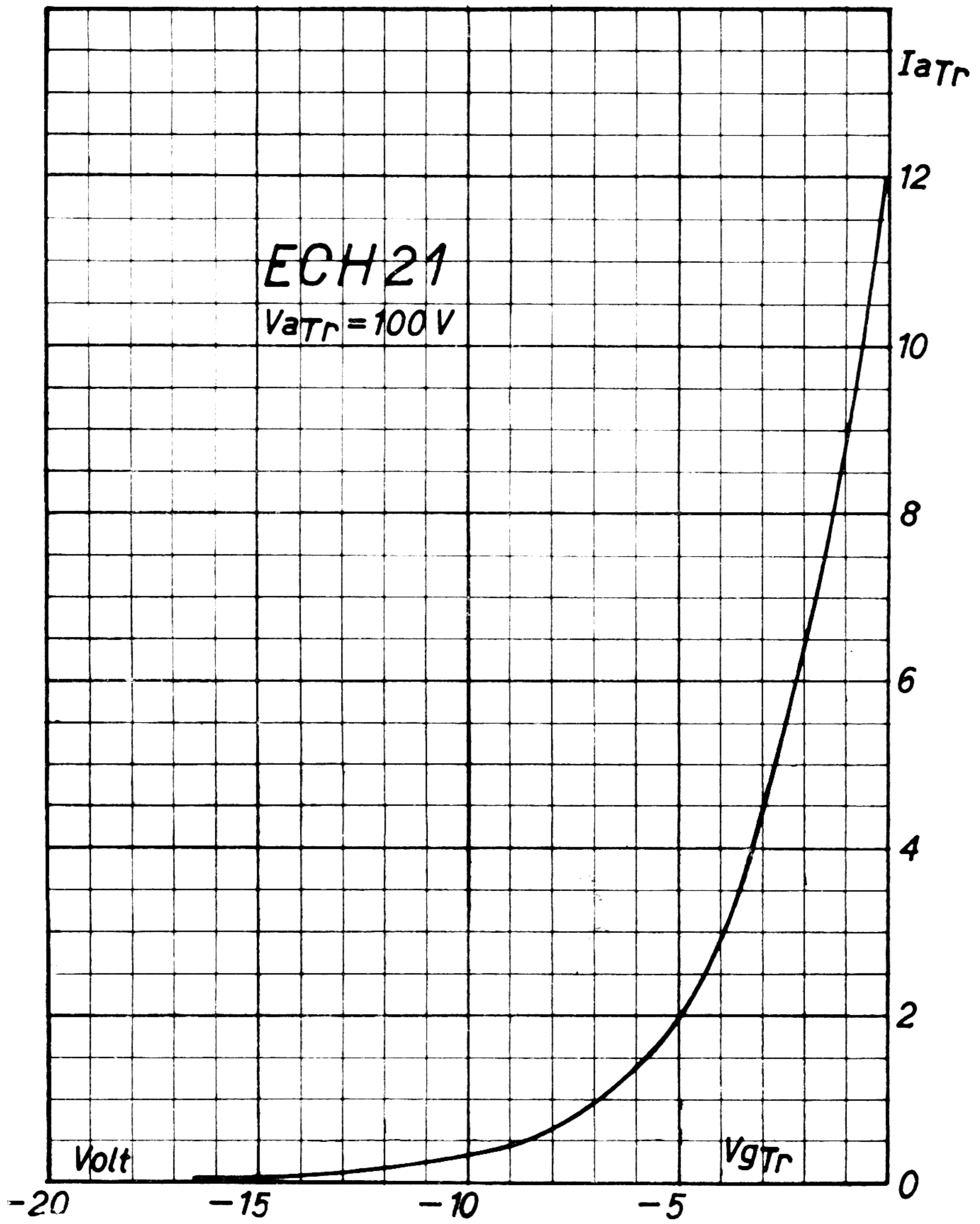


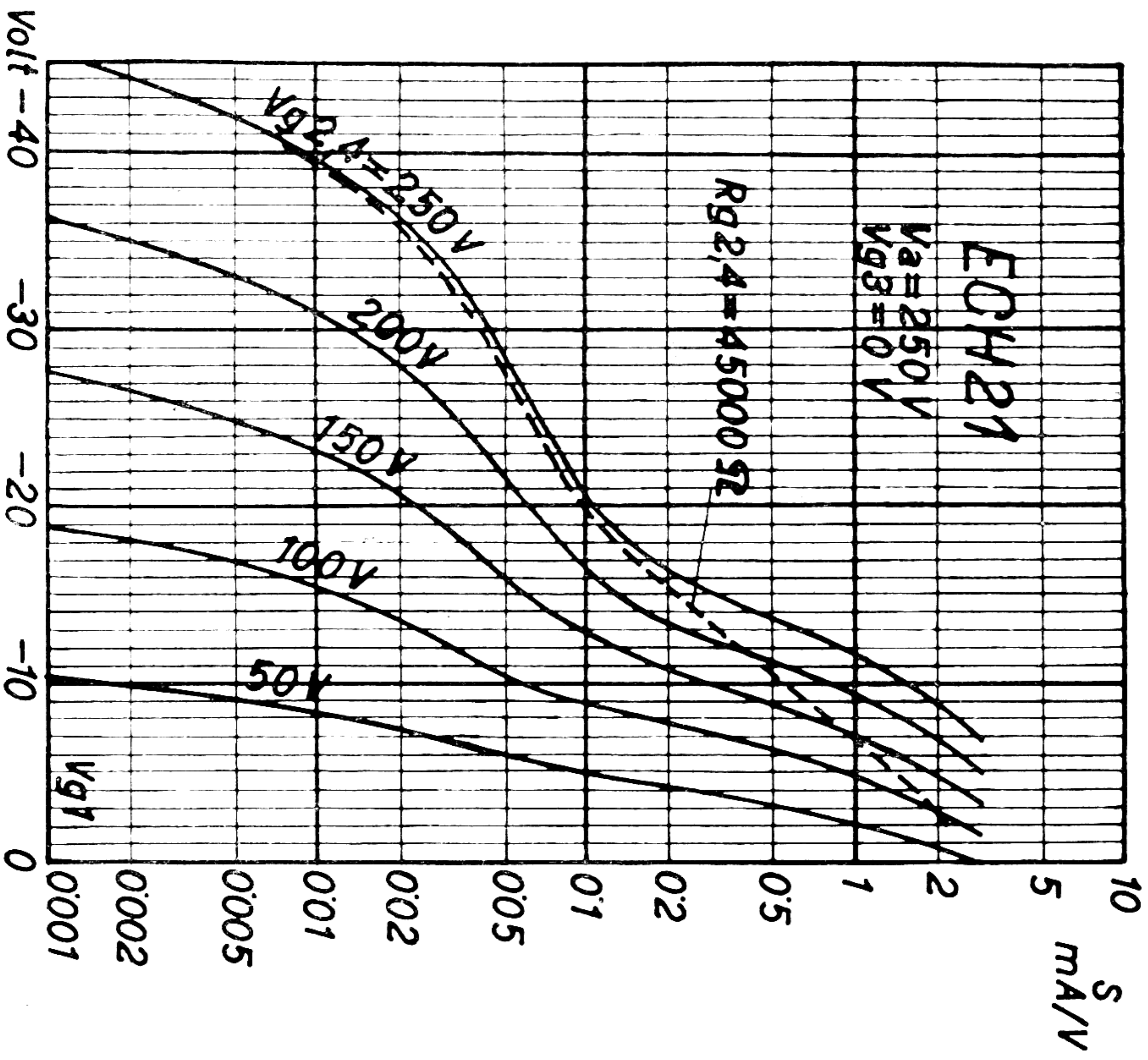
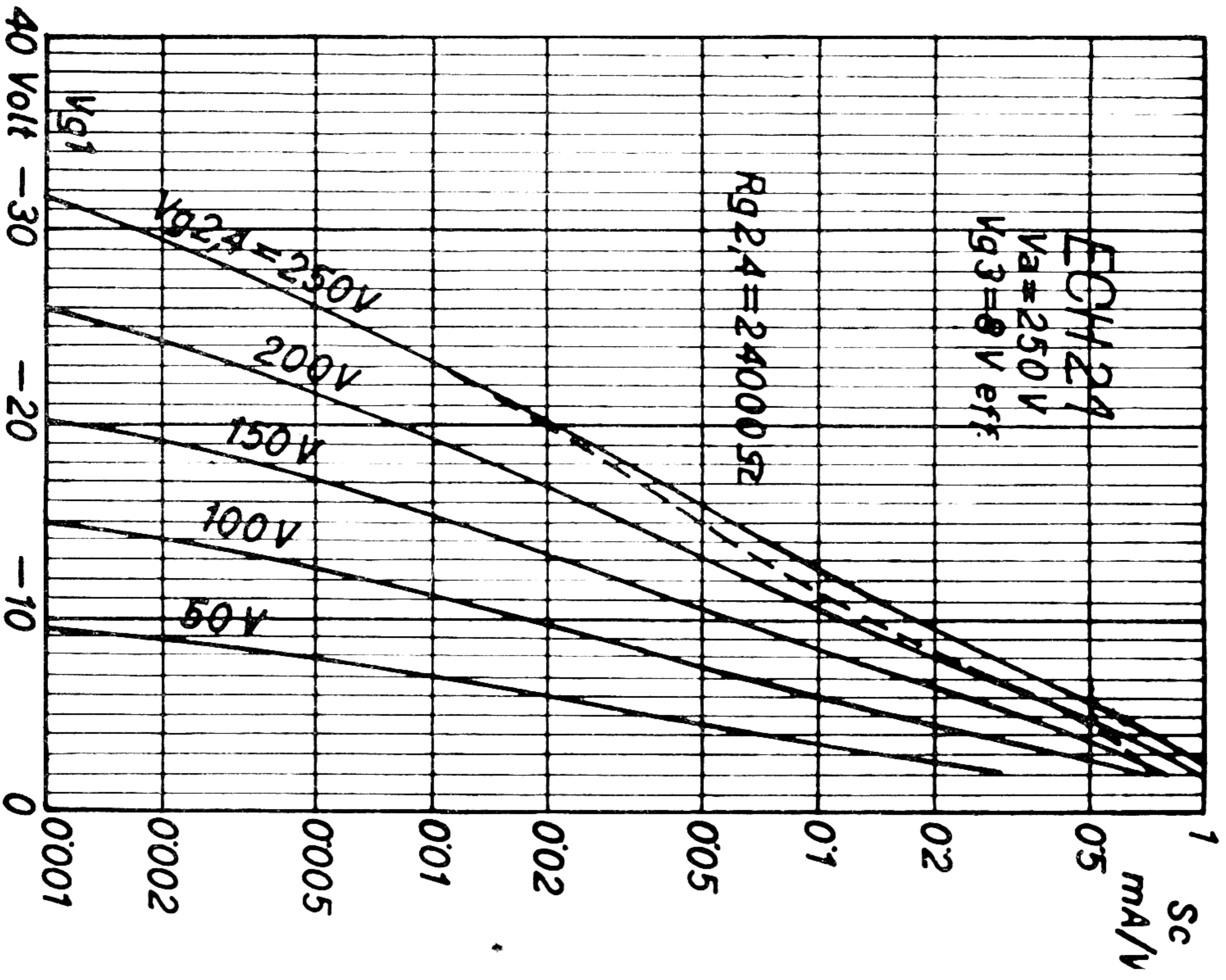
Abmessungen
Dimensions



Schaltungsbeispiel
Circuit diagram
Schema de principe

R ₁	= 24.000 Ω	C ₁	= 0,1 μF
R ₂	= 150 Ω	C ₂	= 0,1 μF
R ₃	= 43.000 Ω	C ₃	= 50 pF
R ₄	= 50 Ω	C ₄	= 1000 pF
R ₅	= 50.000 Ω	C ₅	= 0,1 μF







ECL 11

TRIODE-TETRODE

Heizung
Heating
Chauffage

$V_f = 6,3 \text{ V (i)}$ $I_f = 1 \text{ Amp.}$

Einstellung
Adjustment
Utilisation

a) TRIODE

V_a	$= 200 \text{ V}$	I_a	$= 2 \text{ mA}$		
V_{g1}	$= -2,5 \text{ V}$	(S)	$= 2 \text{ mA/V, g}$		(70)

b) TETRODE

V_a	$= 250 \text{ V}$	I_a	$= 36 \text{ mA}$		
V_{g2}	$= 250 \text{ V}$	I_{g2}	$= 4 \text{ mA}$		
V_{g1}	$= -6 \text{ V}$	(S)	$= 9 \text{ mA/V, Ri}$		$= 50000 \Omega$
R_a	$= 7000 \Omega$	W_o	$= 3,8 \text{ Watt}$	(k)	$= 10^0/0$
V_{g1}	$= 0,4 \text{ Veff.}$	(W_o)	$= 0,05 \text{ Watt}$		

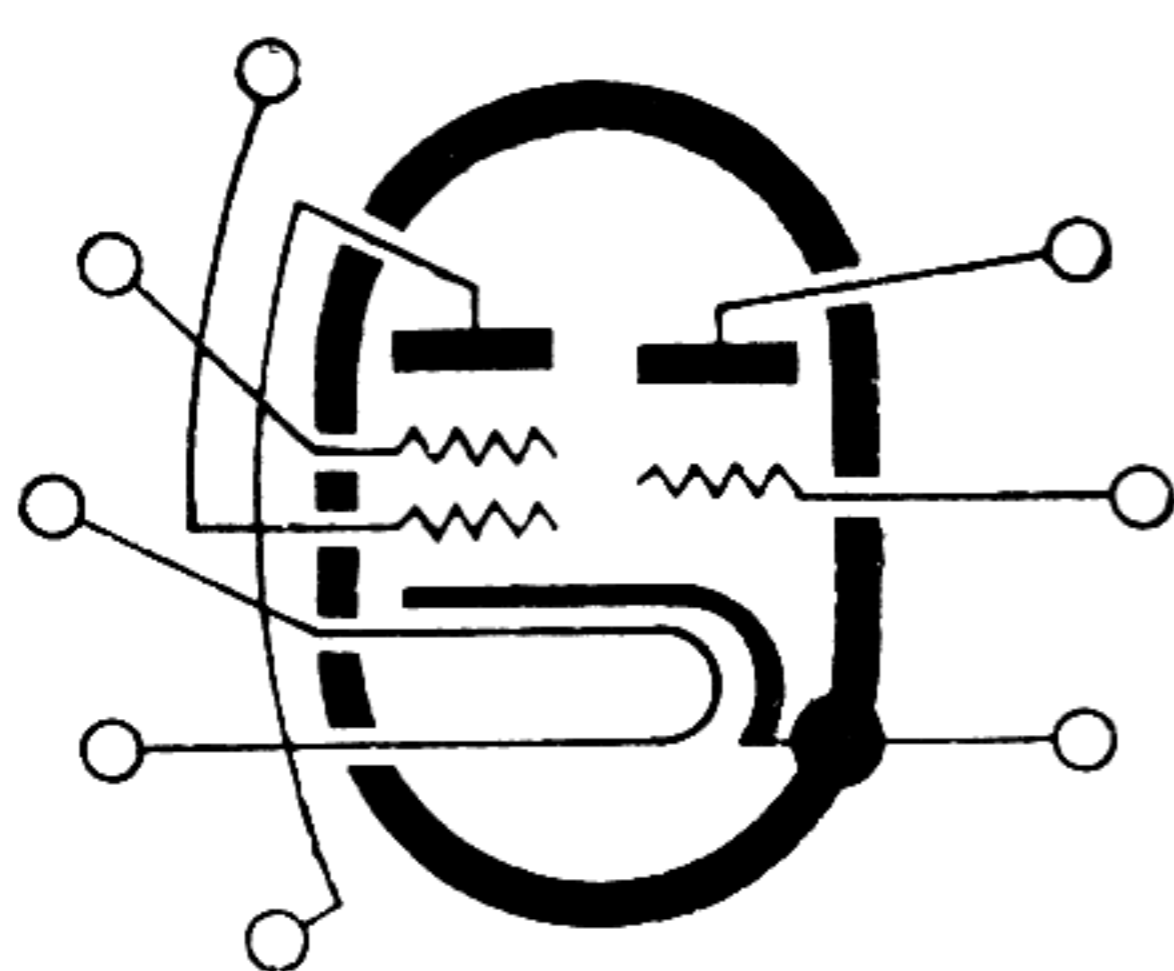
Grenzdaten
Limit ratings
Limites fixées

a) TRIODE

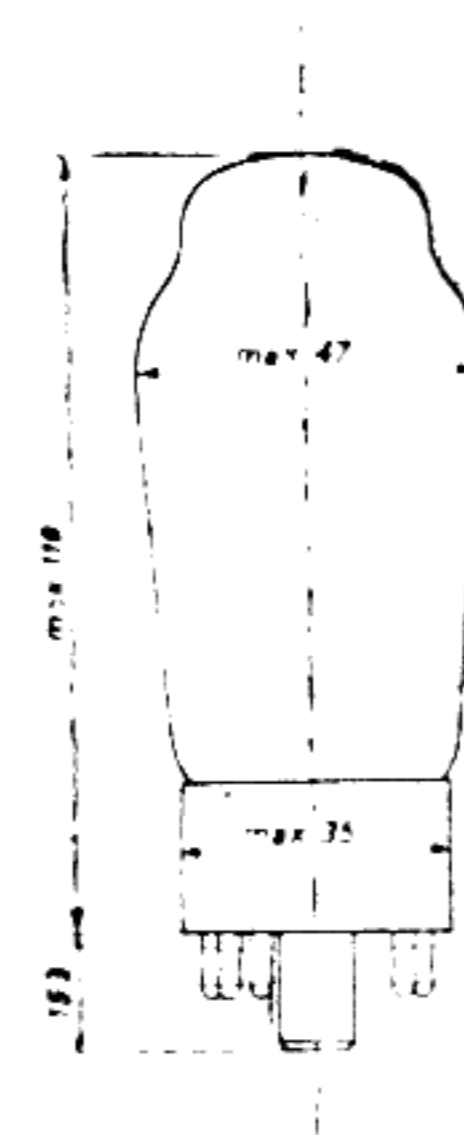
$V_{ao \text{ max}}$	$= 550 \text{ V}$	$V_a \text{ max}$	$= 300 \text{ V}$	$W_a \text{ max}$	$= 0,5 \text{ Watt}$
$R_{g1 \text{ max}}$	$= 1,7 \text{ M}\Omega$				

b) TETRODE

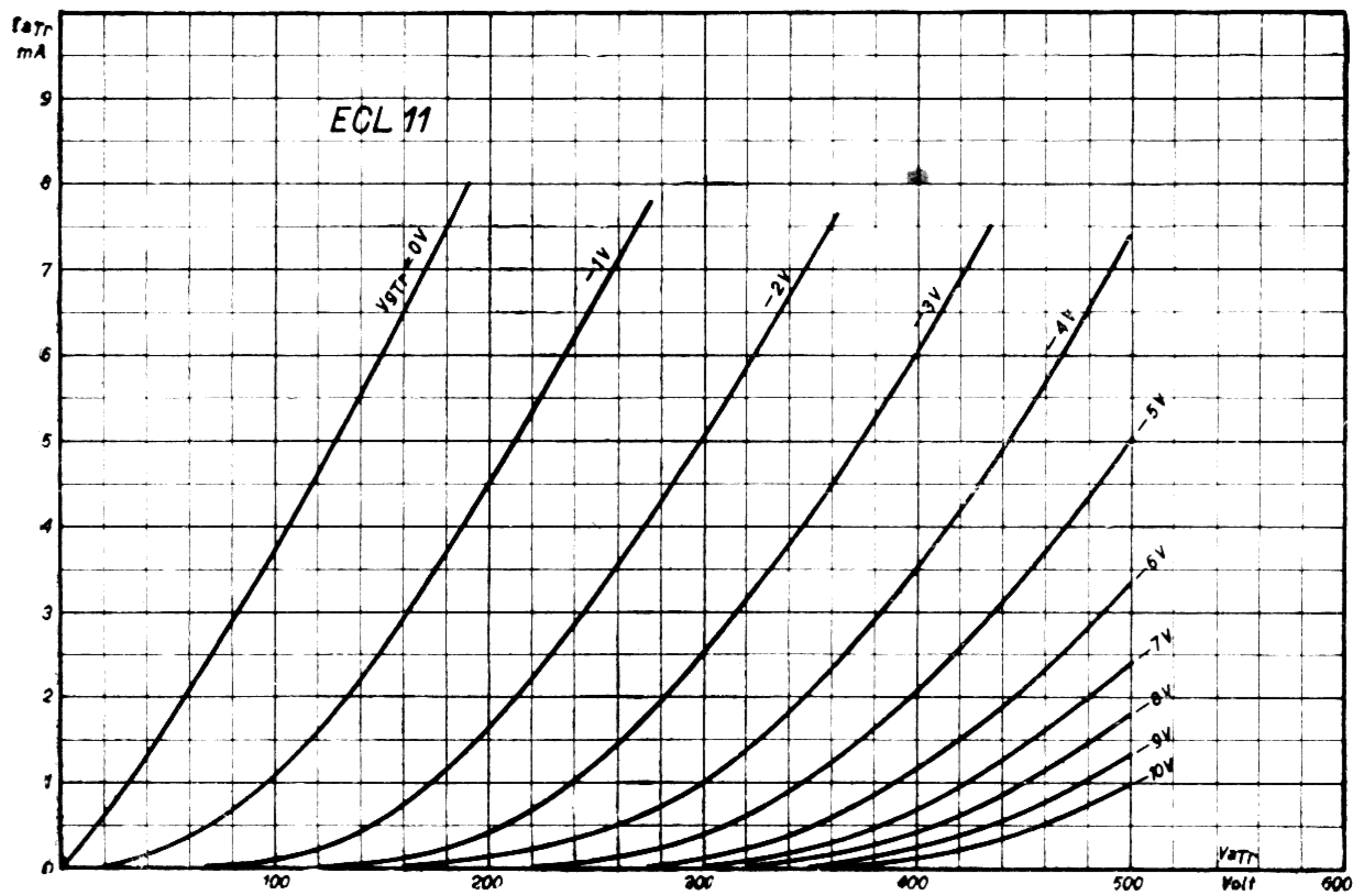
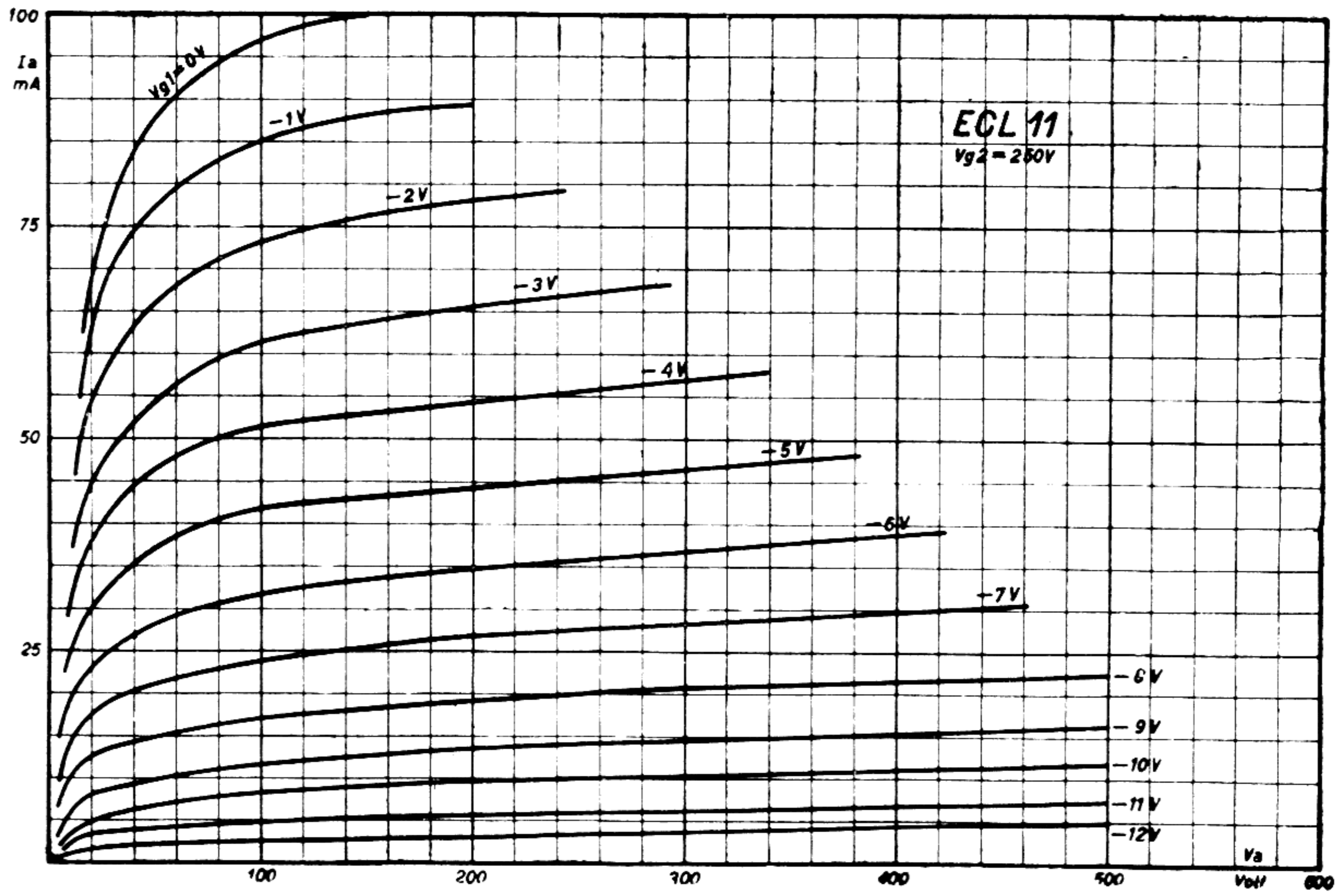
$V_{ao \text{ max}}$	$= 550 \text{ V}$	$V_a \text{ max}$	$= 250 \text{ V}$	$W_a \text{ max}$	$= 9 \text{ Watt}$
$V_{g2o \text{ max}}$	$= 550 \text{ V}$	$V_{g2 \text{ max}}$	$= 275 \text{ V}$	$W_{g2 \text{ max}}$	$= 1,2 \text{ Watt}$
$R_{g1a \text{ max}}$	$= 0,7 \text{ M}\Omega$				
$I_k \text{ max}$	$= 60 \text{ mA}$	$V_{fk \text{ max}}$	$= 50 \text{ V}$	$R_{fk \text{ max}}$	$= 5000 \Omega$



Sockelschaltung
Base connections
Connexions du culot



Abmessungen
Dimensions





EF 5 PENTHODE

Heizung
Heating
Chauffage

V_f **6,3 V (i)**

I_f **0,2 A**

Einstellung
Adjustment
Utilisation

	I.		II.	
V _a	250 V	I _a	8 mA	V _a
V _{g2}	100 V	I _{g2}	2,6 mA	V _{g2}
V _{g1}	- 3 V			V _{g1}
				100 V
				- 3 V

Betriebsdaten
Operating Conditions
Caracteristiques de service

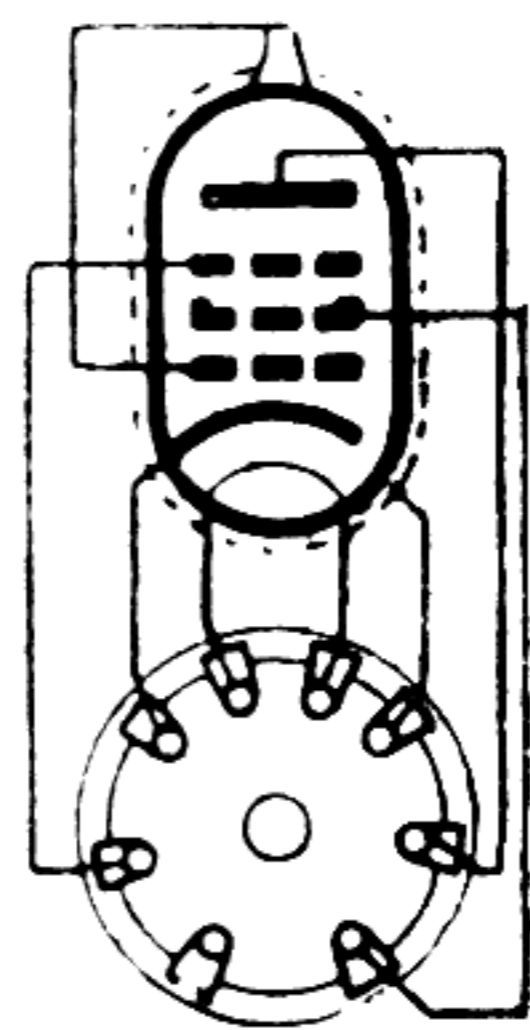
V _{g1}	- 3 V	S	1,7 mA/V	R _i	1,2 MΩ
V _{g1}	- 50 V	S <	0,002 mA/V	R _i	> 10 MΩ

Grenzdaten
Limit ratings
Limites fixées

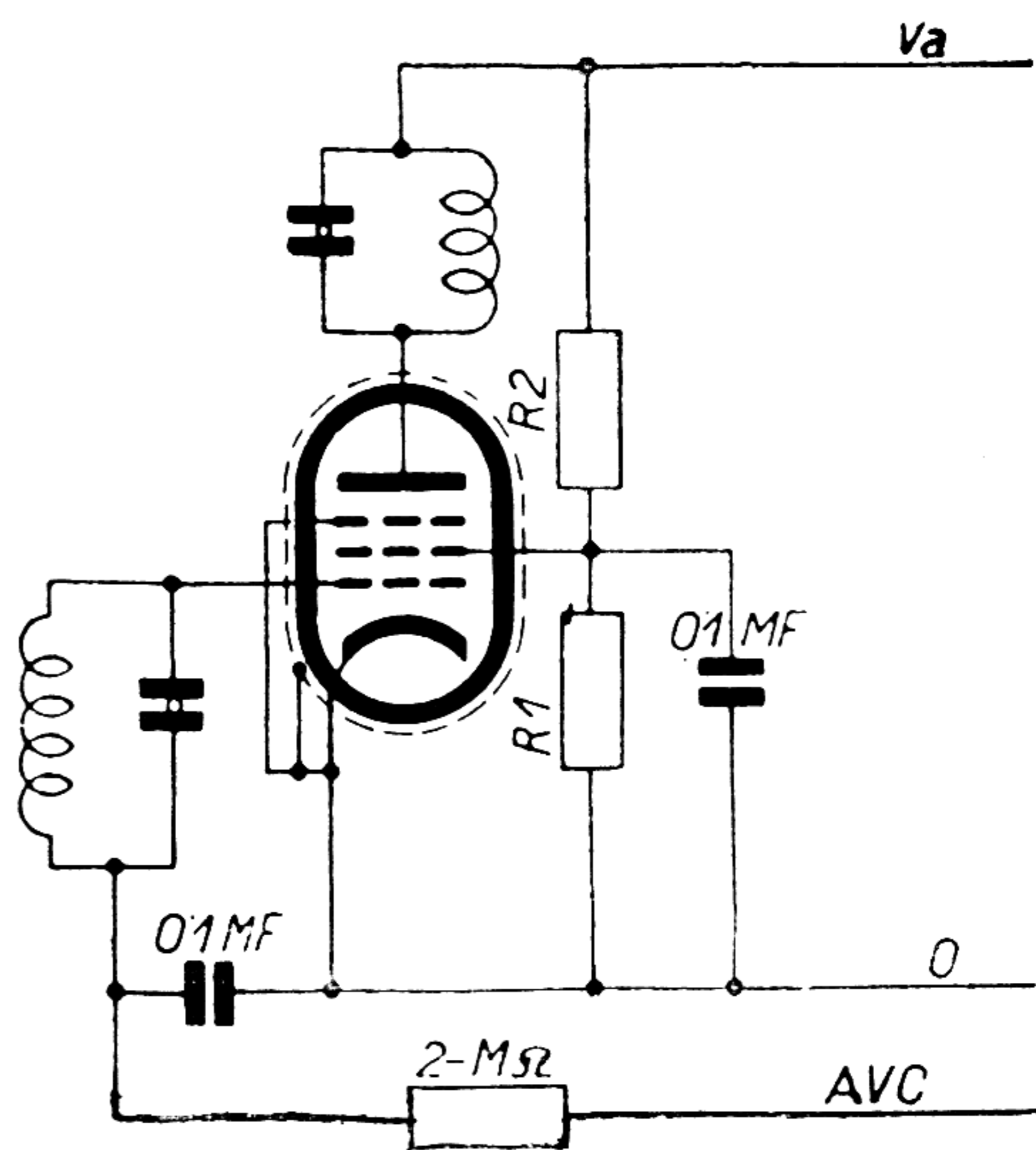
V _{ao} max	550 V	V _a max	250 V	W _a max	2 Watt
V _{g2o} max	550 V	V _{g2} max	100 V	W _{g2} max	0,4 Watt
V _{fk} max	75 V	R _{fk} max	20.000 Ω		
I _k max	15 mA				

Kapazitäten
Capacities
Capacités

C (a/g1)	< 0,003 pF	C (g1)	5,4 pF	C (a)	= 6,9 pF
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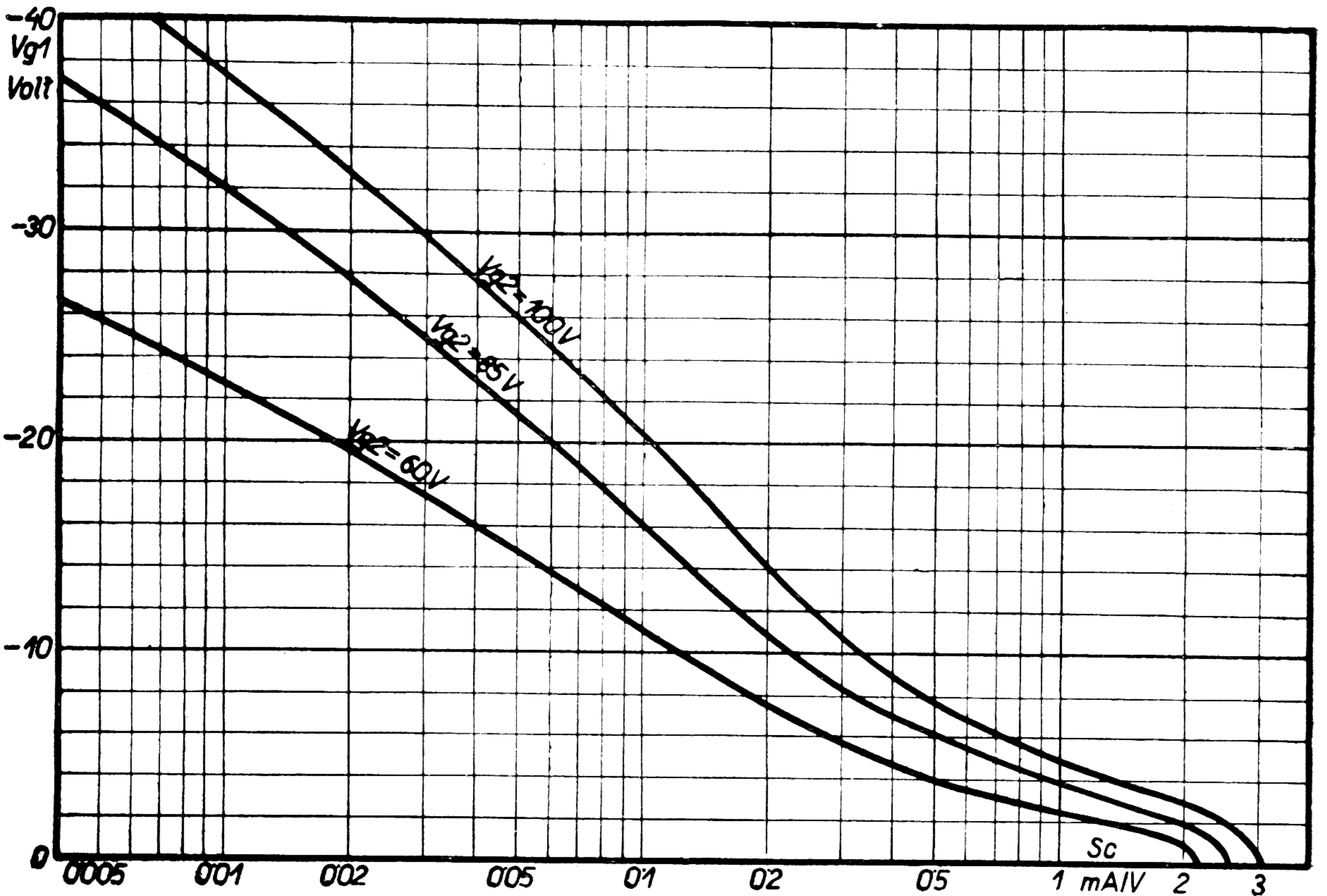
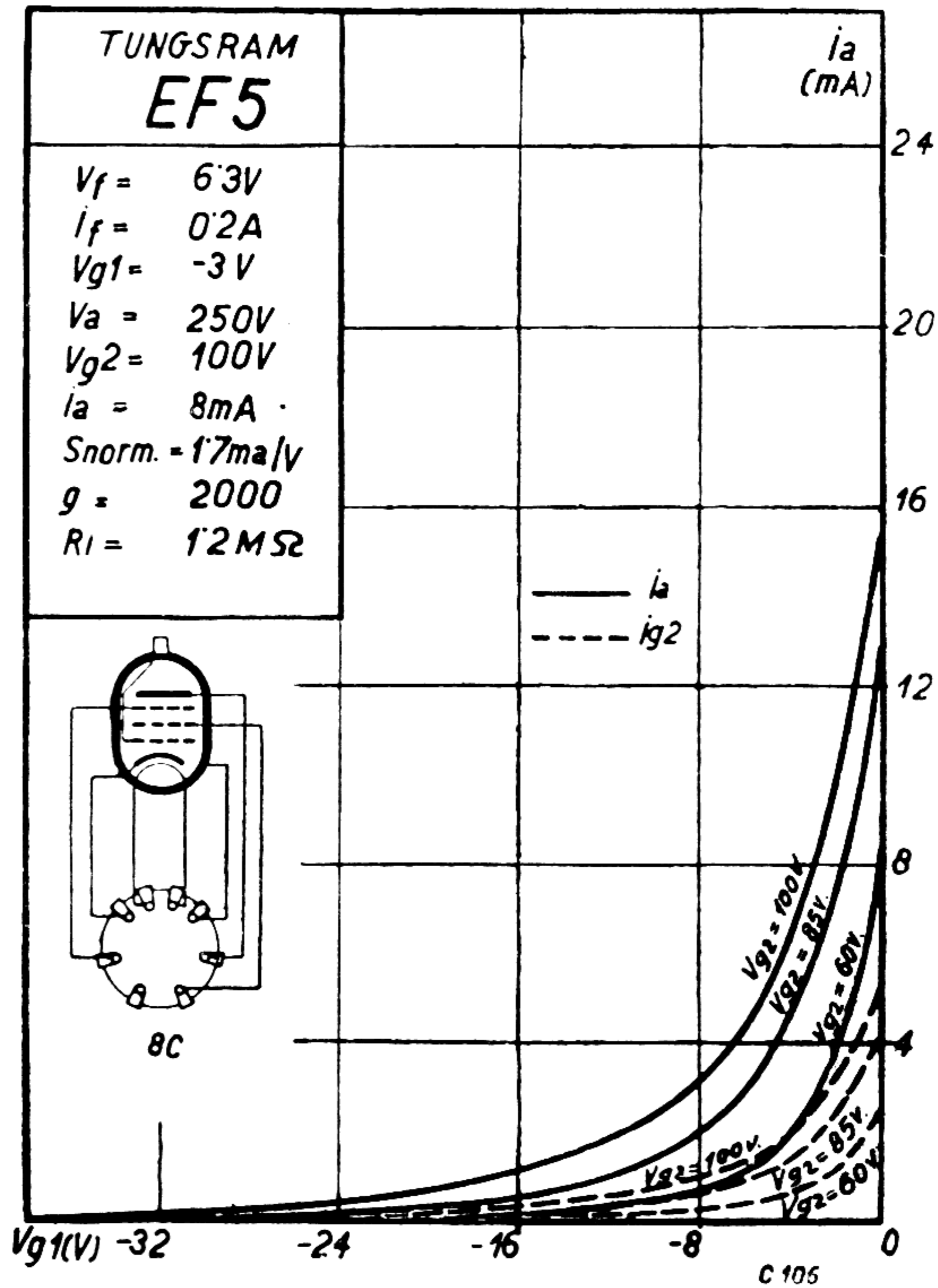


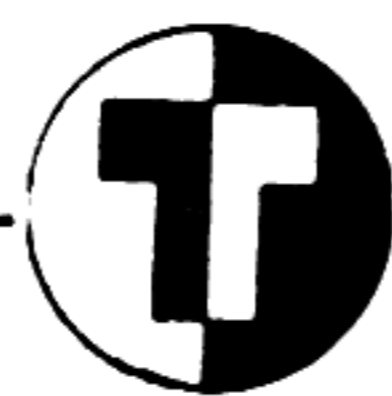
Sockelschaltung
Base connections
Connexions du culot



Schaltungsbeispiel
Circuit diagram
Schema de principe

R ₁	0.1 MΩ
R ₂	0.04 MΩ





EF 6 PENTHODE

Heizung
Heating
Chauffage

Vf **6,3** V (i) If **0,2** Amp.

Einstellung
Adjustment
Utilisation

	I.		II.
Va	250 V	Ia	3 mA
Vg2	100 V	Ig2	0,8 mA
Vg1	— 2 V	Va	100 V
		Vg2	100 V
		Vg1	— 2 V
		Ia	3 mA
		Ig2	0,8 mA

Betriebsdaten
Operating Conditions
Caracteristiques de service

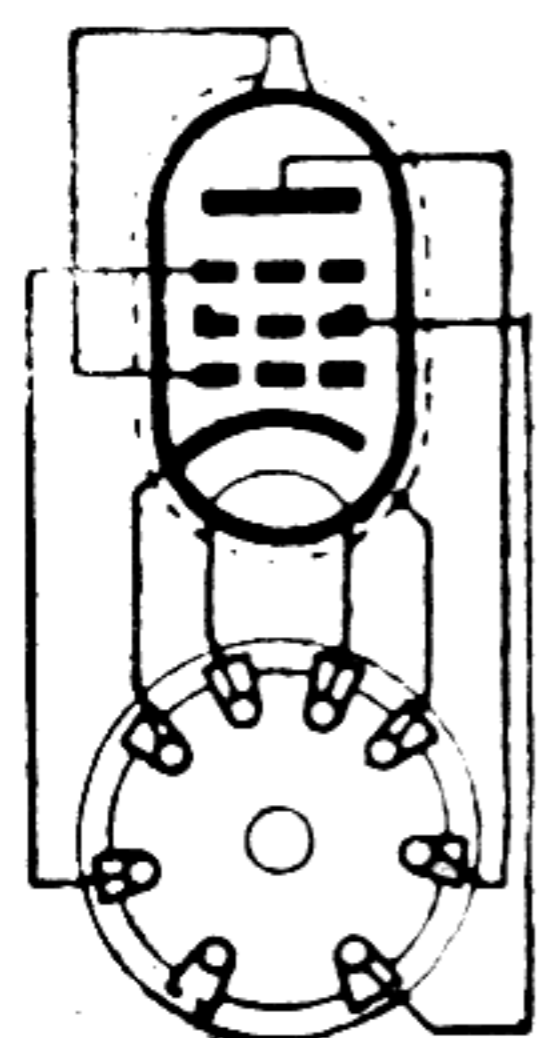
	I. g	= 4.500	S	1,8 mA/V	Ri	2,5 MΩ
	II. g	= 1.800	S	1,8 mA/V	Ri	1,0 MΩ

Grenzdaten
Limit ratings
Limites fixées

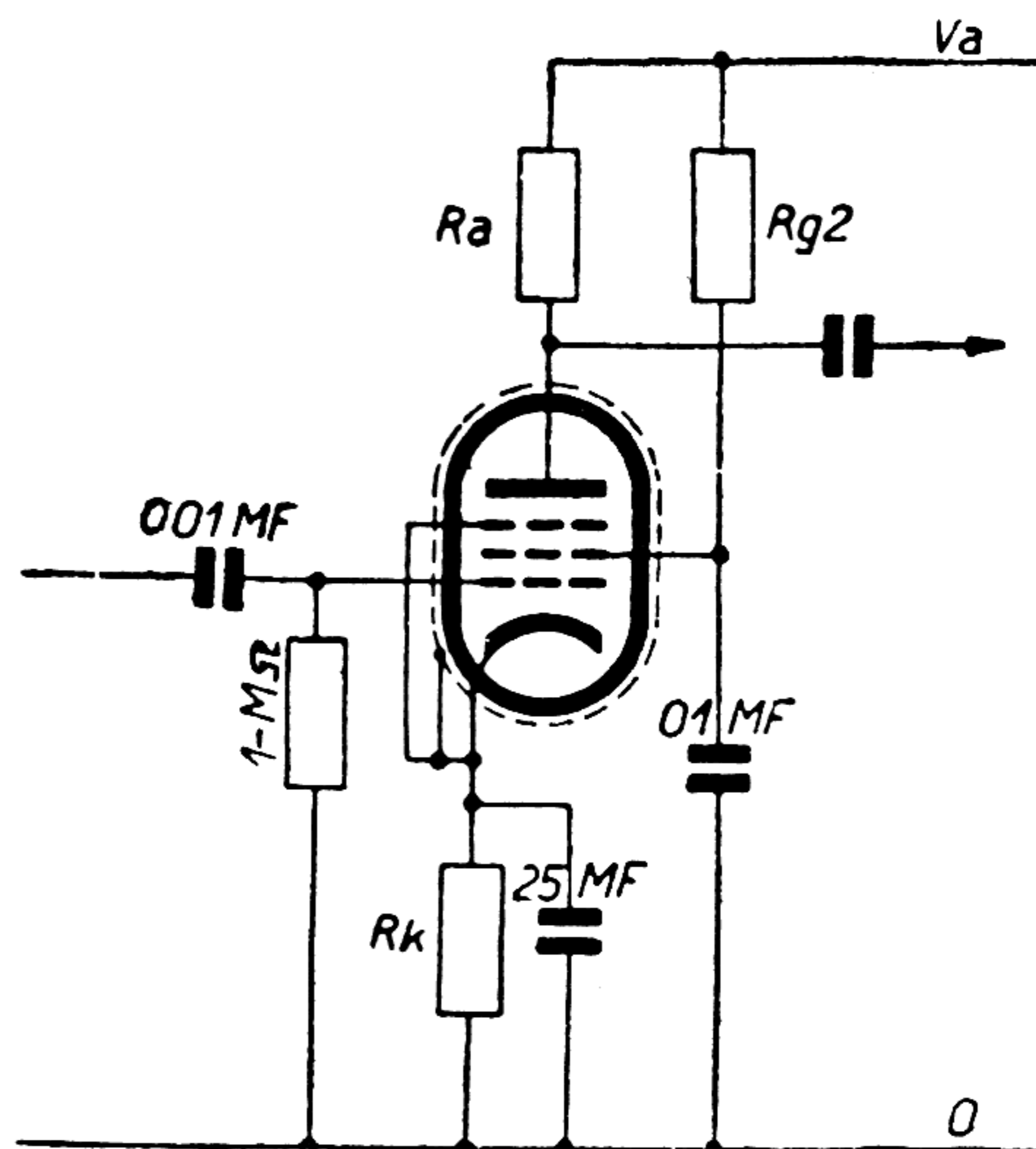
Vao max	= 550 V	Va max	= 300 V	Wa max	= 1 Watt
Vg2o max	= 550 V	Vg2 max	= 125 V	Wg2 max	= 0,3 Watt
Vfk max	= 100 V	Rfk max	= 20.000 Ω		
Rg1 max	= 3 MΩ	Rg1f max	= 1 MΩ		
Ik max	= 6 mA				

Kapazitäten
Capacities
Capacités

C (a/g1) < 0,003 pF C (a) = 6,9 pF C (g1) = 5,4 pF

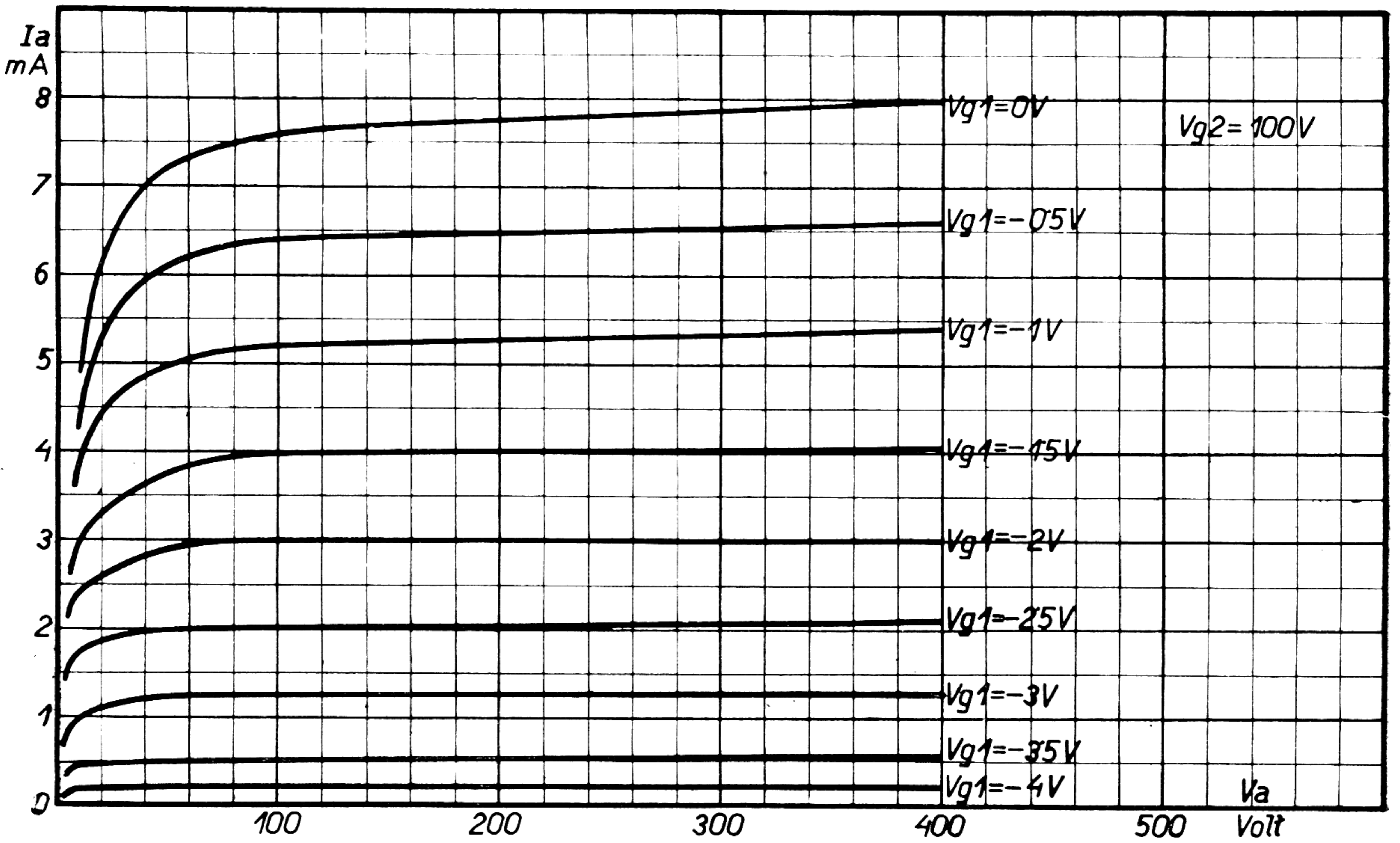
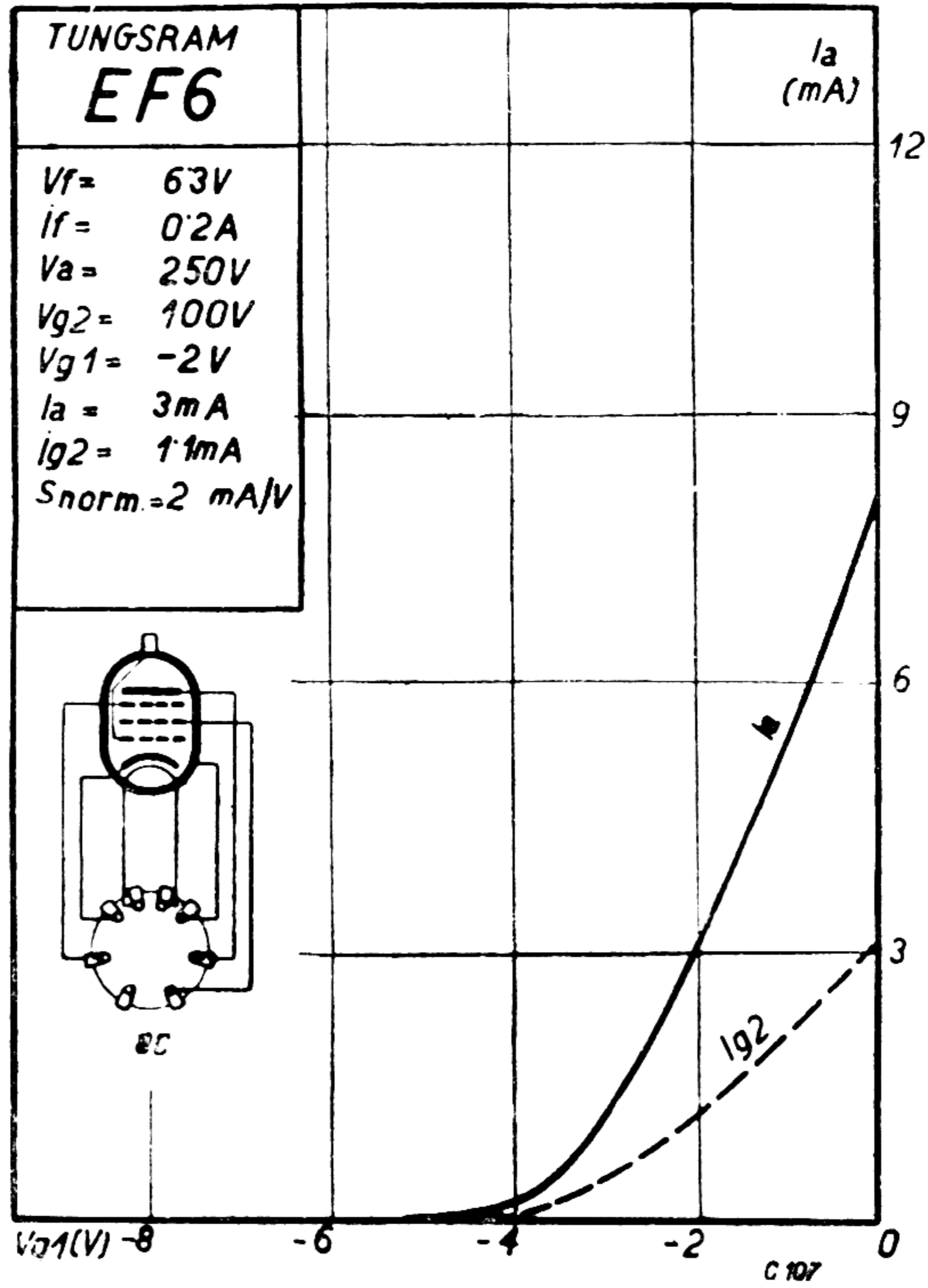


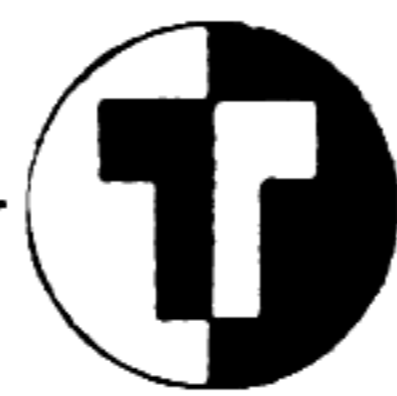
Sockelschaltung
Base connections
Connexions du culot



EF 6 als Widerstandsverstärker
EF 6 as resistance coupled amplifier
EF 6 comme amplificatrice à resistance

		Rk	Ra	Rg2
Va =	250 V	3000 Ω	0,2 Ω	0,4 MΩ
Va =	100—200 V	5000 Ω	0,2 Ω	0,4 MΩ





EF 8 PENTHODE

**Heizung
Heating
Chauffage**

Vf **6,3** V (i)

If **0,2** A

**Einstellung
Adjustment
Utilisation**

Va **250** V (i)
Vg3 **250** V
Vg1 **- 2,5** V
Vg2 **0** V

Ia **8** mA
I_{g3} **0,2** mA

**Betriebsdaten
Operating Conditions
Caracteristiques de service**

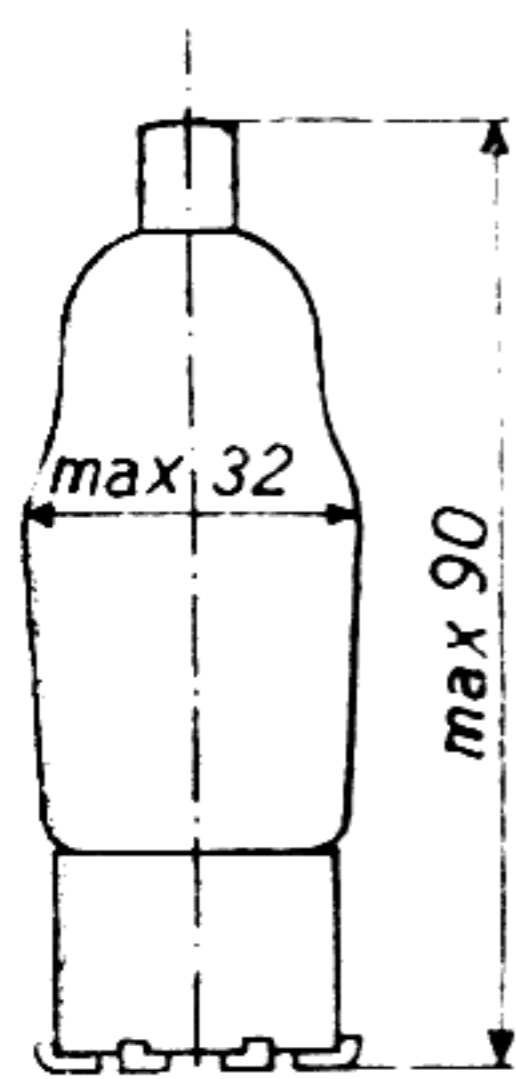
Vg1	- 2,5	V	S	1,8	mA/V	Ri	>	0,45	MΩ
Vg1	- 34	V	S	0,018	mA/V	Ri	>	10	MΩ
Vg1	- 50	V	S	0,001	mA/V	Ri	>	10	MΩ

**Grenzdaten
Limit ratings
Limites fixées**

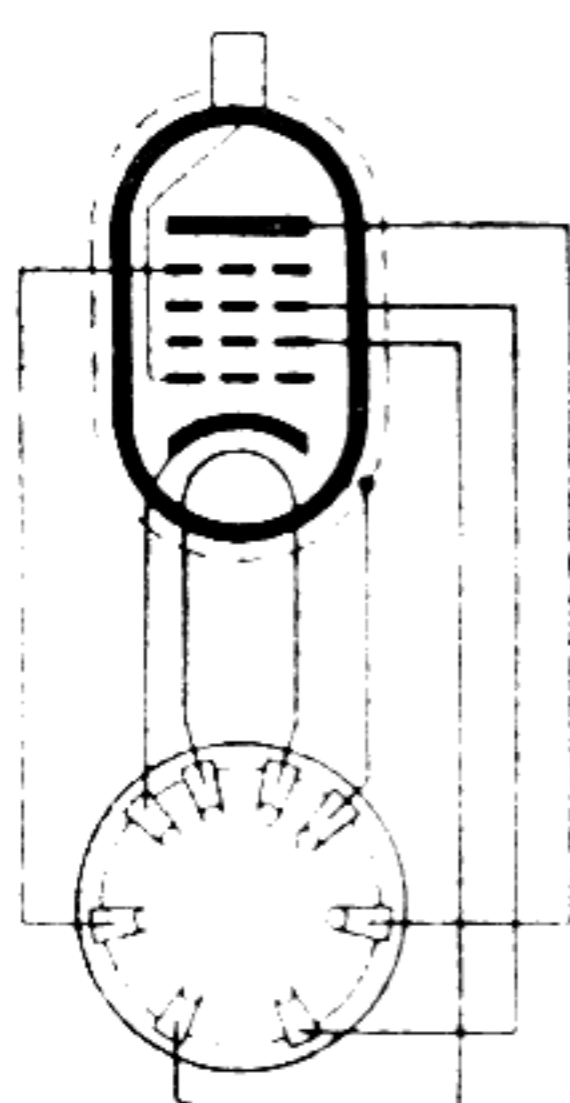
V _{ao} max	550	V	V _a max	300	V	W _a max	2,5	Watt
V _{g3o} max	550	V	V _{g3} max	300	V	W _{g3} max	0,1	Watt
V _{fk} max	100	V	R _{fk} max	20.000	Ω			
R _{g1} max	3	MΩ	R _{g2} max	3	MΩ			
I _k max	15	mA						

**Kapazitäten
Capacities
Capacités**

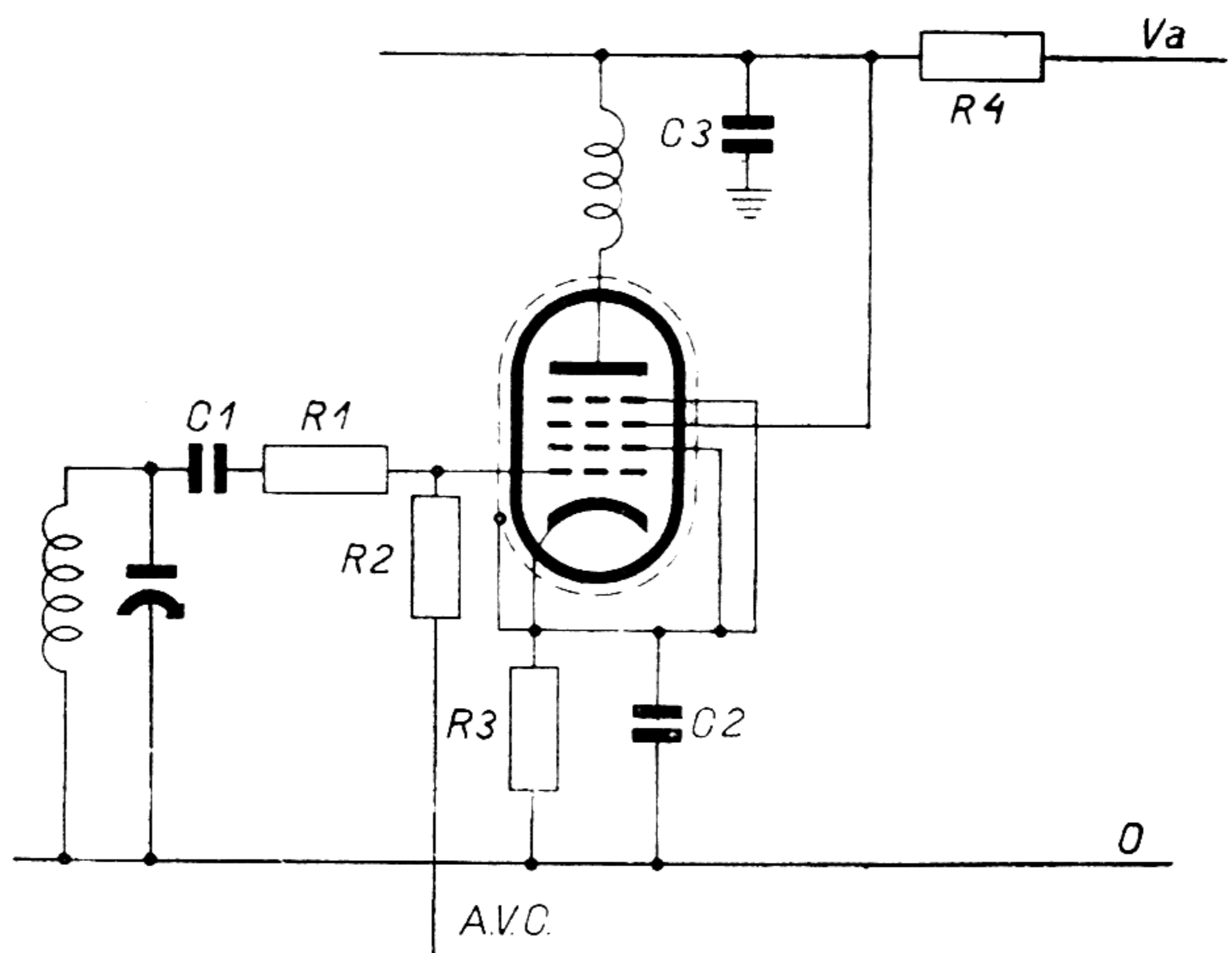
C (a/g1) < **0,007** pF C (g1) **4,6** pF C (a) **7,8** pF



Abmessungen
Dimensions

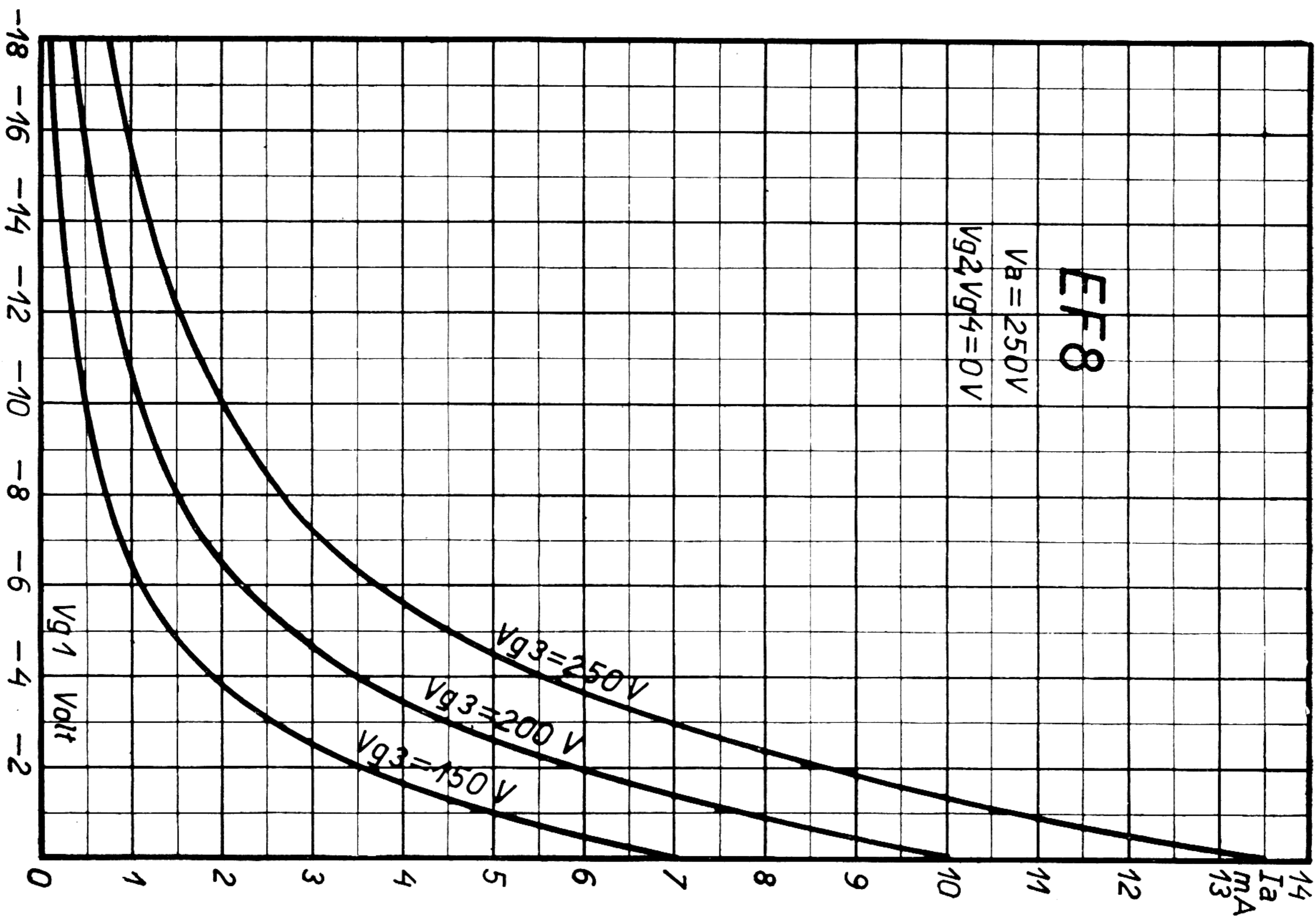
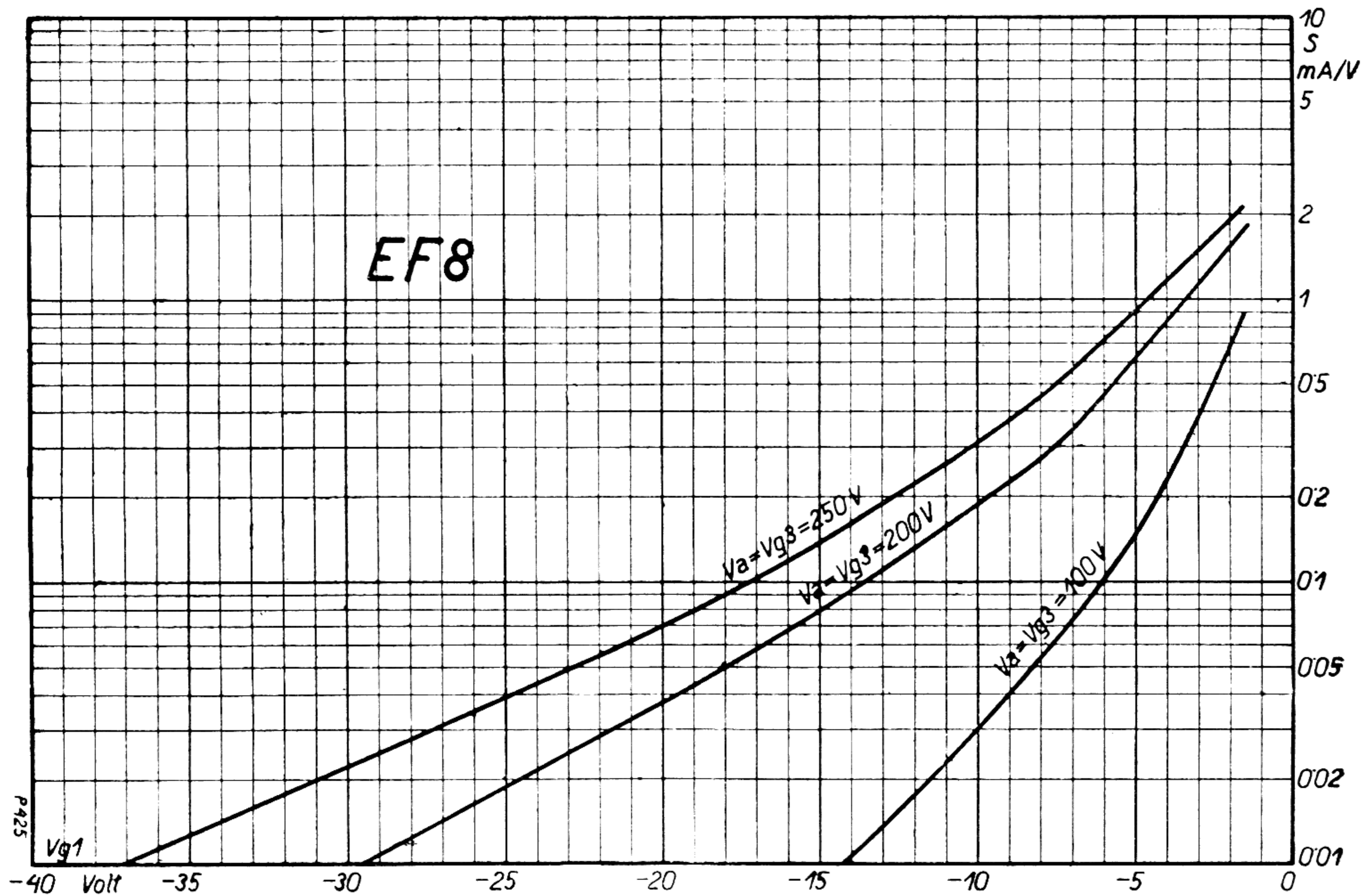


Sockelschaltung
Base connections
Connexions du culot



Schaltungsbeispiel
Circuit diagram
Schema de principe

R1	35	Ω	C1	500	pF
R2	2	MΩ	C2	0,1	μF
R3	305	Ω	C3	0,1	μF
R4	2000	Ω			





EF 9

PENTHODE

Heizung Heating Chauffage

Vf **6,3 V (i)**

If **0,2 Amp.**

Einstellung Adjustment Utilisation

		I.		
Va	250 V		la	6 mA
Vg2	250 V	— 90.000 Ω × lg2	lg2	1,7 mA
Vg1	— 2,5 V			
		II.		
* Va	200 V		la	6 mA
Vg2	200 V	— 60.000 Ω × lg2	lg2	1,7 mA
Vg1	— 2,5 V			
		III.		
Va	100 V		la	6 mA
Vg2	100 V		lg2	1,7 mA
Vg1	— 2,5 V			

Betriebsdaten Operating Conditions Caracteristiques de service

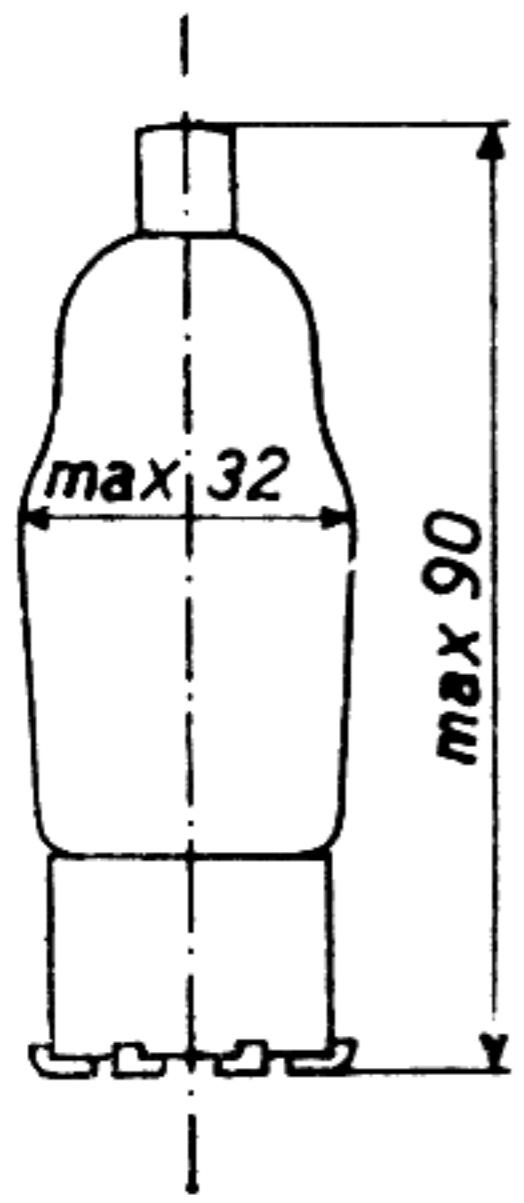
		I. Va	250 V	
Vg1	— 2,5		— 39	— 49 V
S	2,2		0,022	0,0045 mA/V
Ri	1,25		> 10	> 10 MΩ
		II. Va	200 V	
Vg1	— 2,5		— 32	— 39 V
S	2,2		0,022	0,0055 mA/V
Ri	0,9		> 10	> 10 MΩ
		III. Va	100 V	
Vg1	— 2,5		— 16	— 19
S	2,2		0,022	0,007 mA/V
Ri	0,4		> 10	> 10 MΩ

Grenzdaten Limit ratings Limites fixées

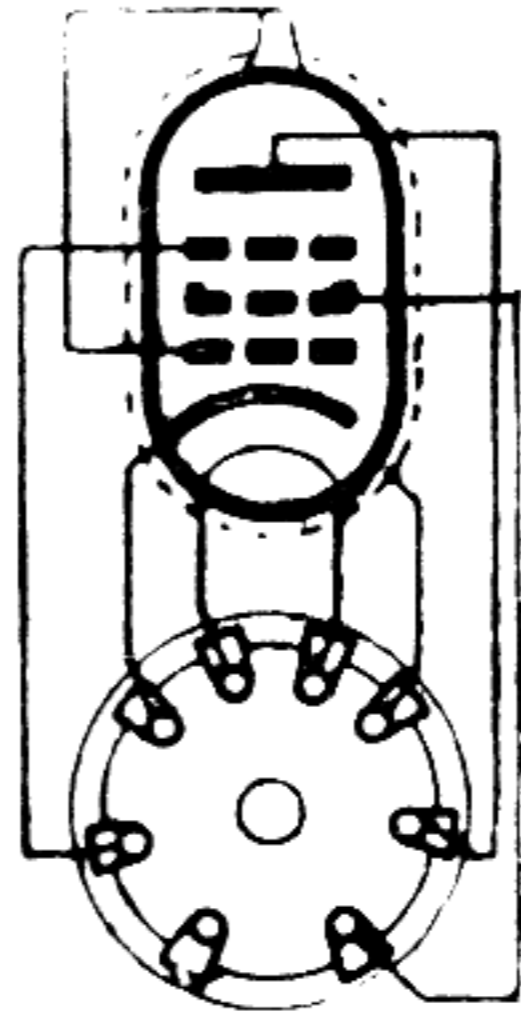
Vao max	550 V	Va max	300 V	Wa max	2 Watt
Vg2o max	550 V	Vg2 max	125 V (Ia 6 mA)	Wg2 max	0,3 Watt
			300 V (Ia < 3 mA)		
Vfk max	100 V	Rfk	20.000 Ω		

Kapazitäten Capacities Capacités

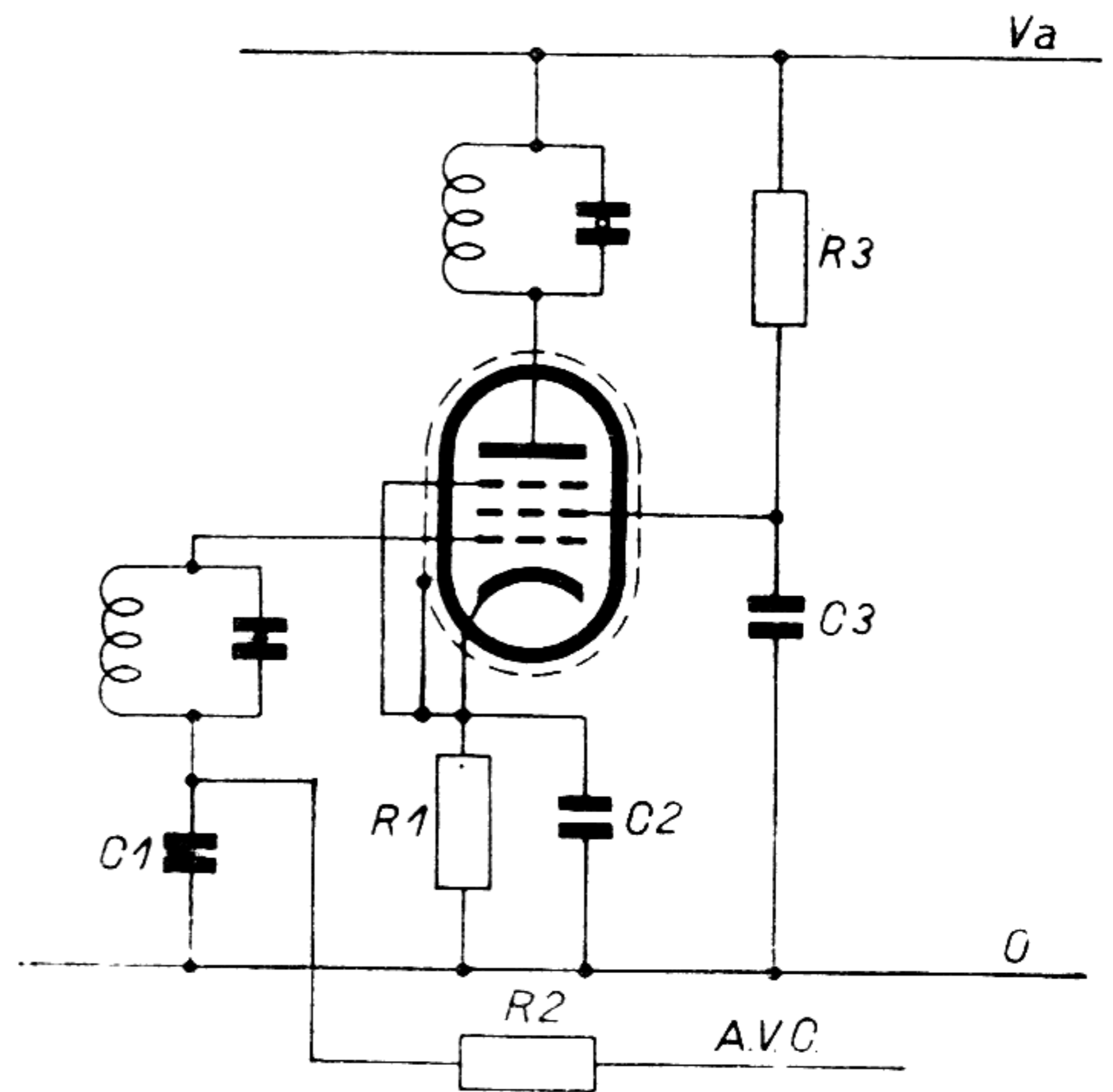
C (a/g1)	< 0,002 pF	C (g1)	5,5 pF	C (a)	7,2 pF
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Abmessungen
Dimensions

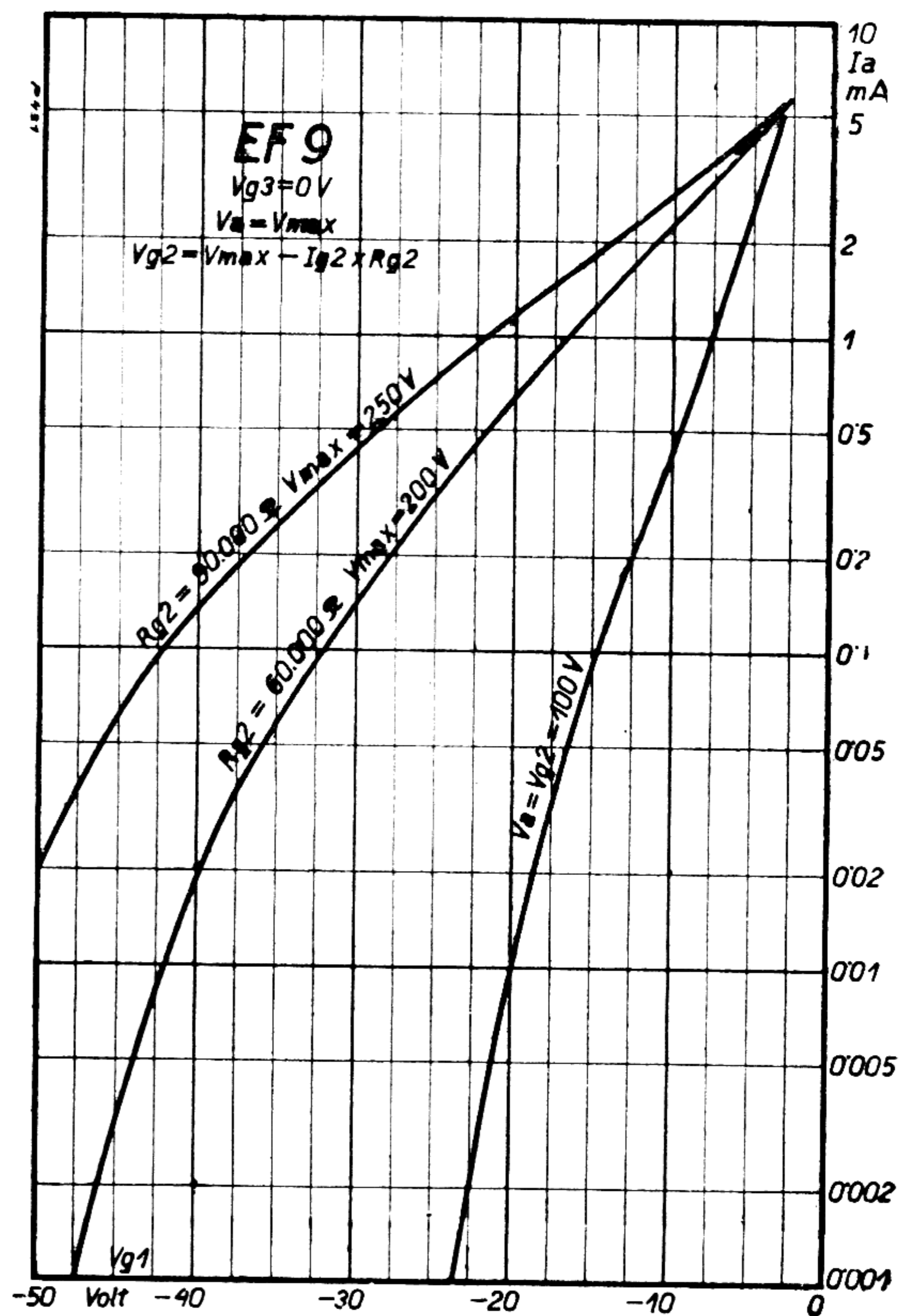
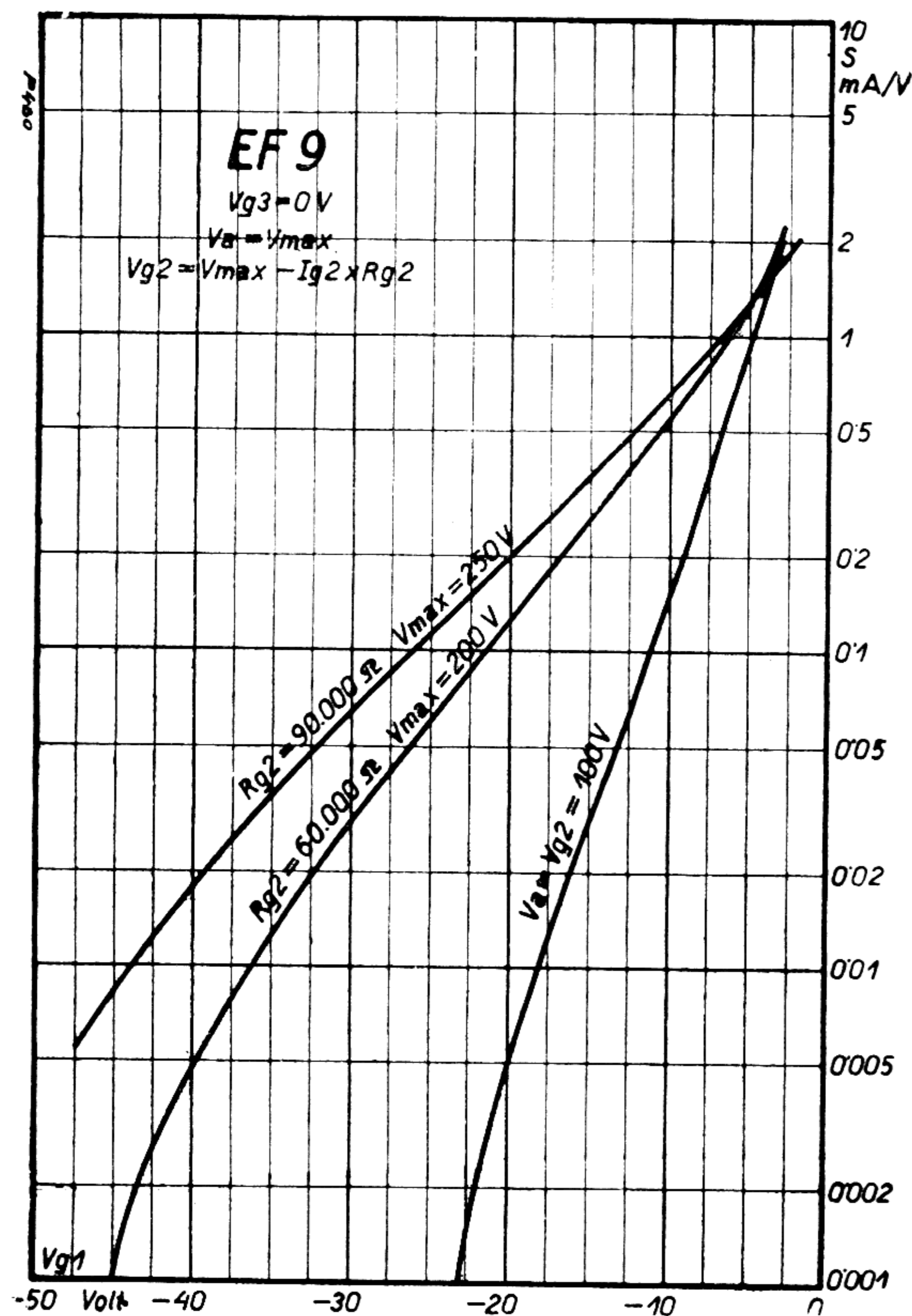
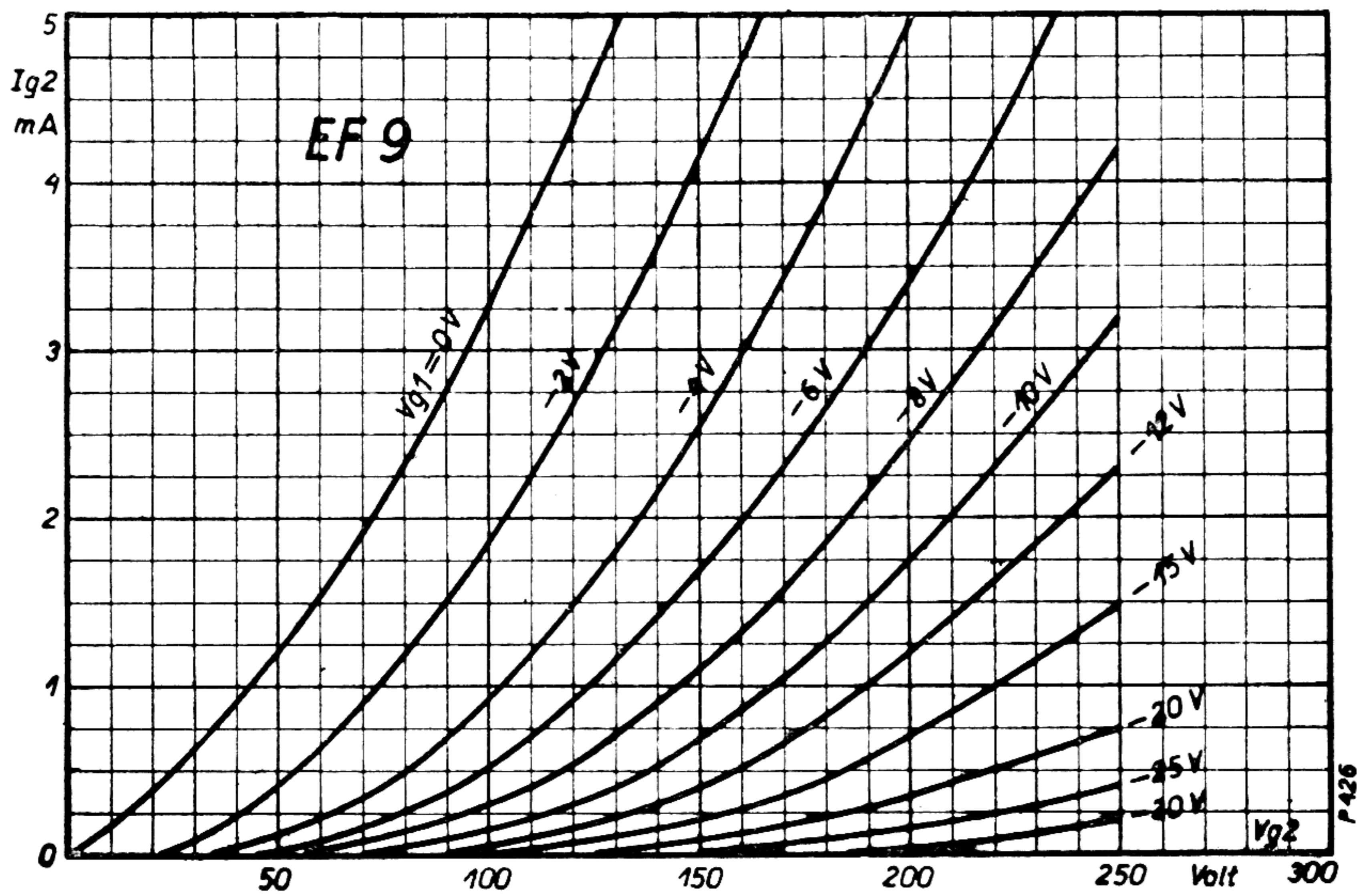


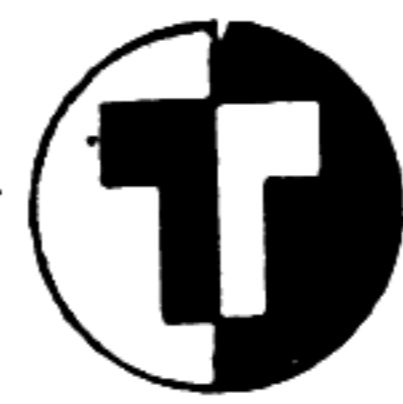
Sockelschaltung
Base connections
Connexions du culot



Schaltungsbeispiel
Circuit diagram
Schema de principe

$R_1 = 325 \Omega$ $C_1 = 0.1 \mu F$
 $R_2 = 1 M\Omega$ $C_2 = 0.1 \mu F$





EF 11

PENTHODE

Heizung
Heating
Chauffage

V_f **6,3 V (i)** I_f **0,2 Amp.**

Einstellung
Adjustment
Utilisation

V_a	250 V	200 V	100 V	I_a	6 mA
V_{g2}	100 V			I_{g2}	2 mA
V_{g1}	— 2 V			R_k	250 Ω

Betriebsdaten
Operating Conditions
Caracteristiques de service

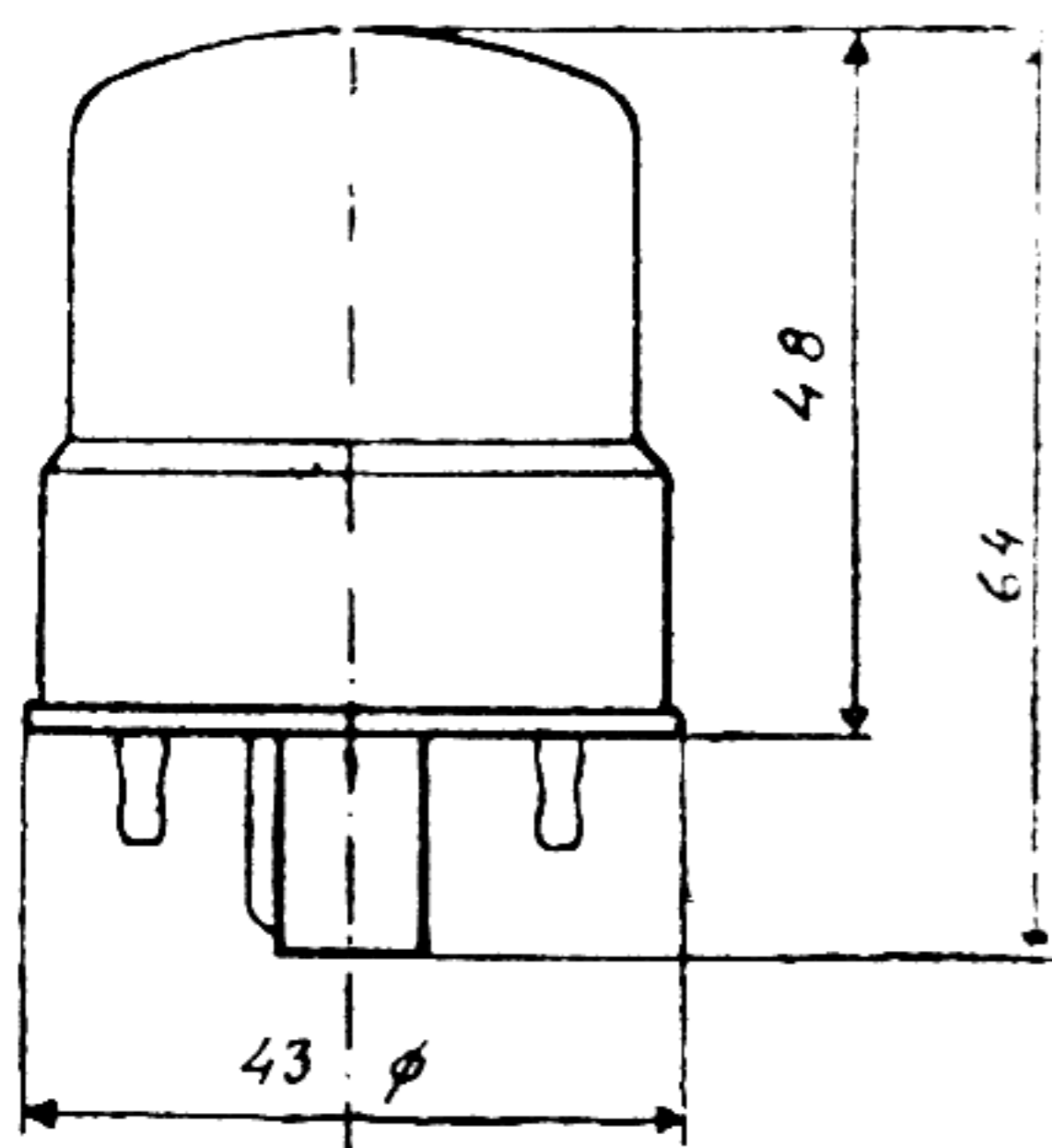
1.	V_a	250 V			
	V_{g2}	250 V	—	$I_{g2} \times R_{g2}$	
	R_{g2}	75.000 Ω			
	V_{g1}	— 2	— 45	— 53	V
	S	2,2	0,022	0,0075	mA/V
	R_i	2	> 10	> 10	MΩ
2.	V_a	200 V			
	V_{g2}	200 V	—	$I_{g2} \times R_{g2}$	
	R_{g2}	50.000 Ω			
	V_{g1}	— 2	— 36	— 42	V
	S	2,2	0,022	0,0055	mA/V
	R_i	1,5	> 10	> 10	MΩ
3.	V_a	100 V			
	V_{g2}	100 V			
	V_{g1}	— 2	— 17	— 21	V
	S	2,2	0,022	0,0074	mA/V
	R_i	0,45	> 10	> 10	MΩ

Grenzdaten
Limit ratings
Limites fixées

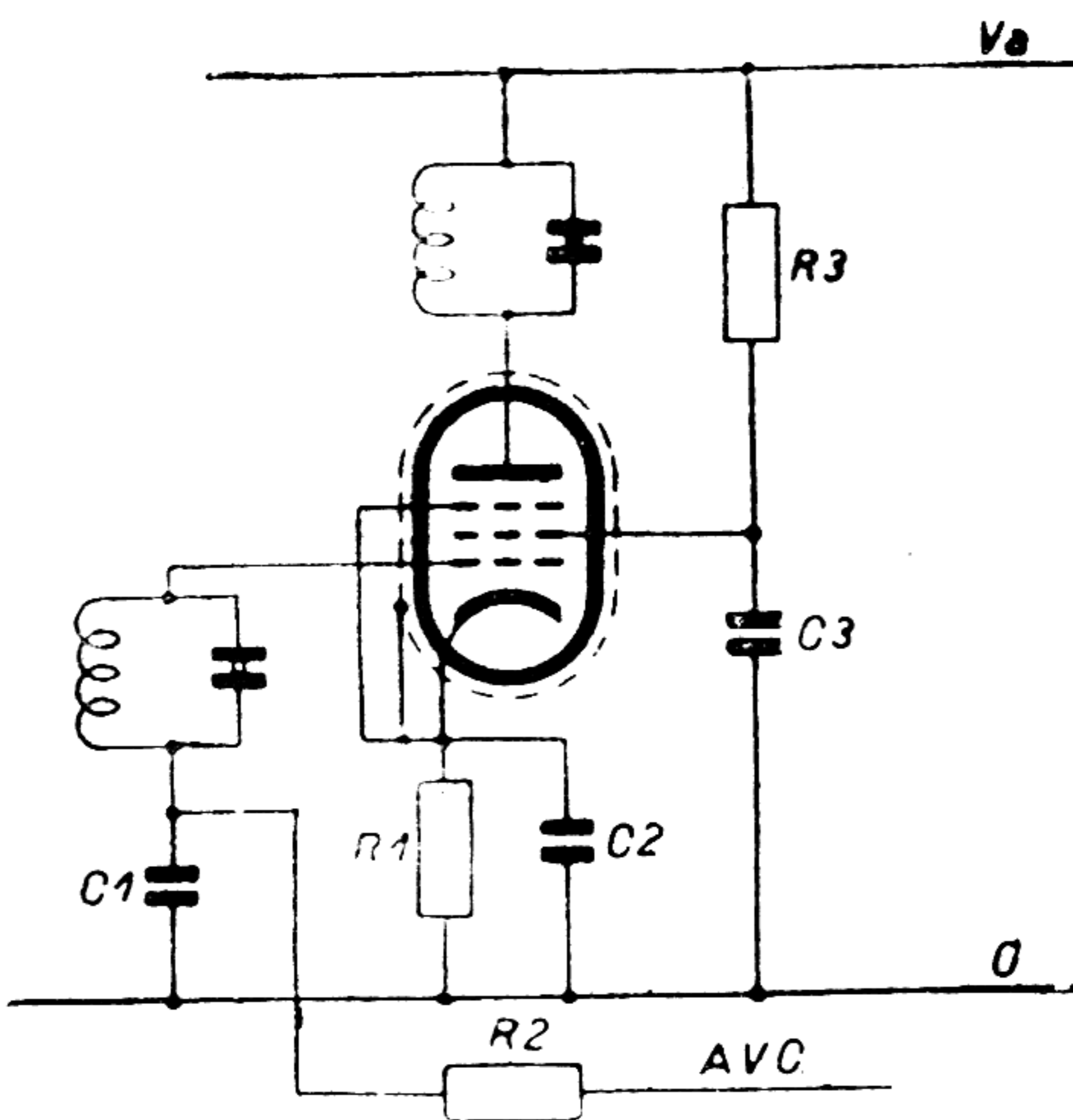
V_{ao} max	550 V	V_a max	300 V	W_a max	2 Watt
V_{g2} max	550 V	V_{g2} max	125 V	W_{g2} max	0,3 Watt
I_k max	10 mA	R_{g1} max	300 V ($I_a < 3mA$)		
V_{fk} max	100 V		3 M Ω		
		R_{fk} max	20.000 Ω		

Kapazitäten
Capacities
Capacités

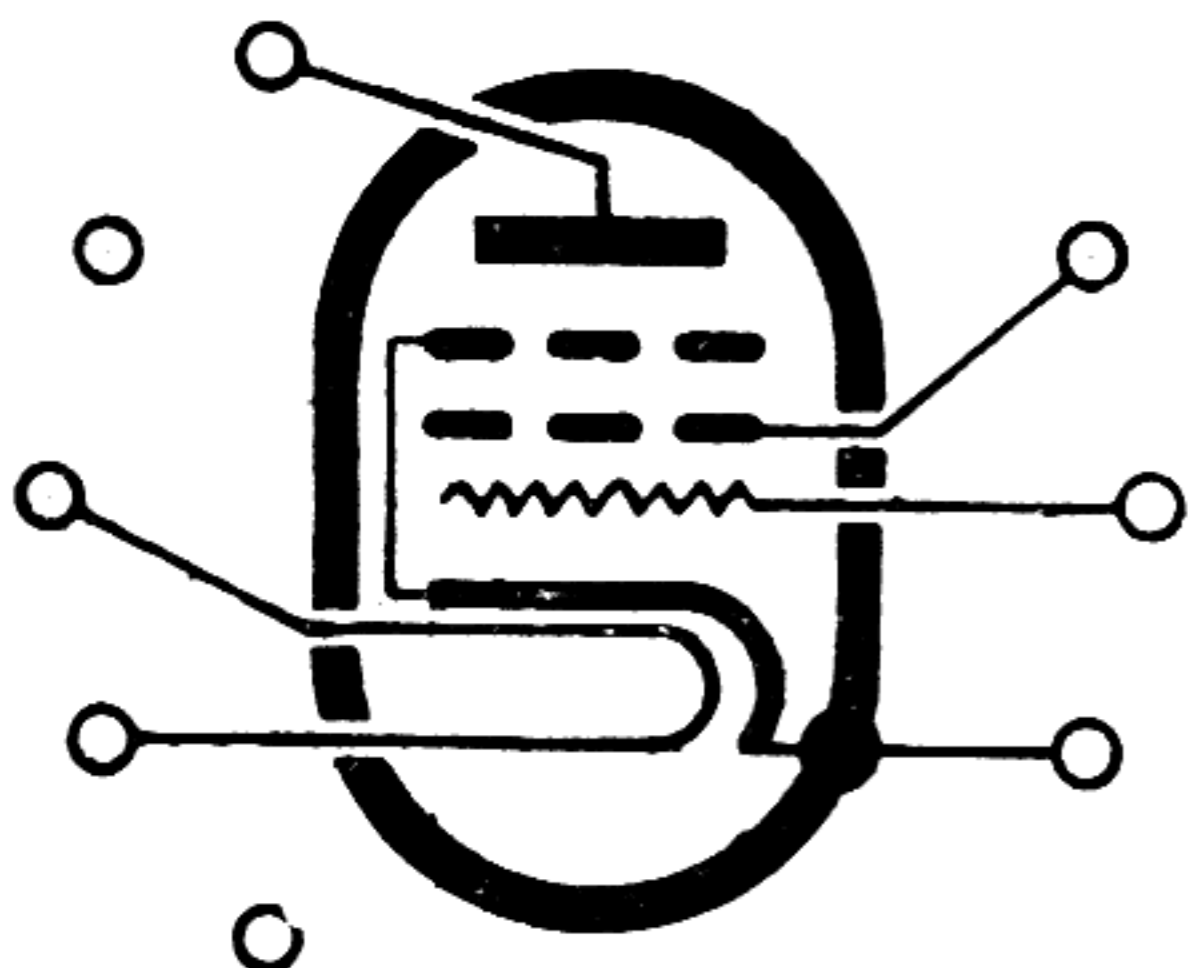
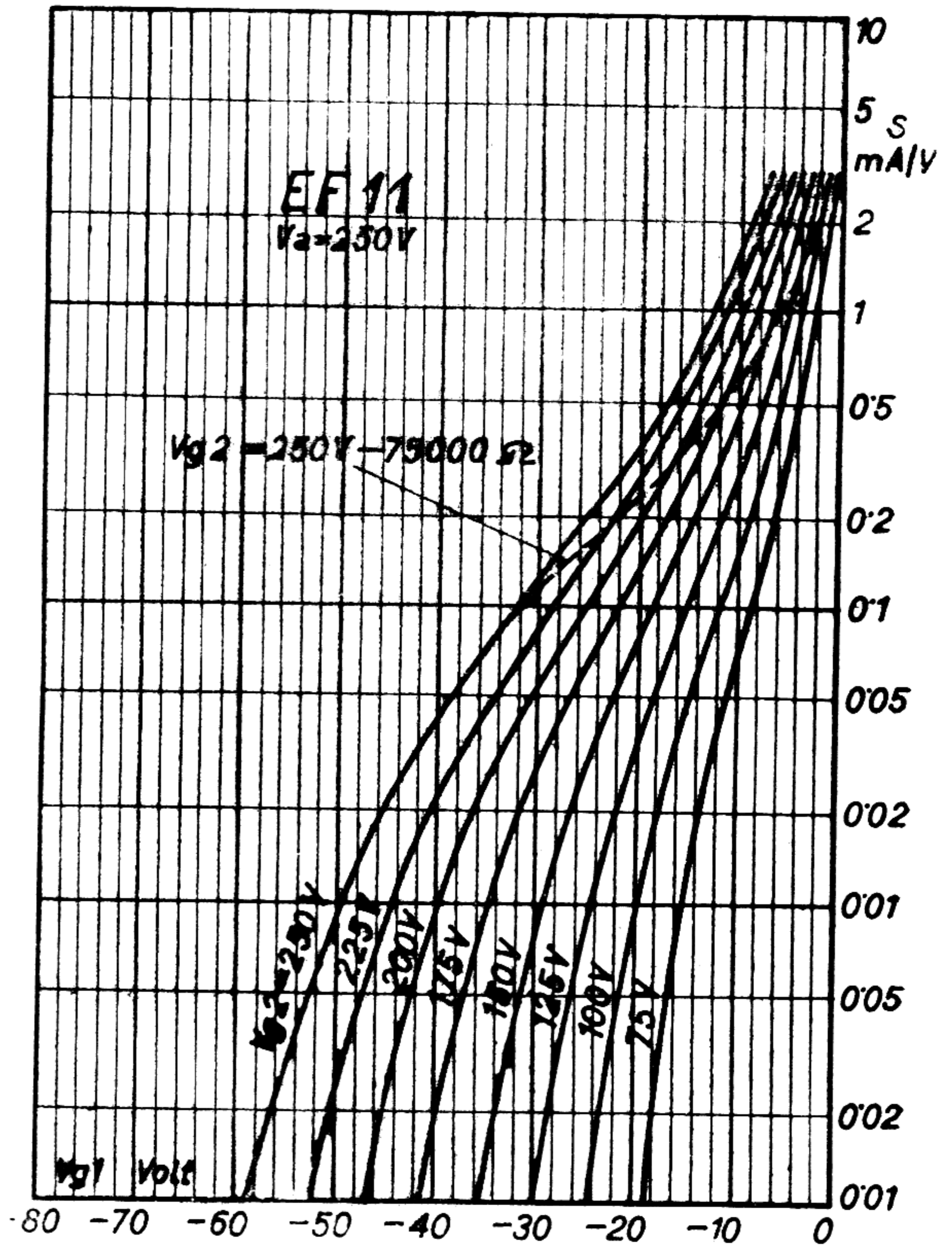
$C (g1)$ 5,8 pF $C (g1/a) < 0,002$ pF
 $C (a)$ 6,5 pF



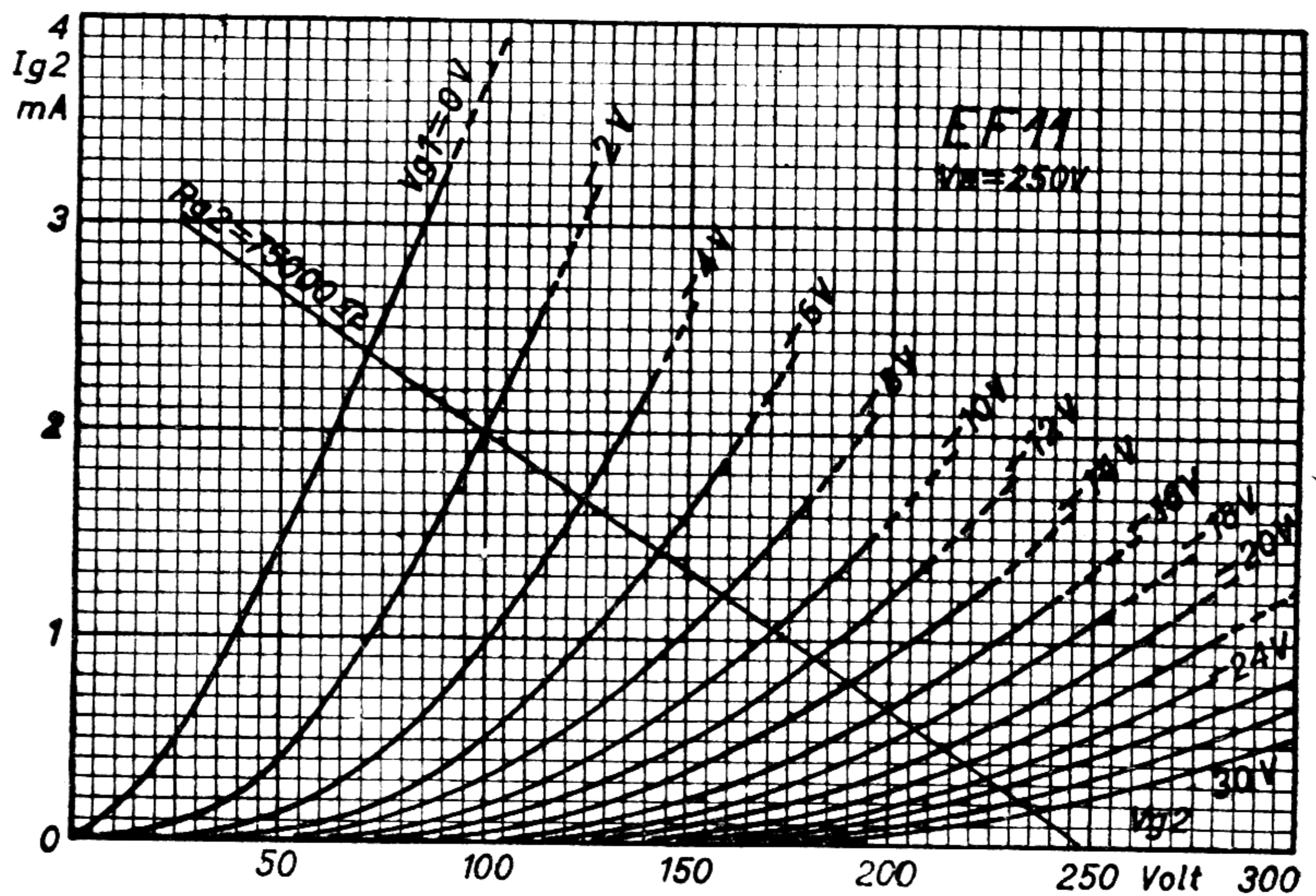
Abmessungen
Dimensions



$R_1 = 250 \Omega$	$C_1 = 0.1 \mu F$
$R_2 = 1 M\Omega$	$C_2 = 0.1 \mu F$
R_3	C_3
250 V = 75.000 Ω	0.1 μF
200 V = 50.000 Ω	0.1 μF
100 V = 0	—



Sockelschaltung
Base connections
Connexions du culot





EF 12 PENTHODE

**Heizung
Heating
Chauffage**

V_f **6,3 V (i)**

I_f **0,2 Amp.**

**Einstellung
Adjustment
Utilisation**

V_a **250 V**
 V_{g2} **100 V**
 V_{g1} **- 2 V**
 S **2,1 mA/V**

I_a **3 mA**
 I_{g2} **1 mA**
 R_k **500 Ω**
 R_i **1,5 M Ω**

**Einstellung als Triode
Adjustment as Triode
Utilisation comme triode**

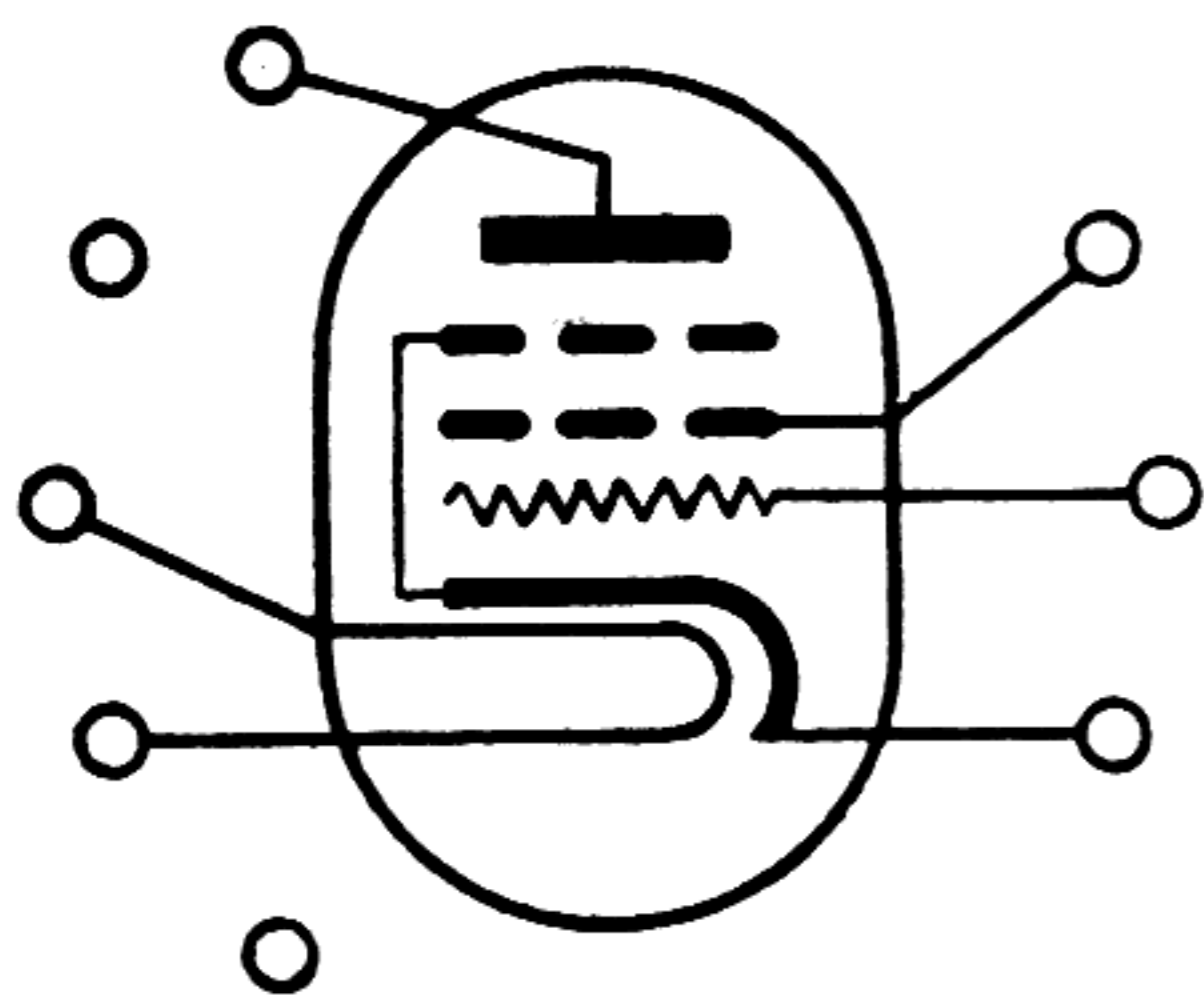
$V(a+g2)$ **200 V**
 V_{g1} **- 5 V**
 S **3 mA/V**

$I(a+g2)$ **6 mA**
 R_k **830 Ω**
 G **25**

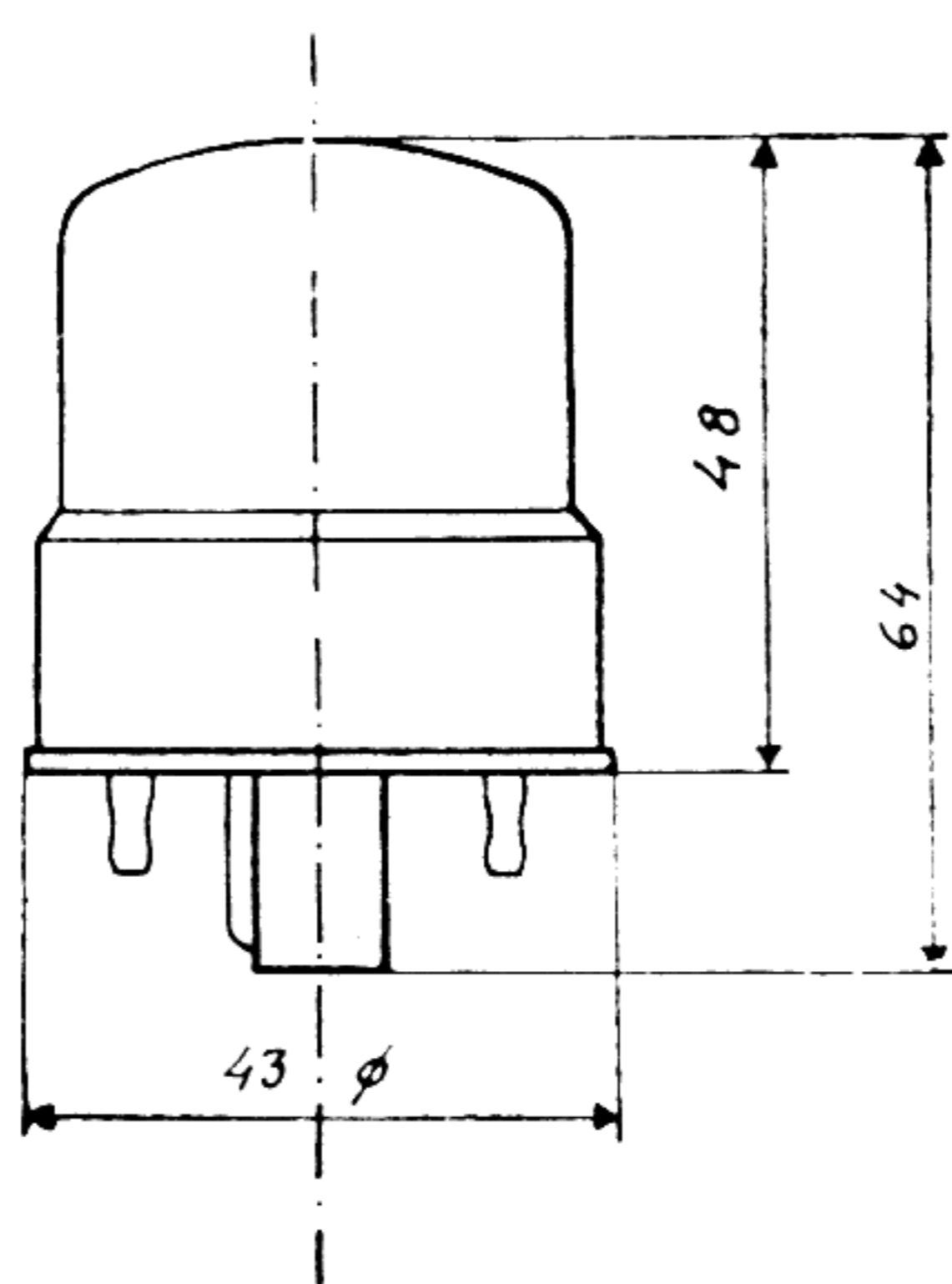
**Kapazitäten
Capacities
Capacités**

C_{g1} **6,5 pF**
 $C(a/g1) <$ **0,002 pF**

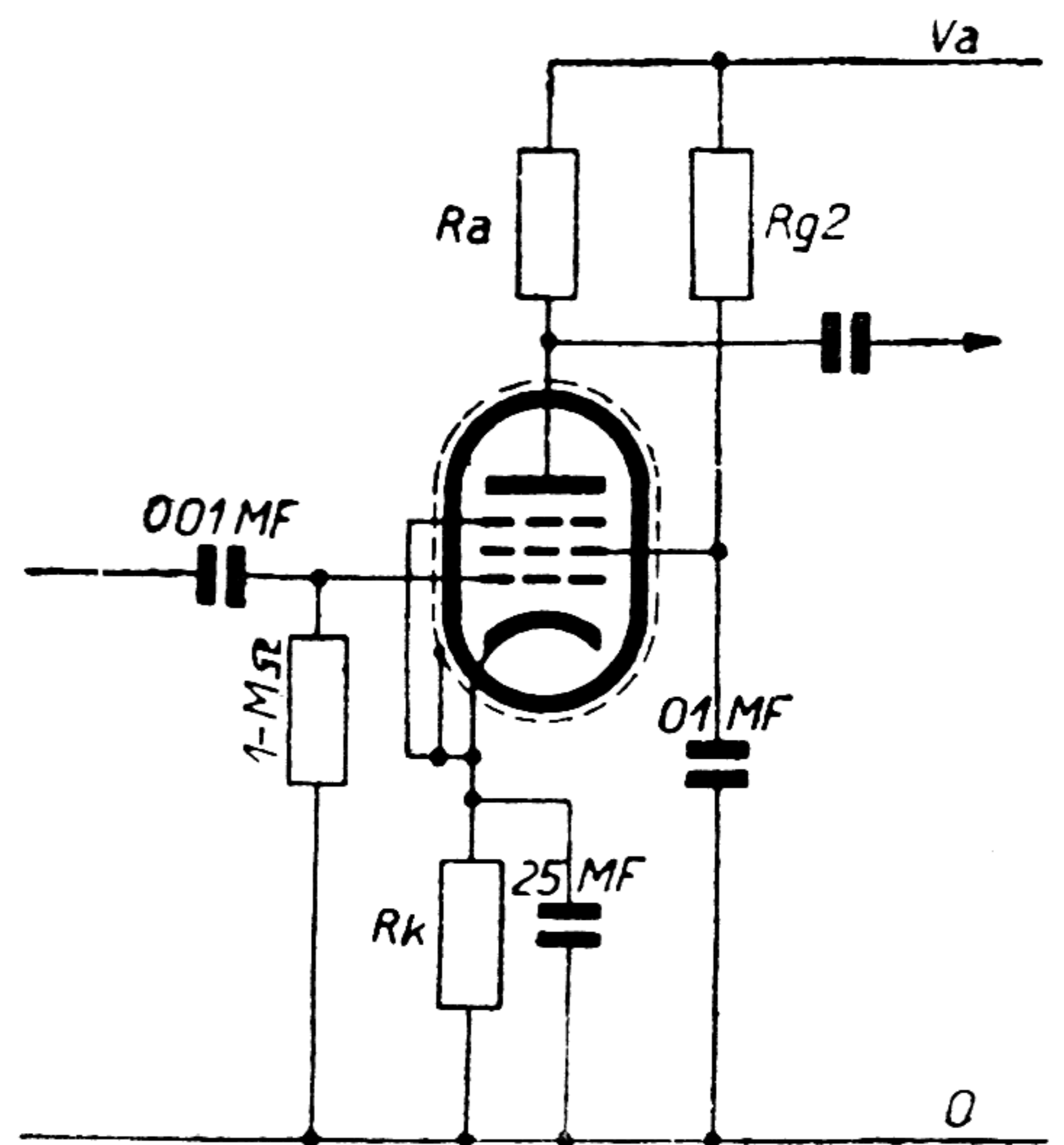
C_a **6,5 pF**



**Sockelschaltung
Base connections
Connexions du culot**

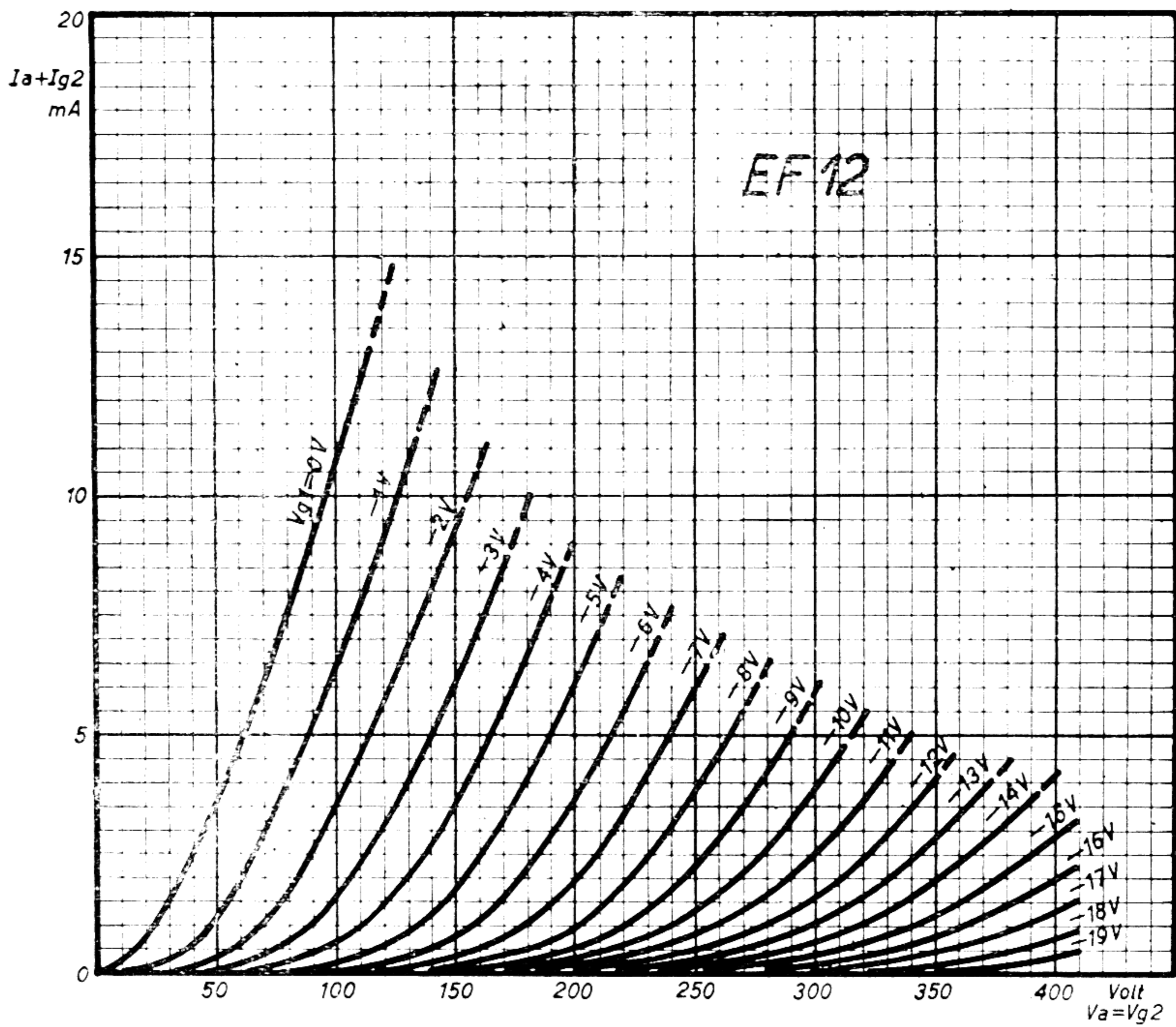
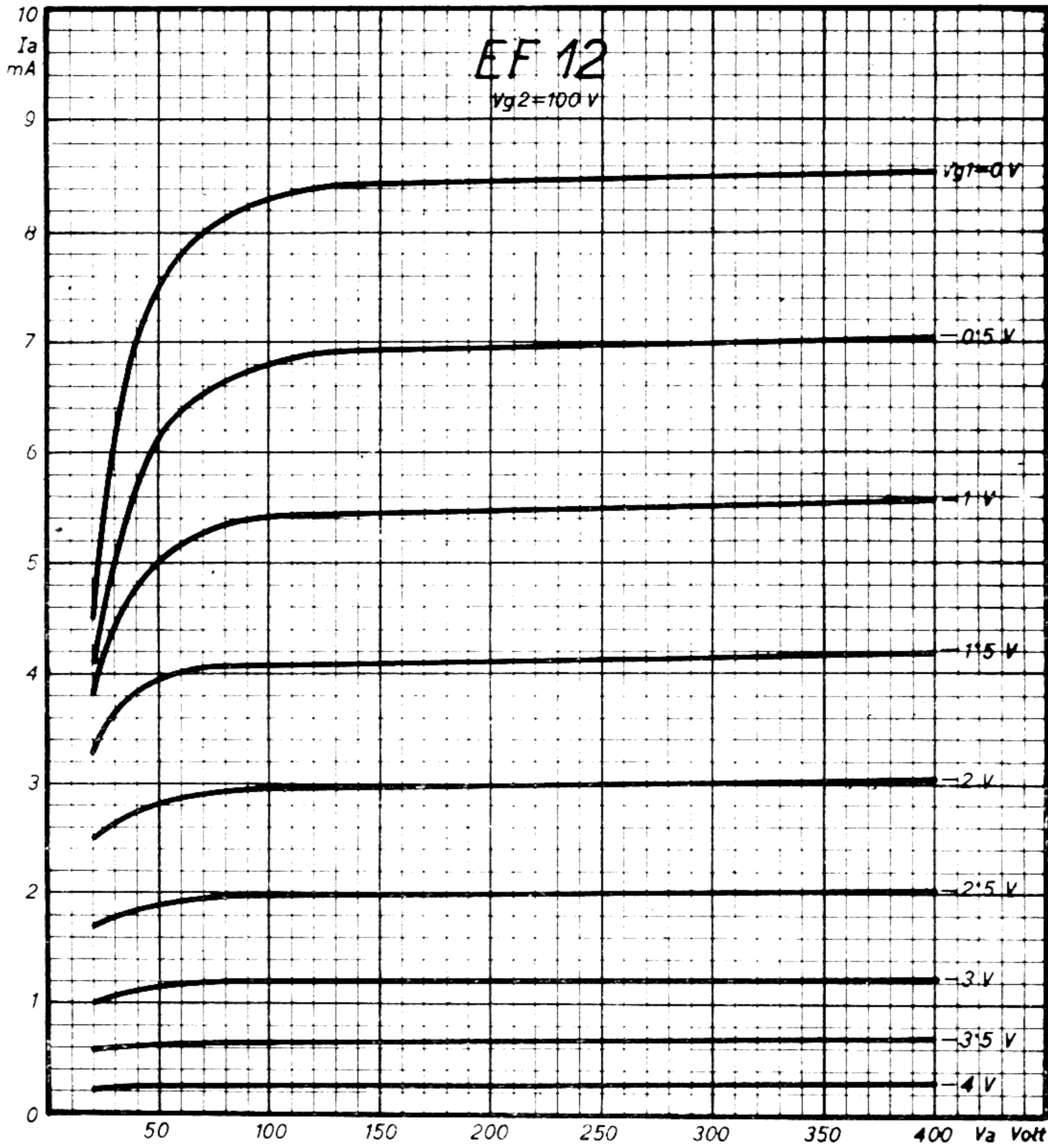


**Abmessungen
Dimensions**



**Schaltungsbeispiel
Circuit diagram
Schema de principe**

	V_o/V_i	R_k	R_a	R_{g2}
$V_a = 250 V$	180	4	300	800 k Ω
	70	1	50	200 k Ω
$V_a = 200 V$	110	6	300	800 k Ω
	50	2	50	200 k Ω
$V_a = 100 V$	90	6	300	800 k Ω
	40	2	50	200 k Ω





EF 22 PENTHODE

Heizung

Heating

Chauffage

Vf

6,3 V

If

0,2 A

Einstellung

Adjustment

Utilisation

Va

250 V

Ia

6 mA

Vg2

250 V — I_{g2} × 90.000 Ω

I_{g2}

1,7 mA

Vg1

— 2,5 V

Betriebsdaten

Operating Conditions

Caracteristiques de service

Vg1

— 2,5

— 43

— 51

V

S

2,2

0,022

0,0045 mA/V

Ri

1

> 10

> 10

MΩ

Grenzdaten

Limit ratings

Limites fixées

V_{ao} max 550 V

V_a max 300 V

W_a max 2 W

V_{g2o} max 550 V

V_{g2} max 125 V (I_a = 6 mA)

W_{g2} max 0,3 W

300 V (I_a < 3 mA)

R_{g1} max 3 MΩ

R_{fk} max 20.000 Ω

V_{fk} max 50 V

I_k max 10 mA

Kapazitäten

Capacities

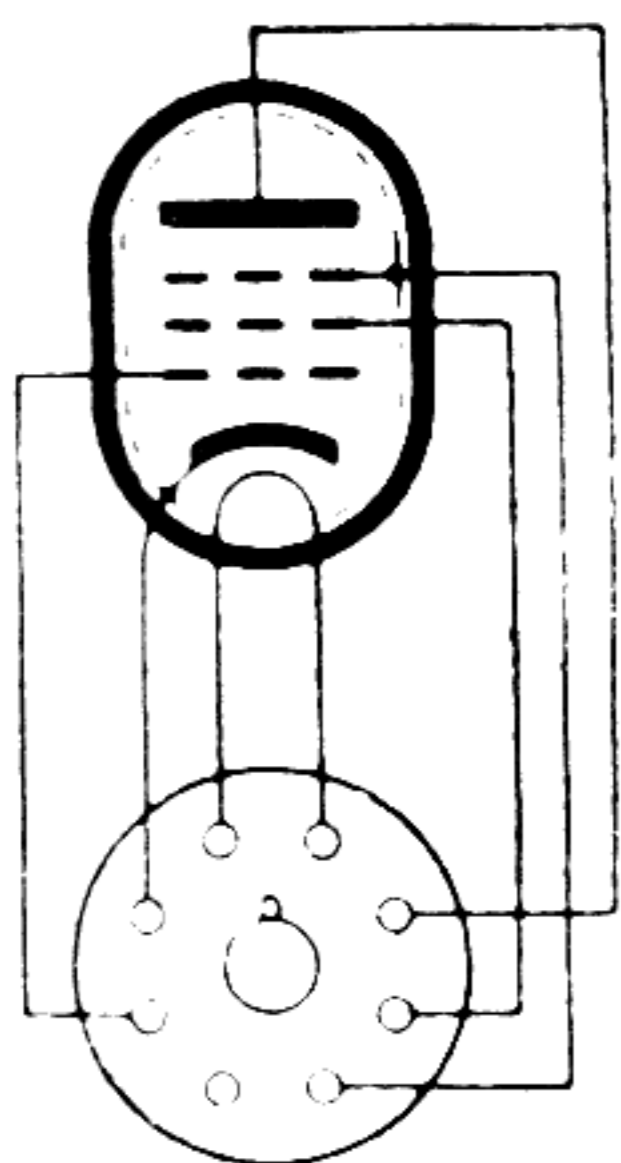
Capacités

C (a/g1) < 0,002 pF

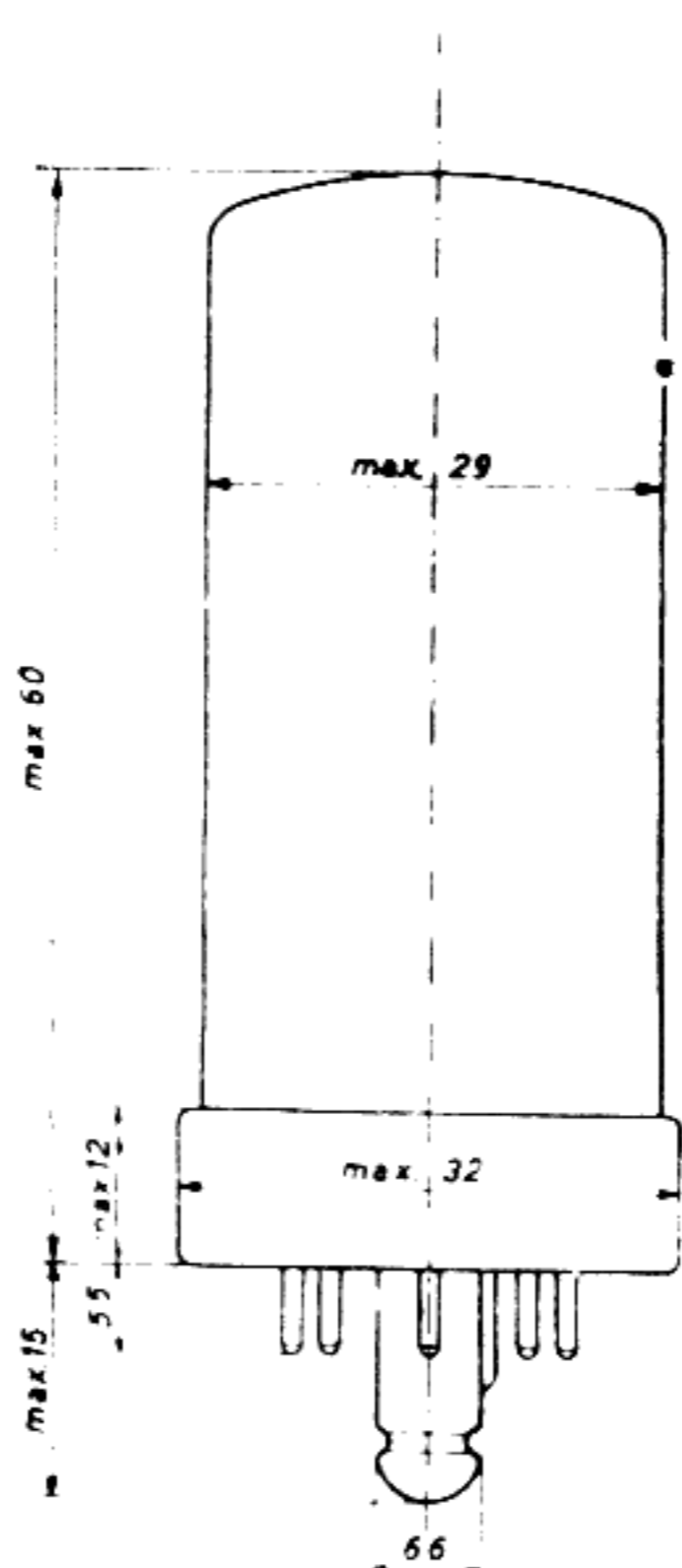
C (g1) 5,5 pF

C (g1/f) < 0,004 pF

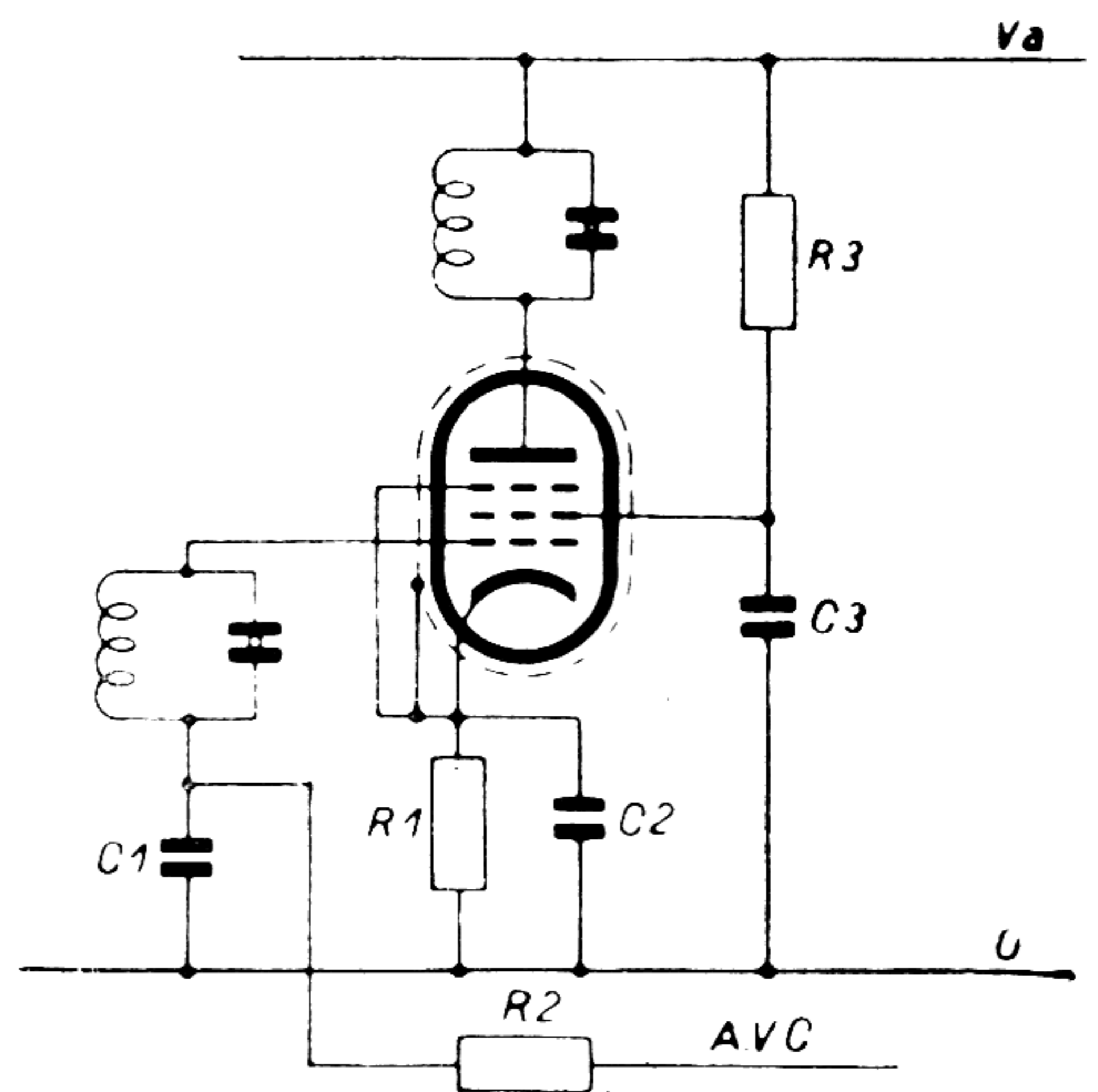
C (a) 6,4 pF



Sockelschaltung
Base connections
Connexions du culot



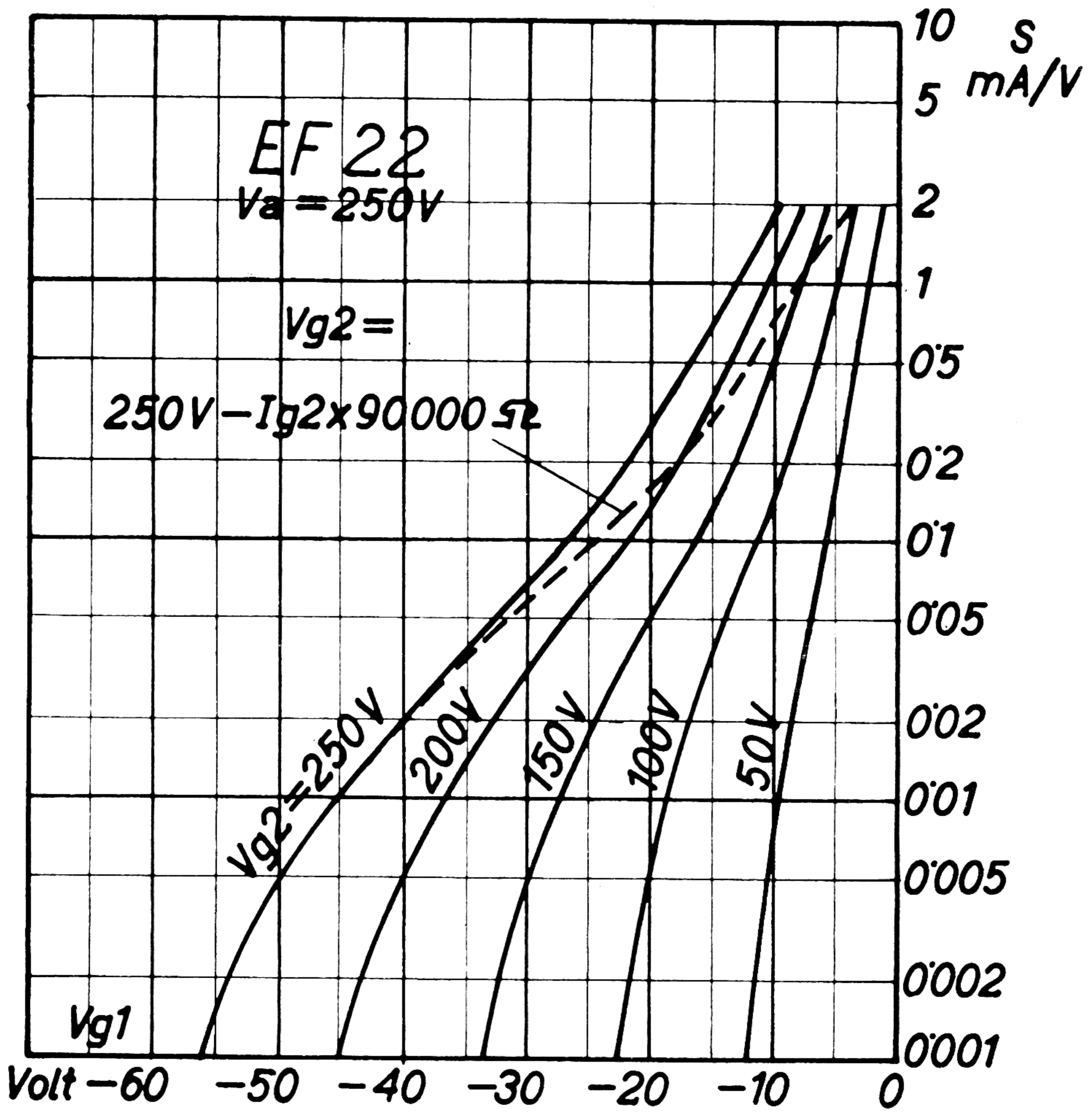
Abmessungen
Dimensions



Schaltungsbeispiel
Circuit diagram
Schema de principe

R₁ 325 Ω
R₂ 1 MΩ
R₃ 90.000 Ω

C₁ 0,1 μF
C₂ 0,1 μF
C₃ 0,1 μF





EFM 1

PENTHODE UND ABSTIMMANZEIGER — PENTHODE AND TUNING INDICATOR
 PENTODE ET INDICATRICE D'ACCORD

Heizung
 Heating
 Chauffage

$V_f = 6,3 \text{ V (i)}$

$I_f = 0,2 \text{ Amp.}$

Einstellung
 Adjustment
 Utilisation

$V_a = 250 \text{ V} - I_a \times 130.000 \ \Omega$
 $V_{g2} = 250 \text{ V} - I_{g2} \times 350.000 \ \Omega$
 $V_{g1} = 2 \text{ V}$
 $V_s = 250 \text{ V}$

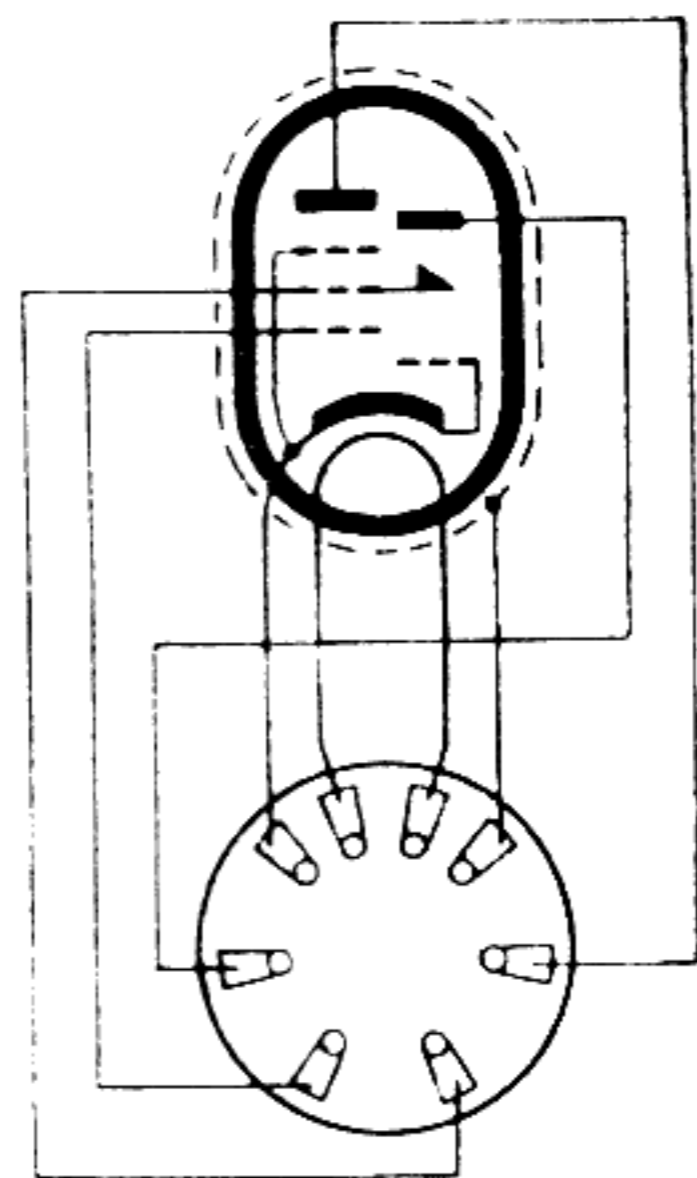
$I_a = 0,8 \text{ mA}$
 $I_{g2} = 0,6 \text{ mA}$
 $I_s = 0,65 \text{ mA}$

Betriebsdaten
 Operating Conditions
 Caracteristiques de service

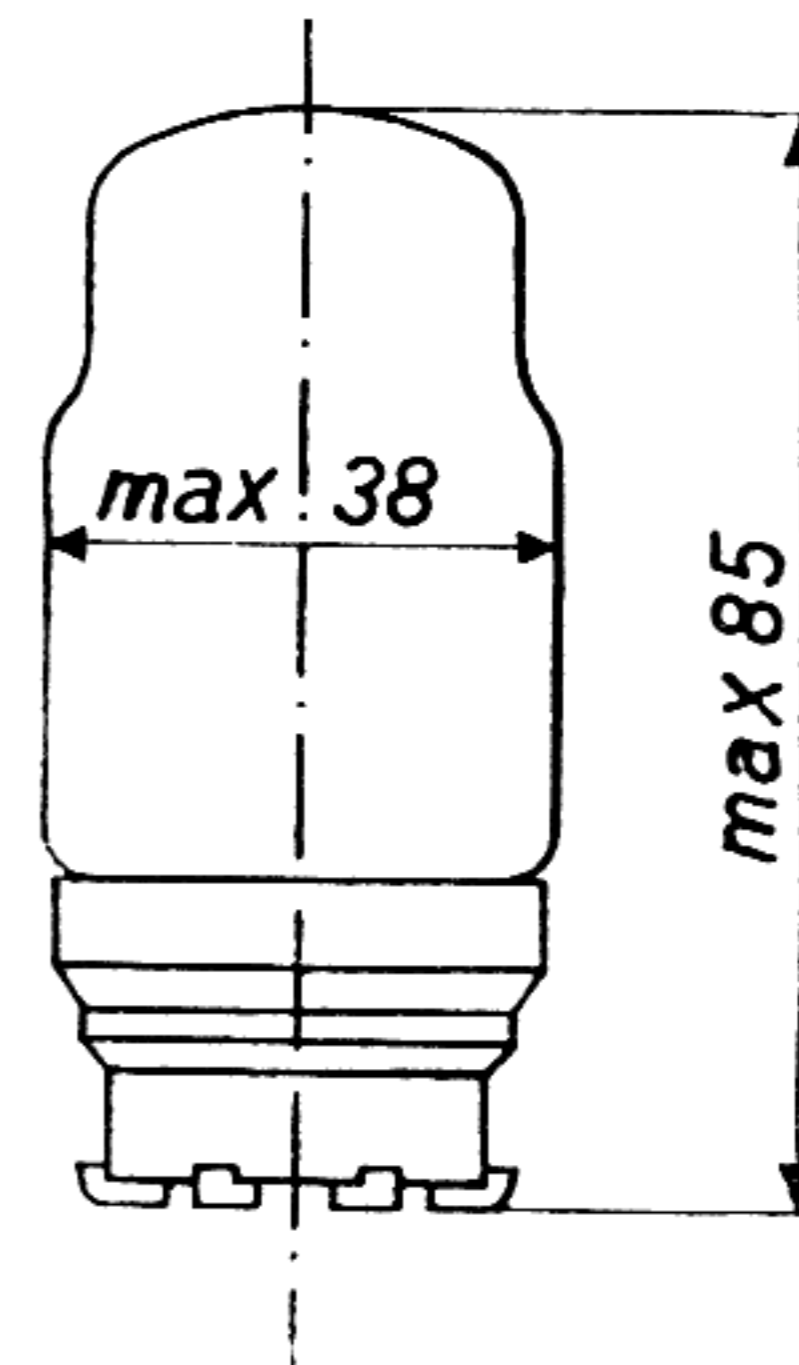
$V_{g1} = 2 - 20 \text{ V}$
 $\frac{V_o}{V_i} = 60 - 13$
 $\theta = 70^\circ - 5^\circ$

Grenzdaten
 Limit ratings
 Limites fixées

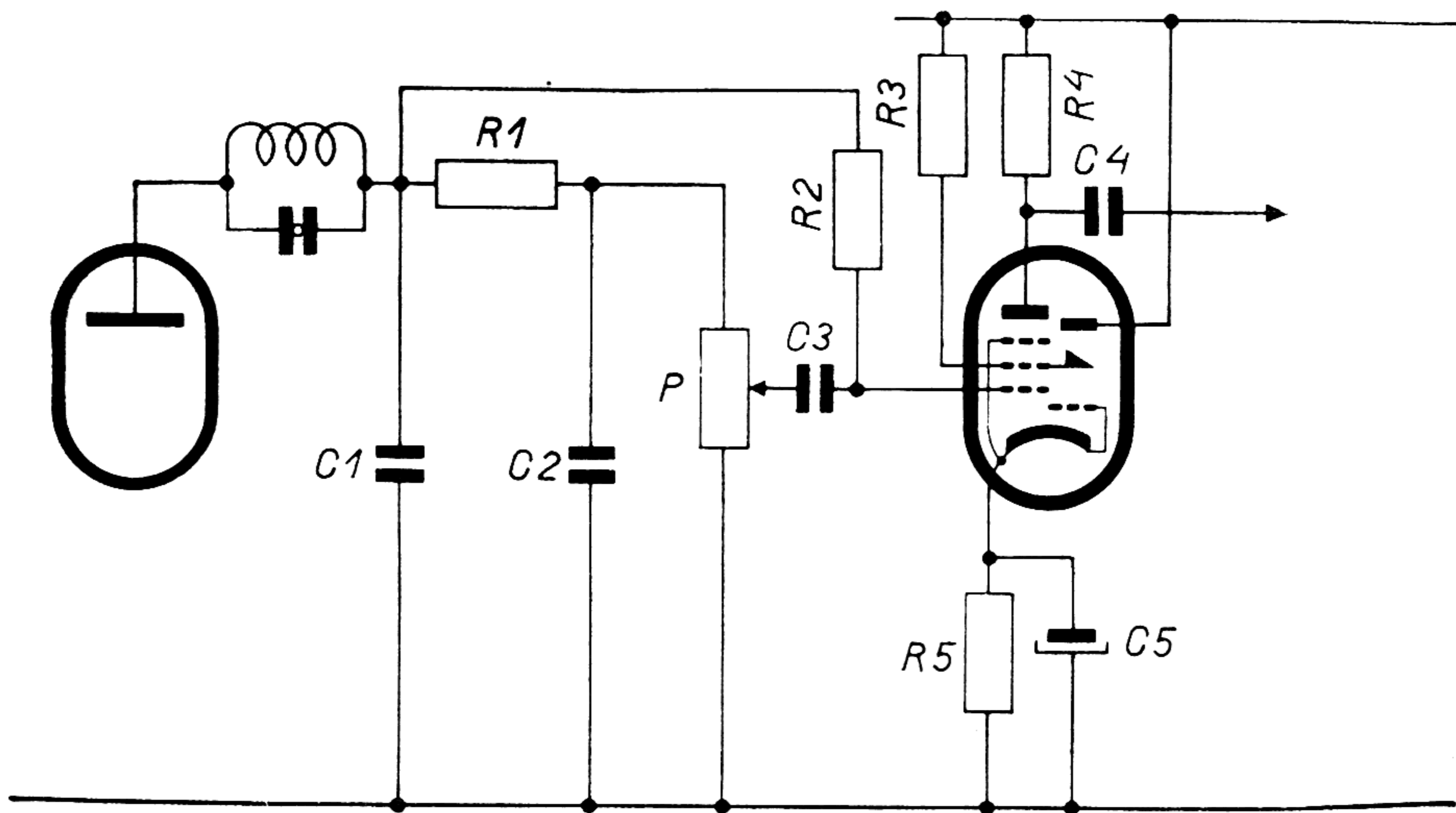
$V_{ao \text{ max}} = 550 \text{ V}$	$V_a \text{ max} = 300 \text{ V}$	$W_a \text{ max} = 0,4 \text{ Watt}$
$V_{g2o \text{ max}} = 550 \text{ V}$	$V_{g2 \text{ max}} = 300 \text{ V}$	$W_{g2 \text{ max}} = 0,4 \text{ Watt}$
$V_{so \text{ max}} = 550 \text{ V}$	$V_s \text{ max} = 300 \text{ V}$	
$R_{g1 \text{ k max}} = 3 \text{ M}\Omega$	$I_k \text{ max} = 5 \text{ mA}$	
$V_{fk \text{ max}} = 100 \text{ V}$	$R_{fk \text{ max}} = 20.000 \ \Omega$	



Sockelschaltung
 Base connections
 Connexions du culot

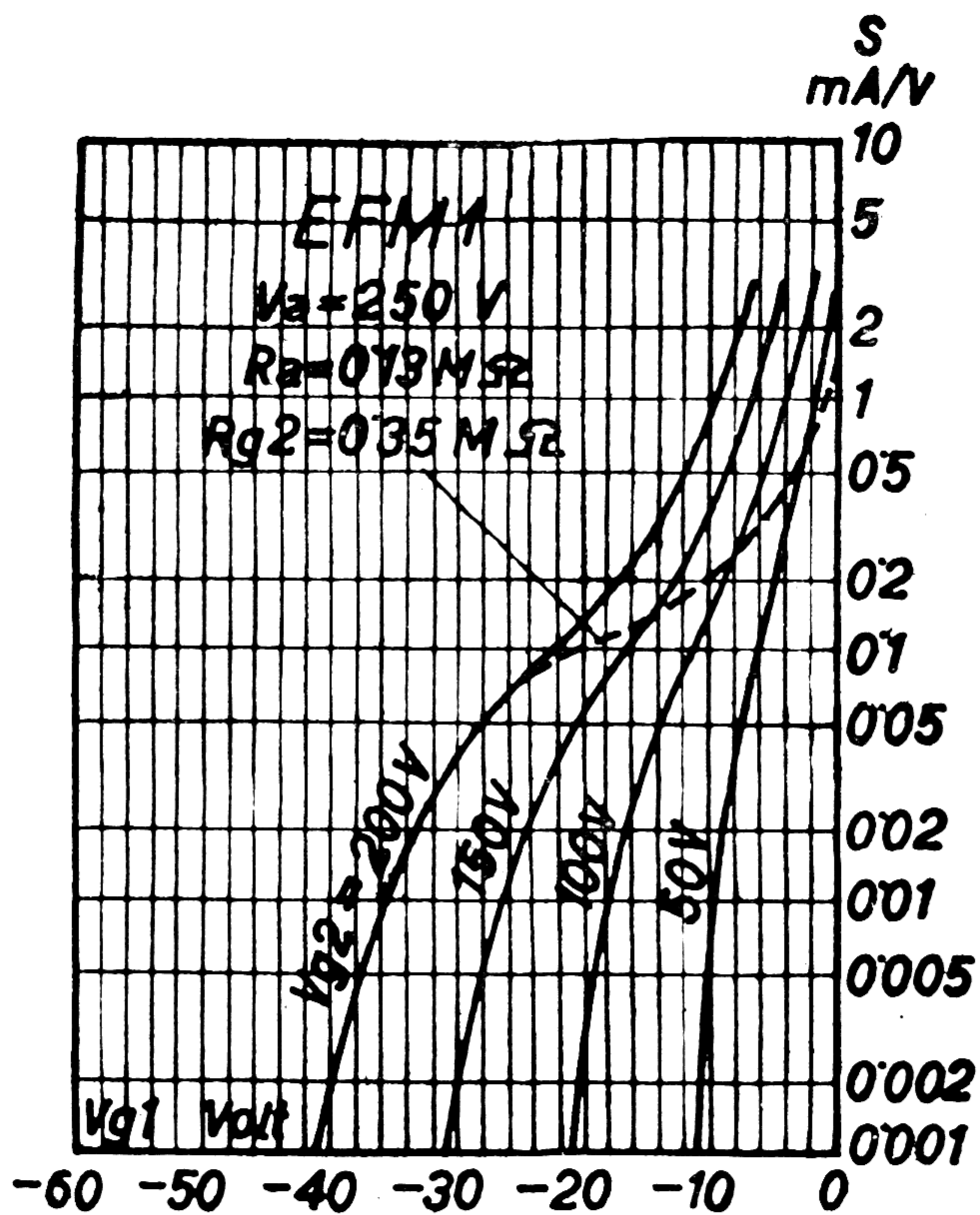


Abmessungen
 Dimensions



Schaltungsbeispiel
Circuit diagram
Schema de principe

R ₁ =	1	MΩ	C ₁	50	pF
R ₂ =	2	MΩ	C ₂	50	pF
R ₃ =	0.35	MΩ	C ₃	0.01	μF
R ₄ =	0.13	MΩ	C ₄	0.01	μF
R ₅ =	1000	Ω	C ₅	8	μF
P =		0.25	MΩ		





EH 2 HEXODE

Heizung
Heating
Chauffage

V_f **6,3** V (i) I_f **0,2** Amp.

I. Einstellung als Mischröhre
Adjustment as mixer
Utilisation comme modulatrice

V_a	250	V	I_a	1,85	mA
$V_g (2+4)$	100	V	$I_g (2+4)$	3,8	mA
V_{g1}	— 3	V	R_i	2	$M\Omega$
V_{osc}	14	V_{eff}			
S_c	0,4	m/AV			

II. Einstellung als Verstärker
Adjustment as amplifier
Utilisation comme amplificatrice

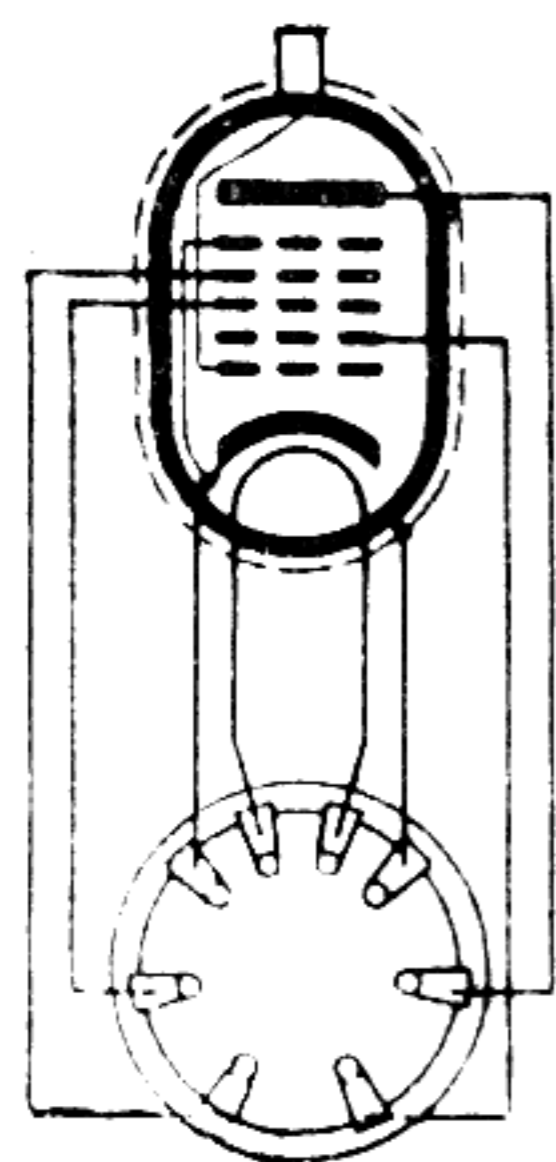
V_a	250	V	I_a	4,2	mA
$V_g (2+4)$	100	V	$I_g (2+4)$	2,8	mA
V_{g3}	— 2	V	R_i	1	$M\Omega$
V_{g1}	— 3	V ... — 25 V	S	1,4 ... 0,002	mA V

Grenzdaten
Limit ratings
Limites fixées

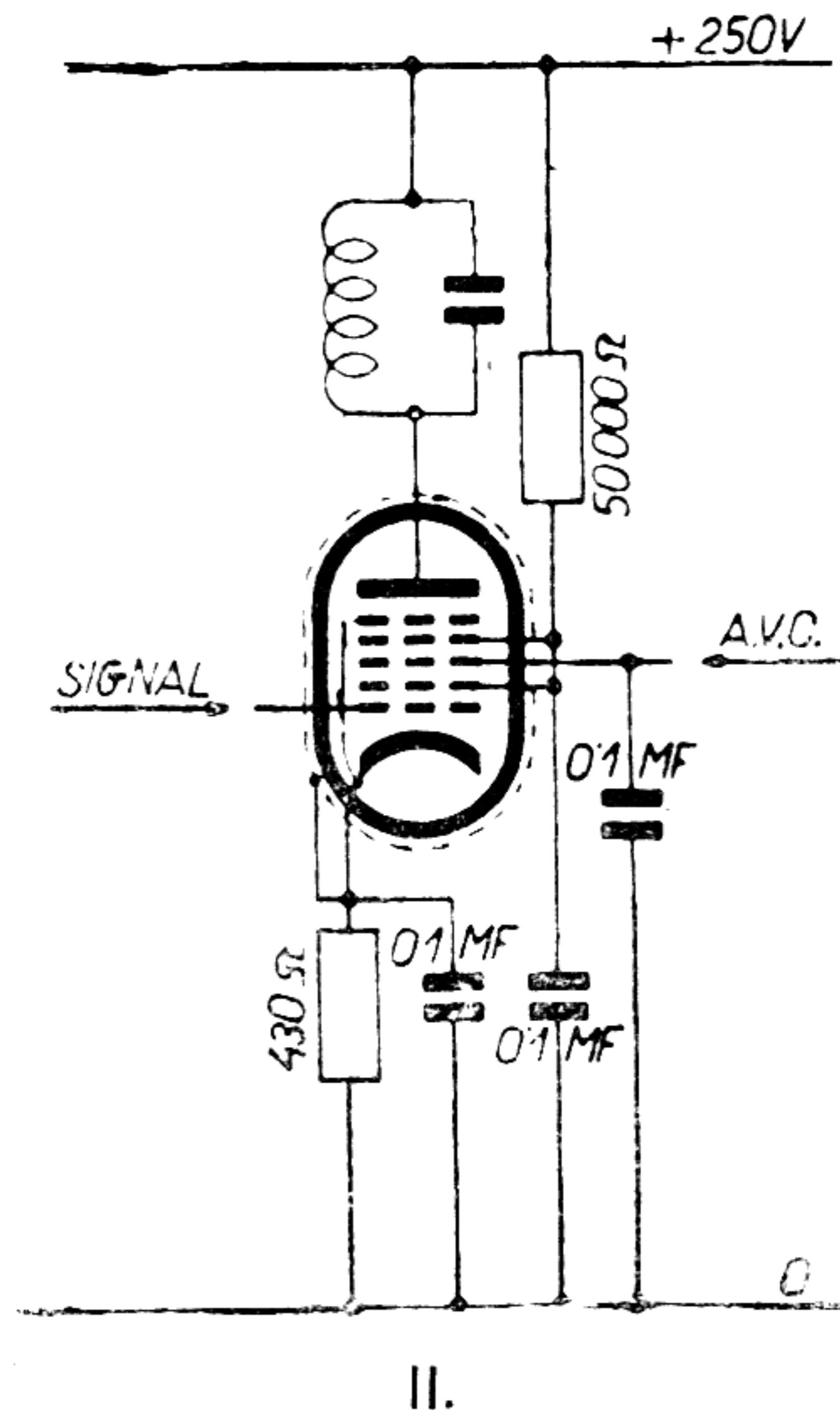
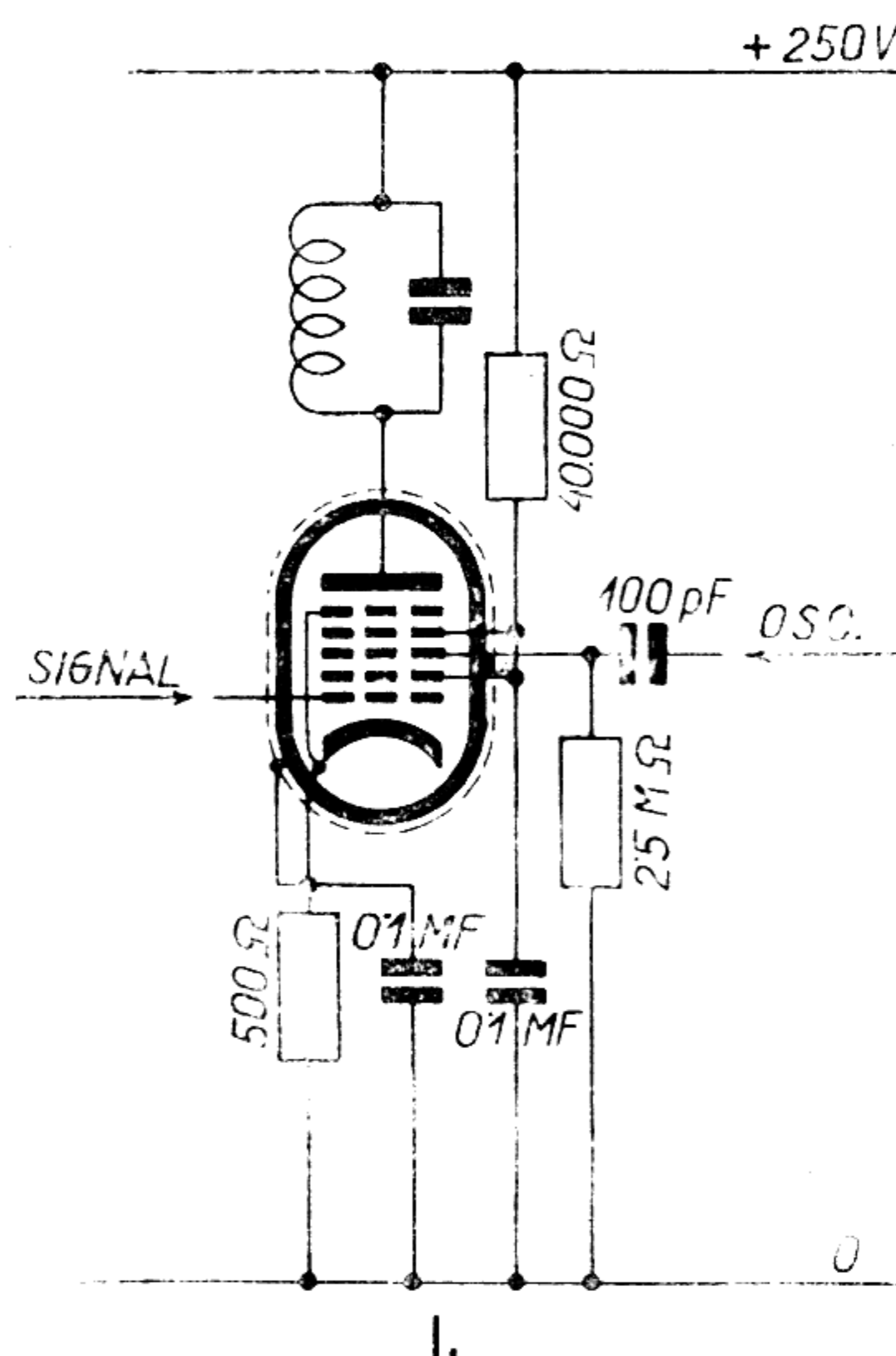
$V_{ao} \max$	550	V	$V_a \max$	250	V	$W_a \max$	1,5	W
$V_g (2+4) \ 0 \ max$	400	V	$V_g (2+4) \ max$	185	V	$W_g (2+4) \ max$	1	W
$V_{fk} \ max$	50	V	$R_{fk} \ max$	5000	Ω			
$R_{g1} \ max$	2,5	$M\Omega$	$R_{g3} \ max$	2,5	$M\Omega$			
$I_k \ max$	10	mA						

Kapazitäten
Capacities
Capacités

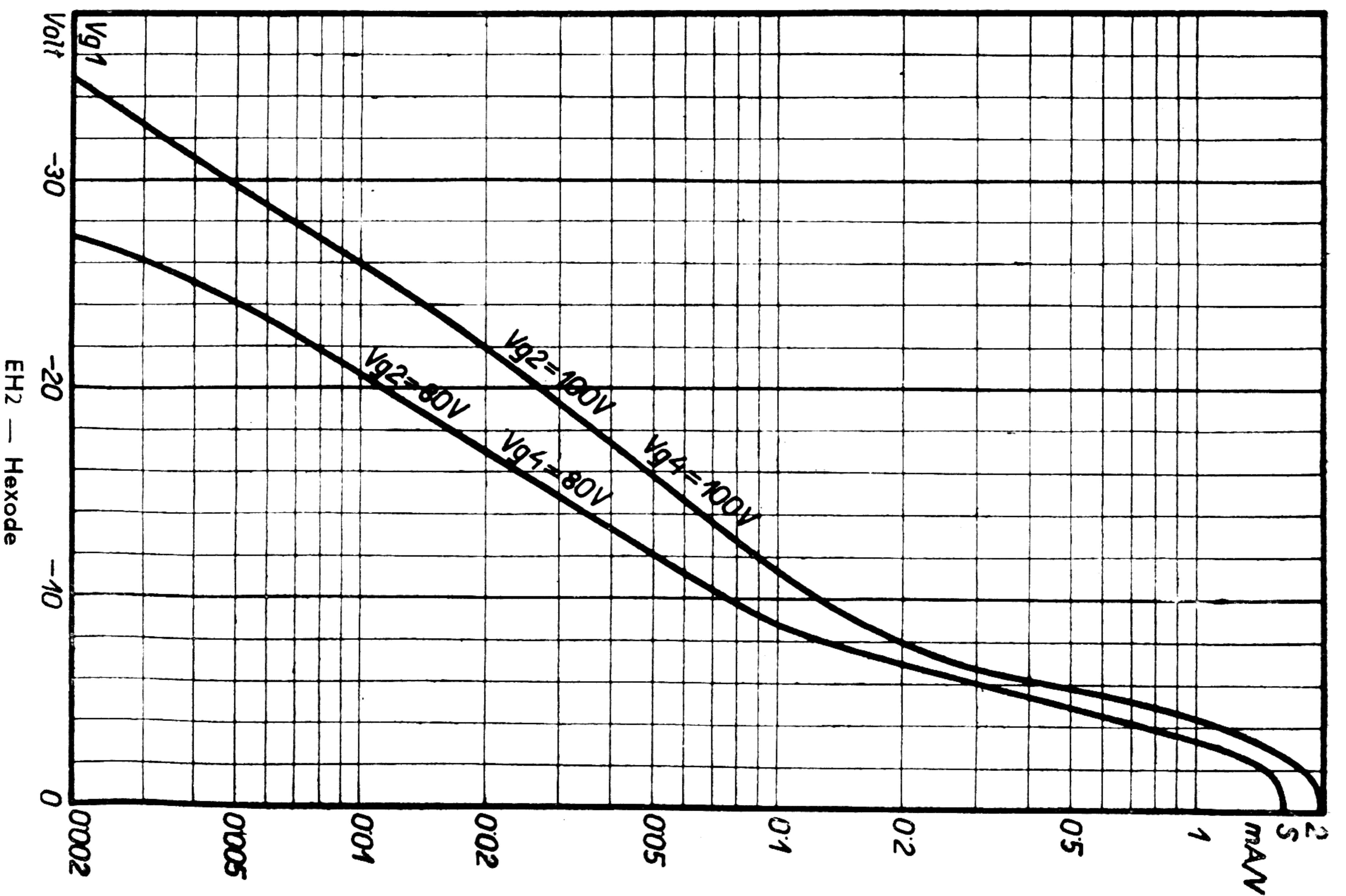
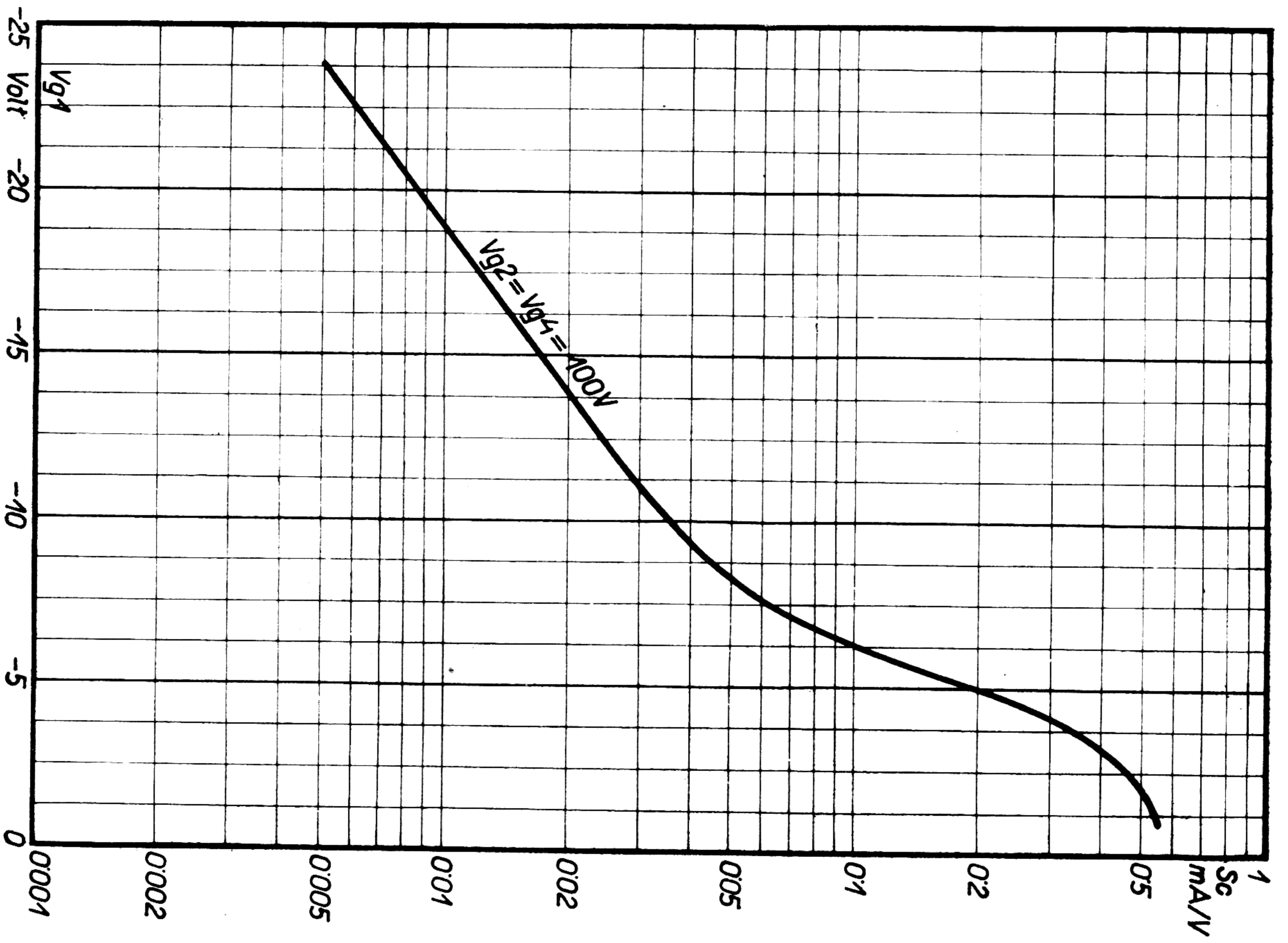
$C (g1)$	5	pF	$C (a)$	11	pF
$C (1.g3)$	0,2	pF	$C (g1/a)$	< 0,0015	pF



Sockelschaltung
Base connections
Connexions du culot



Schaltungsbeispiel
Circuit diagram
Schema de principe





EK 2

OKTODE-OCTODE

Heizung
Heating
Chauffage

V_f = **6,3 V (i)** I_f = **0,2 Amp.**

Einstellung
Adjustment
Utilisation

V_a	=	250 V	I_a	=	1 mA
V_{g2}	=	200 V	I_{g2}	=	2,5 mA
$V_g (3+5)$	=	50 V	$I_g (3+5)$	=	0,8 mA
V_{g4}	=	- 2 V			
V_{g1eff}	=	15 V			

Betriebsdaten
Operating Conditions
Caracteristiques de service

V_{g4}	=	- 2 V	S_c	<	0,55 mA/V	R_i	=	2 MΩ
V_{g4}	=	- 25 V	S_c	<	0,002 mA/V	R_i	>	10MΩ

Einstellung für Kurzwellen
Adjustment for short waves
Utilisation pour les ondes courtes

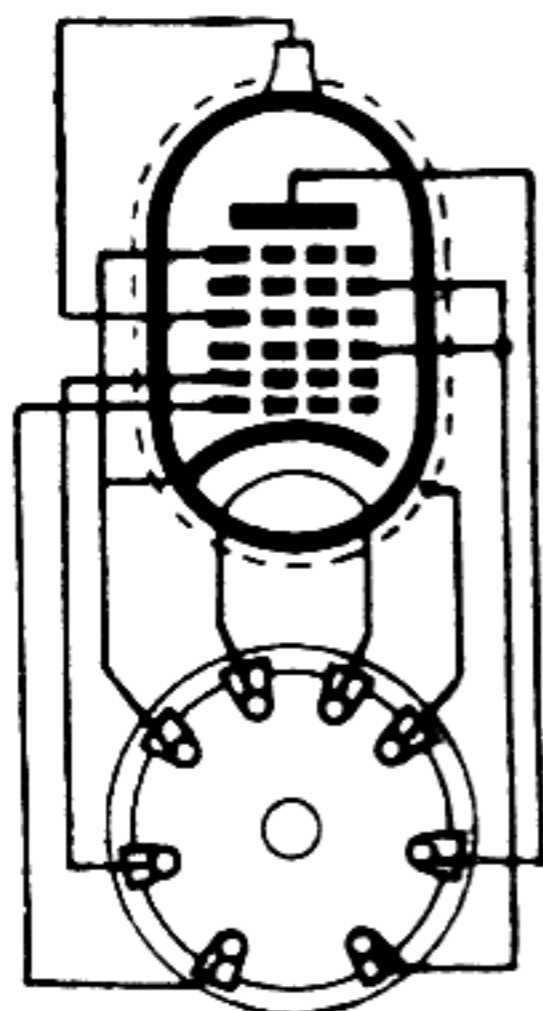
V_a	=	250 V	I_a	=	1,7 mA
V_{g2}	=	200 V	I_{g2}	=	4 mA
$V_g (3+5)$	=	80 V	$I_g (3+5)$	=	1,3 mA
V_{g4}	=	- 4 V			
V_{g1eff}	=	9 V			

Grenzdaten
Limit ratings
Limites fixées

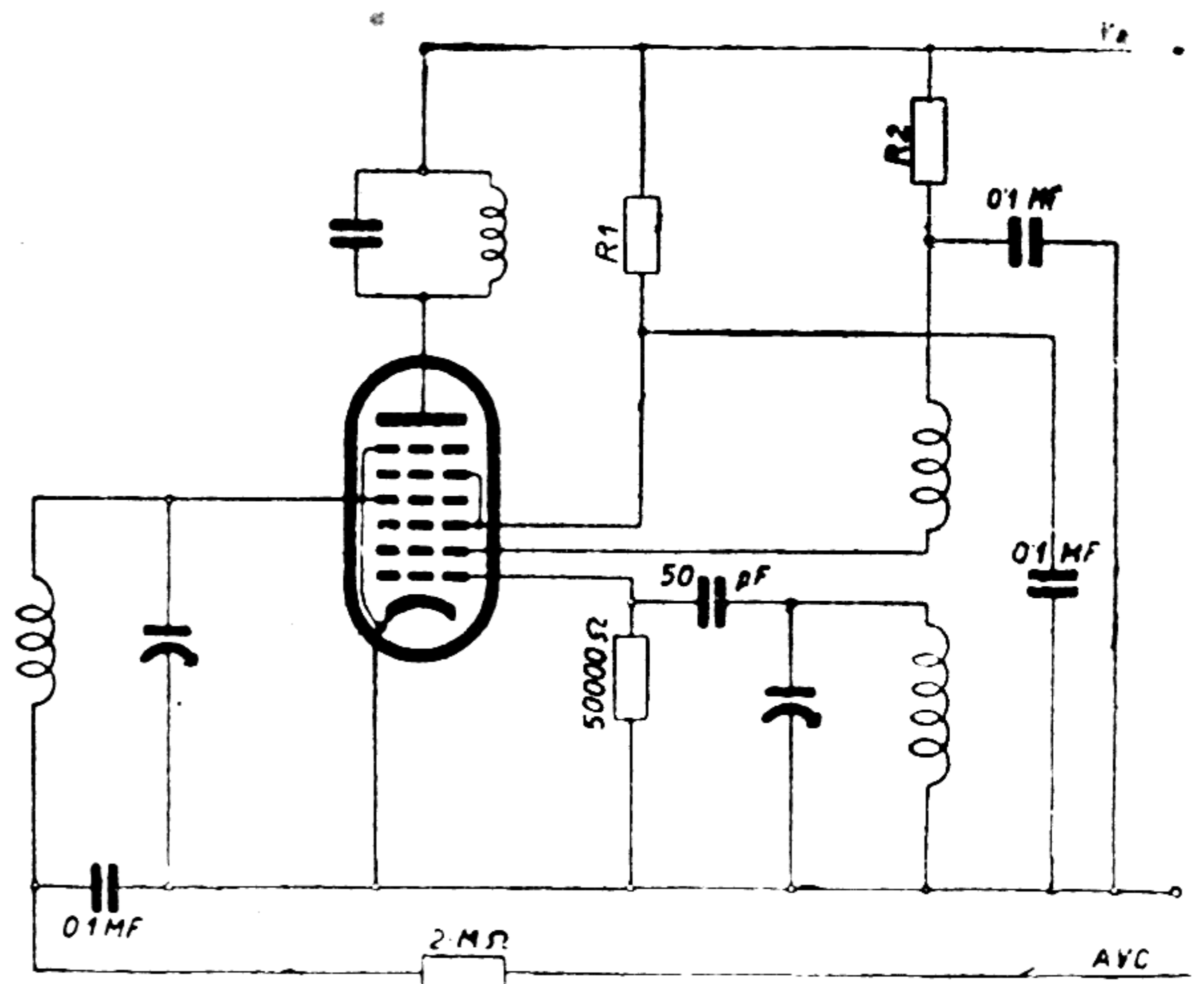
$V_{ao} \text{ max}$	=	550 V	$V_a \text{ max}$	=	250 V	$W_a \text{ max}$	=	1 W
$V_{go} (3+5) \text{ max}$	=	550 V	$V_g (3+5) \text{ max}$	=	125 V	$W_g (3+5) \text{ max}$	=	0,3 W
$V_{g2o} \text{ max}$	=	550 V	$V_{g2} \text{ max}$	=	225 V	$W_{g2} \text{ max}$	=	1,3 W
$V_{fkm} \text{ max}$	=	50 V	$R_{fk} \text{ max}$	=	5000 Ω	$I_k \text{ max}$	=	12 mA

Kapazitäten
Capacities
Capacités

$C (g1)$	=	6,0 pF	$C (g1/g4)$	=	1,1 pF
$C (g4)$	=	8,8 pF	$C (g2/g4)$	<	0,25 pF
$C (a)$	=	10,0 pF	$C (a/g4)$	<	0,07 pF
$C (g2)$	=	4,5 pF			

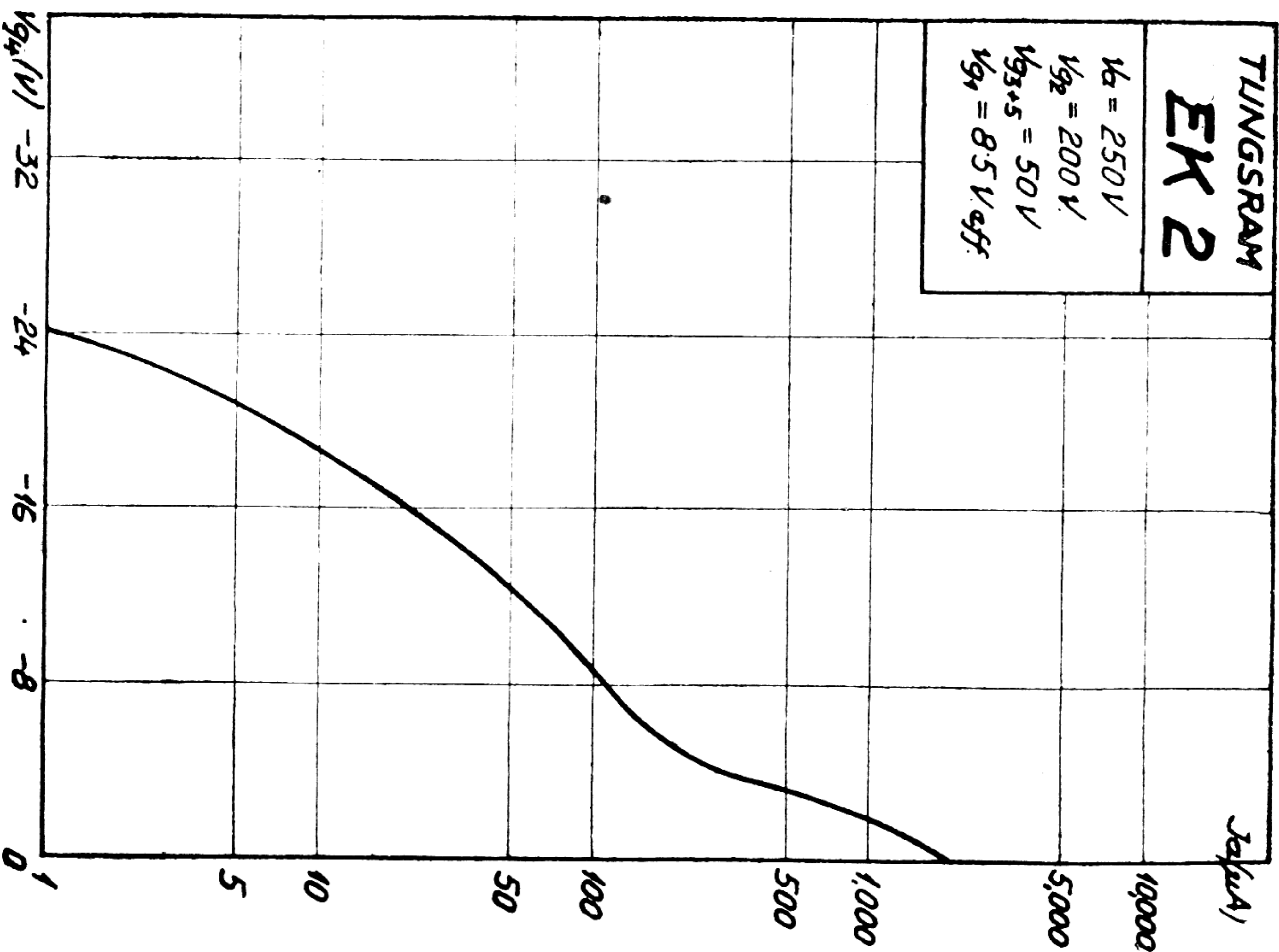
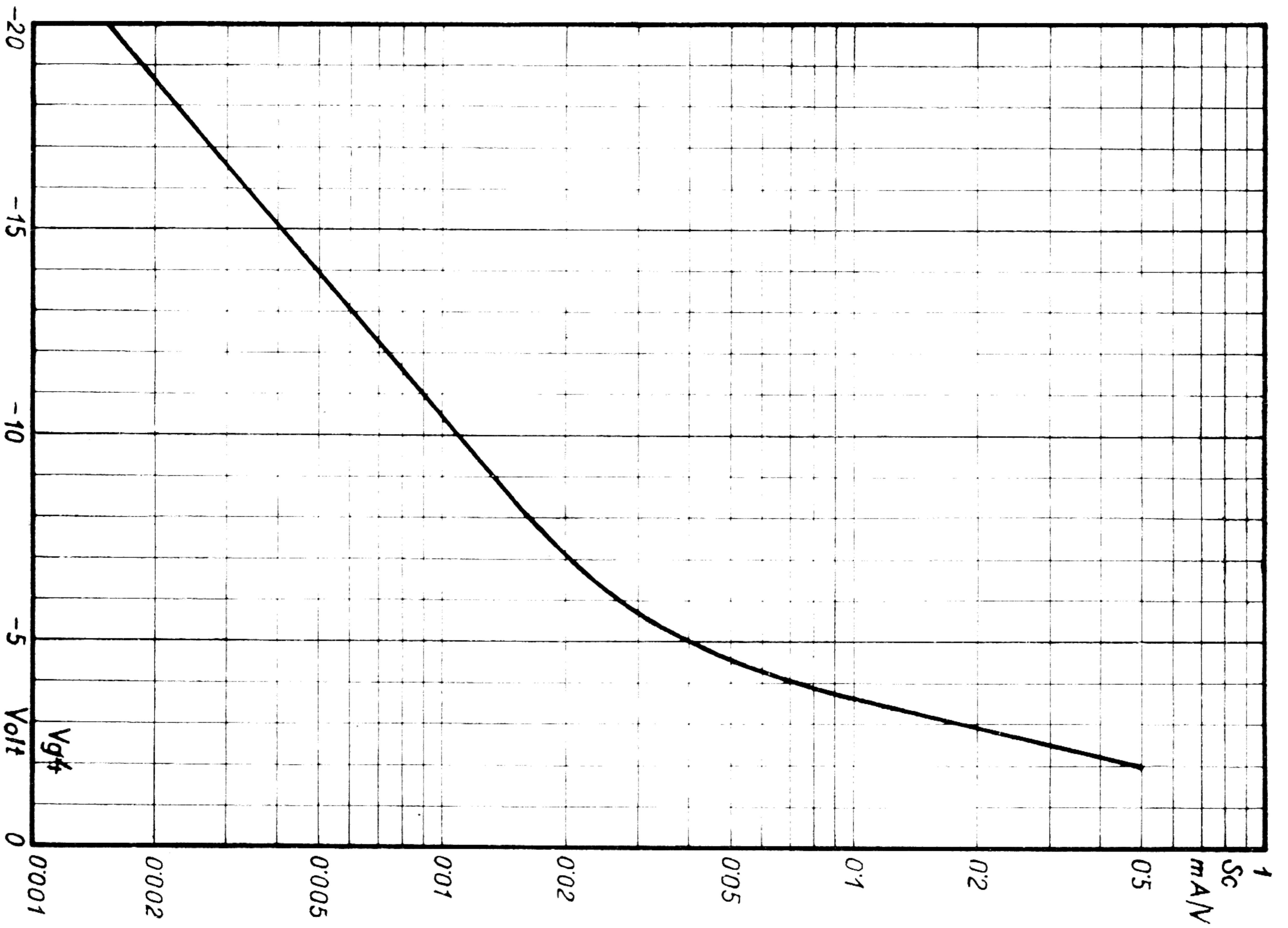


Sockelschaltung
Base connections
Connexions du culot



Schaltungsbeispiel
Circuit diagram
Scheme de principe

$R_1 = 250.000 \Omega$ $R_2 = 20.000 \Omega$



TUNGSRAM
EK 2
 $V_b = 250V$
 $V_{g2} = 200V$
 $V_{g3+5} = 50V$
 $V_{g1} = 8.5V_{eff}$



EK 3

OKTODE-OCTODE

Heizung
Heating
Chauffage

Vf = 6,3 V (i) If = 0,6 Amp.

Einstellung
Adjustment
Utilisation

Va	250 V	Ia	2,5 mA
Vg (3 + 5)	100 V	Ig (3 + 5)	5,5 mA
Vg2	100 V	Ig2	5 mA
Vg4	- 2,5 V	Rk	190 Ω
Vg1	12 Veff	Ig1	300 μA

Betriebsdaten
Operating Conditions
Caracteristiques de service

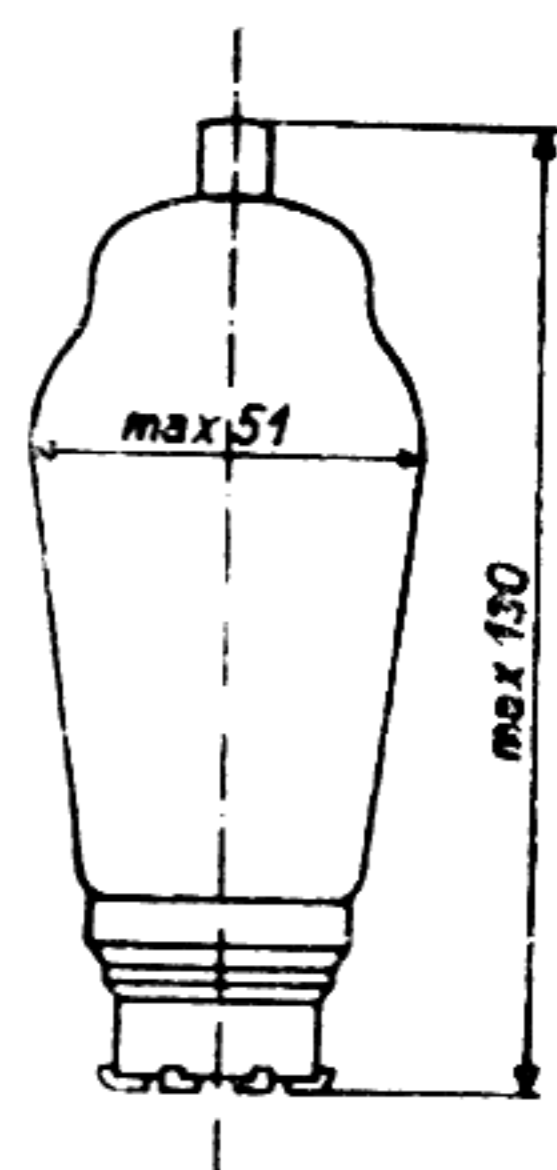
Vg1	- 2,5	38	42 V
Sc	0,65	0,0065	0,003 mA/V
Ri	2	10	10 MΩ

Grenzdaten
Limit ratings
Limites fixées

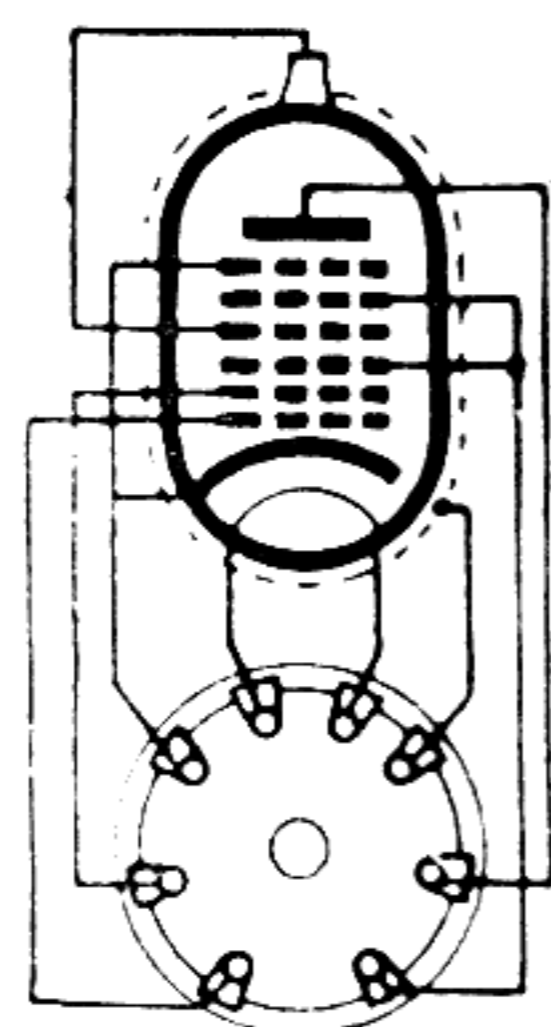
Vao max	550 V	Va max	300 V	Wa max	1 W
Vg (3+5) max	550 V	Vg (3+5) max	150 V	Wg (3+5) max	1 W
Vg2o max	550 V	Vg2 max	150 V	Wg2 max	1 W
Vfk max	50 V	Rfk max	20.000 Ω	Ik max	23 mA
Rg4 max	3 MΩ				

Kapazitäten
Capacities
Capacités

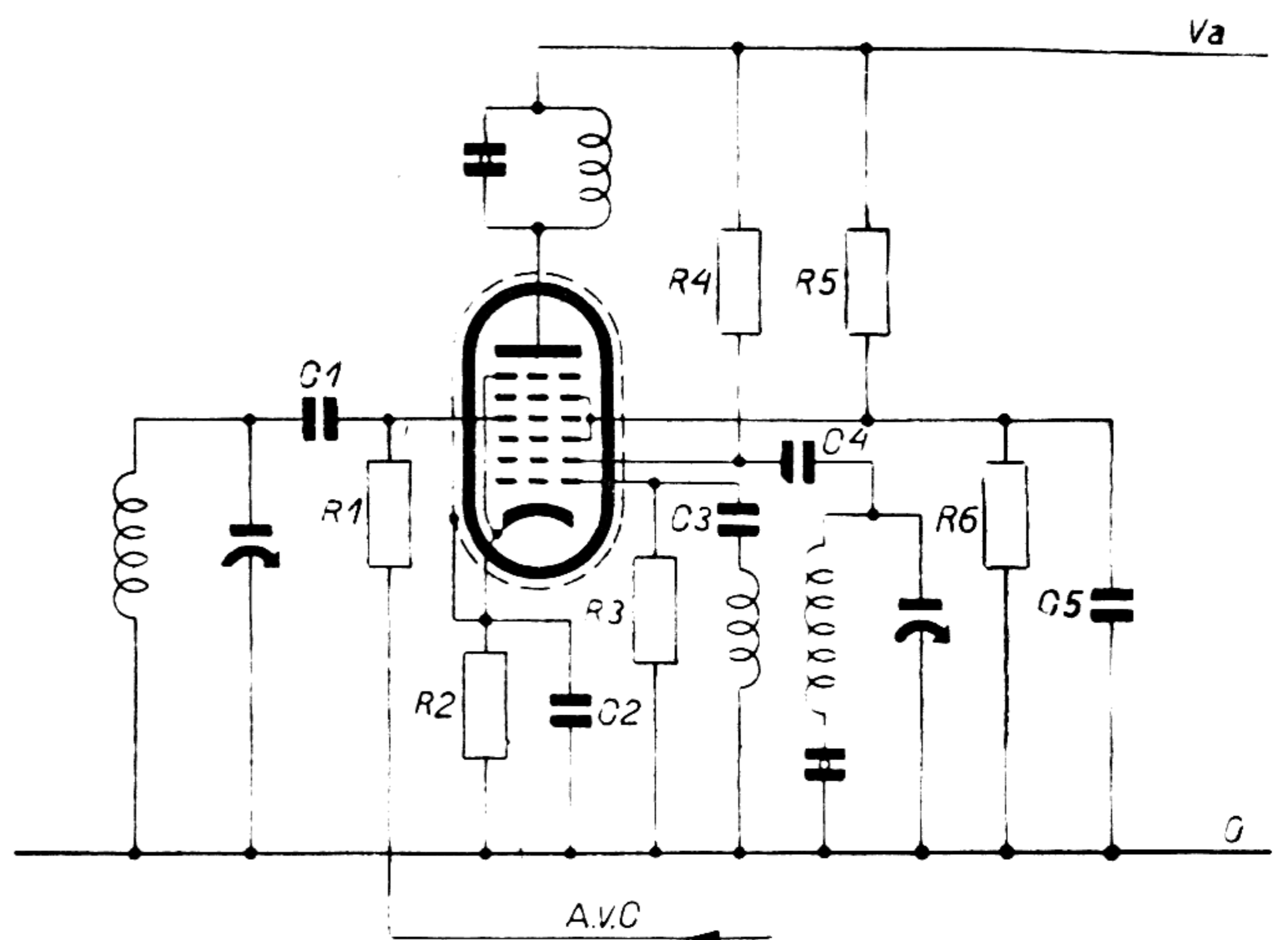
C (a)	16,5 pF	C (g4)	15,2 pF
C (g1)	14 pF	C (gt/g4)	1,1 pF
C (g2)	8,6 pF	C (a/g4)	< 0,07 pF



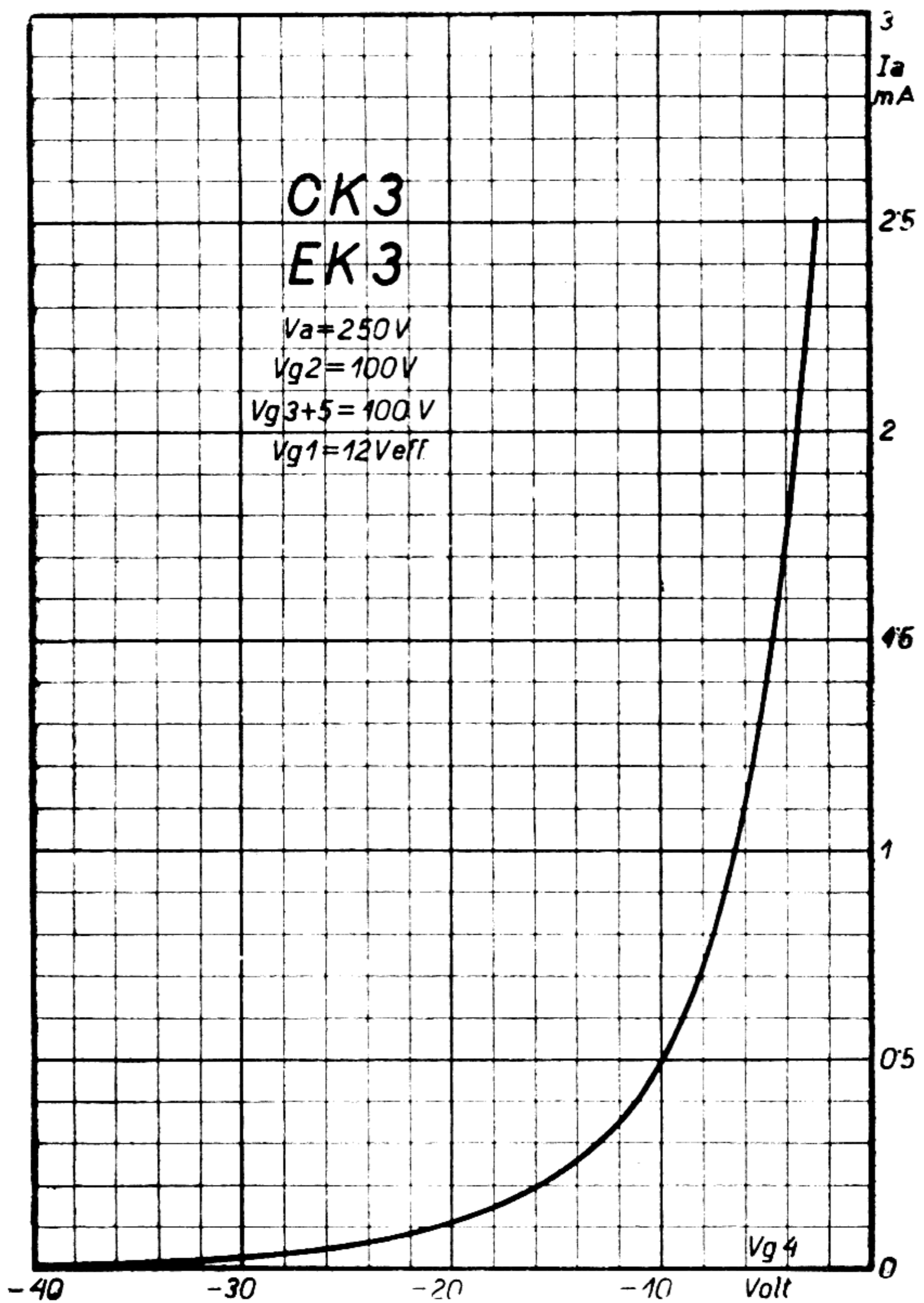
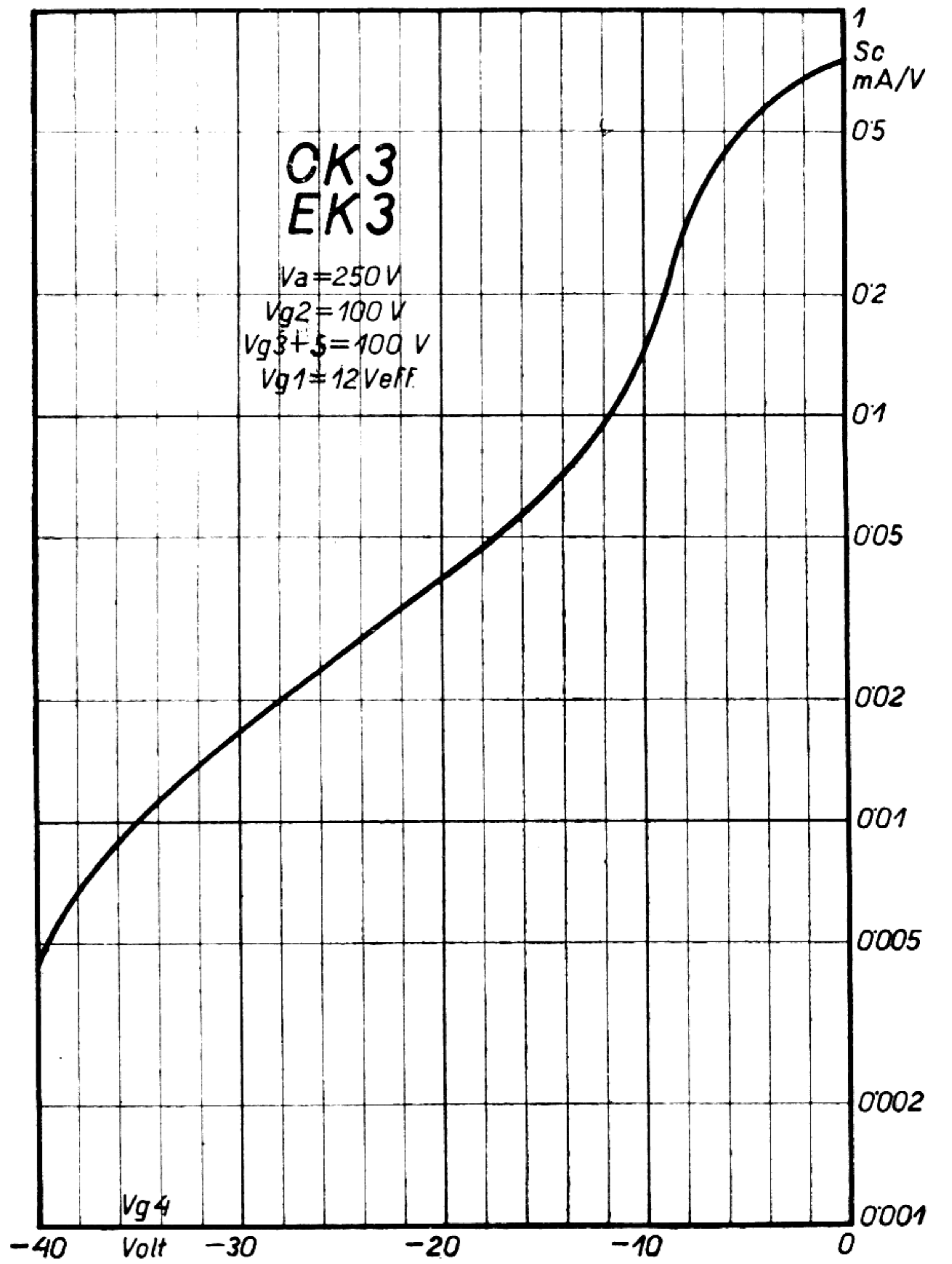
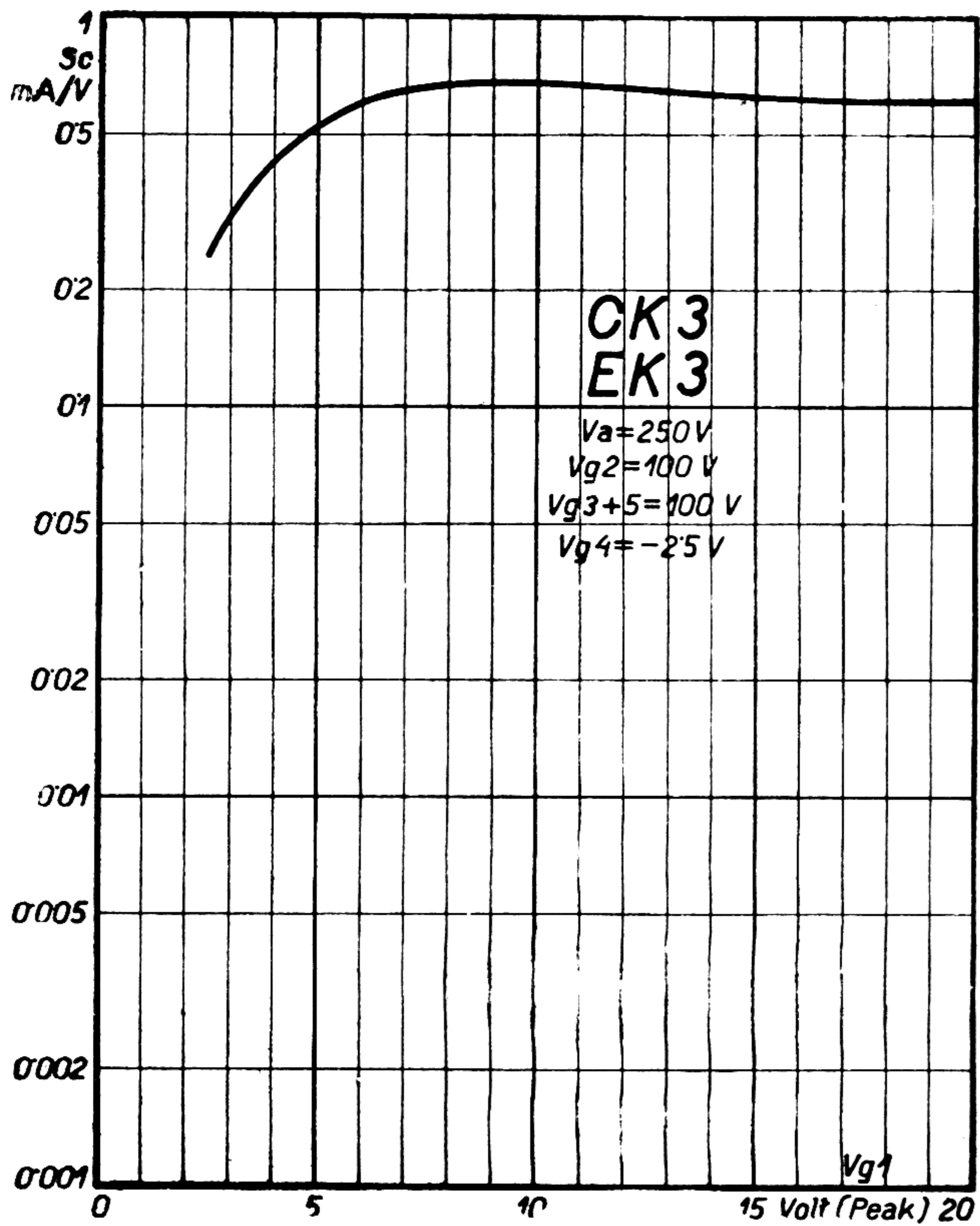
Abmessungen
Dimensions

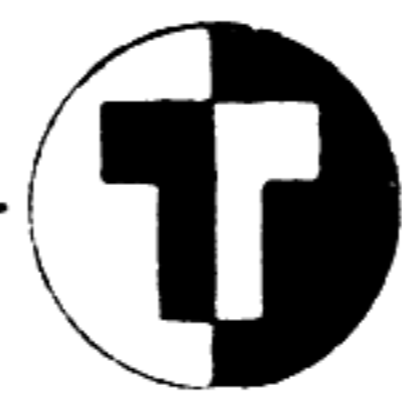


Sockelschaltung
Base connections
Connexions de culot



R1	1 MΩ	C1	500 pF
R2	180 Ω	C2	0,1 μF
R3	50000 Ω	C3	100 pF
R4	25000 Ω	C4	1000 pF
R5	12000 Ω	C5	0,1 μF
R6	20000 Ω		





EL 2

PENTHODE

Heizung Heating Chauffage

V_f **6,3** V (i) I_f **0,2** Amp.

Einstellung Adjustment Utilisation

I.	V _a	250	V	I _a	32	mA
	V _{g2}	250	V	I _{g2}	5	mA
	V _{g1}	18	V	R _k	485	Ω
	R _i	70.000	Ω	R _a	8000	Ω
	V _{ieff}	10	V	W _o	3,6	W (K --- 10%)
	V _{ieff}	0,9	V	W _o	0,05	W
	S	2,8	mA/V			
II.	V _a	200	V	I _a	25	mA
	V _{g2}	200	V	I _{g2}	4	mA
	V _{g1}	14	V	R _k	480	Ω
	R _i	70.000	Ω	R _a	8000	Ω
	V _{ieff}	8,5	V	W _o	2,3	W (K --- 10%)
	V _{ieff}	1	V	W _o	0,05	W

Gegentaktschaltung Push-pull service Service en push-pull

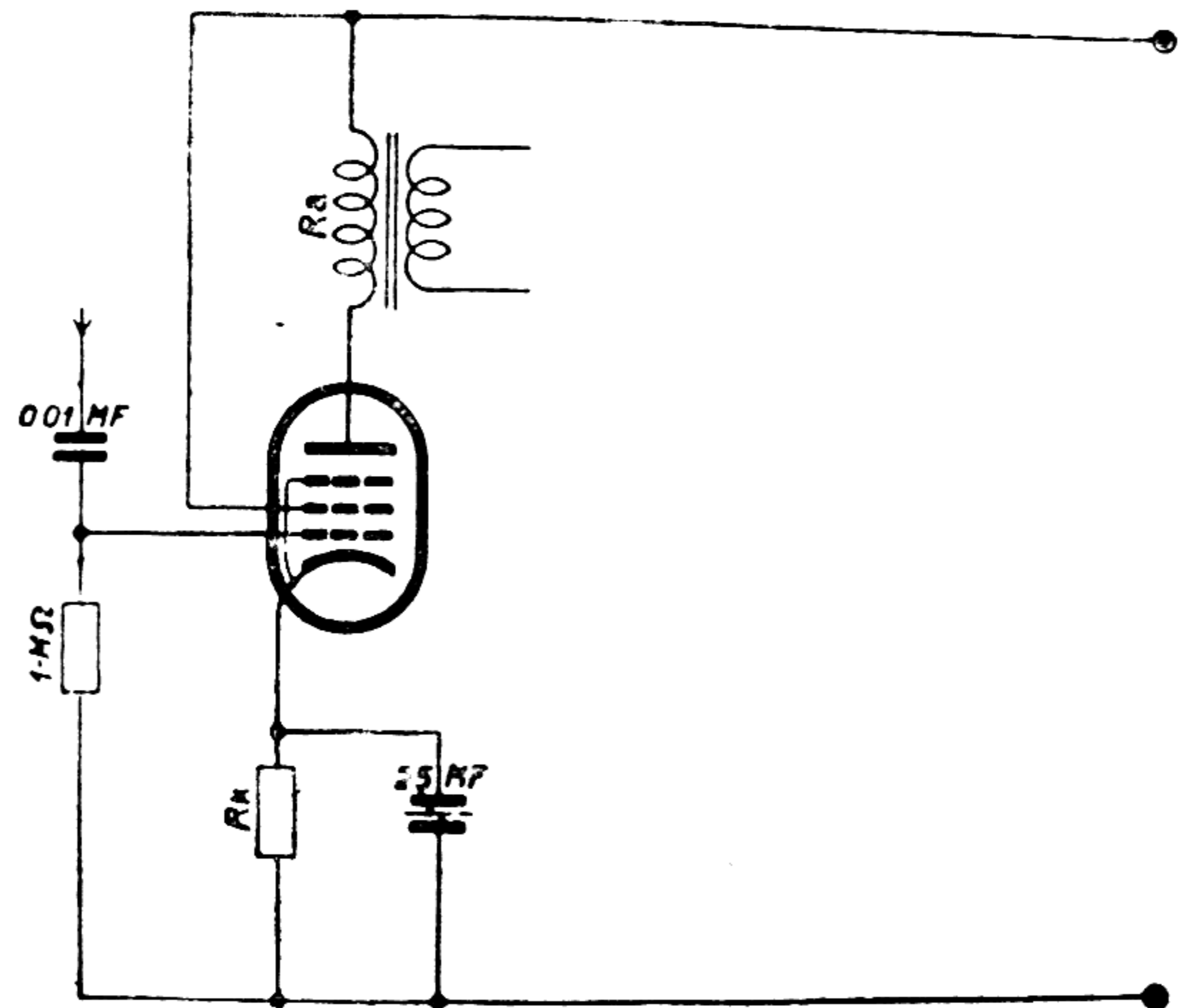
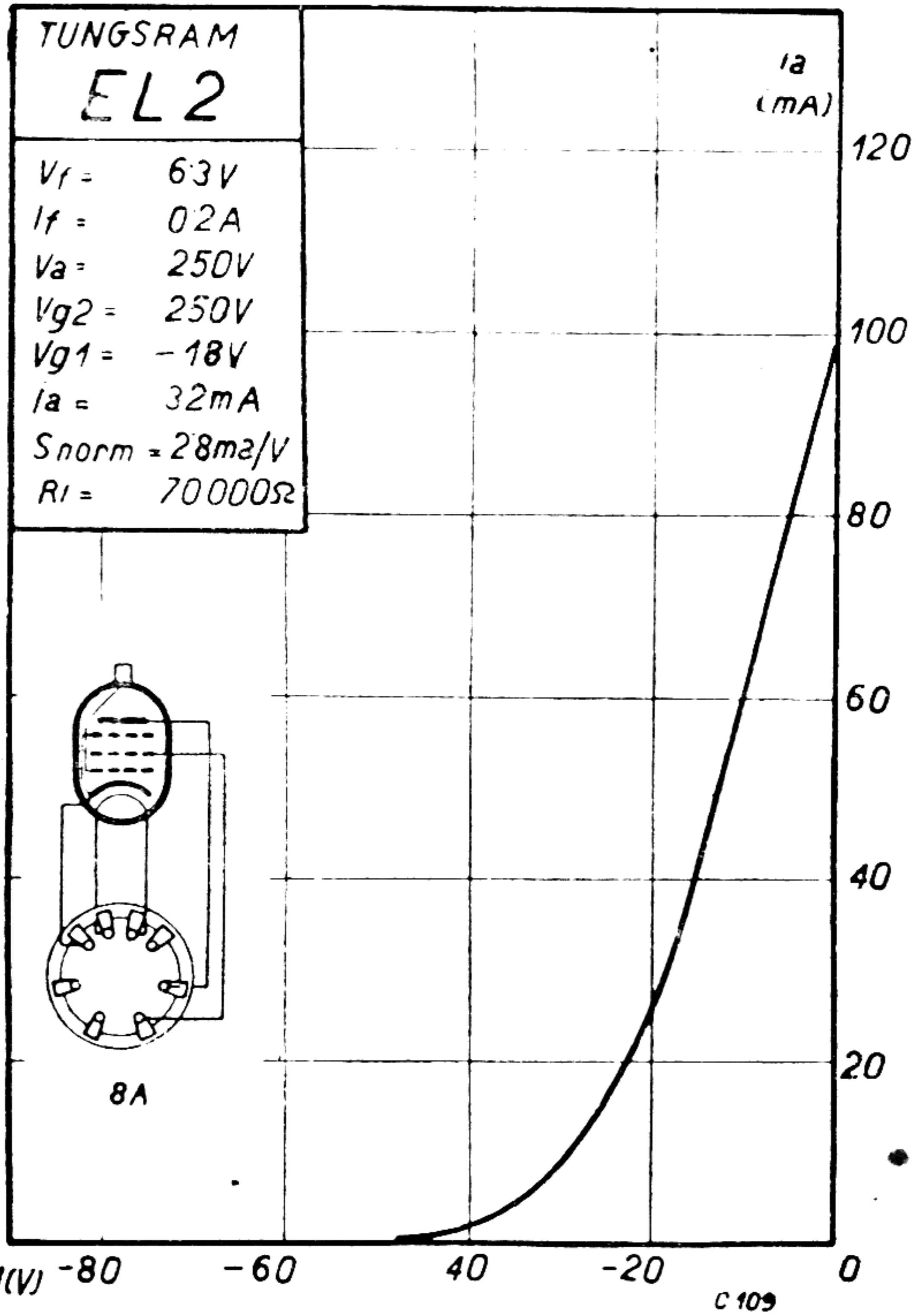
I.	V _a	250	V	I _a	2 × 27,5	mA
	V _{g2}	250	V	I _{g2}	2 × 3,5	mA
	R _k	300	Ω	R _{aa}	8.000	Ω
	W _o	8	W	K	1,5	%
II.	V _a	200	V	I _a	2 × 27,5	mA
	V _{g2}	200	V	I _{g2}	2 × 4,5	mA
	R _k	320	Ω	R _{aa}	9.000	Ω
	W _o	5	W	K	1,4	%

Grenzdaten Limit ratings Limites fixées

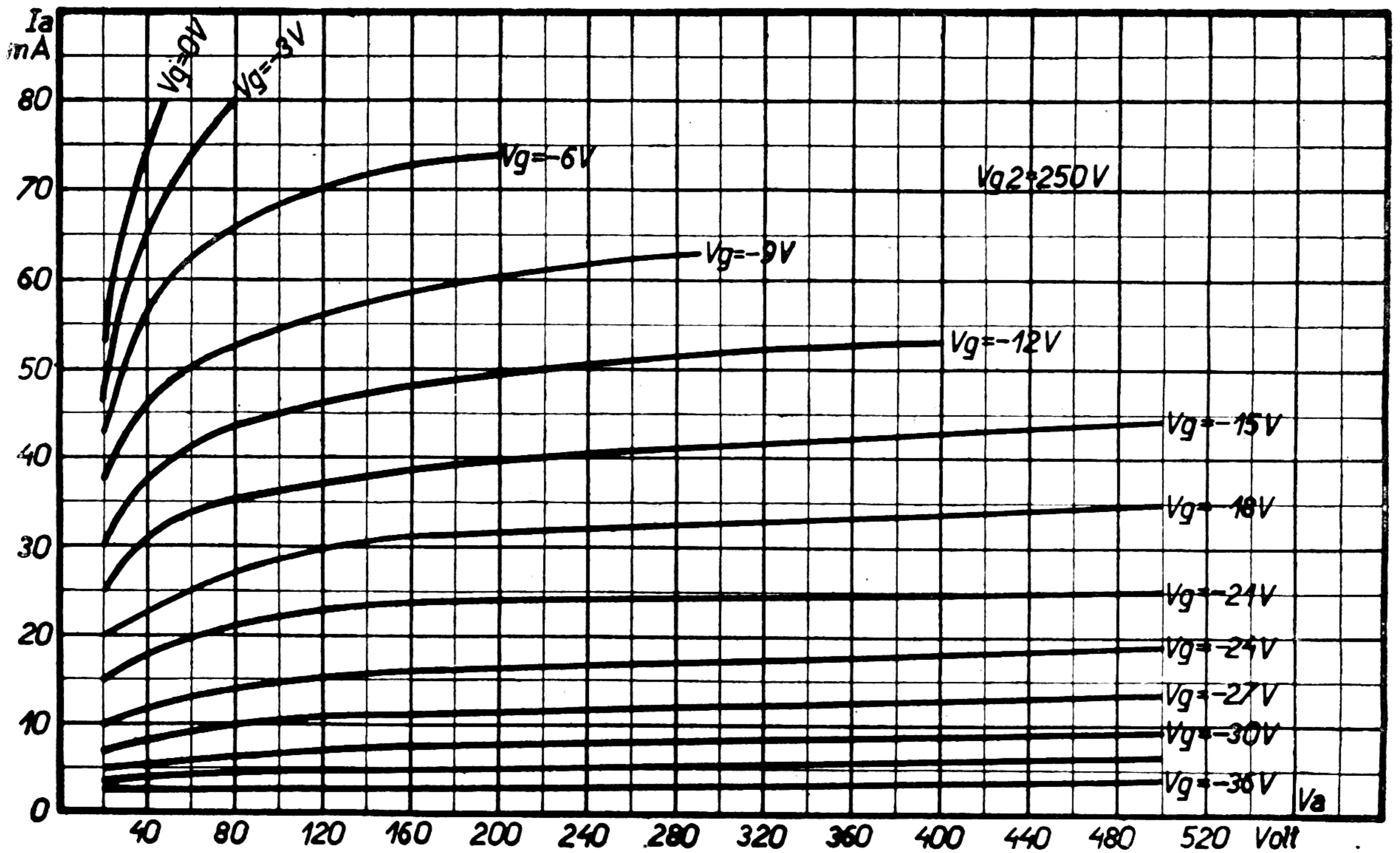
V _{ao} max	550	V	V _a max	250	V	W _a max	8	W
V _{g2o} max	550	V	V _{g2} max	250	V	W _{g2} max	1,6	W
R _{g1} max	1	MΩ	I _k max	45	mA			
R _{fk} max	5000	Ω	V _{fk} max	50	V			

Kapazitäten Capacities Capacités

C_{ag1} < **0,6** pF



Schaltungsbeispiel
Circuit diagram
Schema de principe





EL 3 PENTHODE

Heizung

Heating

Chauffage

V_f	6,3 V (i)	I_f	0,9 Amp.
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Einstellung

Adjustment

Utilisation

V_a	250 V	I_a	36 mA
V_{g2}	250 V	I_{g2}	4 mA
V_{g1}	— 6 V	R_k	150 Ω
R_i	50.000 Ω	R_a	7.000 Ω
V_{ieff}	4,2 V	W_o	4,5 W (K = 10^{0/0})
V_{ieff}	0,33 V	W_o	0,05 W
S	9 mA/V		

Gegentaktschaltung

Push-pull service

Service en push-pull

V_a	250 V	I_a	2 × 24 mA
V_{g2}	250 V	I_{g2}	2 × 2,8 mA
R_{aa}	10.000 Ω	R_k	140 Ω
W_o	8,2 W	K	3,1 %

Grenzdaten

Limit ratings

Limites fixées

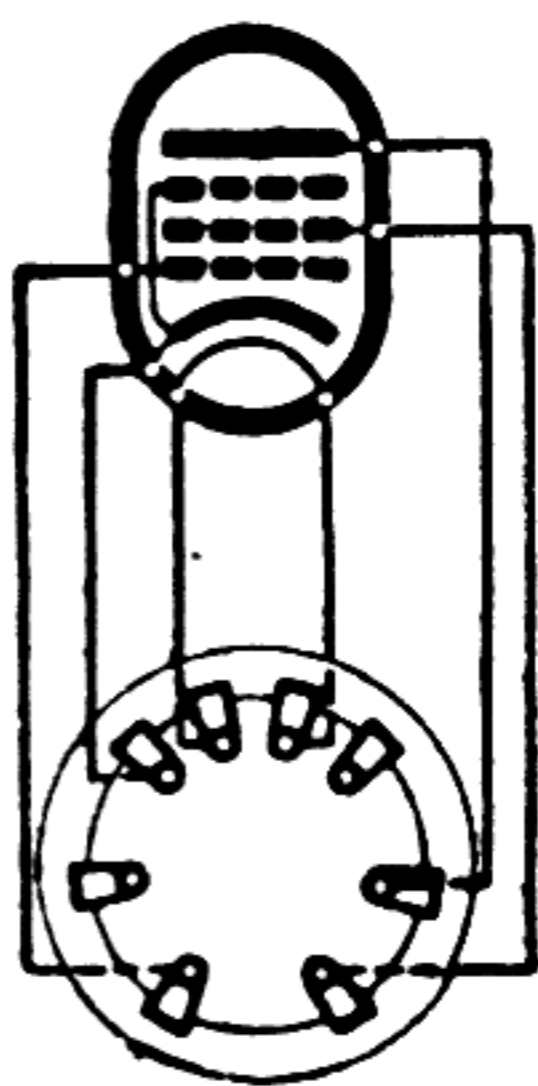
V_{ao} max	550 V	V_a max	250 V	W_a max	9 W
V_{g2o} max	550 V	V_{g2} max	275 V	W_{g2} max	1,2 W
R_{g1} max	1 MΩ	R_{fk} max	5.000 Ω	V_{fk} max	50 V
I_k max	55 mA				

Kapazitäten

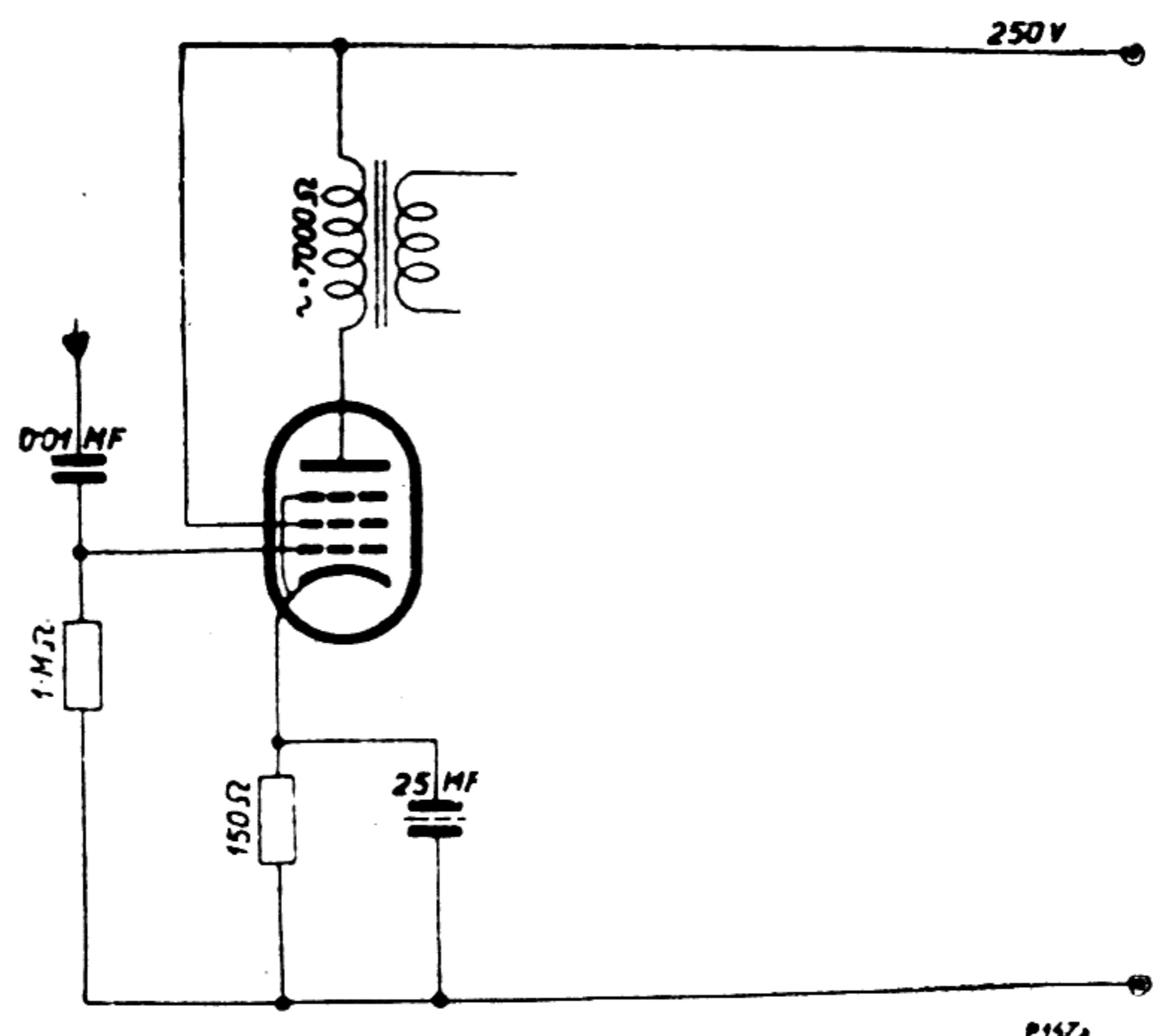
Capacities

Capacités

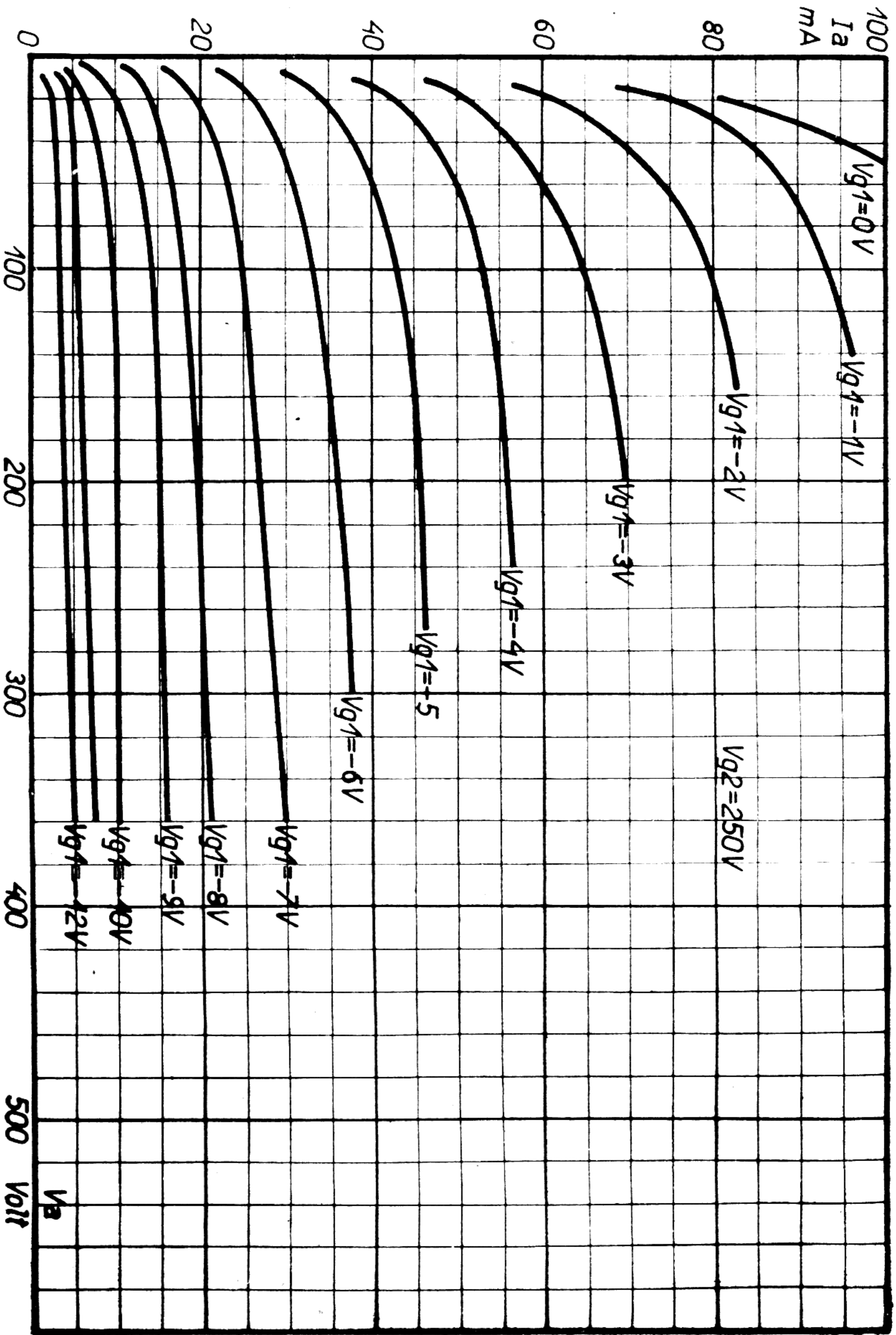
$C(a/g1) < 0,8 \text{ pF}$



Sockelschaltung
Base connections
Connexions du culot



Schaltungsbeispiel
Circuit diagram
Schema de principe



EL 3 — V_a/I_a



EL 5 PENTHODE

**Heizung
Heating
Chauffage**

Vf **6,3 V (i)** If **1,35 Amp.**

**Einstellung
Adjustment
Utilisation**

Va 250 V	Ia 72 mA
Vg2 275 V	Ig2 7 mA
Vg1 - 14 V	Rk 175 Ω
Ri 22.000 Ω	Ra 3.500 Ω
Vieff 9,1 V	Wo 8,8 W (K = 100%)
Vieff 0,5 V	Wo 0,05 W
S 8,5 mA/V	

**Gegentaktschaltung
Push-pull service
Service en push-pull**

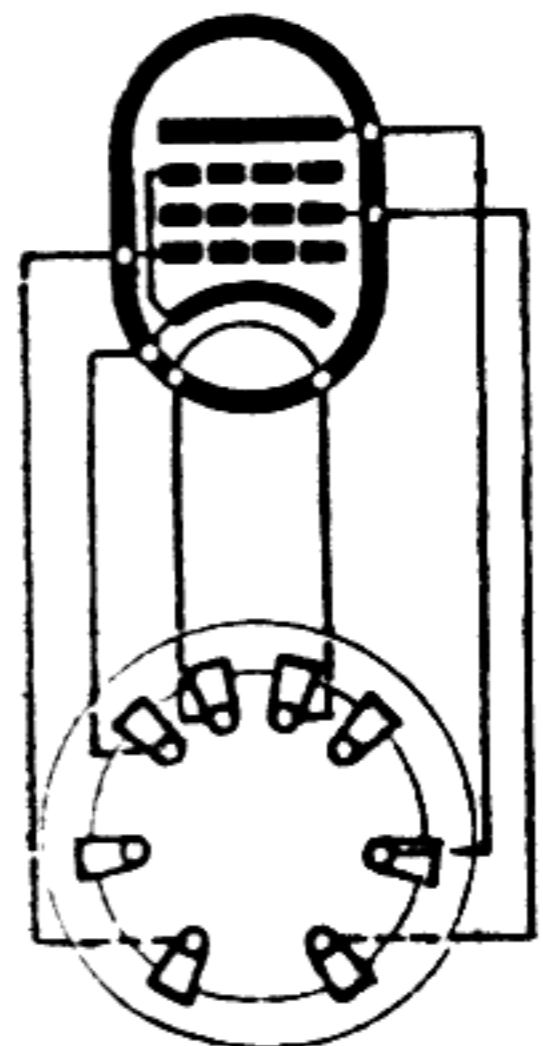
Va 250 V	Ia 2 × 58 mA
Vg2 275 V	Ig2 2 × 6,5 mA
Rk 120 Ω	Raa 4.500 Ω
Wo 19,5 W	K 5,1 %

**Grenzdaten
Limit ratings
Limites fixées**

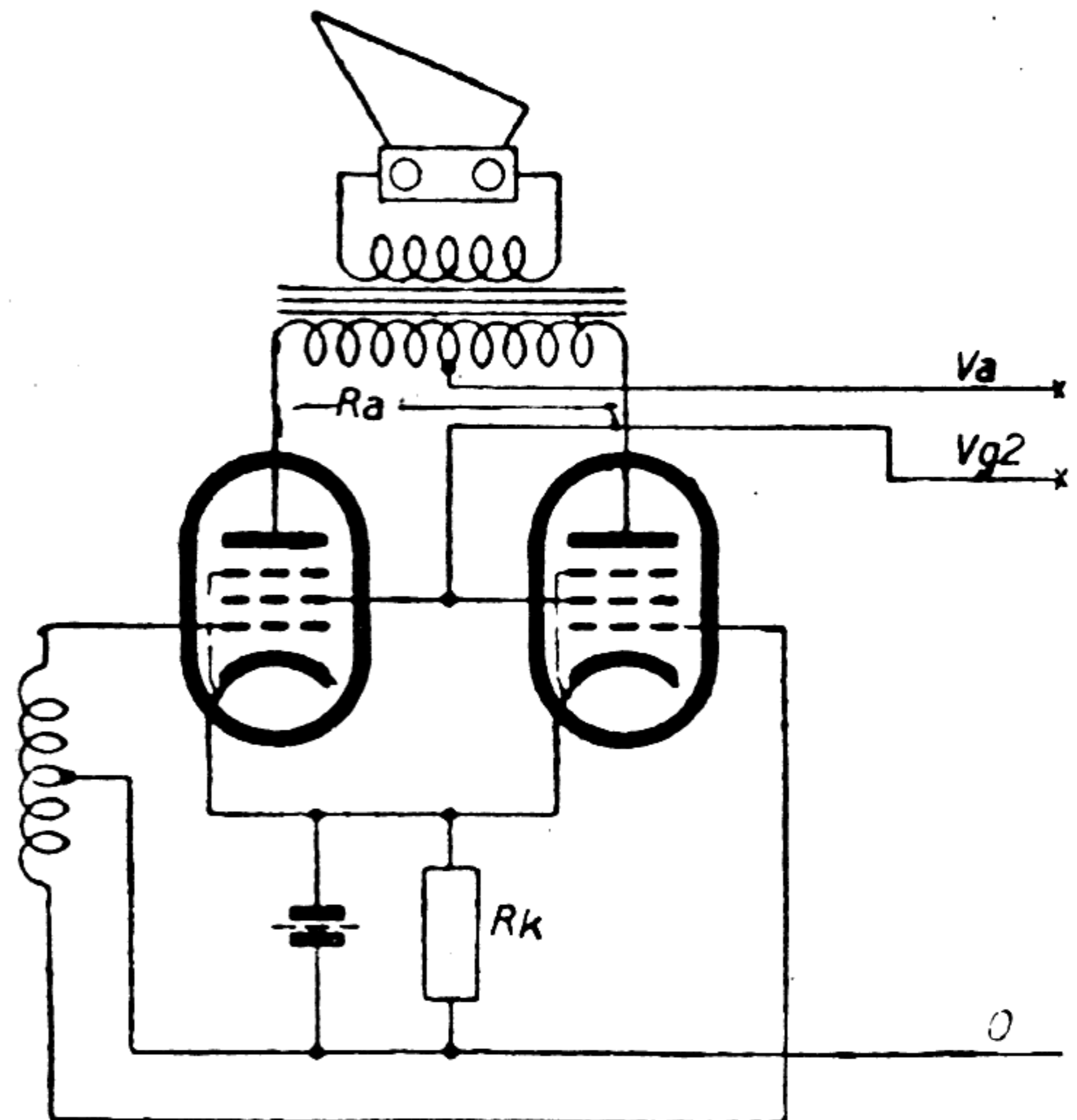
Vao max 550 V	Va max 250 V	Wa max 18 W
Vgko max 550 V	Vg2 max 275 V	Wg2 max 3 W
Rg1 max 0,7 MΩ	Vfk max 50 V	Rfk max 5.000 Ω
Ik max 90 mA		

**Kapazitäten
Capacities
Capacités**

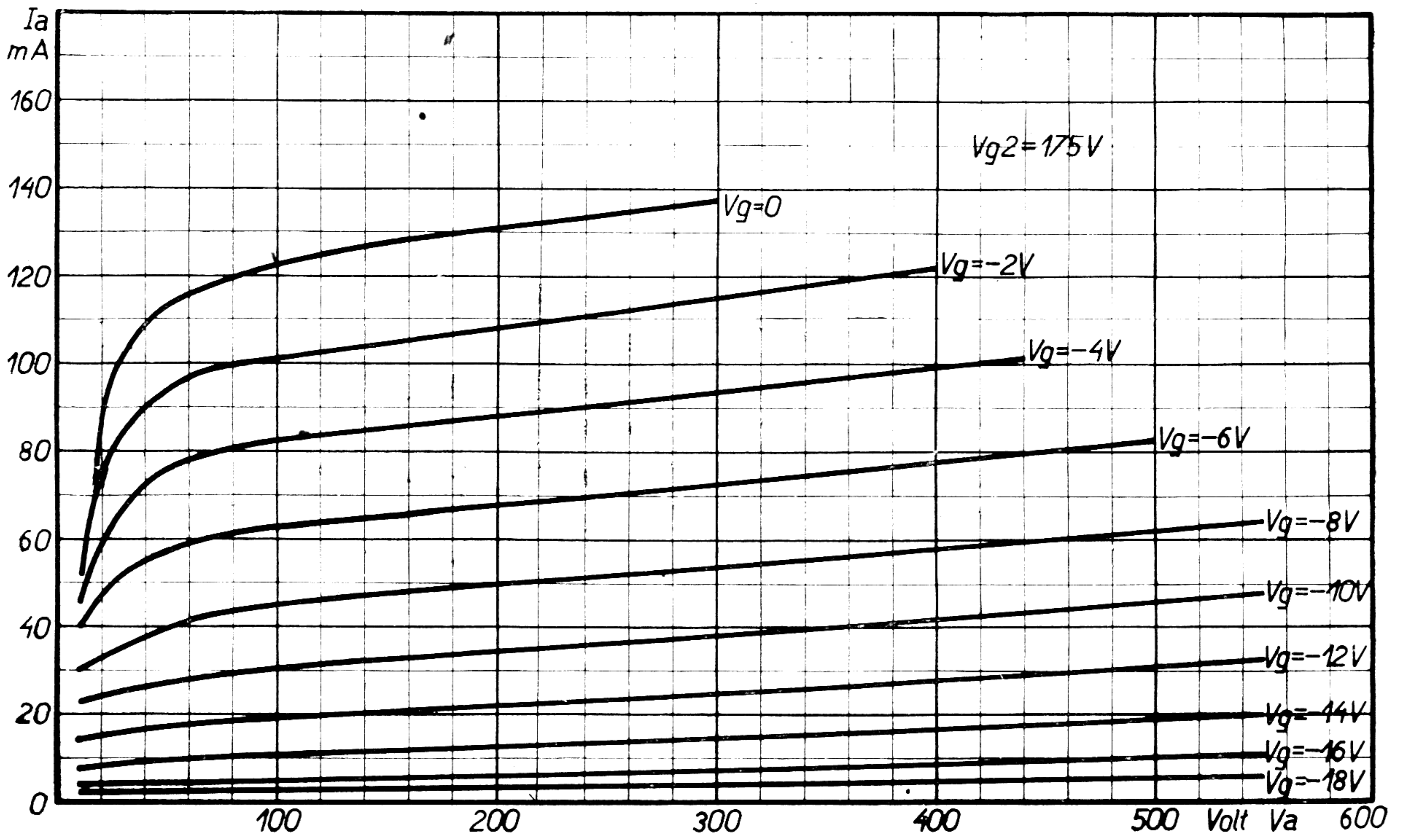
C (a/g1) < **0,8 pF**



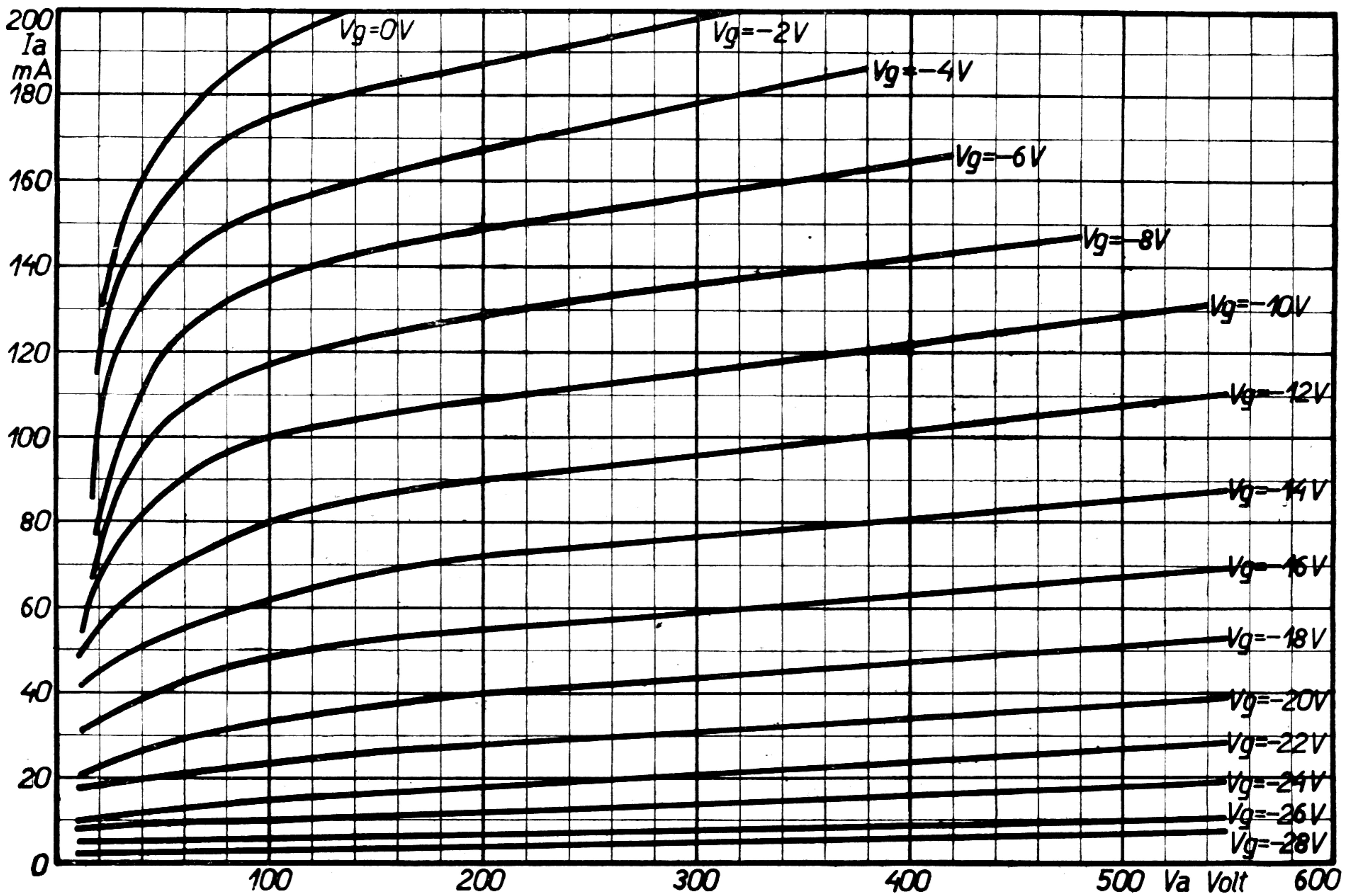
**Sockelschaltung
Base connections
Connexions du culot**



**Schaltungsbeispiel
Circuit diagram
Schema de principe**



EL 5; $V_{g2} = 175$ V



EL 5; $V_{g2} = 275$ V



EL 6 PENTHODE

Heizung

Heating

Chauffage

$V_f = 6,3 \text{ V (i)}$ $I_f = 1,3 \text{ Amp.}$

Einstellung

Adjustment

Utilisation

V_a	$=$	250	V	I_a	$=$	72	mA
V_{g2}	$=$	250	V	I_{g2}	$=$	8	mA
V_{g1}	$=$	— 7	V	R_k	$=$	90	Ω
R_i	$=$	20.000	Ω	R_a	$=$	3.500	Ω
V_{ieff}	$=$	4,8	V	W_o	$=$	8,2	W (K = 10%)
V_{ieff}	$=$	0,3	V	W_o	$=$	0,05	W
S	$=$	14,5	mA/V				

Gegentaktschaltung

Push-pull service

Service en push-pull

V_a	$=$	250	V	I_a	$=$	2 × 45	mA
V_{g2}	$=$	250	V	I_{g2}	$=$	2 × 5,1	mA
R_k	$=$	90	Ω	R_{aa}	$=$	5.000	Ω
W_o	$=$	14,5	W	K	$=$	10	%

Grenzdaten

Limit ratings

Limites fixées

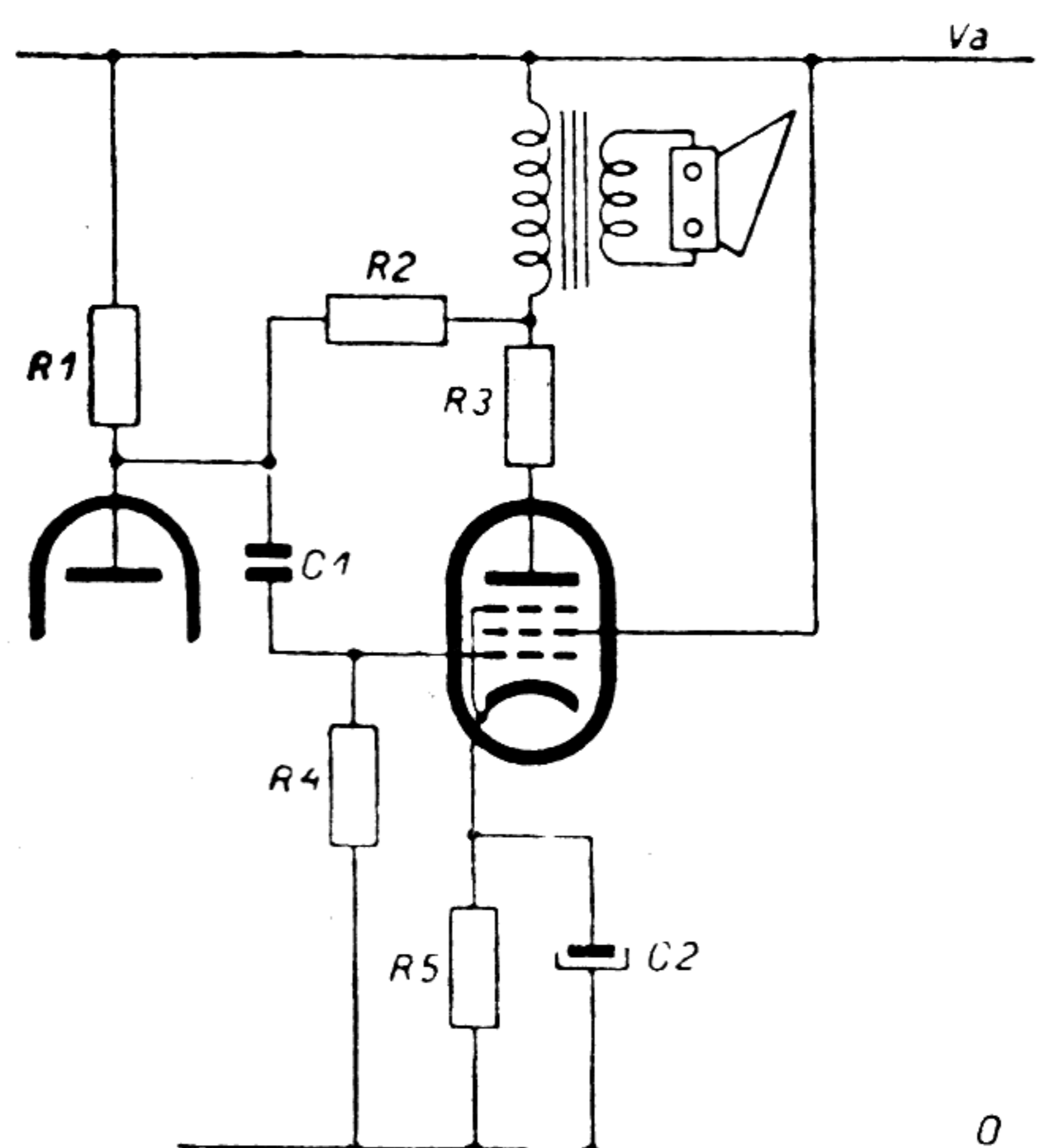
$V_{ao \text{ max}}$	$=$	550	V	$V_a \text{ max}$	$=$	250	V	$W_a \text{ max}$	$=$	18	W
$V_{g2o \text{ max}}$	$=$	550	V	$gV2 \text{ max}$	$=$	275	V	$W_{g2 \text{ max}}$	$=$	3	W
$R_{g1 \text{ max}}$	$=$	0,7	M Ω	$R_{fk \text{ max}}$	$=$	5.000	Ω	$V_{fk \text{ max}}$	$=$	50	V
$I_k \text{ max}$	$=$	90	mA								

Kapazitäten

Capacities

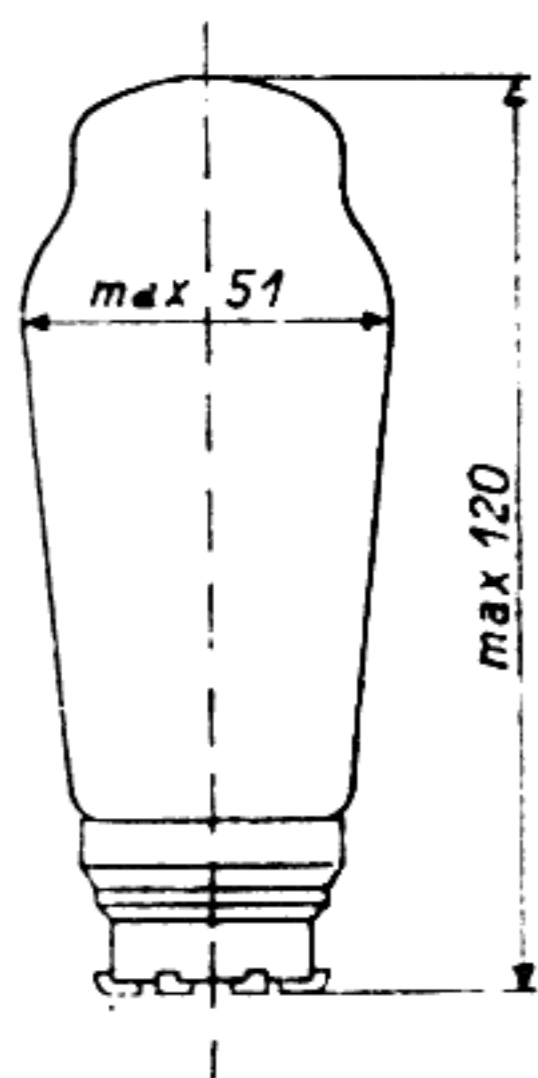
Capacités

$C (a/g1) < 0,7 \text{ pF}$

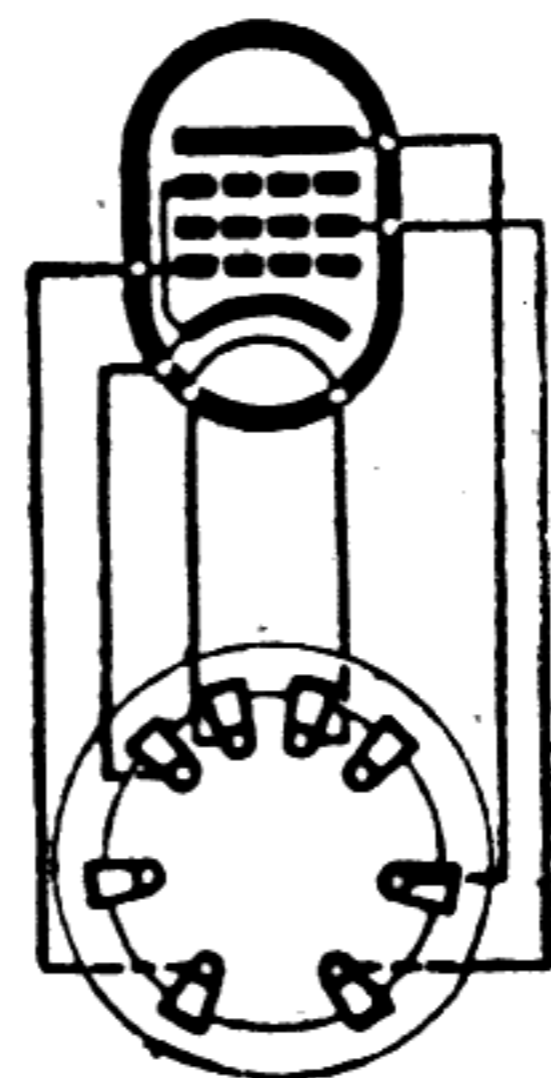


Schaltungsbeispiel
Circuit diagram
Schema de principe

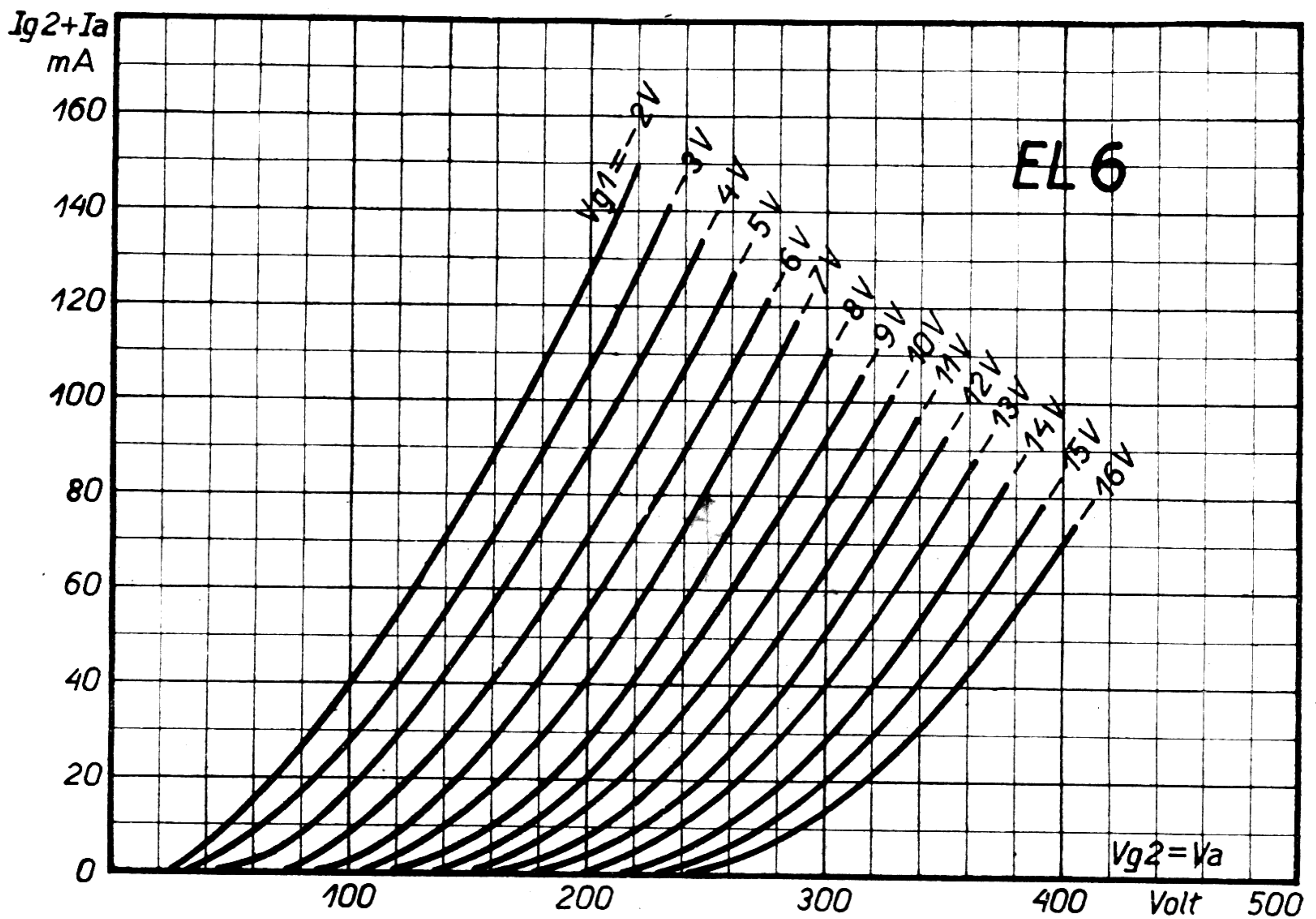
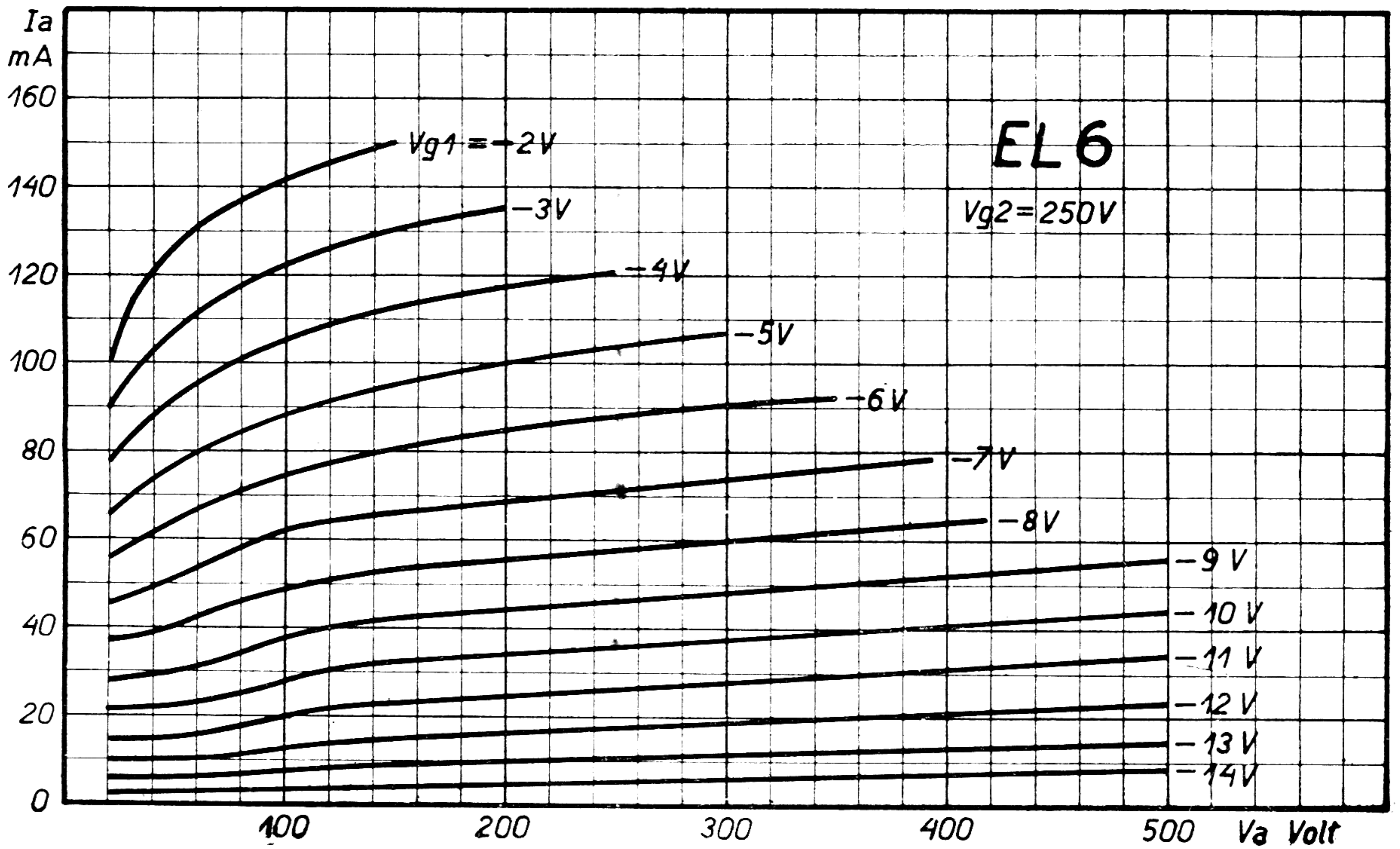
R_1	$=$	0,15	M Ω	C_1	$=$	10.000	pF
R_2	$=$	1	M Ω	C_2	$=$	25	μ F
R_3	$=$	50	Ω				
R_4	$=$	1	M Ω				
R_5	$=$	90	Ω				



Abmessungen
Dimensions



Sockelschaltung
Base connections
Connexions du culot





EL 11

ENDPENTHODE — POWER PENTODE — PENTODE DE SORTIE

**Heizung
Heating
Chauffage**

V_f 6,3 V (i)

I_f 0,9 Amp.

**Einstellung
Adjustment
Utilisation**

V_a 250 V
 V_{g2} 250 V
 V_{g1} — 6 V

I_a 36 mA
 I_{g2} 4 mA
 R_k 150 Ω

**Betriebsdaten
Operating Conditions
Caracteristiques de service**

S 9 mA/V
 R_a 7000 Ω
 V_i 0,33 V_{eff}

R_i 50.000 Ω
 W_o 4,5 Watt
(W_o 0,05 Watt)

$D_{g2 g1}$ 4%
 k 100%

**Gegentaktschaltung
Push-pull service
Service en push-pull**

V_a 250 V
 V_{g2} 250 V
 R_k 140 Ω
 R_{aa} 10,000 Ω

W_o 8,2 Watt

I_a 2 × 25 mA
 I_{g2} 2 × 2,8 mA
 k 50%

**Grenzdaten
Limit ratings
Limites fixées**

$V_{ao max}$ 550 V
 $V_{g2o max}$ 550 V

$V_a max$ 250 V
 $V_{g2 max}$ 275 V

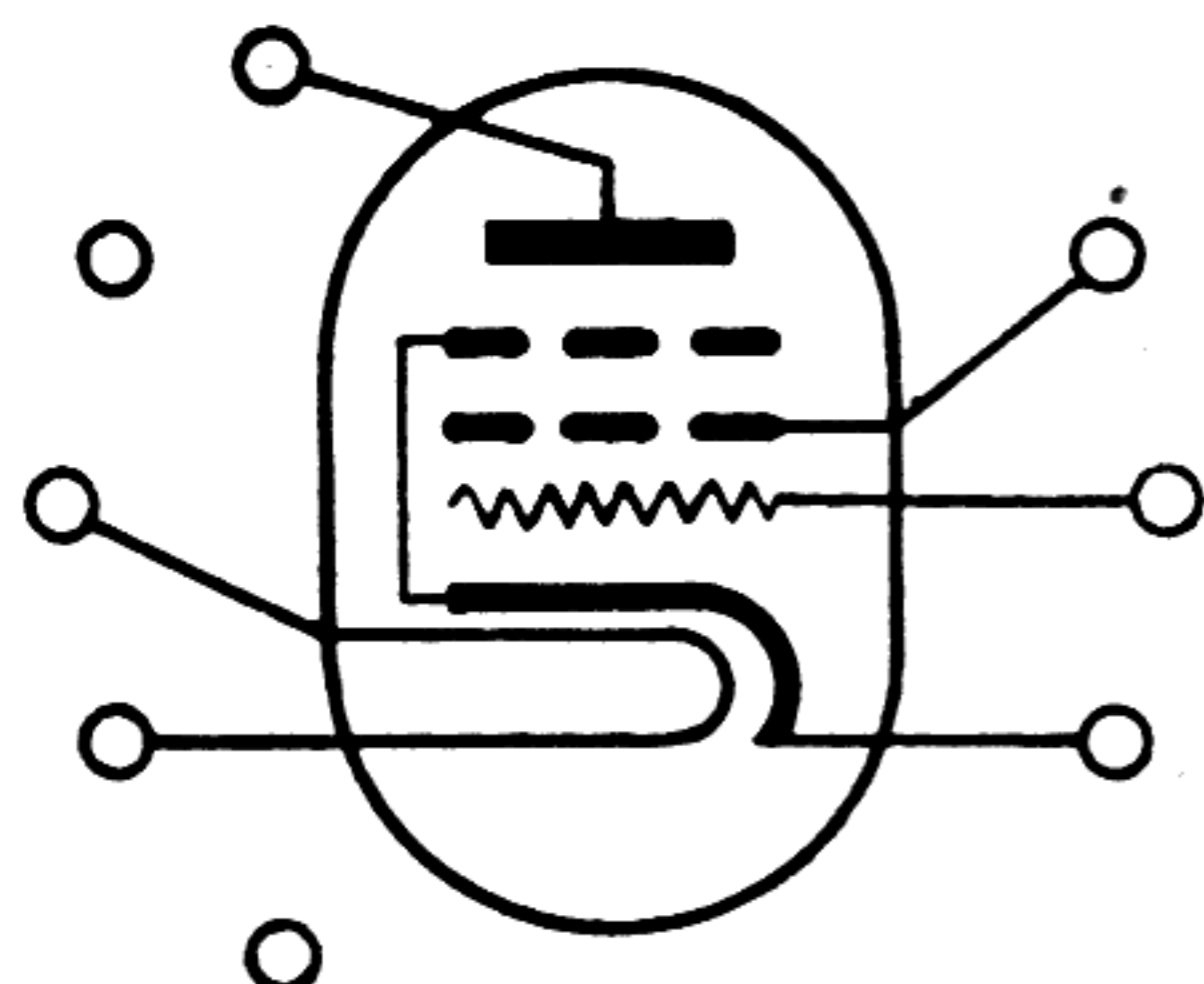
$W_a max$ 9 Watt
 $W_{g2 max}$ 1,2 Watt ($W_o = 0$)
2,5 Watt ($W_o = max$)

$I_k max$ 55 mA
 $V_{fk max}$ 50 V

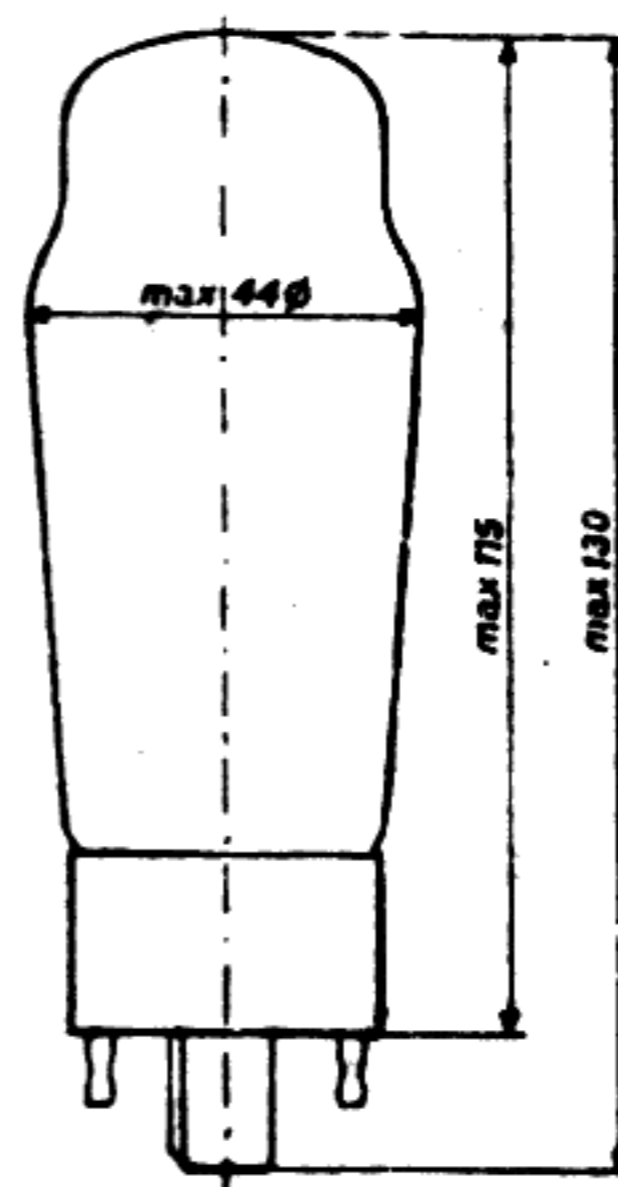
$R_{g1a max}$ 1 $M\Omega$
 $R_{fk max}$ 5000 Ω

**Kapazitäten
Capacities
Capacités**

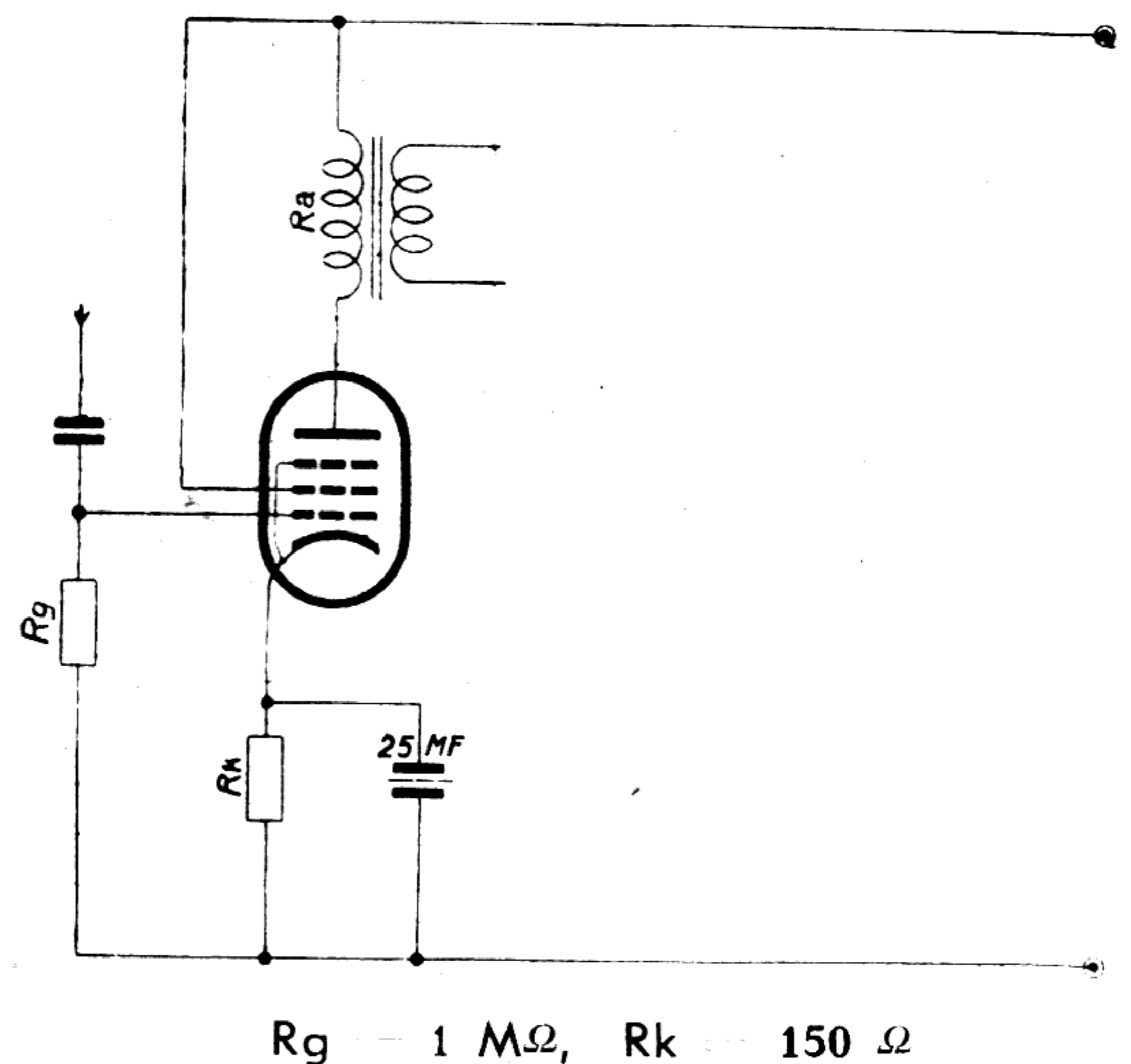
$C(a/g1) < 0,8$ pF

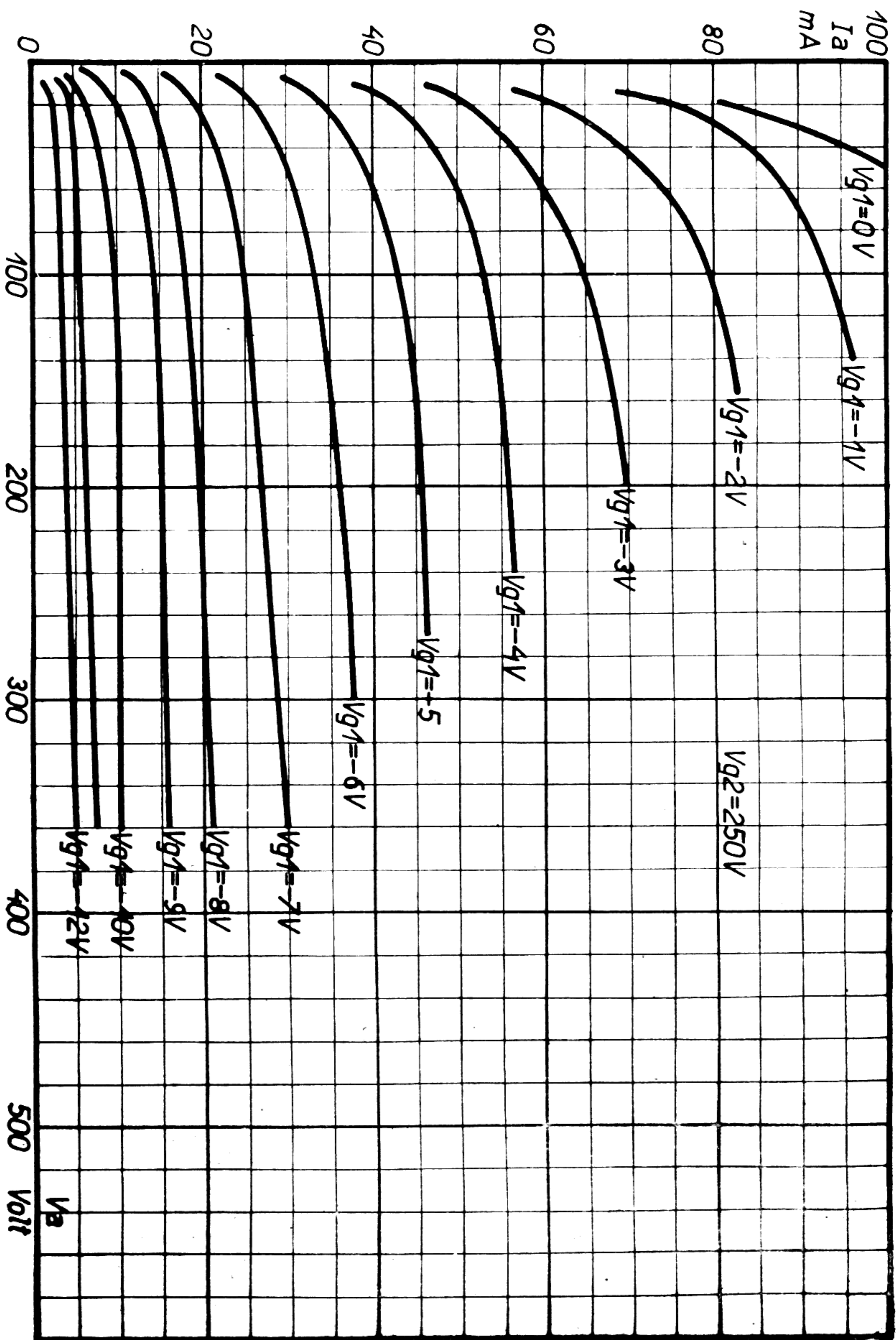


Sockelschaltung
Base connections
Connexions de culot



Abmessungen
Dimensions







ELL 1

GEGENTAKT PENTHODE — PUSH-PULL PENTODE PENTHODE PUSH-PULL

Heizung

Heating

Chauffage

Vf

6,3 V

If

0,45 Amp.

Einstellung

Adjustment

Utilisation

Va **250** V
 Vg2 **250** V
 Vg1 — **20** V
 Raa 16.000 Ω
 S 1,8 mA/V

Iao 2 × 15 mA
 Ig2o 2 × 2,5 mA
 Rk 600 Ω

Ia max 2 × 17,5 mA
 Ig2 max 2 × 5,8 mA
 Wo 4,5 W (K = 3,7%)

Grenzdaten

Limit ratings

Limites fixées

Vao max 550 V
 Vg2o max 550 V
 Rg1 max 1 MΩ
 Ik max 2 × 30 mA

Va max 250 V
 Vg2 max 275 V
 Vfk max 50 V

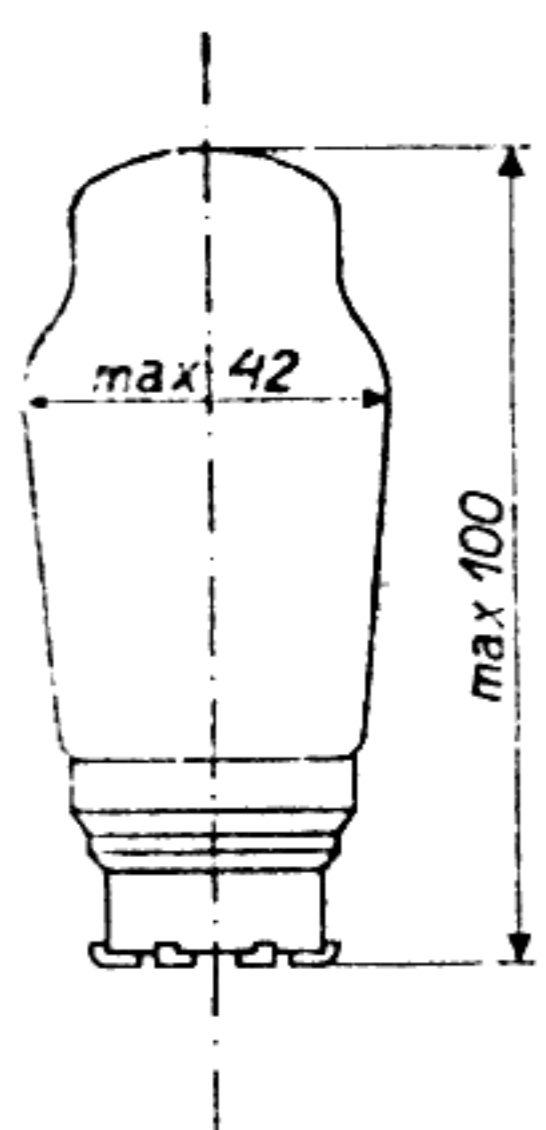
Wo max 4,5 W
 Wg2 max 1,5 W
 Rfk max 5.000 Ω

Kapazitäten

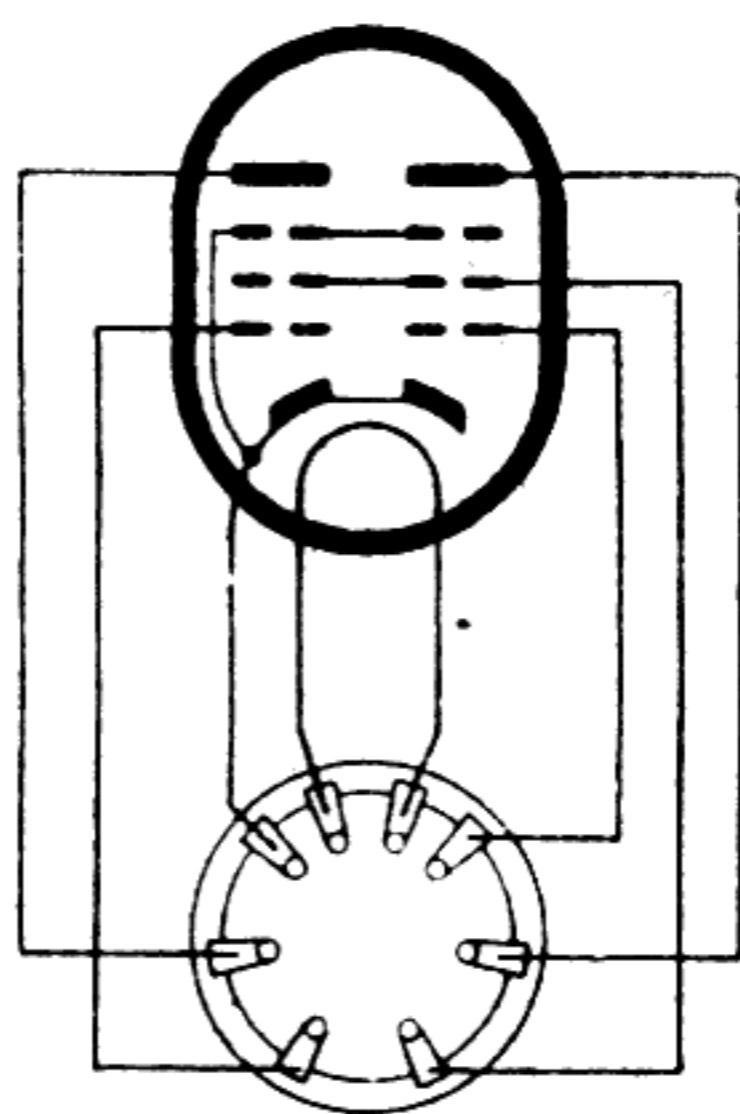
Capacities

Capacités

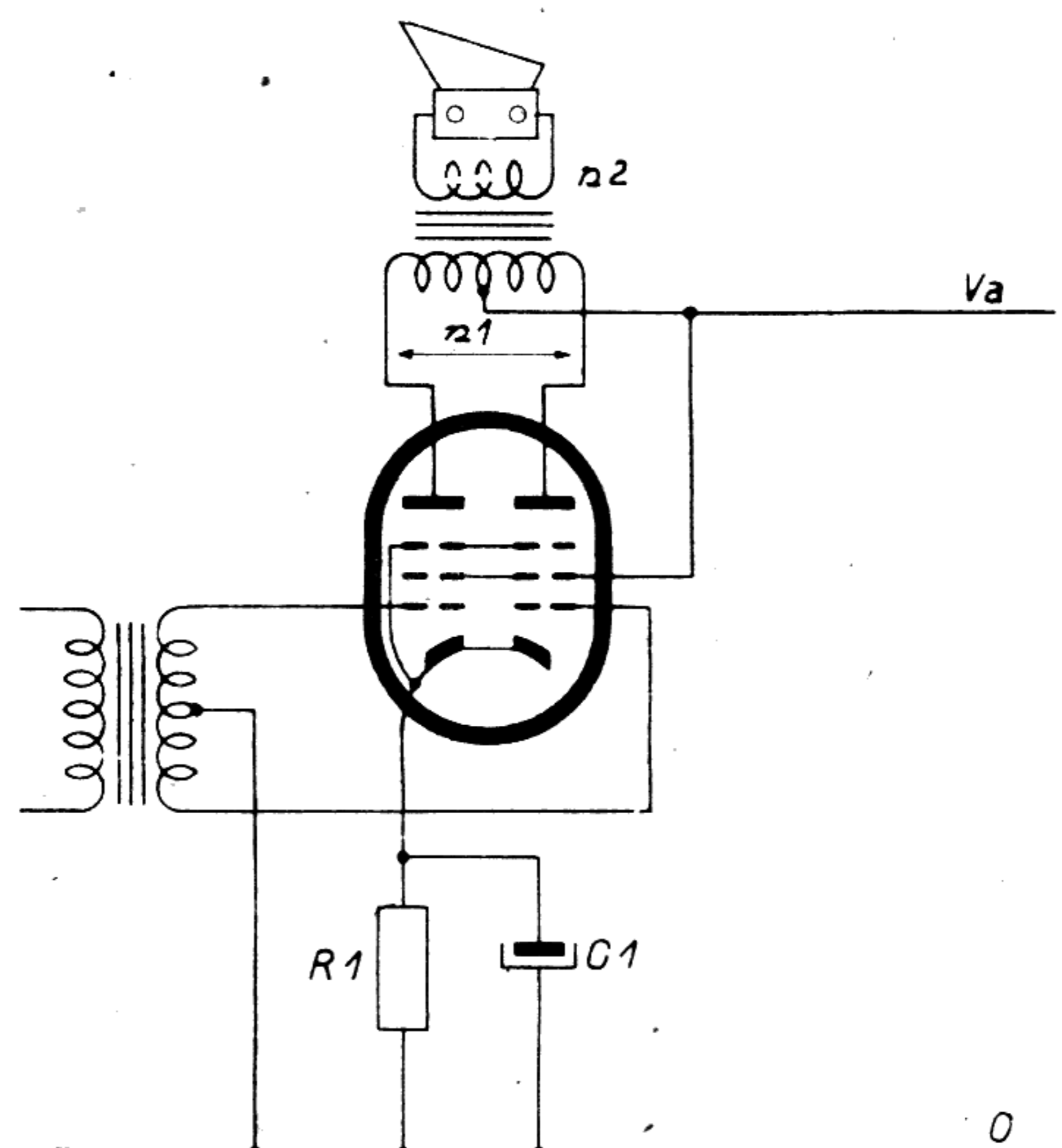
C (a/g1) < 2 pF



Abmessungen
Dimensions

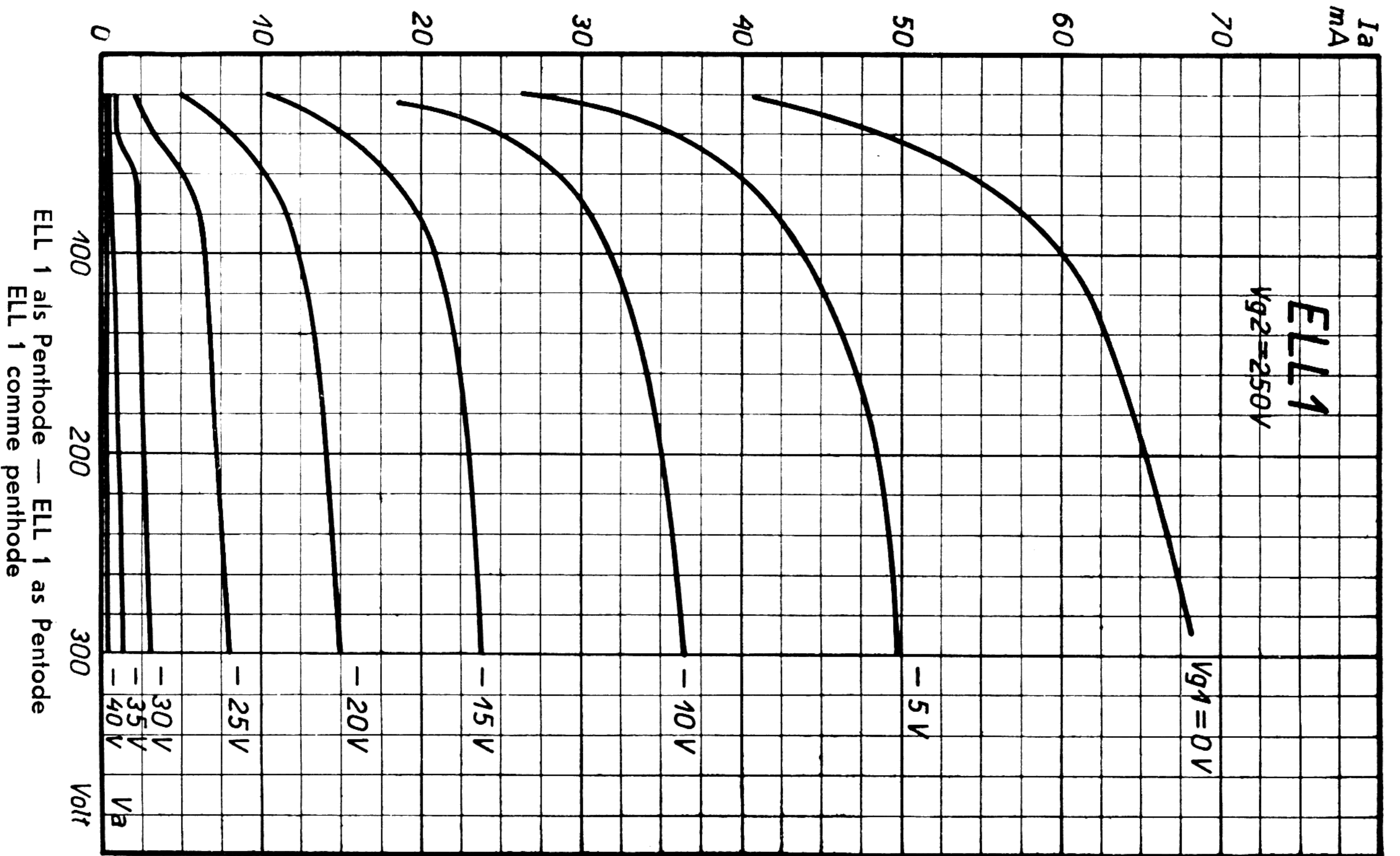


Sockelschaltung
Base connections
Connexions du culot

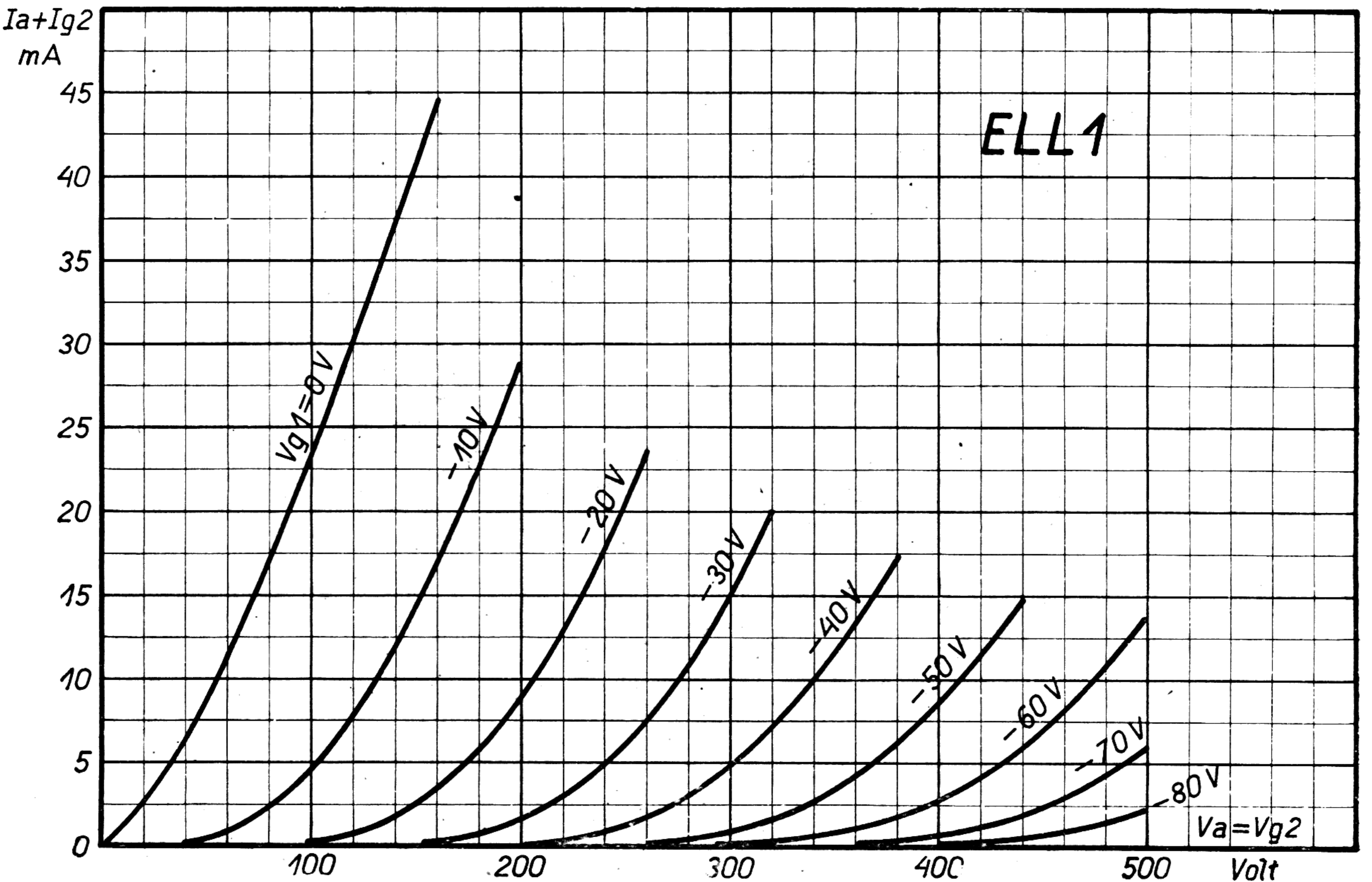


Schaltungsbeispiel
Circuit diagram
Schema de principe

R1 = 600 Ω



P378



ELL 1 als Triode — ELL 1 as Triode — ELL 1 comme triode



EM 1

ABSTIMMANZEIGER — TUNING INDICATOR INDICATRICE D'ACCORD

**Heizung
Heating
Chauffage**

Vf = **6,3 V**

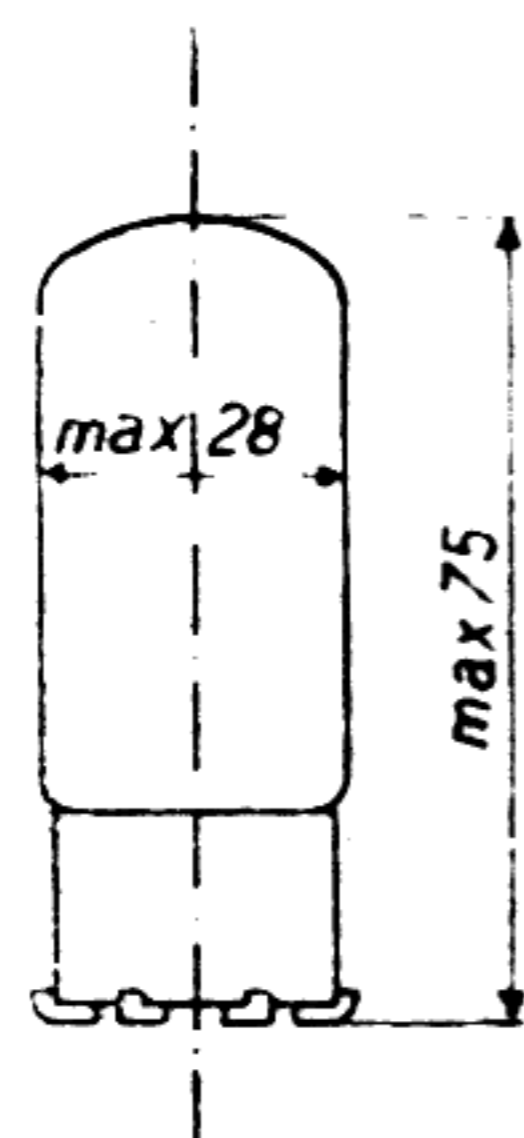
If = **0,2 A**

**Einstellung
Adjustment
Utilisation**

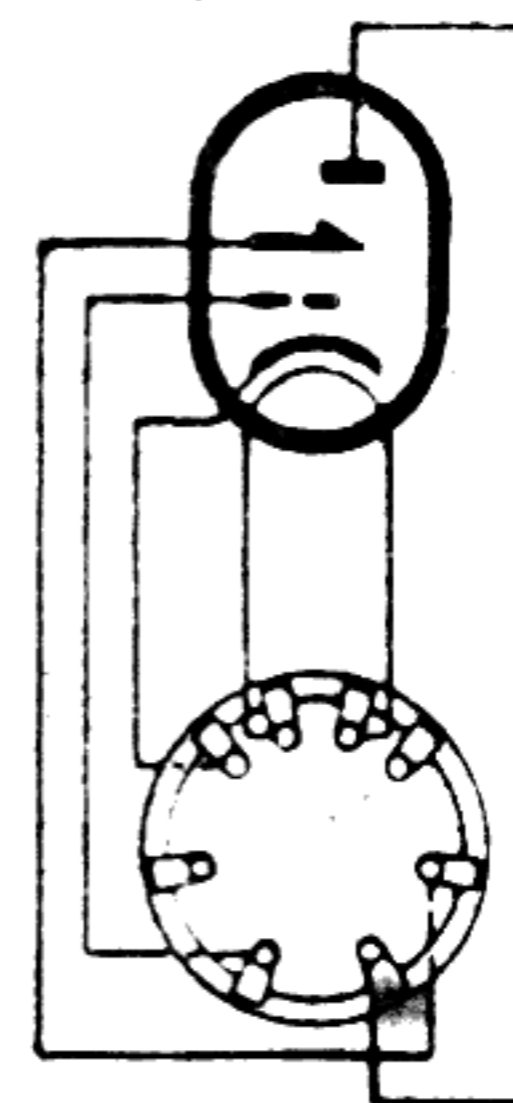
Va	=	250 V — Ra × Ia,	Ra	=	2 MΩ	Ia	=	0,1 mA
Vs	=	250 V				Is	=	0,5 mA
Vg	=	0 V				θ	=	20°
Vg	=	— 5 V				θ	=	90°

**Grenzdaten
Limit ratings
Limites fixées**

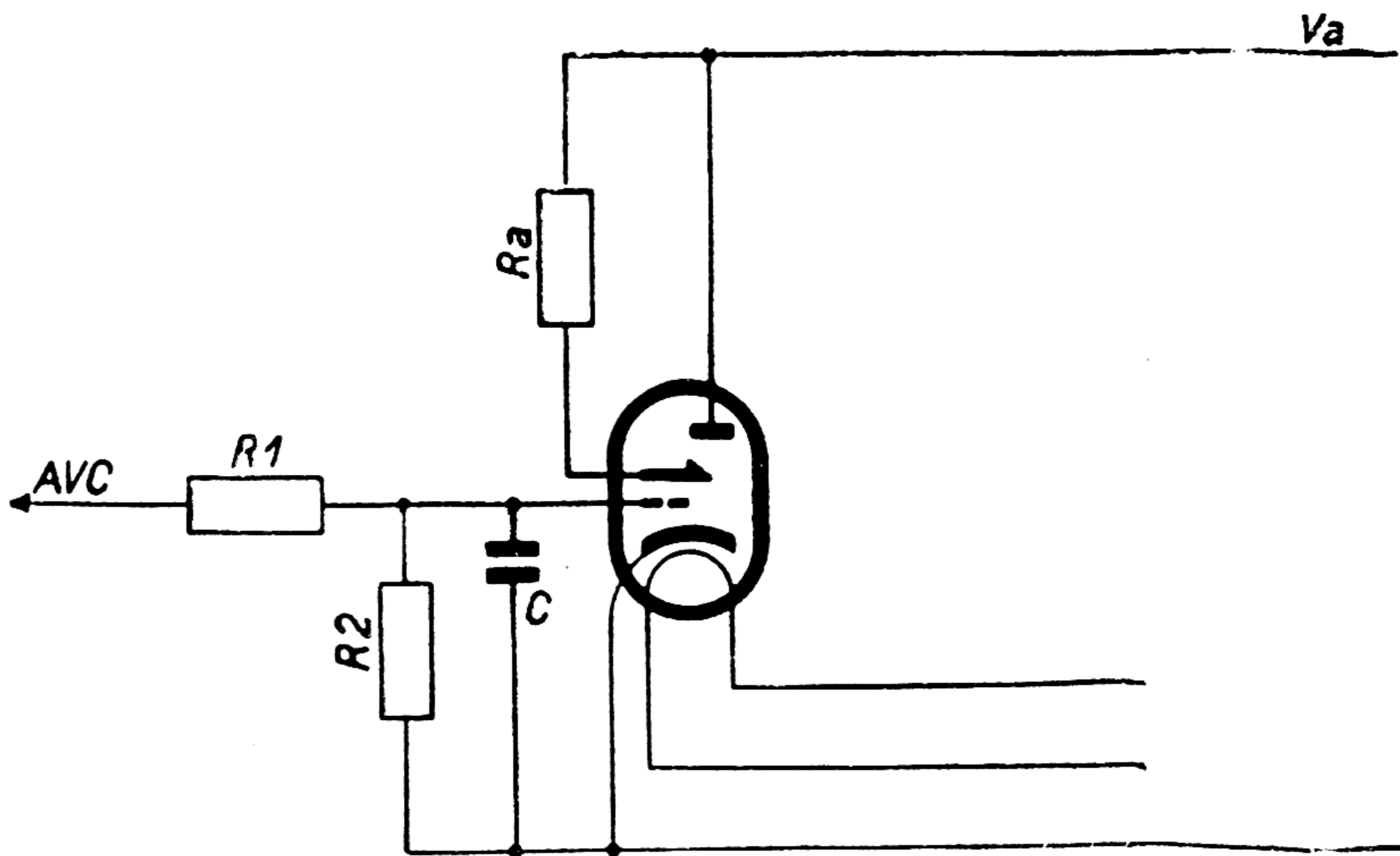
Vao max	=	550 V		Va max	=	250 V
Vfk max	=	100 V		Rfk max	=	5000 Ω
Rg max	=	3 MΩ		Vs max	=	250 V
Vs max	=	550 V				



**Abmessungen
Dimensions**

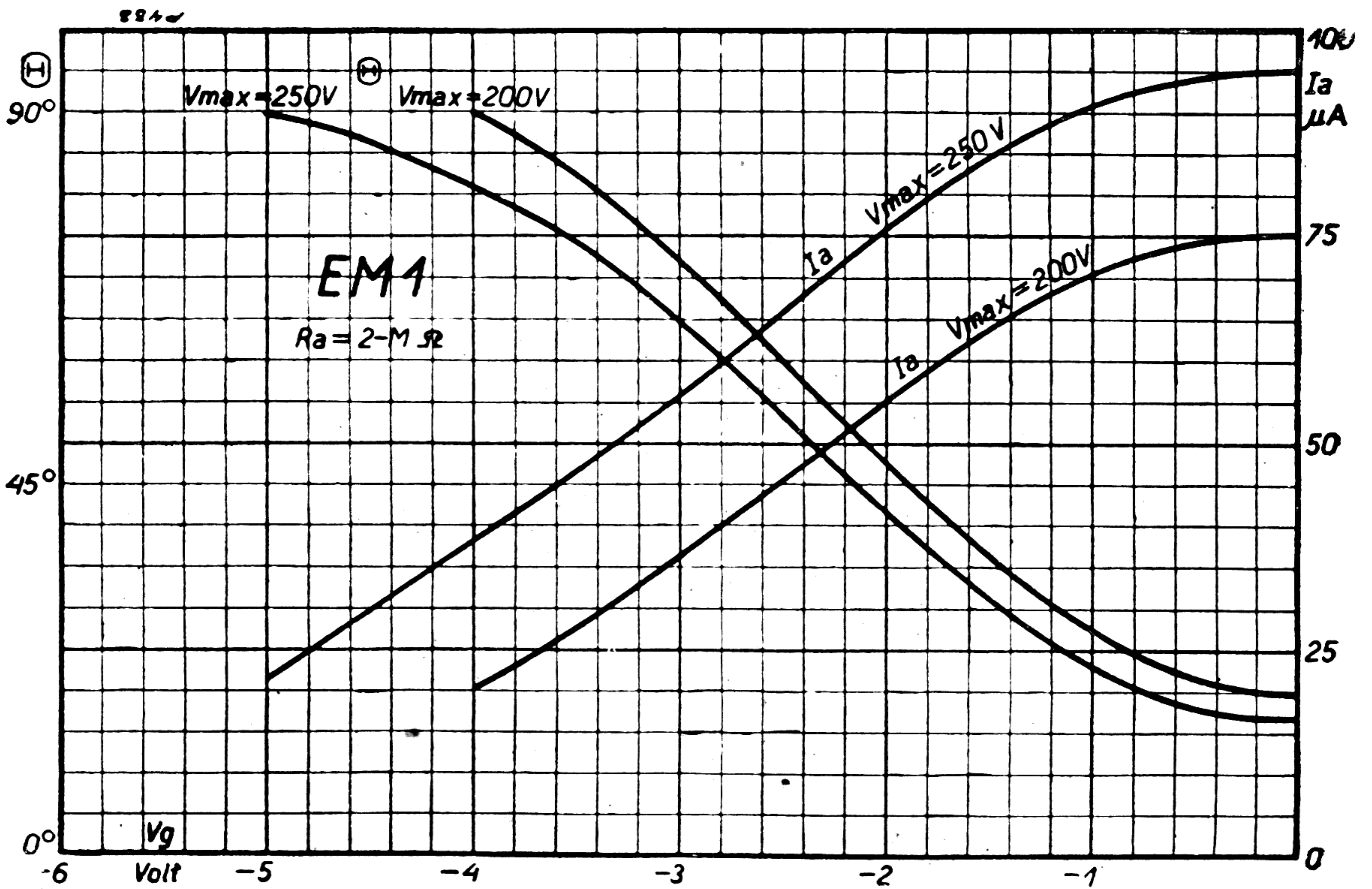


**Sockelschaltung
Base connections
Connexions du culot**



Schaltungsbeispiel
 Circuit diagram
 Schema de principe

- | | | | | | |
|----------------|-----|------|---|-----|--------|
| R ₁ | --- | 1 MΩ | C | --- | 100 pF |
| R ₂ | --- | 3 MΩ | | | |
| R _a | --- | 2 MΩ | | | |





EM 4

ZWEIFACHER ABSTIMMANZEIGER — DOUBLE TUNING INDICATOR INDICATRICE D'ACCORD DOUBLE

Heizung
Heating
Chauffage

Vf = 6,3 (i)

If = 0,2 Amp.

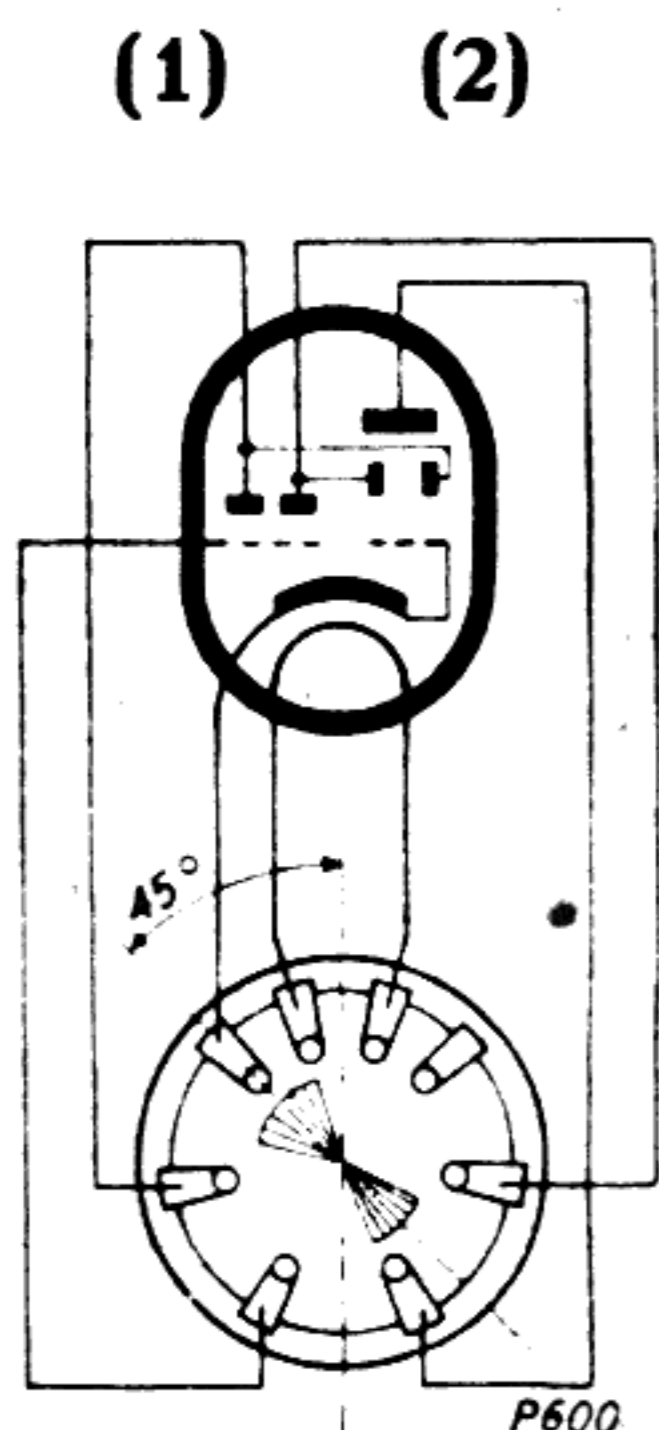
Einstellung
Adjustment
Utilisation

Va	100	200	250	V
Ra1 Ra2	1	1	1	MΩ
Vg	0 — 2,5 — 8	0 — 4,2 — 12,5	0 — 5 — 16	V
IL	0,18 0,3 0,4	0,8 1,2 1,4	1,2 1,75 2	mA
θ1	90° 0°	90° 5°	90° 5°	
θ2	90° 0°	90° 5°	90° 5°	

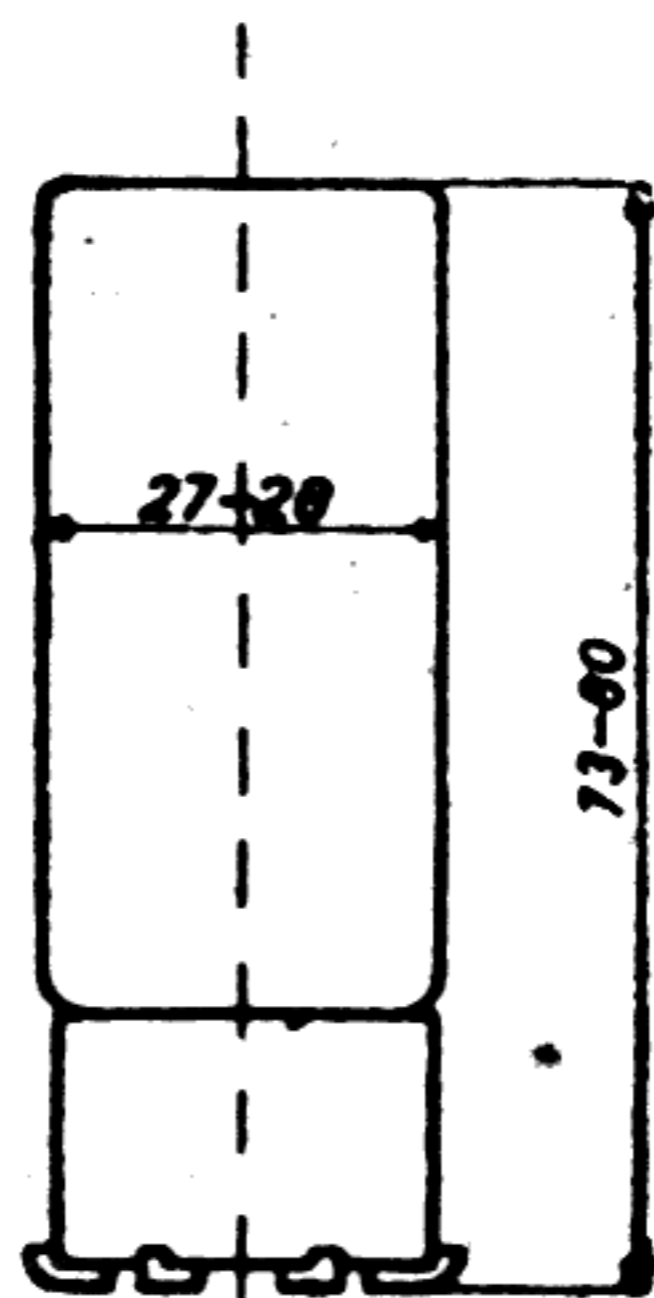
Grenzdaten
Limit ratings
Limites fixées

Va max = 550 V
VLo max = 550 V
Rg1 max = 3 MΩ
Rfk max = 20.000 Ω

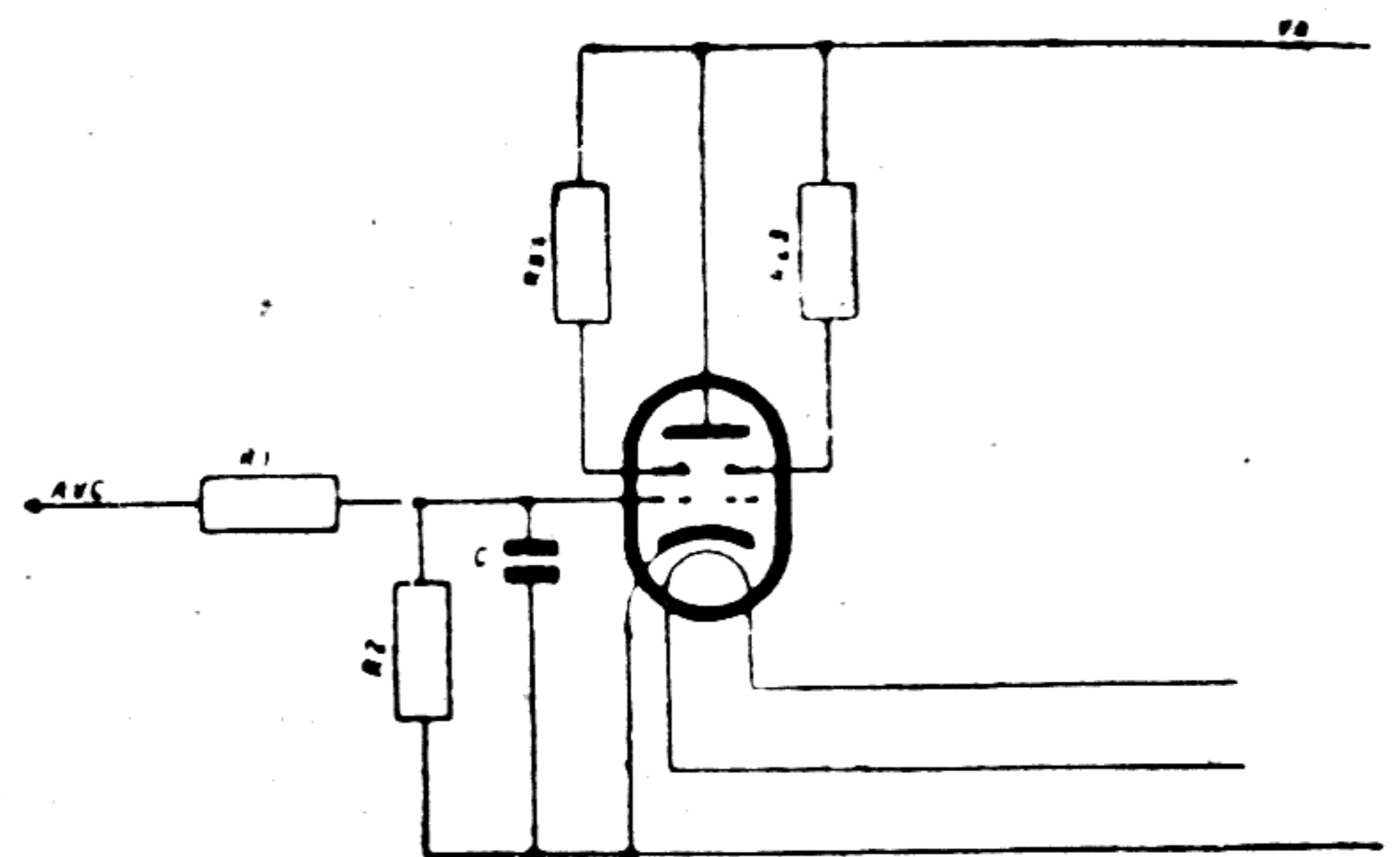
Va max = 275 V
VL max = 275 V
Vfk max = 100 V



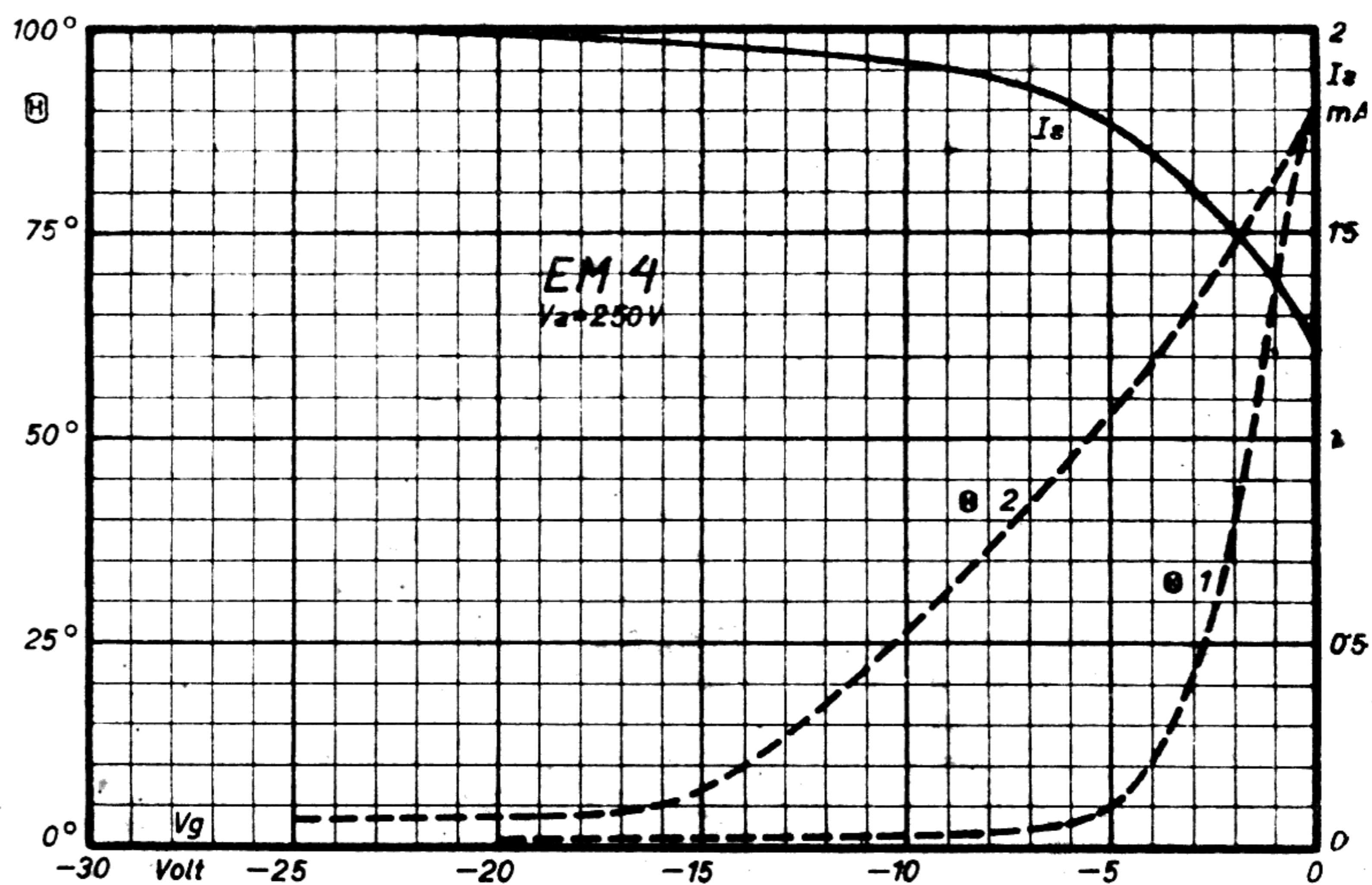
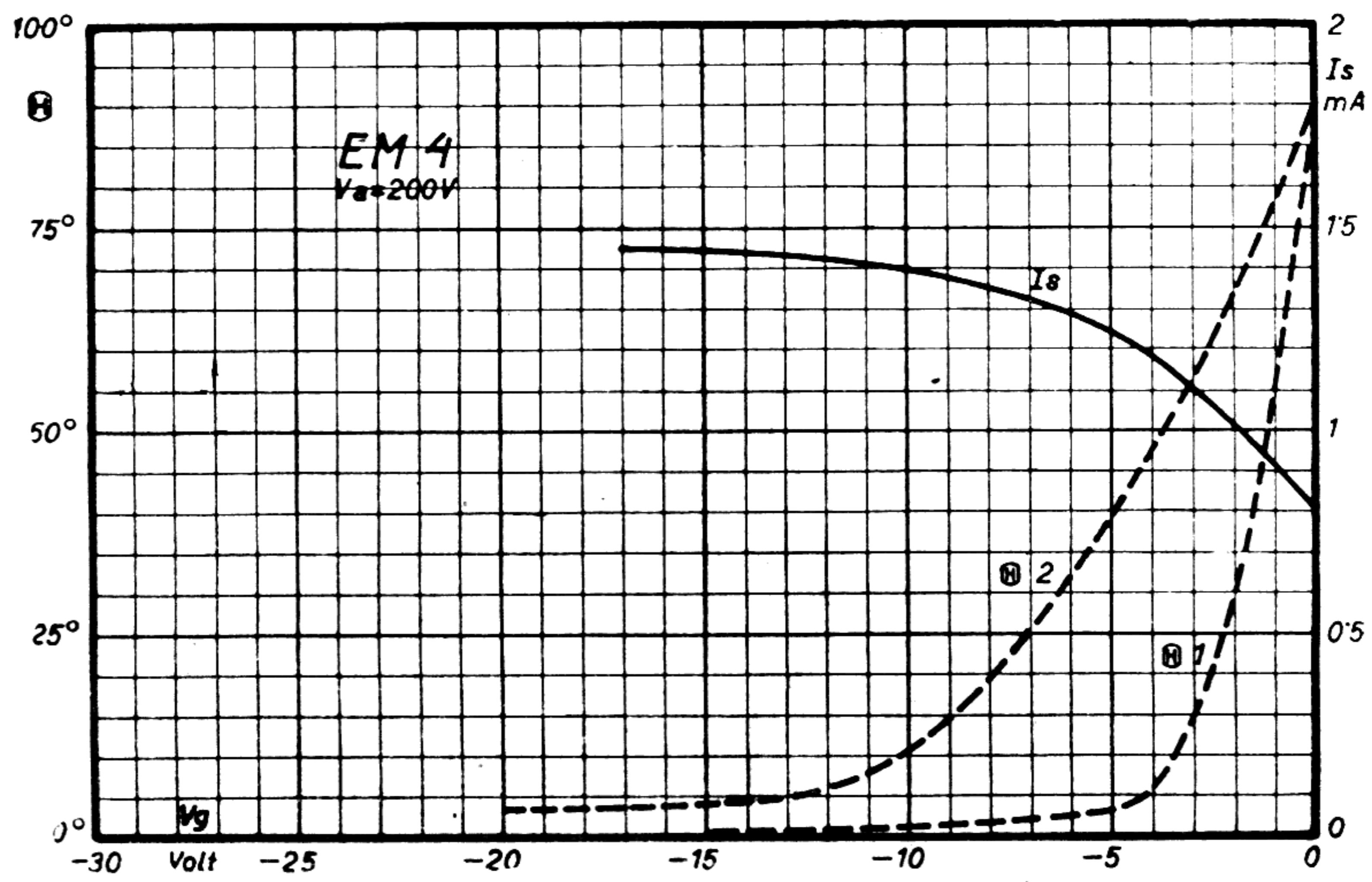
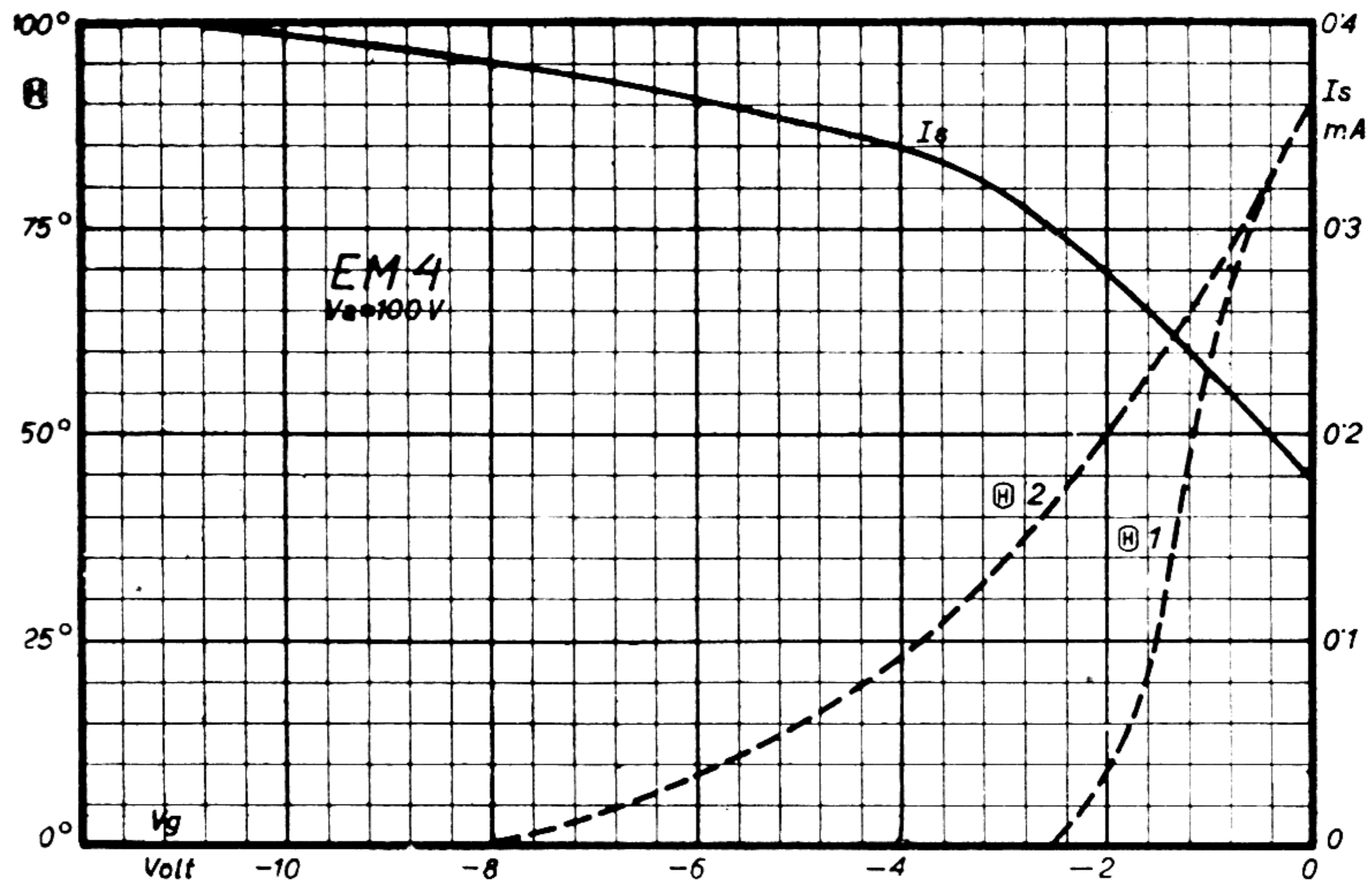
Sockelschaltung
Base connections
Connexions du culot



Abmessungen
Dimensions



Schaltungsbeispiel
Circuit diagram
Schema de principe





UBL 21

DUODIODE-PENTHODE

Heizung
Heating
Chauffage

V_f 55 V I_f 0,1 A

Einstellung und Betriebsdaten
Adjustment and Operating Conditions
Utilisation et caractéristiques de service

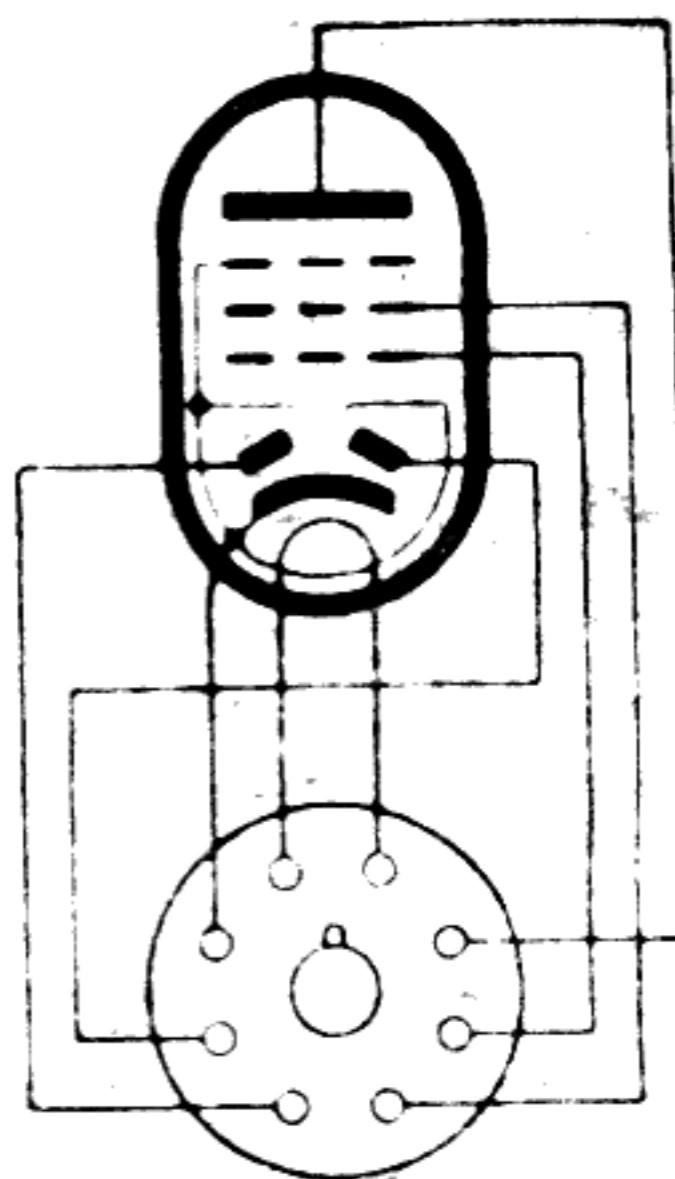
I.	V _a	100 V	I _a	32,5 mA	
	V _{g2}	100 V	I _{g2}	5,5 mA	
	V _{g1}	— 5,3 V	R _k	140 Ω	
	V _i	3,8 V _{eff}	W _o	1,35 W (k 10 ^{0/0})	
	V _i	0,55 V _{eff}	W _o	0,05 W	
	S	7,5 mA/V	R _a	3000 Ω	
II.	V _a	180 V	I _a	61 mA	
	V _{g2}	180 V	I _{g2}	10 mA	
	V _{g1}	— 10 V	R _k	140 Ω	
	V _i	6,2 V _{eff}	W _o	4,8 W (k 10 ^{0/0})	
	V _i	0,5 V _{eff}	W _o	0,05 W	
	S	9,0 mA/V	R _a	3000 Ω	
III.	V _a	200 V	I _a	55 mA	
	V _{g2}	200 V	I _{g2}	9,5 mA	
	V _{g1}	— 13 V	R _k	200 Ω	
	V _i	6,1 V _{eff}	W _o	5 W (k 10 ^{0/0})	
	V _i	0,5 V _{eff}	W _o	0,05 W	
	S	8,0 mA/V	R _a	3500 Ω	

Grenzdaten
Limit ratings
Limites fixées

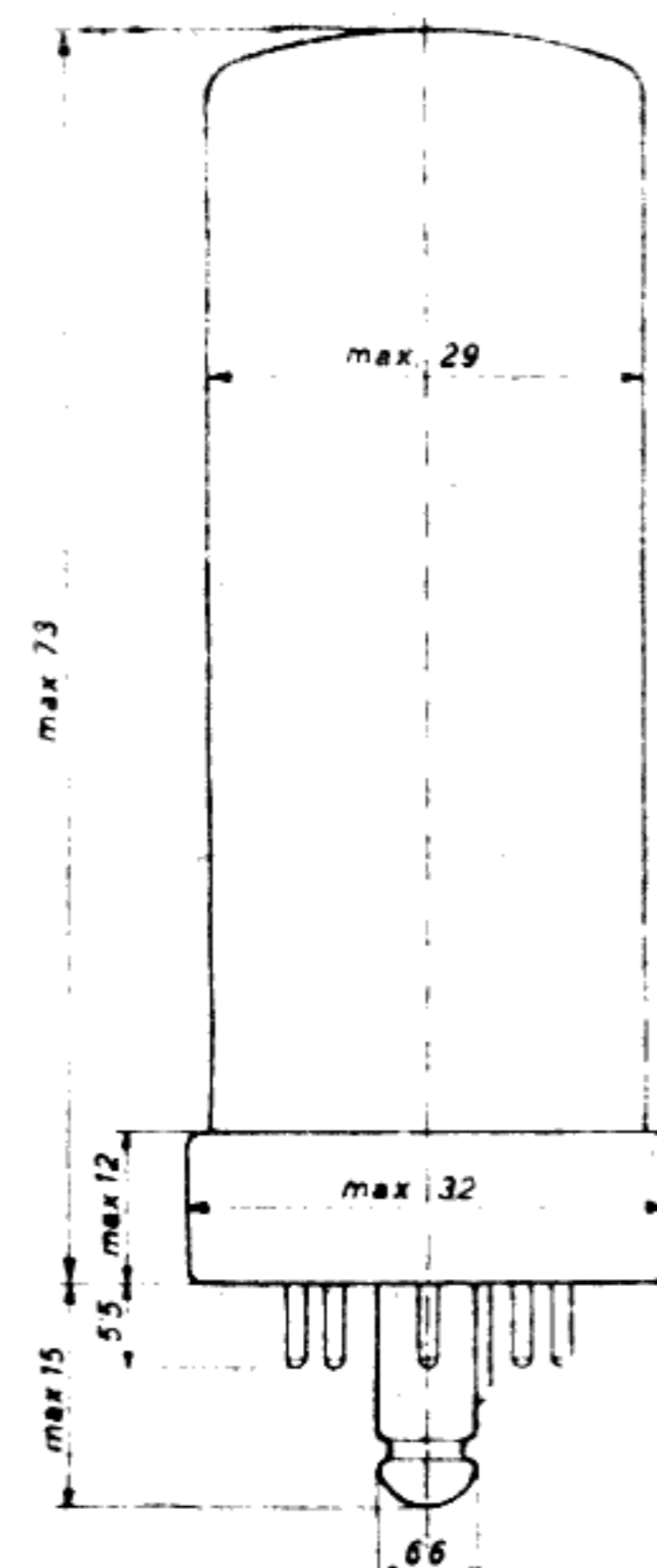
V _{ao} max = 550 V	V _a max = 250 V	W _a max = 11 W
V _{g2o} max = 550 V	V _{g2} max = 250 V	W _{g2} max = 3,5 W
R _{g1} max = 1 MΩ	R _{fk} max = 20.000 Ω	V _{fk} max = 150 V
I _k max = 75 mA		

Kapazitäten
Capacities
Capacités

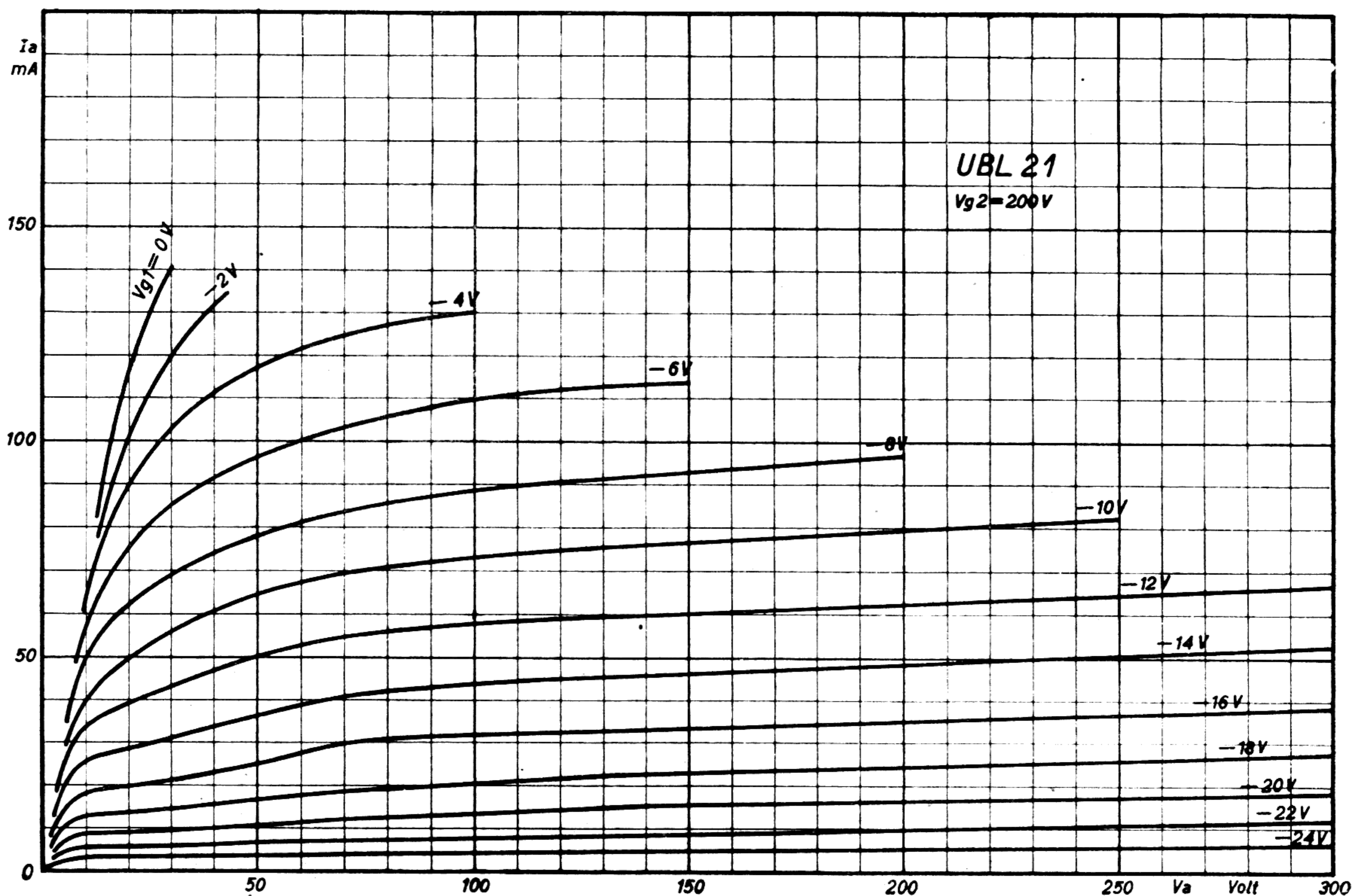
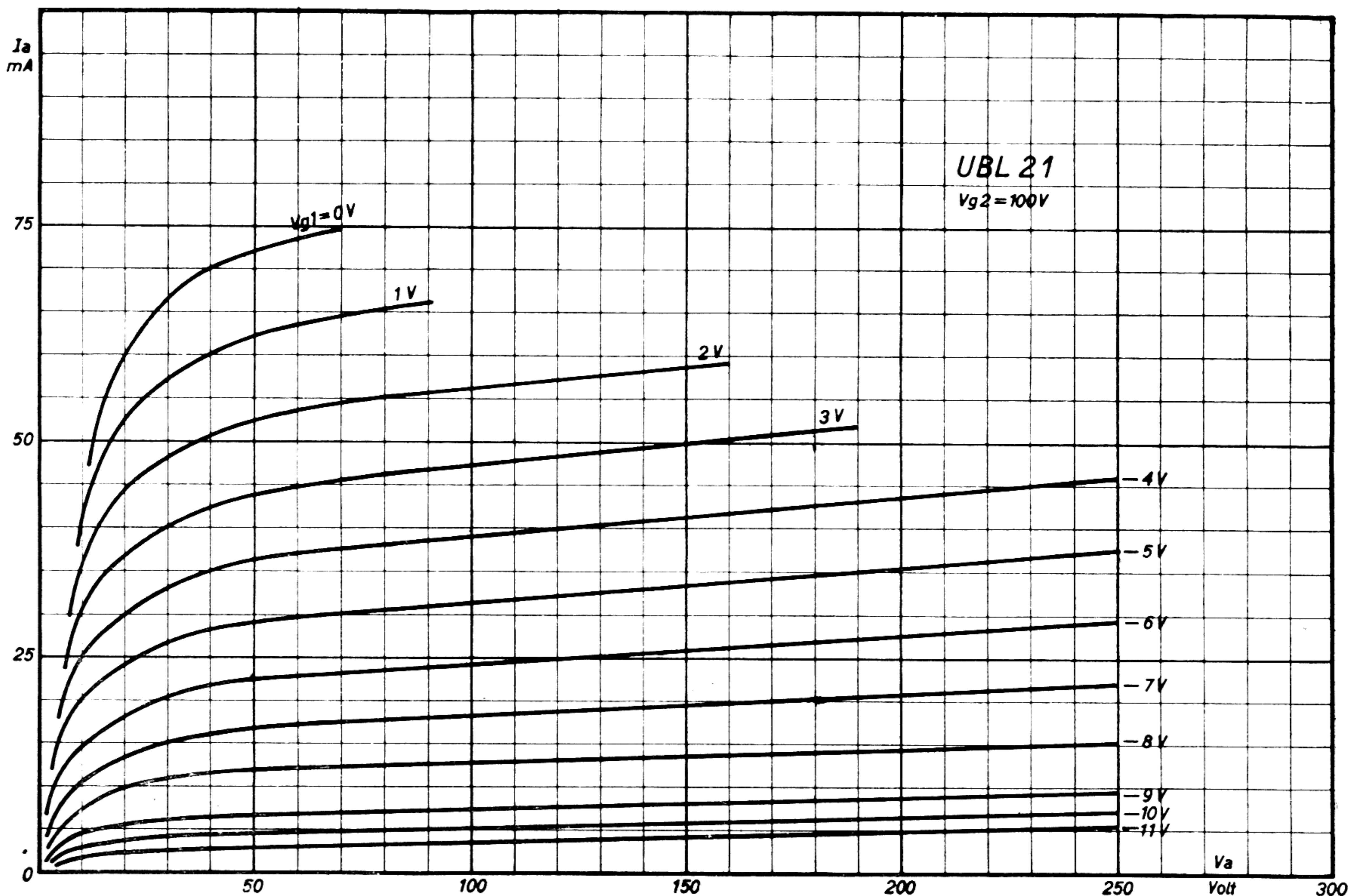
C (d/k) = 2 pF	C (d1/d2) < 0,15 pF
C (d/g1) < 0,1 pF	C (d/a) < 0,06 pF
C (a/g1) < 1,2 pF	



Sockelschaltung
Base connections
Connexions du culot



Abmessungen
Dimensions





UCH 21

TRIODE-HEPTODE

Heizung
Heating
Chauffage

$V_f = 20 \text{ V}$ $I_f = 0,1 \text{ A}$

Einstellung und Betriebsdaten bei 100 V
Adjustment and Operating Conditions at 100 V
Utilisation et caracteristiques de service à 100 V

Heptode als Mischröhre
Heptode as mixer
Heptode comme modulatrice

V_a	=	100	V	I_a	=	1,1	mA
$V_{g2,4}$	=	100	V — $15.500 \Omega \times I_{g2,4}$	$I_{g2,4}$	=	3	mA
$R (g_3 + g_T)$	=	50.000	Ω	$I (g_3 + g_T)$	=	95	μA
V_{g1}	=	— 1	V $R_i = 1 \text{ M}\Omega$	S_c	=	0,580	mA/V
V_{g1}	=	— 14	V $R_i > 10 \text{ M}\Omega$	S_c	=	0,0058	mA/V

Triode als Oszillator
Triode as oscillator
Triode comme oscillatrice

V_a	=	100	V — $28.500 \Omega \times I_a$	I_a	=	1,5	mA
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Heptode als Z. F. Verstärker
Heptode as I. F. amplifier
Heptode comme amplificatrice M. F.

V_a	=	100	V	I_a	=	2,6	mA
$V_g (2,4)$	=	100	V — $I_g (2,4) \times 30.000 \Omega$	$I_{g2,4}$	=	3,5	mA
V_{g3}	=	0	V	S	=	2	mA/V
V_{g1}	=	— 1	V $R_i = 0,7 \text{ M}\Omega$	S	=	0,02	mA/V
V_{g1}	=	— 15	V $R_i > 10 \text{ M}\Omega$	S	=	0,002	mA/V
V_{g1}	=	— 20	V $R_i > 10 \text{ M}\Omega$	S	=	0,002	mA/V

Triode als N. F. Verstärker
Triode as L. F. Amplifier
Triode comme amplificatrice B. F.

V_a	=	100	V	I_a	=	0,68	mA
V_g	=	— 1	V	R_a	=	0,1	$\text{M}\Omega$



Einstellung und Betriebsdaten bei 200 V
Adjustment and Operating Conditions at 200 V
Utilisation et caractéristiques de service à 200 V

Heptode als Mischröhre**Heptode as mixer****Heptode comme modulatrice**

V_a	=	200 V		I_a	=	3,5	mA
$V_{g(2,4)}$	=	$200 V - 15.500 \Omega \times I_{g2,4}$		$I_{g2,4}$	=	6,5	mA
$R(g_3 + g_T)$	=	50.000 Ω		$I(g_3 + g_T)$	=	190	μA
V_{g1}	=	— 2 V	$R_i = 1,3 M\Omega$	S_c	=	0,75	mA/V
V_{g1}	=	— 28 V	$R_i > 10 M\Omega$	S_c	=	0,0075	mA/V

Triode als Oscillator**Triode as oscillator****Triode comme oscillatrice**

V_a	=	$200 V - 28.500 \Omega \times I_a$		I_a	=	3,5	mA
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Heptode als Z. F. Verstärker**Heptode as I. F. amplifier****Heptode comme amplificatrice M. F.**

V_a	=	200 V		I_a	=	5,2	mA
$V_{g2,4}$	=	$200 V - 30.000 \Omega \times I_{g2,4}$		$I_{g2,4}$	=	3,5	mA
V_{g3}	=	0 V		S	=	2,2	mA/V
V_{g1}	=	— 2 V	$R_i = 0,7 M\Omega$	S	=	0,22	mA/V
V_{g1}	=	— 28 V	$R_i > 10 M\Omega$	S	=	0,022	mA/V
V_{g1}	=	— 36 V	$R_i > 10 M\Omega$				

Triode als N. F. Verstärker**Triode as L. F. amplifier****Triode comme amplificatrice B. F.**

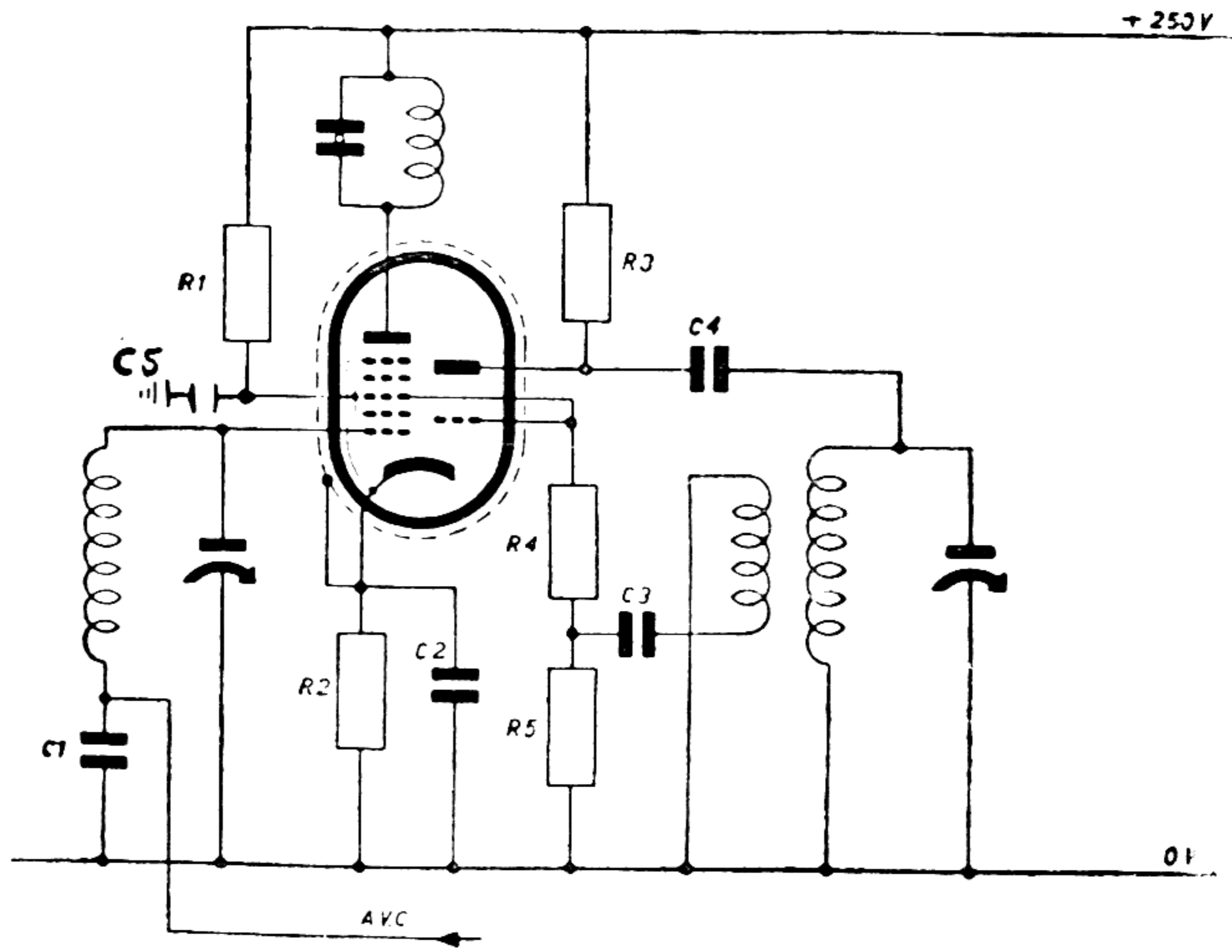
V_a	=	200 V		I_a	=	0,8	mA
V_{g1}	=	— 2 V		R_a	=	0,2	$M\Omega$

Grenzdaten**Limit ratings****Limites fixées**

$V_{a0} \max$	=	550 V	$V_a \max$	=	250 V	$W_a \max$	=	1,5	W
$V_{g2,4 0} \max$	=	550 V	$V_{g2,4} \max$	=	250 V ($I_a < 1 \text{ mA}$) 100 V ($I_a = 3 \text{ mA}$)	$W_{g2,4} \max$	=	1	W
$V_{aT0} \max$	=	550 V	$V_{aT} \max$	=	175 V	$W_{aT} \max$	=	0,5	W
$R_{gk} \max$	=	3 $M\Omega$	$R_{gT} \max$	=	3 $M\Omega$	$I_k \max$	=	15	mA
$V_{fk} \max$	=	150 V	$R_{fk} \max$	=	20.000 Ω				

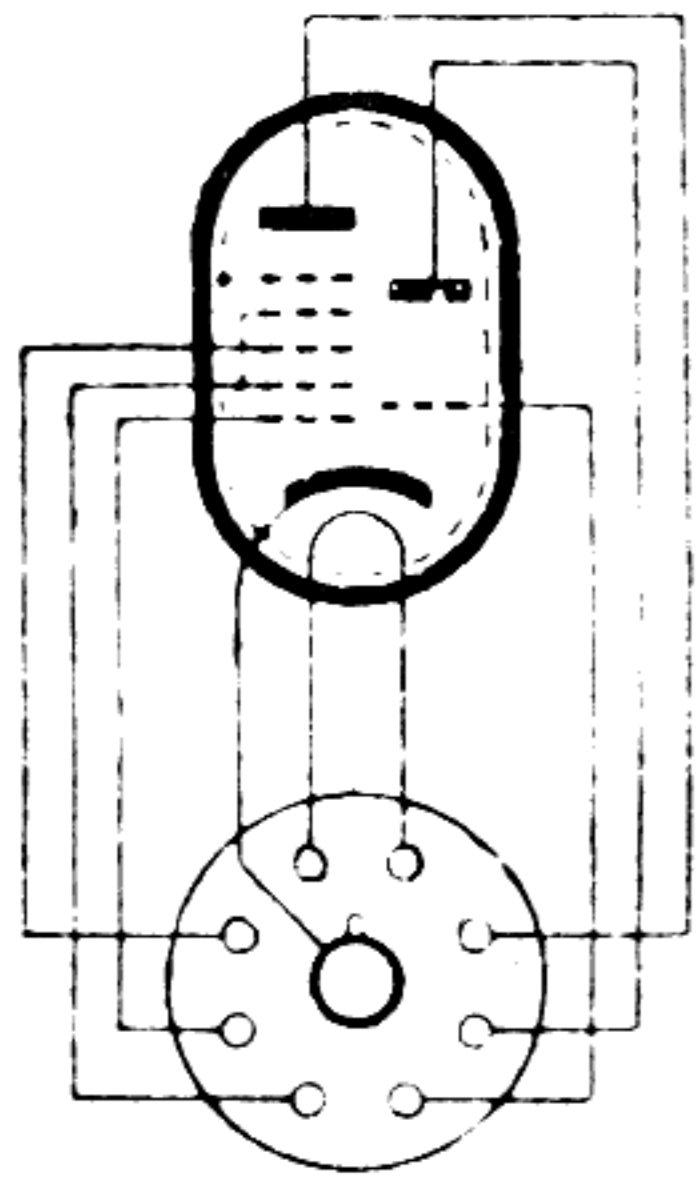
Kapazitäten**Capacities****Capacités**

$C(g_1)$	=	6,8	pF	$C(g_3)$	=	8	pF	$C(a)$	=	9,5	pF
$C(aT)$	=	3,5	pF	$C(gT)$	=	4,5	pF	$C(g_1/a)$	=	< 0,002	pF
$C(g_1/f)$	=	< 0,007	pF	$C(g_1/g_3)$	=	< 0,3	pF	$C(gT/g_1)$	=	< 0,2	pF
$C(gT + g_3/g_1)$	=	< 0,35	pF	$C(gT + g_3/a)$	=	< 0,1	pF	$C(aT/gT)$	=	1,1	pF
$C(aT/k)$	=	2	pF	$C(gT/k)$	=	3,2	pF	$C(gT/f)$	=	< 0,05	pF

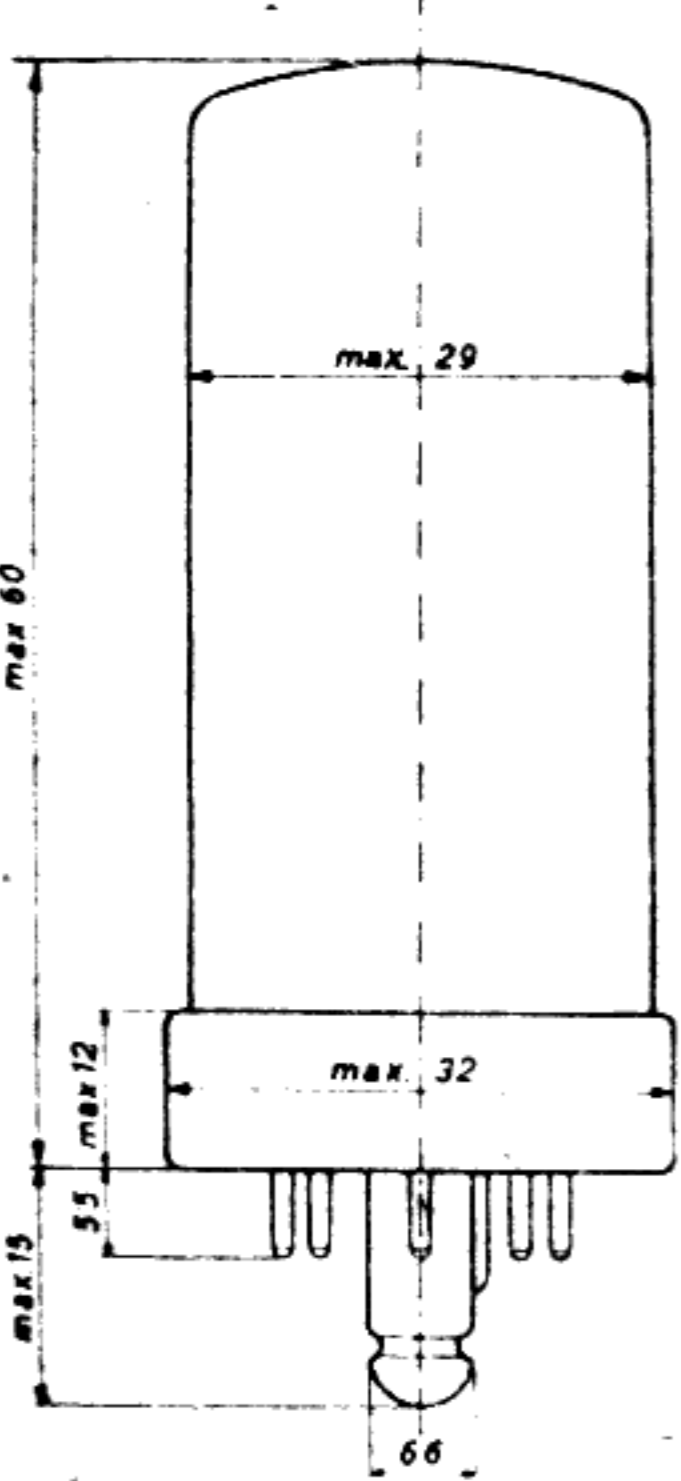


R1	15.500 Ω	C1	0.1 μF
R2	150 Ω	C2	0.1 μF
R3	28.500 Ω	C3	50 pF
R4	50 Ω	C4	1000 pF
R5	50.000 Ω	C5	0.1 μF

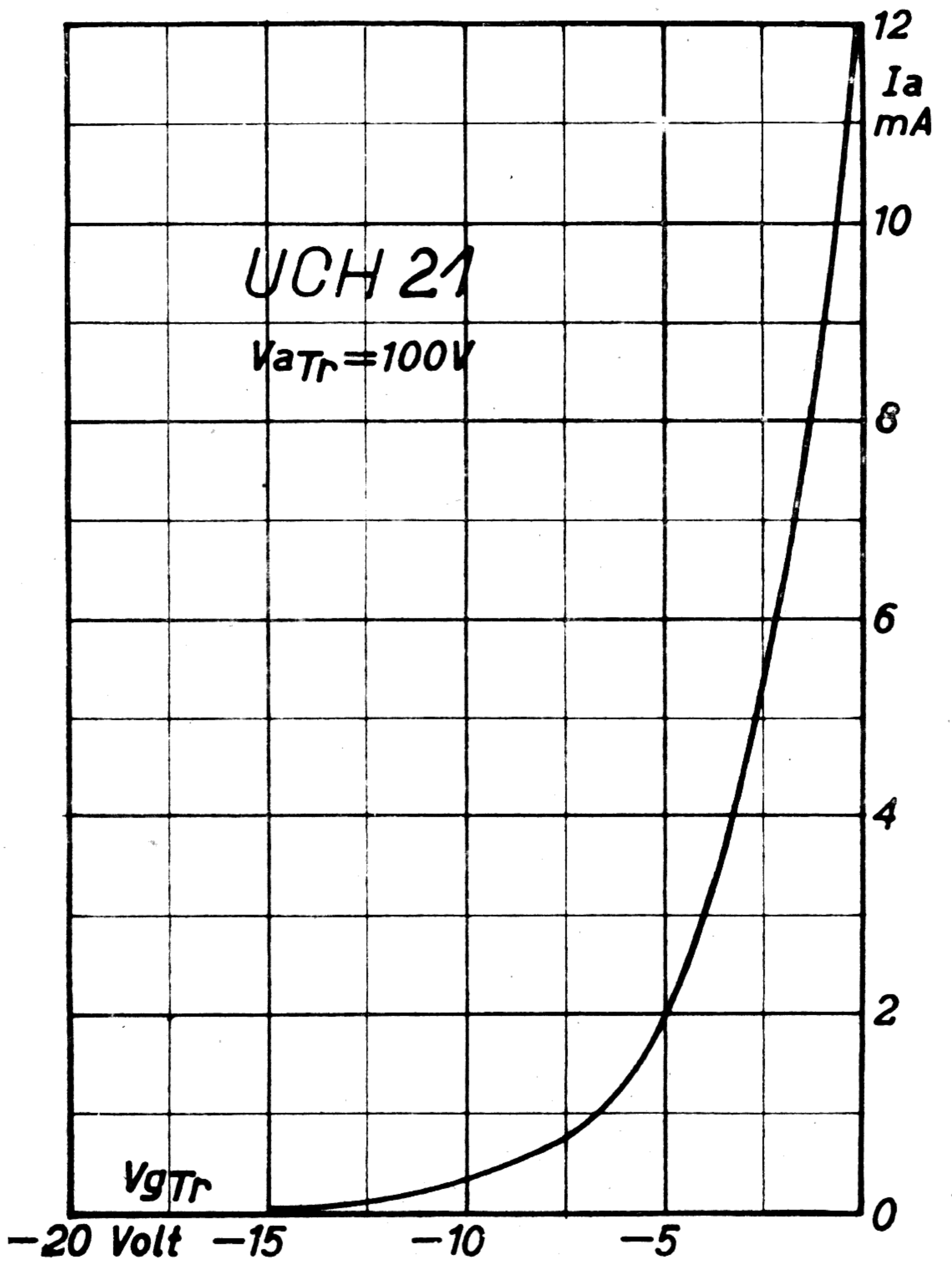
Schaltungsbeispiel
Circuit diagram
Schema de principe

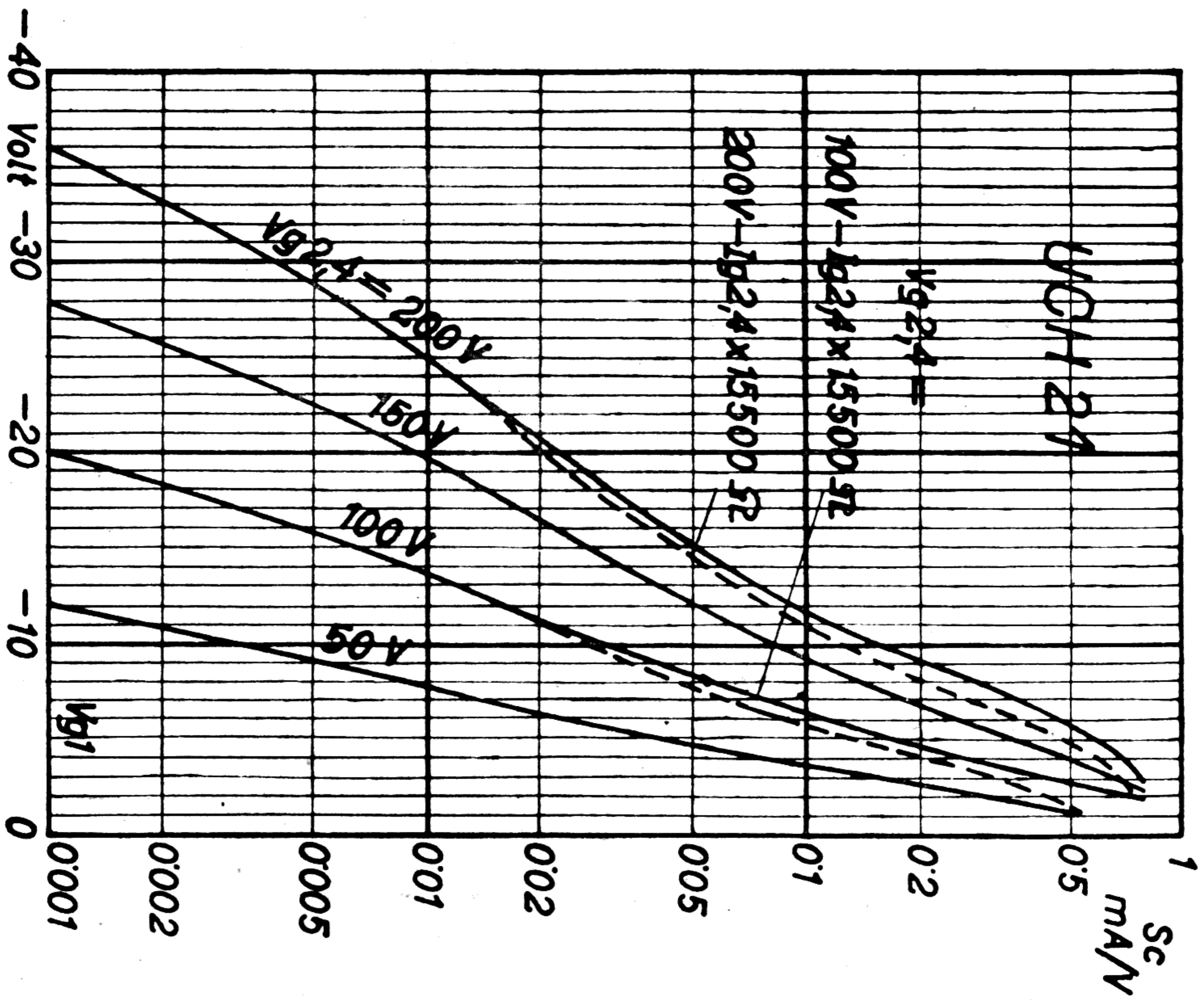
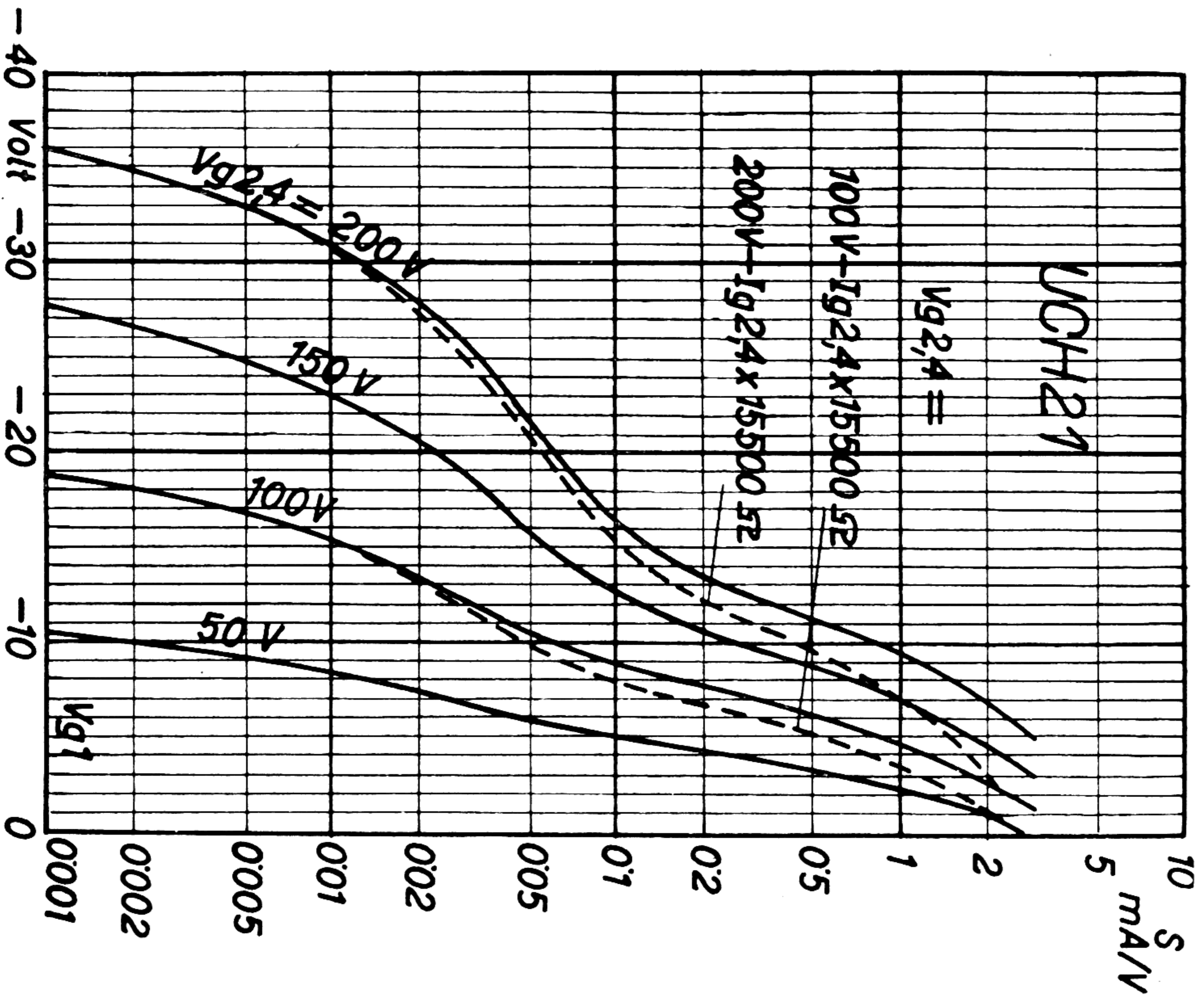


Sockelschaltung
Base connections
Connexions du culot



Abmessungen
Dimensions







UF 21 PENTHODE

**Heizung
Heating
Chauffage**

Vf 12,6 V

If 0,1 A

**Einstellung
Adjustment
Utilisation**

a)
Va 200 V
Ia 6 mA
Vg2 200 V — I_{g2} × 60.000 Ω
Vg1 — 2,5 V

b)
Va 100 V
Ia 6 mA
I_{g2} 1,7 mA
Vg1 — 2,5 V

**Betriebsdaten
Operating Conditions
Caracteristiques de service**

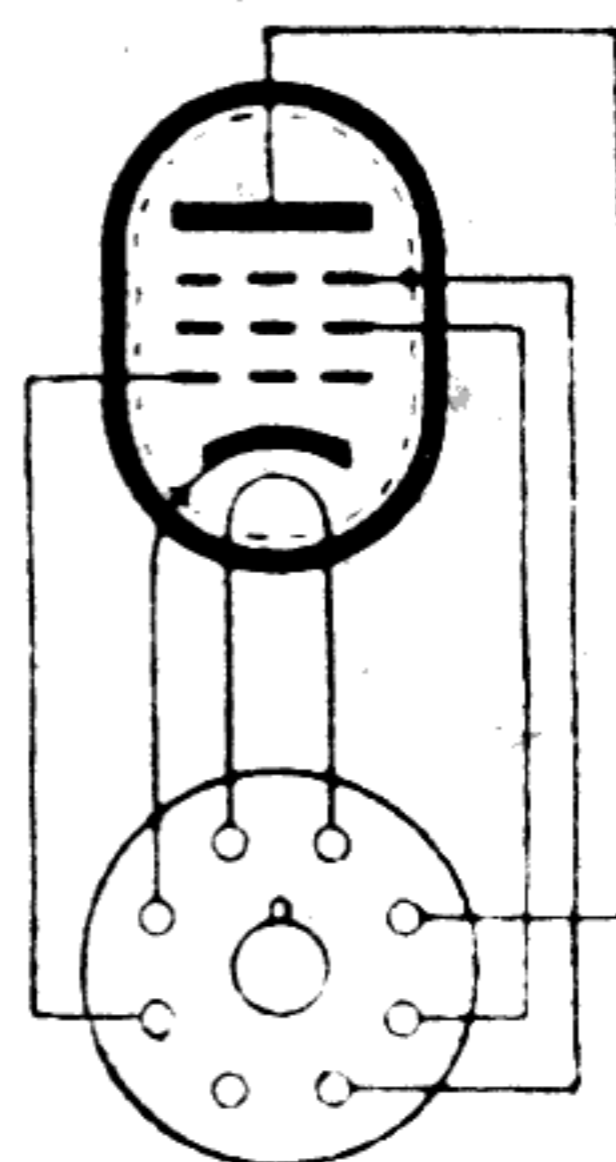
a) Vg1	— 2,5	— 37	— 46	V
S	2,2	0,022	0,0045	mA/V
Ri	0,9	> 10	> 10	MΩ
b) Vg1	— 2,5	— 19	— 22	V
S	2,2	0,022	0,007	mA/V
Ri	0,4	> 10	> 10	MΩ

**Grenzdaten
Limit ratings
Limites fixées**

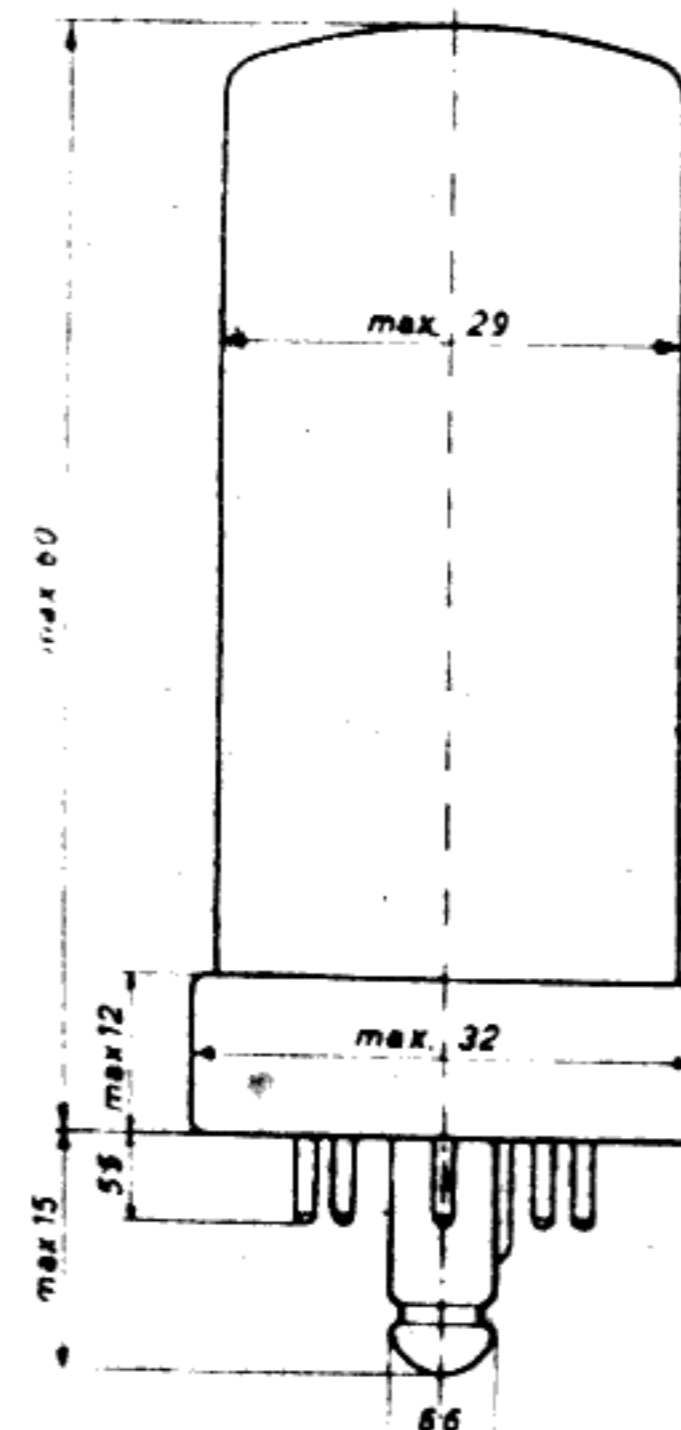
V _{ao} max	== 550 V	V _a max	== 250 V	W _a max	== 2 W
V _{g2o} max	== 550 V	V _{g2} max	== 125 V (I _a == 6 mA) == 250 V (I _a < 3 mA)	W _{g2} max	== 0,3 W
R _{g1} max	== 3 MΩ	R _{fk} max	== 20.000 Ω	V _{fk} max	== 150 V
I _k max	== 10 mA				

**Kapazitäten
Capacities
Capacités**

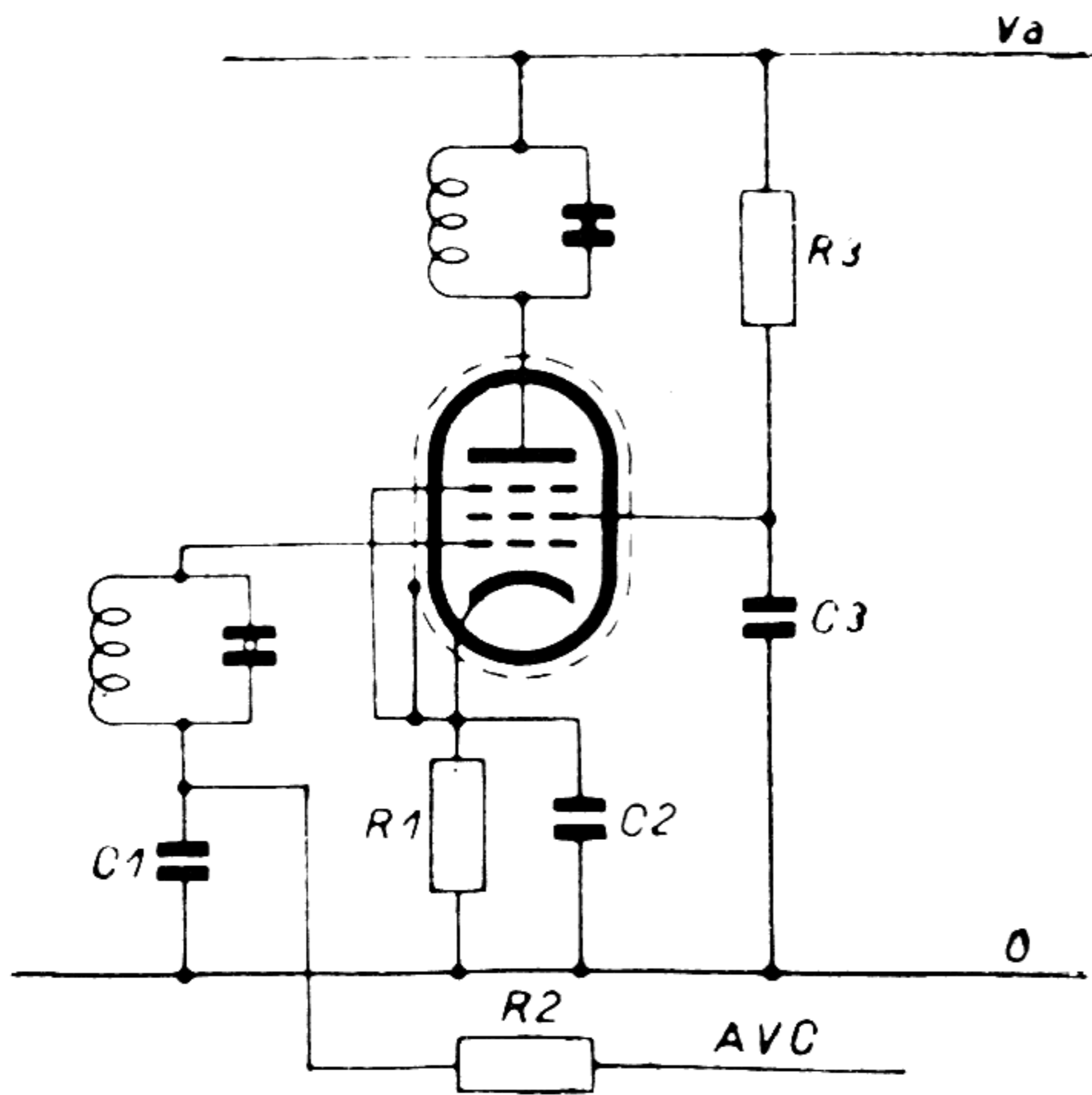
C (g1 a)	< 0,002 pF	C (g1)	== 5,6 pF
C (g1/f)	< 0,006 pF	C (a)	== 5,6 pF



**Sockelschaltung
Base connections
Connexions de culot**

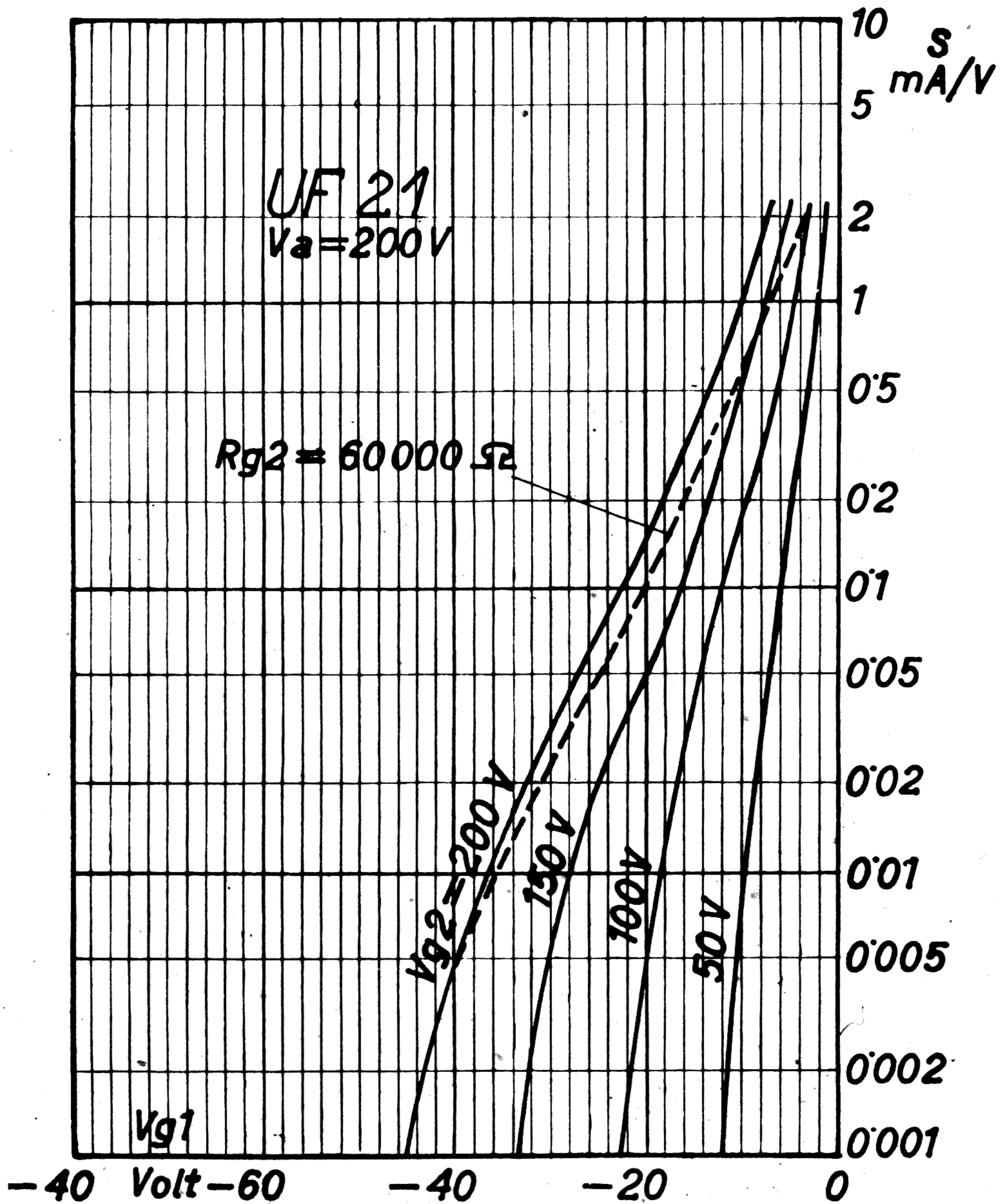


**Abmessungen
Dimensions**



Schaltungsbeispiel
Circuit diagram
Schema de principe

Va	200 V	Va	100 V
R1	325		325 Ω
R2	1		1 MΩ
R3	60,000		0 Ω
C1	0.1		0.1 μF
C2	0.1		0.1 μF
C3	0.1		— μF





UY 21

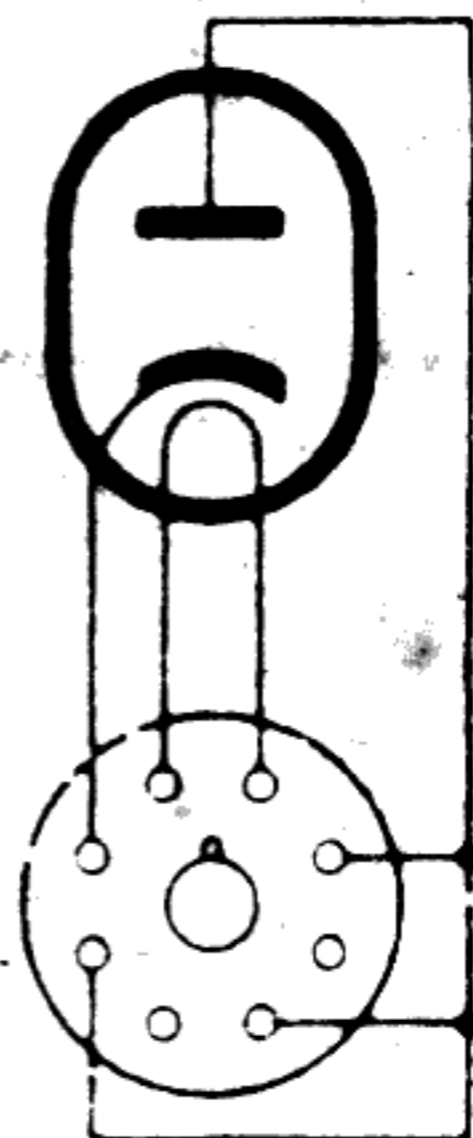
GLEICHRICHTER — RECTIFIER — REDRESSEUR

Heizung
Heating
Chauffage

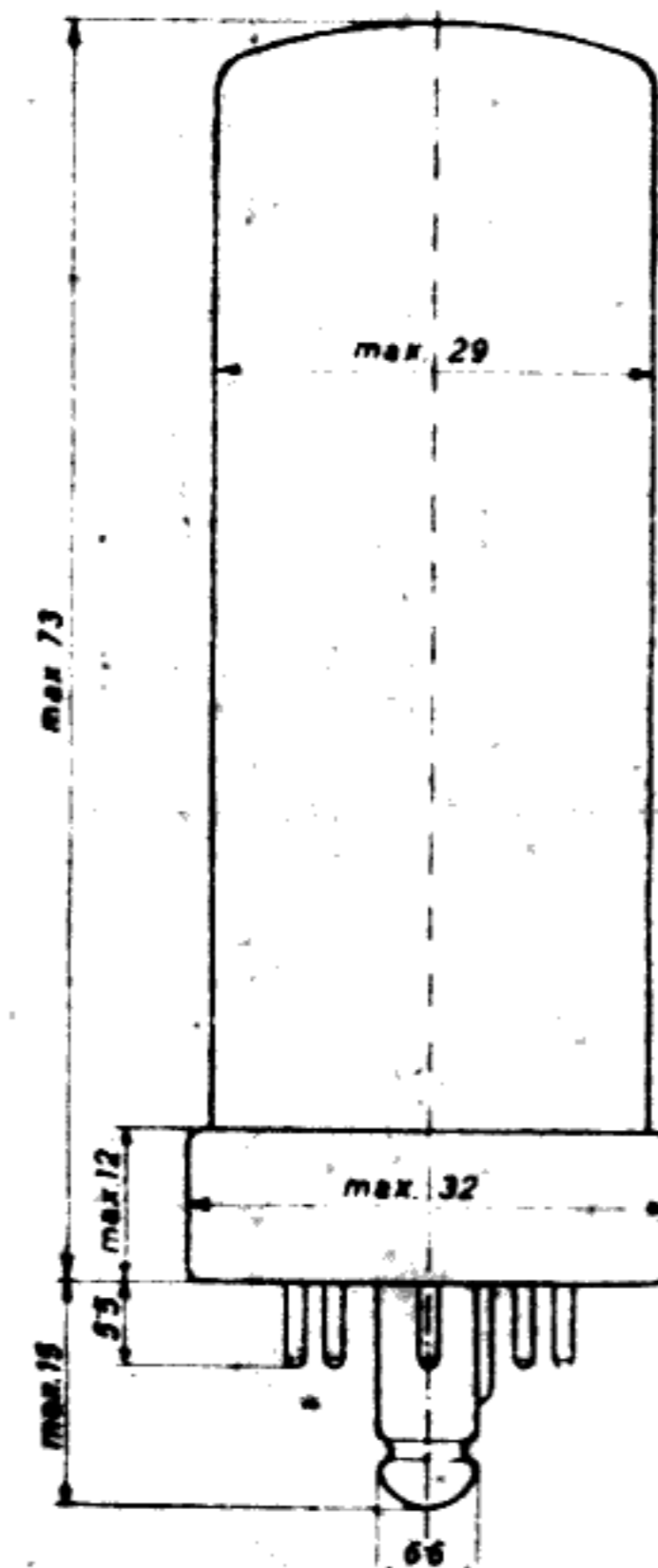
Vf	50 V	If	0,1 A
Va	250 V		
C	60	32	16
Rmin	175	125	75
			8 μ F
			0 Ω
Va	175 V		
C	60	32	16 μ F
Rmin	100	75	30 Ω
Va	127 V	C = 60 μ F	R = 0 Ω

Grenzdaten
Limit ratings
Limites fixées

Va max	—	250 V
C max	—	60 μ F
Vfk max	—	550 V
Ia max	—	140 mA



Sockelschaltung
Base connexions
Connexions du culot



Abmessungen
Dimensions

