SPECIAL QUALITY DOUBLE TRIODE with high mutual conductance and low noise for use in cascode circuits, in H.F. or I.F. amplifiers, mixer or phase-inverter stages or as multivibrator and cathode follower in computers

DOUBLE TRIODE A HAUTE SECURITE à pente haute et à faible bruit pour utilisation dans circuits en montage cascode, dans amplificateurs H.F. ou M.F., dans circuits mélangeurs ou inverseurs de phase ou dans des montages à charge cathodique et comme multivibrateur dans des machines à calculer

ZUVERLÄSSIGE DOPPELTRIODE mit hoher Steilheit und niedrigem Geräusch zur Verwendung in Cascodeschaltungen, für HF- oder ZF-Verstärker, für Misch- oder Phasenumkehrstufen oder in Katodenfolgeschaltungen und als Multivibrator in Rechenmaschinen

The E88CC is a long life tube, is shock and vibration resistent and will maintain its emission capabilities after long periods of operation under cut-off conditions

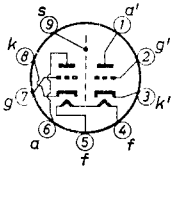
Le tube E88CC est un tube avec une durée de vie longue; il résiste aux chocs et vibrations et conservera son pouvoir d'émission après de longues périodes de fonctionnement dans les conditions de cut-off

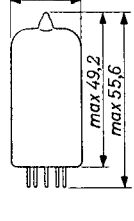
Diese Röhre ist eine Röhre mit langer Lebensdauer; sie ist stoss- und vibrationsfest und behält ihre Emissionsfähigkeit auch nach langen Betriebsperioden im gesperrten Zustand bei

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

$V_f = 6{,}3$ V[1)]
$I_f = 300$ mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: NOVAL

[1)] See page 6; voir page 6; siehe Seite 6

SPECIAL QUALITY, LONG LIFE, SHOCK AND VIBRATION RESISTANT DOUBLE TRIODE with high mutual conductance and low noise for use in cascode circuits, R.F. or I.F. amplifiers, mixer or phase inverter stages or as multivibrator or cathode follower in computers

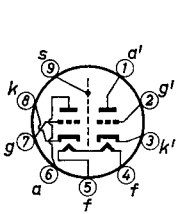
The E88CC has separate cathodes and will maintain its emission capabilities after long periods of operation under cut-off conditions

HEATING

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

Heater voltage V_f = 6.3 V

Heater current I_f = 300 mA



Base: NOVAL with gold plated pins
(Dimensions in mm)

CHARACTERISTICS

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

Heater current		I	II	III	
Heater voltage	V_f =	6.3			V
Heater current	I_f =	300	285-315	285-315	mA

Capacitances (without external shield)

		I	II	
Anode to all other elements except grid	$C_{a(k+f+s)}$ =	1.75	1.55-1.95	pF
	$C_{a'(k'+f+s)}$ =	1.65	1.45-1.85	pF
Anode to cathode and heater	$C_{a(k+f)}$ =	0.5	0.4-0.6	pF
	$C_{a'(k'+f)}$ =	0.4	0.3-0.5	pF

Capacitances (without external shield)
Capacités (sans blindage extérieur)
Kapazitäten (ohne äussere Abschirmung)

$C_{a-(k+f+s)}$	= 1,75 ± 0,2 pF	$C_{a'-(k'+f+s)}$	= 1,65 ± 0,2 pF
$C_{a-(k+f)}$	= 0,5 ± 0,1 pF	$C_{a'-(k'+f)}$	= 0,4 ± 0,1 pF
$C_{g-(k+f+s)}$	= 3,3 ± 0,6 pF	$C_{g'-(k'+f+s)}$	= 3,3 ± 0,6 pF
$C_{g-(k+f)}$	= 3,3 ± 0,6 pF	$C_{g'-(k'+f)}$	= 3,3 ± 0,6 pF
C_{ag}	= 1,4 ± 0,2 pF	$C_{a'g'}$	= 1,4 ± 0,2 pF
C_{ak}	= 0,18 ± 0,05 pF	$C_{a'k'}$	= 0,18 ± 0,05 pF
C_{kf}	= 2,6 pF	$C_{k'f}$	= 2,7 pF
C_{as}	= 1,3 ± 0,2 pF	$C_{a's}$	= 1,3 ± 0,2 pF

Between the two systems
Entre les deux systèmes
Zwischen beiden Systemen

$C_{aa'}$	< 0,045 pF [1]
$C_{gg'}$	< 0,005 pF
$C_{ag'}$	< 0,005 pF
$C_{a'g}$	< 0,005 pF
$C_{gk'}$	< 0,005 pF
$C_{g'k}$	< 0,005 pF

In grounded grid connection
Connexion avec la grille à la masse
In Gitterbasisschaltung

$C_{a-(g+f+s)}$	= 2,9 ± 0,3 pF
$C_{k-(g+f+s)}$	= 6,0 ± 0,9 pF
$C_{k'-(g'+f+s)}$	= 6,0 ± 0,9 pF
$C_{a'-(g'+f+s)}$	= 2,8 ± 0,3 pF

Typical characteristics [2]
Caractéristiques types
Kenndaten

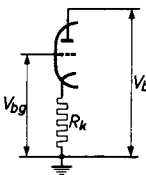


Fig. 1
Abb. 1

V_{ba}	=	100	90 V
V_{bg}	=	+9	0 V
R_k	=	680	120 Ω
I_a	=	15 ± 0,8	12 mA
S	=	$12,5^{+2,5}_{-2}$	11,5 mA/V
μ_{ag}	=	33	-
R_{eq} (f = 45 Mc/s)	=	300	- Ω
V_g (I_g = 0,3 µA)	=	0,75	- Veff
F	=	4,6	- dB [3]
r_g (f=100 Mc/s)	=	3	- kΩ ←

[1]) Average value 0.030 pF
Valeur moyenne 0,030 pF
Mittelwert 0,030 pF

[2]) See page 5; voir page 5; siehe Seite 5

[3]) Measured in a cascode circuit at f = 200 Mc/s and matched for minimum noise
Mesuré dans un circuit en montage cascode à f = 200 MHz et adapté au bruit minimum
Gemessen in einer Kaskodenschaltung bei f = 200 MHz und angepasst für minimales Geräusch

CHARACTERISTICS (continued)

Capacitances (continued)

		I	II	
→ Grid to all other elements except anode	$C_{g(k+f+s)}$ =	3.3	2.7-3.9	pF
	$C_{g'(k'+f+s)}$ =	3.3	2.7-3.9	pF
→ Grid to cathode and heater	$C_{g(k+f)}$ =	3.3	2.7-3.9	pF
	$C_{g'(k'+f)}$ =	3.3	2.7-3.9	pF
Anode to grid	C_{ag} =	1.4	1.2-1.6	pF
	$C_{a'g'}$ =	1.4	1.2-1.6	pF
Anode to all other elements except cathode	$C_{a(g+f+s)}$ =	3.0	2.7-3.3	pF
	$C_{a'(g'+f+s)}$ =	2.9	2.6-3.2	pF
Cathode to all other elements except anode	$C_{k(g+f+s)}$ =	6.0	5.1-6.9	pF
	$C_{k'(g'+f+s)}$ =	6.0	5.1-6.9	pF
Anode to cathode	C_{ak} =	0.18	0.14-0.22	pF
	$C_{a'k'}$ =	0.18	0.14-0.22	pF
Anode to screen	C_{as} =	1.3	1.1-1.5	pF
	$C_{a's}$ =	1.3	1.1-1.5	pF
Cathode to heater	C_{kf} =	2.6		pF
	$C_{k'f}$ =	2.7		pF
→ Anode to anode of other section	$C_{aa'}$ =	0.025	< 0.045	pF
Grid to grid of other section	$C_{gg'}$ =		< 0.005	pF
Anode to grid of other section	$C_{ag'}$ =		< 0.005	pF
	$C_{a'g}$ =		< 0.005	pF
Grid to cathode of other section	$C_{gk'}$ =		< 0.005	pF
	$C_{g'k}$ =		< 0.005	pF

Typical characteristics for computer circuits
Caractéristiques types pour circuits de comptage
Kenndaten für Zählschaltungen

V_{ba}	=	150	60 V
$-V_g$ (I_a = 0,1 mA)	=	7 ± 1,5	- V
$-V_g$ (I_a ≟ 5 µA)	=	max. 15	- V
$\lvert V_g - V_g' \rvert$ ($I_a = I_a'$ = 0,1 mA)	<	2	- V
I_a	=	33±5	>9 mA [4]

Inverse grid current (V_f = 6,3 V; V_a = 90 V) $-I_g$ = max. 0,1 µA
Courant inverse de grille
Negativer Gitterstrom (I_a = 15 mA)

Hum voltage
Tension de ronfl.
Brummspannung

V_a	=	90 V
I_a	=	15 mA
R_g	=	0,5 MΩ
R_k	=	80 Ω
C_k	=	1000 µF

V_g hum < 50 µV [5]

Heater-cathode insulation
Isolation filament-cathode
Katoden-Heizfadenisolation

(V_{kf} = 60 V; k neg.) I_{kf} = max. 6 µA
(V_{kf} = 120 V; k pos.) I_{kf} = max. 6 µA

Operating characteristics as additive mixer
Caractéristiques d'utilisation comme tube convertisseur de fréquence additif
Betriebsdaten als additive Mischröhre

V_{ba}	=	60	90	150	V
R_a	=	0	1	3,9	kΩ
R_g	=	1	1	1	MΩ
V_{osc}	=	2	2,5	3	Veff
I_a	=	4,7	7,7	11	mA
S_c	=	2,9	3,5	4,1	mA/V
R_i	=	8,3	7	6,1	kΩ

[4]) See fig. 2; measuring time max. 1 sec.
Voir fig.2; temps de mesure max.1 sec.
Siehe Abb. 2; Messzeit max. 1 Sek.

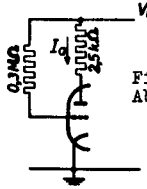


Fig.2
Abb.2

[5]) See page 5
Voir page 5
Siehe Seite 5

CHARACTERISTICS (continued)

Typical characteristics			I	II	III	
Anode supply voltage	V_{ba}	=	100			V [1]
Grid supply voltage	V_{bg}	=	+9			V [1]
Cathode resistor	R_k	=	680			Ω [1]
Anode current	I_a	=	15	14.2-15.8	13.5	mA
Mutual conductance	S	=	12.5	10.5-15	9	mA/V
Amplification factor	μ	=	33			
Grid current starting point	V_g	=	0.75			V(RMS) [2]
Equivalent noise resistance	R_{eq}	=	300			Ω [3]
Noise factor	F	=	4.6			dB [4]
Input damping at f = 100 Mc/s	r_g	=	3			kΩ

			I	II	III
Anode supply voltage	V_{ba}	=	90		V
Cathode resistor	R_k	=	120		Ω
Anode current	I_a	=	12		mA
Mutual conductance	S	=	11.5		mA/V

Hum voltage (referred to grid)

Measured with straight response curve filter; frequency of heater supply voltage 50 c/s + 3% 500 c/s; tubeholder fully screened

			I	II	III
Anode supply voltage	V_{ba}	=	90		V
Anode current	I_a	=	15		mA
Cathode resistor	R_k	=	80		Ω
Cathode capacitor	C_k	=	1000		μF
Grid resistor	R_g	=	0.5		MΩ
Hum voltage	V_{ghum}	=		< 50	μV

[1]) Operation of the tube under these conditions is recommended because of the small spread in characteristics

[2]) A.C. input voltage for start of grid current (I_g = + 0.3 μA)

[3]) Measured at f = 45 Mc/s

[4]) Measured in a cascode circuit matched for minimum noise at f = 200 Mc/s

Operating characteristics as output tube, class A
Caractéristiques d'utilisation comme tube de sortie, classe A
Betriebsdaten als Endröhre, Klasse A

V_a	=		220	V
$R_a \sim$	=		20	kΩ
V_{g1}	=		-6,8	V
V_i	=	0	1,5	4,5 Veff
I_a	=	6,5	-	9,2 mA
W_o	=	-	0,05	0,5 W
d_{tot}	=	-	-	7 %

Operating characteristics as push-pull output tube, class B (sinusoïdal input voltage)
Caractéristiques d'utilisation comme tube de sortie push-pull classe B (tension d'entrée sinusoïdale)
Betriebsdaten als Gegentakt-Endröhre, Klasse B (sinusförmige Eingangsspannung)

V_a	=		200	V
$R_{aa\sim}$	=		22	kΩ
V_{g1}	=		-6	V
V_i	=	0	0,9	4,0 Veff
I_a	=	2 x 5	-	2 x 9 mA
W_o	=	-	0,05	1,2 W
d_{tot}	=	-	-	3 %

Operating characteristics as push-pull output tube, class B (speech and music signals) [1]
Caractéristiques d'utilisation comme tube de sortie push-pull classe B (signaux de la parole et de la musique) [1]
Betriebsdaten als Gegentakt-Endröhre, Klasse B (Sprech- und Musiksignale) [1]

V_a	=		200	V
$R_{aa\sim}$	=		10	kΩ
V_{g1}	=		-6	V
V_i	=	0	0,9	4,0 Veff
I_a	=	2x5	-	2x13,5 mA
W_o	=	-	0,05	1,5 W
d_{tot}	=	-	-	4 %

1) See page 7; voir page 7; siehe Seite 7

CHARACTERISTICS (continued)

Negative grid current

			I	II	III	
Anode voltage	V_a	=	90			V
Anode current	I_a	=	15			mA
Grid resistor	R_g	=	0.1			MΩ
Negative grid current	$-I_g$	=		< 0.1	1.0	µA

Typical characteristics for computer circuits

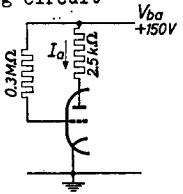
			I	II	III	
Anode supply voltage	V_{ba}	=	150			V [1]
Anode current	I_a	=	33	28-38		mA [2]

			I	II	III	
Anode supply voltage	V_{ba}	=	60			V [1]
Anode current	I_a	=		> 9		mA

			I	II	III	
Anode supply voltage	V_{ba} = V_{ba}'	=	150			V
Anode current	I_a = I_a'	=	0.1			mA
Negative grid voltage	$-V_g$ = $-V_g'$	=	6.5	5.0-8.5		V
Unbalance	$\lvert V_g - V_g' \rvert$	=		< 2	2	V

			I	II	III	
Anode supply voltage	V_a	=	150			V
Grid voltage	V_g	=	-15			V
Anode current	I_a	=		< 5		µA

[1]) Measuring circuit



[2]) Measuring time max. 1 sec.

Limiting values (design centre values); each section
Caractéristiques limites (valeurs moyennes); chaque système
Grenzdaten (mittlere Entwicklungsdaten); jedes System

V_a (cold; froid; kalt)	= max. 550 V
V_{ao} (Ia = 0)	= max. 400 V
V_a	= max. 220 V
V_a ($W_a \leqq 0{,}8$ W)	= max. 250 V
W_a	= max. 1,5 W[6]
W_a ($W_a+W_a' \leqq 2$ W)	= max. 1,8 W[6]
W_g	= max. 30 mW
$-V_g$	= max. 100 V
$-V_{gp}$ (T_{imp} = max. 200 µsec; δ = max. 0,1)	= max. 200 V
I_k	= max. 20 mA[6]
I_{kp} (T_{imp} = max. 200 µsec; δ = max. 0,1)	= max. 100 mA
V_{kf} (k pos.; f neg.)	= max. 120 V
V_{kf} (k neg.; f pos.)	= max. 60 V
R_g	= max. 1 MΩ[6]
t_{bulb}	= max. 170 °C

2) It is recommended to operate the tube under the conditions given in the first column because of the small spread in characteristics in this case
Il est recommandé de faire fonctionner le tube sous les conditions données dans la première colonne en conséquence de la petite dispersion des caractéristiques dans ce cas
Es wird empfohlen die Röhre unter den in der ersten Spalte angegebenen Bedingungen zu betreiben mit Rücksicht auf die kleine Streuung der Kenndaten in diesem Fall

5) V_g hum is the hum voltage referred to the grid. Measured with a fully screened tubeholder and straight response curve of the filter; frequency of the heater voltage = 50 c/s + 3 percent of voltage 500 c/s. Centre tapping of the heater supply transformer grounded
V_g hum est la tension de ronflement associée à la grille. Mesurée avec un support de tube complètement blindé et une courbe de réponse rectiligne du filtre. Fréquence de la tension de chauffage = 50 Hz + 3 % de la tension 500 Hz. Prise médiane du transformateur de chauffage mise à la masse
V_g hum ist die Brummspannung bezogen auf das Gitter, gemessen mit einer vollständig abgeschirmten Röhrenfassung und gradlinigem Filterfrequenzgang, bei einer Heizspannungsfrequenz = 50 Hz + 3% der Spannung 500 Hz. Mittelanzapfung des Heiztransformators geerdet

6) Fixed bias only permitted for $I_a < 5$ mA
Polarisation fixe seulement admissible pour $I_a < 5$ mA
Feste Gittervorspannung nur zulässig für $I_a < 5$ mA

CHARACTERISTICS (continued)

Heater to cathode insulation

			I	II	III	
Heater voltage	V_f	=	6.3			V
Voltage between heater and cathode (cathode negative)	V_{kf}	=	60			V
Heater to cathode current	I_{kf}	=		< 6	12	µA

			I	II	III	
Heater voltage	V_f	=	6.3			V
Voltage between heater and cathode (cathode positive)	V_{kf}	=	120			V
Cathode to heater current	I_{kf}	=		< 6	12	µA

Insulation between two arbitrary electrodes

When measured between an electrode and cathode, the cathode should be positive

			I	II	III	
Voltage	V	=	200			V
Insulation resistance	R_{isol}	=		>100	20	MΩ

SHOCK RESISTANCE: about 500 g [1])

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

VIBRATION RESISTANCE: 2.5 g [1])

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

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

Heater voltage	V_f	= 6.3 V
Anode supply voltage	V_{ba} = $V_{ba'}$	= 100 V
Grid supply voltage	V_{bg} = $V_{bg'}$	= +9 V
Cathode resistor	R_k = $R_{k'}$	= 680 Ω
Grid resistor	R_g = $R_{g'}$	= 47 kΩ
Voltage between cathode and heater (cathode negative)	V_{kf} = $V_{k'f}$	= 60 V

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

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

Shock resistance: about 500 g [7])

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

Vibration resistance: 2.5 g [7])

Vibrational forces for a period of 32 hours at a frequency of 50 c/s in each of 3 positions

Résistance aux chocs: environ 500 g [7])

Des forces comme appliquees par la machine à chocs NRL pour dispositifs électroniques, produites par 5 coups du marteau, soulevé d'un angle de 30° dans chacune de quatre positions différentes

Résistance aux vibrations: 2,5 g [7])

Des forces de vibration pendant une période de 32 heures à une fréquence de 50 Hz dans chacune de trois positions

Stossfestigkeit: etwa 500 g [7])

Stossbeschleunigungen gemäss NRL-Stossmaschine für elektronische Geräte, verursacht durch 5 Schläge des Hammers, der in jeder von vier verschiedenen Positionen über einen Winkel von 30° gehoben wird

Vibrationsfestigkeit: 2,5 g [7])

Vibrationskräfte während einer Periode von 32 Stunden bei einer Frequenz von 50 Hz in jeder von 3 Stellungen

---

[1])The maximum deviation of If at Vf = 6.3 V is ± 15 mA. In order to obtain a prolonged tube life, the maximum variation of Vf should be less than ± 5 % (absolute limits).

La déviation de If à Vf = 6,3 V est de ± 15 mA au maximum Afin d'obtenir une vie prolongée du tube, la variation maximum de Vf sera moins de ± 5 % (limites absolues)

Die Höchstabweichung von If bei Vf = 6,3 V ist ± 15 mA Zur Erhaltung einer verlängerten Lebensdauer der Röhre soll die maximale Schwankung von Vf weniger als ± 5 % betragen (absolute Grenzen)

[7])These test conditions are only given for evaluation of the ruggedness of the tube. They are by no means to be interpreted as suitable operating conditions

Ces conditions d'essai sont données seulement pour l'évaluation de la robustesse du tube. En aucune manière elles ne doivent être interprétées comme des conditions de fonctionnement normales

Diese Prüfbedingungen dienen lediglich zur Beurteilung der Robustheit der Röhre und sind keinesfalls als geeignete Betriebsbedingungen aufzufassen

OPERATING CHARACTERISTICS AS OUTPUT TUBE CLASS A

Anode voltage	V_a	=		220		V
Load resistance	$R_{a\sim}$	=		20		kΩ
→ Grid bias	V_g	=		-6.5		V
Input voltage	V_i	=	0	1.5	4.5	V(RMS)
Anode current	I_a	=	6.5	-	9.2	mA
Output power	W_o	=	0	0.05	0.5	W
Total distortion	d_{tot}	=	-	-	7	%

OPERATING CHARACTERISTICS AS PUSH-PULL OUTPUT TUBE CLASS B
(sinusoidal input voltage)

Anode voltage	V_a	=		200		V
Load resistance	$R_{aa\sim}$	=		22		kΩ
Grid bias	V_g	=		-6		V
Input voltage	V_i	=	0	0.9	4.0	V(RMS)
Anode current	I_a	=	2x5.0	-	2x9	mA
Output power	W_o	=	0	0.05	1.2	W
Total distortion	d_{tot}	=	-	-	3	%

OPERATING CHARACTERISTICS AS PUSH-PULL OUTPUT TUBE CLASS B
(speech and music signals)

These values have been measured with sinusoidal input voltage. With full drive, however, the maximum permissible anode dissipation is exceeded. Therefore, operation with a sinusoidal input voltage is not allowed in this setting. When, however, the tube is operated with normal speech and music signals, the RMS-value of the input voltage will generally be less than 4 V so that in this case no overload of the tube will occur

Anode voltage	V_a	=		200		V
Load resistance	$R_{aa\sim}$	=		10		kΩ
Grid bias	V_g	=		-6		V
Input voltage	V_i	=	0	0.9	4.0	V(RMS)
Anode current	I_a	=	2x5.0	-	2x13.5	mA
Output power	W_o	=	0	0.05	1.5	W
Total distortion	d_{tot}	=	-	-	4	%

[1]) These values have been measured with sinusoidal input voltage. With full drive,however, the maximum permissible anode dissipation is exceeded. Therefore, operation with a sinusoidal input voltage is not allowed in this setting. When, however, the tubes are operated with normal speech and music signals, the r.m.s.-value of the input voltage will generally be less than 4 V so that in that case no overload of the tubeswill occur

Ces valeursont été mesurées avec une tension d'entrée sinusoïdale. Cependant, en modulation complète la dissipation anodique maximum permissible est dépassée. C'est pourquoi l'utilisation avec une tension d'entrée sinusoïdale n'est pas permise dans ce cas. Quand cependant les tubes fonctionnent avec des signaux normaux de la parole et de la musique la valeur efficace de la tension d'entrée sera en général moins de 4 V de sorte qu'il ne se produira pas de surcharge des tubes dans ce cas.

Diese Werte sind gemessen mit einer sinusförmigen Eingangsspannung. Bei Vollaussteuerung wird dabei aber die maximal zulässige Anodenverlustleistung überschritten. Es ist deshalb nicht gestattet die Röhren in dieser Einstellung mit sinusförmiger Eingangsspannung zu betreiben. Werden aber die Röhren mit normalen Sprech- und Musiksignalen betrieben so ist der Effektivwert der Eingangsspannung im allgemeinen weniger als 4 V und wird keine Überlastung der Röhren auftreten

OPERATING CHARACTERISTICS AS ADDITIVE MIXER					
Anode supply voltage	V_{b_a}	=	60	90	150 V
Anode resistor	R_a	=	0	1	3.9 kΩ
Grid resistor	R_g	=	1	1	1 MΩ
Oscillator voltage	V_{osc}	=	2.0	2.5	3.0 V(RMS)
Anode current	I_a	=	4.7	7.7	11 mA
Conversion conductance	S_c	=	2.9	3.5	4.1 mA/V
Internal resistance	R_i	=	8.3	7.0	6.1 kΩ

LIMITING VALUES (Design centre limits; each section)			
Anode voltage in cold condition	V_{a_o}	= max.	550 V
Anode voltage when anode current = 0 mA	$V_a(I_a = 0)$	= max.	400 V
Anode voltage	V_a	= max.	220 V
Anode voltage when anode dissipation < 0.8 W	$V_a(W_a<0.8\ W)$	= max.	250 V
Anode dissipation	W_a	= max.	1.5 W
Anode dissipation	W_a	= max.	1.8 W [1]
Grid dissipation	W_g	= max.	0.03 W
Negative grid voltage	$-V_g$	= max.	100 V
Peak negative grid voltage	$-V_{g_p}$	= max.	200 V [2]
Cathode current	I_k	= max.	20 mA
Peak cathode current	I_{k_p}	= max.	100 mA [2]
Heater to cathode voltage			
cathode positive	V_{kf}	= max.	150 V
cathode negative	V_{kf}	= max.	100 V
Heater voltage	V_f	= 6.3 V ± 5 % [3]	
Bulb temperature	t_{bulb}	= max.	170 °C [3]

MAX. CIRCUIT VALUES			
Grid resistor	R_g	= max.	1 MΩ [4]

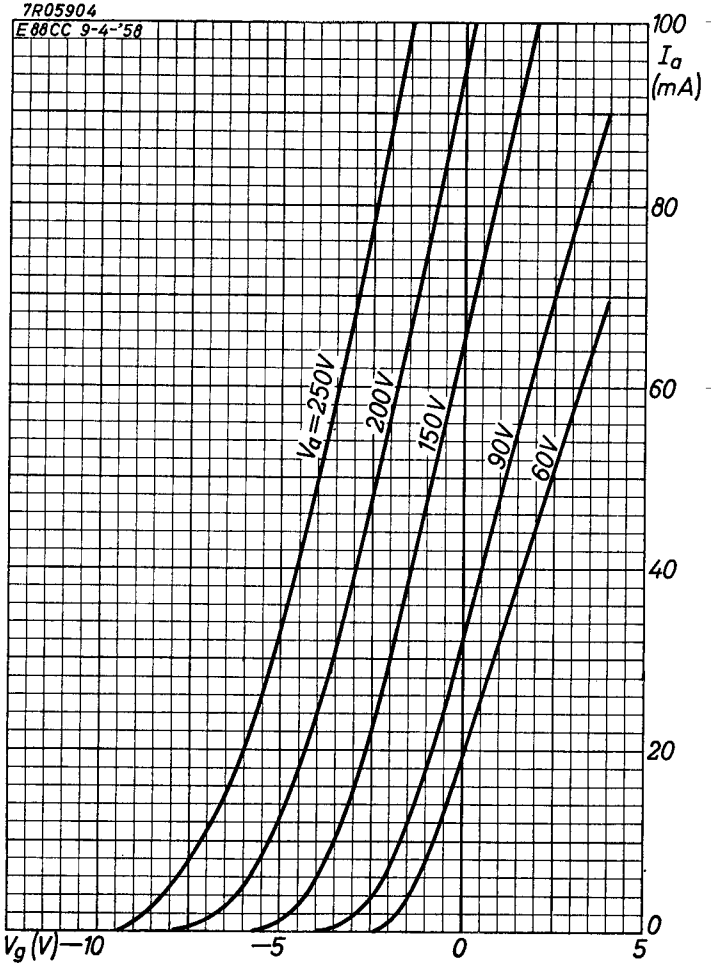
[1]) When $W_a + W_{a'}$ is less than 2 W

[2]) Pulse duration max. 200 µsec, duty factor max. 10 %

[3]) Absolute limits

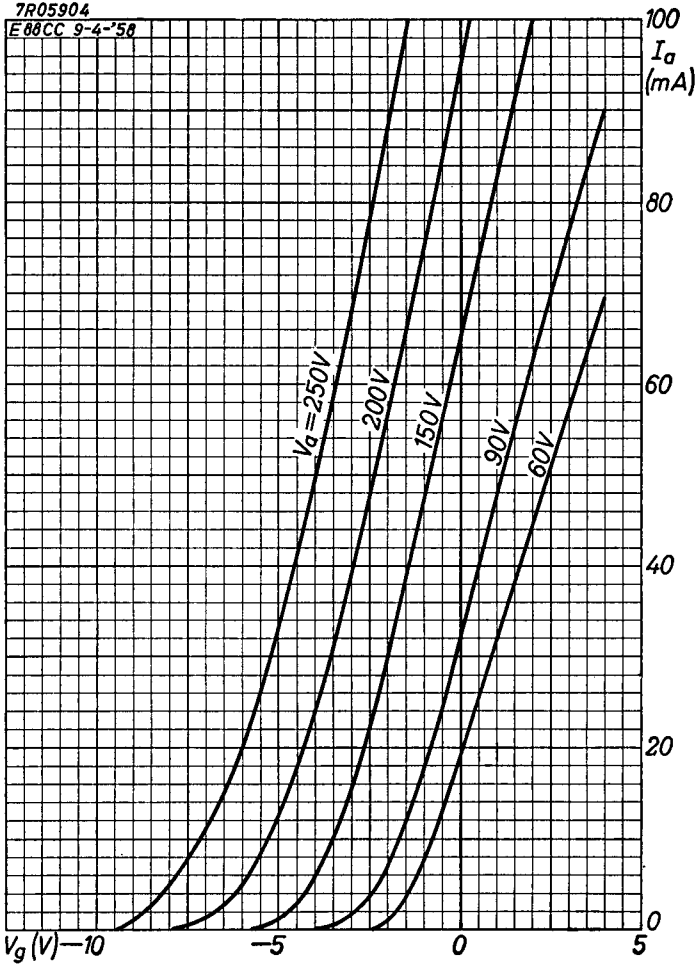
[4]) Fixed bias is only permitted when I_a < 5 mA

SQ PHILIPS E88CC



6.6.1958

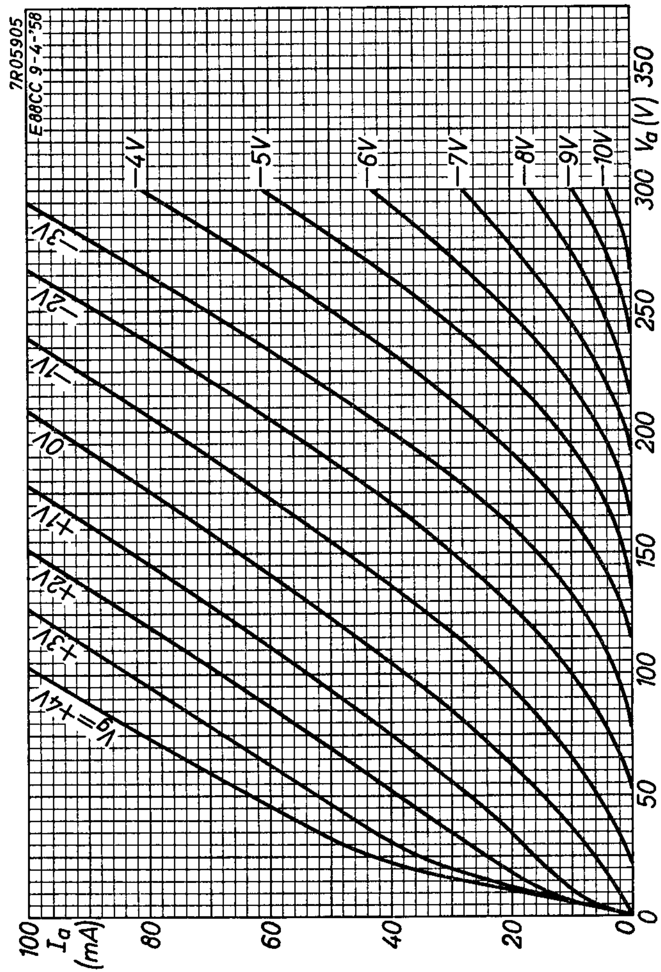
A


7R05904
E88CC 9-4-'58
100
I_a (mA)
80
60
40
20
0
V_a = 250V
200V
150V
90V
60V
V_g (V) −10
−5
0
5

E88CC

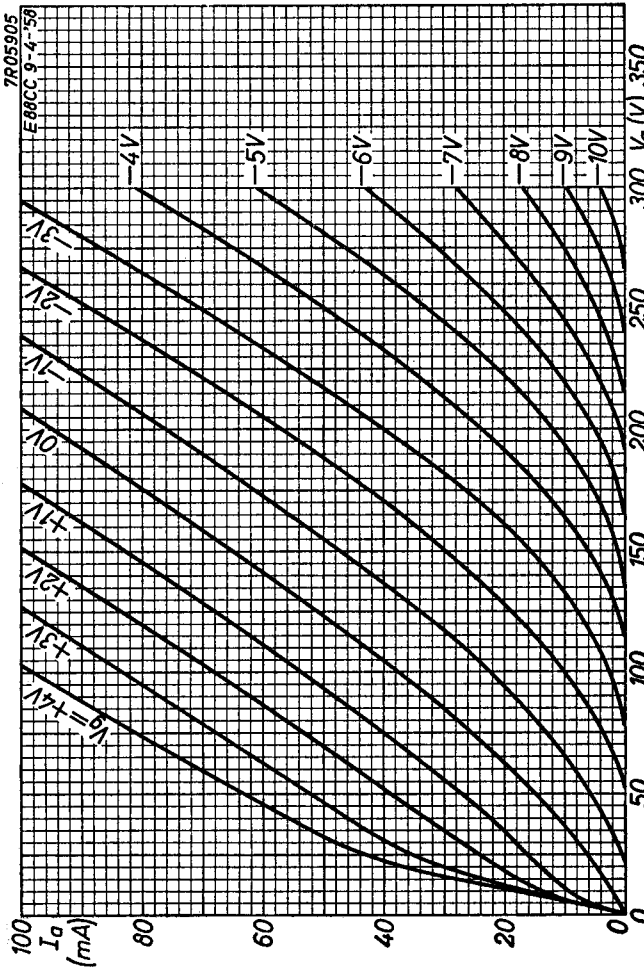
PHILIPS

SQ



B

E88CC **PHILIPS** **SQ**



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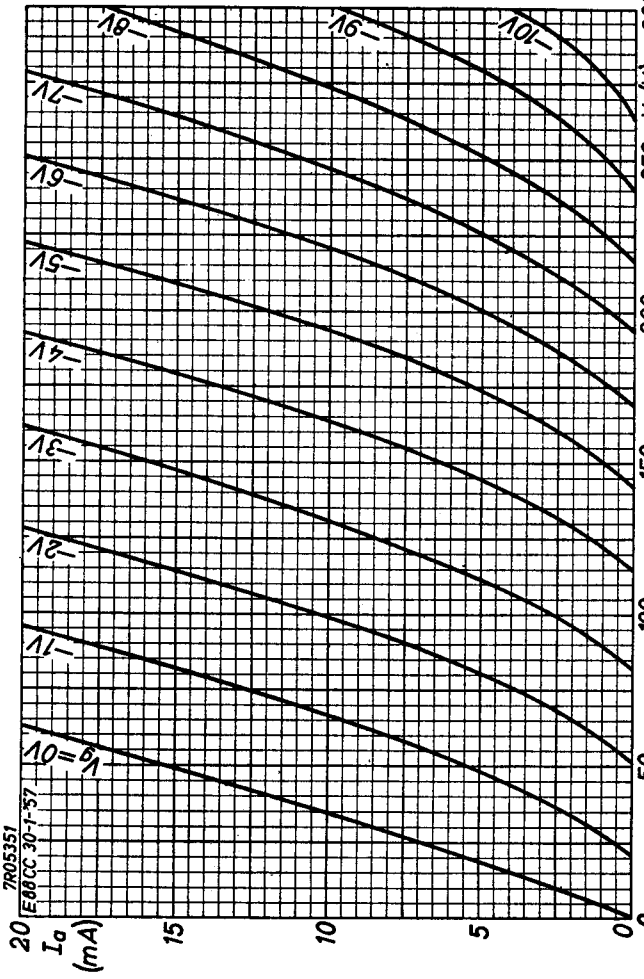

6.6.1957

c

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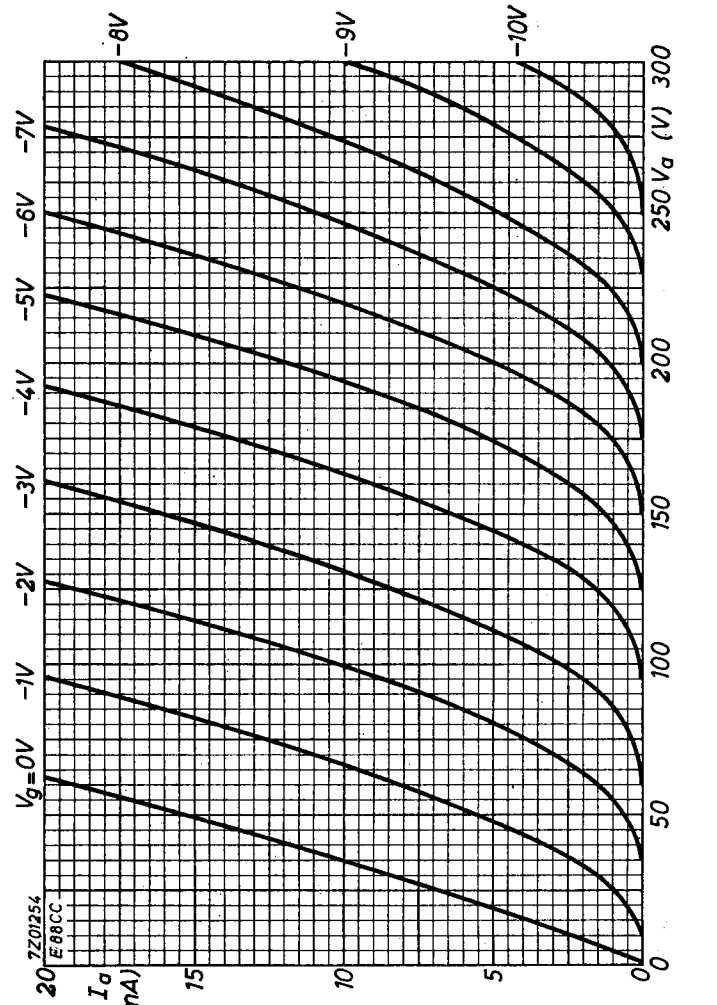
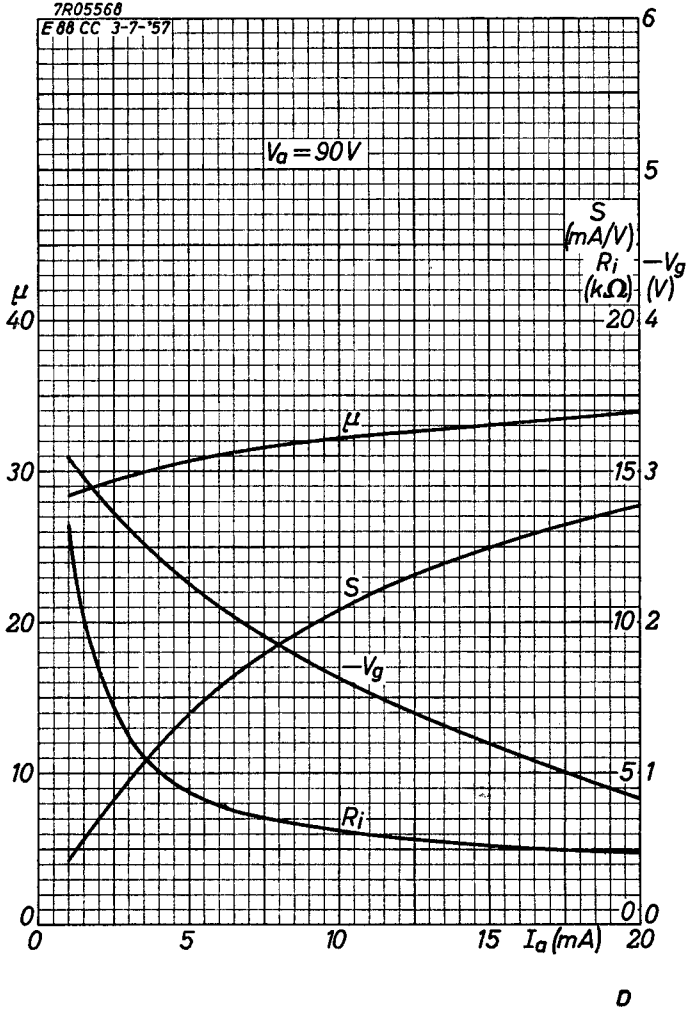


12.12.1962

C

E 88 CC **PHILIPS**



D

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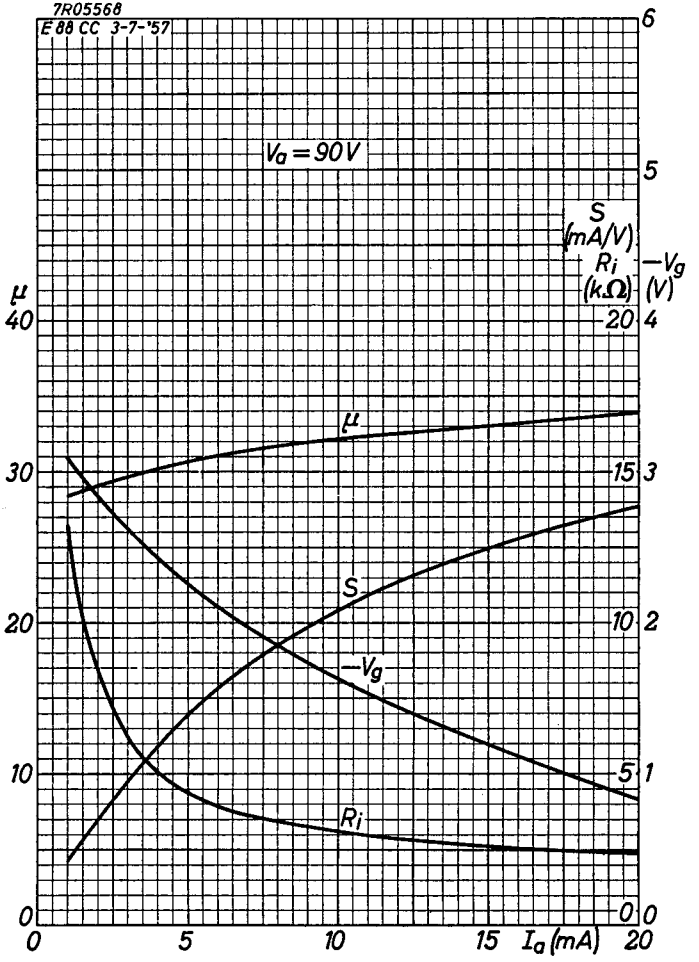

D

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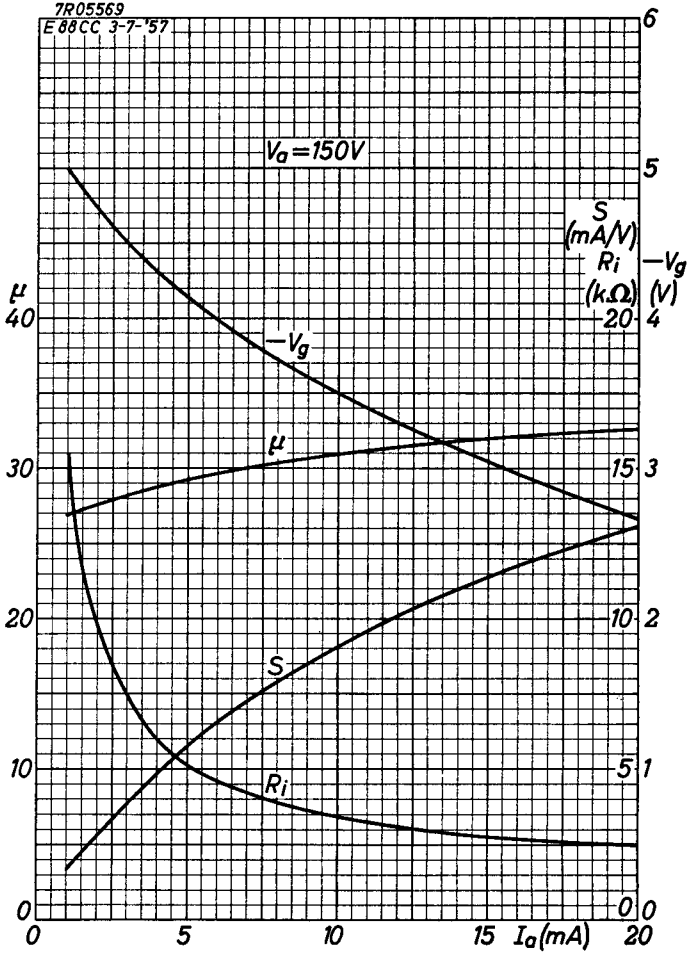

6.6.1957 E

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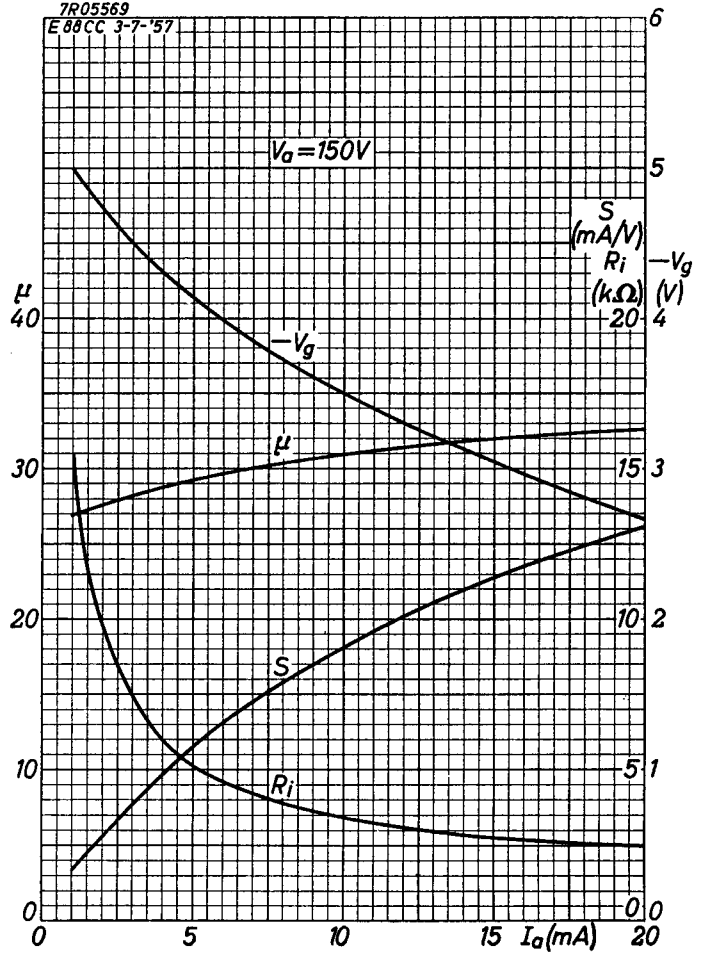
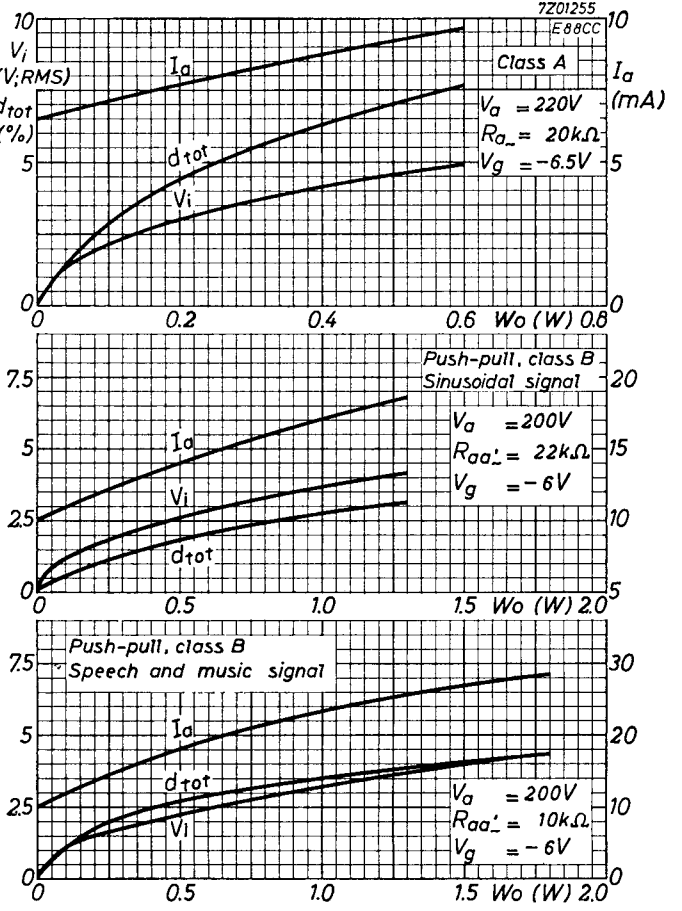


12.12.1962

E

E88CC PHILIPS SQ



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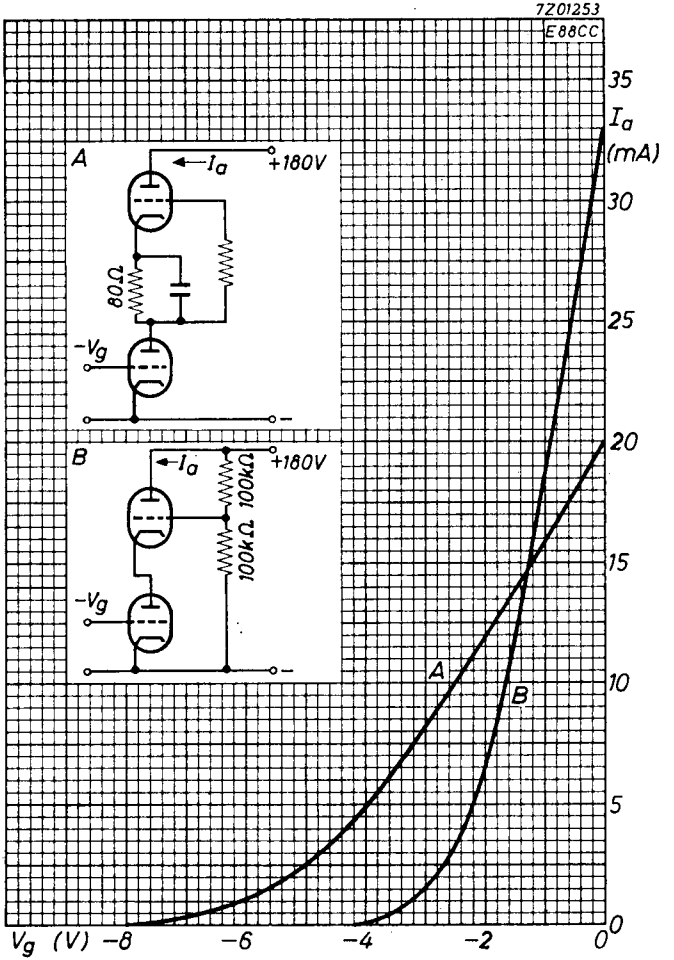

12.12.1962

G

E88CC

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19	C	1957.06.06

20	C	1962.12.12
21	D	1957.06.06
22	D	1962.12.12
23	E	1957.06.06
24	E	1962.12.12
25	F	1962.12.12
26	G	1962.12.12
27,28	FP	1999.03.02