SQ PHILIPS E188CC

SPECIAL QUALITY, SHOCK AND VIBRATION RESISTANT DOUBLE TRIODE for use in R.F. and A.F. circuits as cascode amplifier, cathode follower, etc.

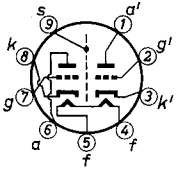
DOUBLE TRIODE A HAUTE SECURITE, RESISTANTE AUX CHOCS ET VIBRATIONS pour utilisation dans des circuits H.F. et B.F. comme amplificatrice cascode, amplificatrice à charge cathodique, etc.

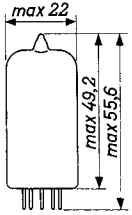
ZUVERLÄSSIGE, STOSS- UND VIBRATIONSFESTE DOPPELTRIODE zur Verwendung in HF- und NF-Schaltungen als Kaskodenverstärker, in Anodenbasisschaltung, usw.

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

$\frac{Vf = 6{,}3\ V}{If = 335\ mA}$

Dimensions in mm
Dimensions en mm
Abmessungen in mm





Base, culot, Sockel: NOVAL

Characteristics (each triode; see page 2)
Caractéristiques (chaque triode; voir page 2)
Kenndaten (jede Triode; siehe Seite 2)

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

Colonne I: Valeurs pour le réglage de la triode et les résultats moyens de mesures de tubes neufs
II: Gamme de valeurs caractéristiques pour l'étude d'équipements
III: Valeurs déterminant la fin de durée de vie

Spalte I: Einstelldaten der Triode und mittlere Messergebnisse
II: Charakteristischer Wertbereich für Gerätentwurf
III: Werte die das Ende der Lebensdauer bestimmen

SPECIAL QUALITY, LONG LIFE, SHOCK AND VIBRATION RESISTANT DOUBLE TRIODE with anti-microphonic construction for use in R.F. or A.F. circuits as cascode amplifier, cathode follower, etc.

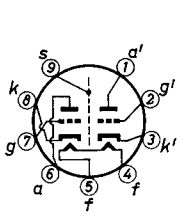
The E188CC has separate cathodes and will maintain its emission capabilities after long periods of operation under cut-off conditions.

HEATING

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

Heater voltage $V_f = 6.3$ V

Heater current $I_f = 335$ 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
II: Characteristics range values for equipment design
III: Data indicating the end of life

		I	II	III	
Heater current					
Heater voltage	V_f =	6.3			V
Heater current	I_f =	335	318-352	318-352	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 (measured without external shield)
Capacités (mesurées sans blindage extérieur)
Kapazitäten (ohne äussere Abschirmung gemessen)

	I	II			I	II	
$C_{a-(k+f+s)}$	= 1,8	1,6-2,0	pF	$C_{a'-(k'+f+s)}$	= 1,7	1,5-1,9	pF
$C_{a-(k+f)}$	= 0,5	0,4-0,6	pF	$C_{a'-(k'+f)}$	= 0,4	0,3-0,5	pF
$C_{g-(k+f+s)}$	= 3,1	2,5-3,7	pF	$C_{g'-(k'+f+s)}$	= 3,1	2,5-3,7	pF
$C_{g-(k+f)}$	= 3,1	2,5-3,7	pF	$C_{g'-(k'+f)}$	= 3,1	2,5-3,7	pF
C_{ag}	= 1,4	1,2-1,6	pF	$C_{a'g'}$	= 1,4	1,2-1,6	pF
C_{ak}	= 0,18	0,14-0,22	pF	$C_{a'k'}$	=0,18	0,14-0,22	pF
C_{kf}	= 2,6		pF	$C_{k'f}$	= 2,7		pF
C_{as}	= 1,3	1,1-1,5	pF	$C_{a's}$	= 1,3	1,1-1,5	pF
$C_{aa'}$	=	< 0,045	pF	$C_{a-(g+f+s)}$	= 3,0	2,7-3,3	pF
$C_{gg'}$	=	< 0,005	pF	$C_{k-(g+f+s)}$	= 6,0	5,1-6,9	pF
$C_{ag'}$	=	< 0,005	pF	$C_{a'-(g'+f+s)}$	= 2,9	2,6-3,2	pF
$C_{a'g}$	=	< 0,005	pF	$C_{k'-(g'+f+s)}$	= 6,0	5,1-6,9	pF
$C_{gk'}$	=	< 0,005	pF				
$C_{g'k}$	=	< 0,005	pF				

Heater current; courant de chauffage; Heizstrom

	I	II	III	
V_f = 6,3				V
I_f = 335		318-352	318-352	mA

Typical characteristics; caractéristiques types; Kenndaten

		I	II	III	
V_{ba}		= 100		V [1]	
V_{bg}		= +9		V [1]	
R_k		= 680		Ω [1]	
I_a		= 15	14,2-15,8	13,5	mA
S		=12,5	10,5-14,5	9	mA/V
μ		= 33			
R_{eq}	(f = 45 Mc/s)	= 250		Ω	
F	(f = 200 Mc/s)	= 4,6		dB [2]	
r_g	(f = 100 Mc/s)	= 3		kΩ	

[1])[2]) See page 8; voir page 8; siehe Seite 8

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 (continued)
Caractéristiques types (suite)
Kenndaten (Fortsetzung)

	I	II	III			I	II	
V_{ba} =	90		V	V_a	=	100		V
R_k =	120		Ω	$-V_g$	=	5,5		V
I_a =	12		mA	R_a	=	1		MΩ
S =	11,5		mA/V	I_a	=		< 20	µA
V_{ba} =	100		V					
V_{bg} =	+9		V					
R_k =	680		Ω					
R_g =	0,1		MΩ					
$-I_g$ =		<0,1	1,0 µA					

Insulation; isolement; Isolation

		I	II	III
V_{kf} (k neg.)	=	60		V
I_{kf}	=		< 6	12 µA
V_{kf} (k pos.)	=	120		V
I_{kf}	=		< 6	12 µA
V [3])	=	200		V
R_{isol} [3])	=		>100	20 MΩ

Conditions of life test operation
Conditions de fonctionnement en essai de durée
Betriebsbedingungen einer Lebensdauerprobe

V_f = 6,3 V $R_g = R_g'$ = 47 kΩ
$V_{ba} = V_{ba}'$ = 100 V $V_{kf} = V_k'f$ = 60 V (k neg.)
$V_{bg} = V_{bg}'$ = +9 V $I_a = I_a'$ = 15 mA
$R_k = R_k'$ = 680 Ω

The data indicating the endpoint of life are given in column III under the heading Characteristics
Les valeurs déterminant la fin de la durée sont données dans la colonne III des Caractéristiques
Die werte die das Ende der Lebensdauer bestimmen sind angegeben worden in Spalte III der Kenndaten

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[3]) See page 8; voir page 8; siehe Seite 8

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	10.5-14.5	9	mA/V
Amplification factor	μ	=	33			
Equivalent noise resistance	R_{eq}	=	250			Ω [2]
Noise factor	F	=	4.6			dB [3]
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	
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]) Measured at f = 45 Mc/s

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

Shock resistance: about 500 g [4])

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 [4])

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

Résistance aux chocs: environ 500 g [4])

Des forces comme appliquées 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 du tube

Résistance aux vibrations: 2,5 g [4])

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

Stossfestigkeit: etwa 500 g [4])

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

Vibrationsfestigkeit: 2,5 g [4])

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

Vibrational noise output
Tension de sortie par vibrations
Vibrations-Ausgangsspannung

V_{ba} =	100	270	V
R_a =	2	18	kΩ
V_{bg} =	+9	0	V
R_g =	-	1	MΩ
R_k =	680	180	Ω
C_k =	1000	50	µF
Vibration frequency Fréquence de la vibration = Vibrationsfrequenz	10-50	50-5000	c/s
Vibrational acceleration Accélération par la vibration = Vibrationsbeschleunigung	2,5 g	0,5	g
V_o =	max. 100	max. 140	mV

[4]) See page 8; voir page 8; siehe Seite 8

CHARACTERISTICS (continued)

Negative grid current			I	II	III	
Anode supply voltage	V_{ba}	=	100			V
Grid supply voltage	V_{bg}	=	+9			V
Cathode resistor	R_k	=	680			Ω
Grid resistor	R_g	=	0.1			MΩ
Negative grid current	$-I_g$	=		< 0.1	1.0	μA

Vibrational noise output			I	II	III	
Anode supply voltage	V_{ba}	=	100			V
Anode resistor	R_a	=	2			kΩ
Grid supply voltage	V_{bg}	=	+9			V
Cathode resistor	R_k	=	680			Ω
Cathode capacitor	C_k	=	1000			μF
Vibrational frequency	f	=	10-50			c/s
Vibrational acceleration		=	2.5			g
Vibrational noise output	V	=		< 100		mV

			I	II	III	
Anode supply voltage	V_{ba}	=	270			V
Anode resistor	R_a	=	18			kΩ
Grid resistor	R_g	=	1			MΩ
Cathode resistor	R_k	=	180			Ω
Cathode oapacitor	C_k	=	50			μF
Vibrational frequency	f	=	50-5000			c/s
Vibrational acceleration		=	0.5			g
Vibrational noise output	V	=		< 140		mV

Hum voltage Tension de ronflement Brummspannung	V_{ba}	=	90 V
	R_k	=	80 Ω
	C_k	=	1000 µF
	R_g	=	0,5 MΩ
	I_a	=	15 mA
	V_{ghum}	= max.	50 µV [1]

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

Vba	=	60	90	150 V
$R_{a\sim}$	=	0	1	3,9 kΩ
Rg	=	1	1	1 MΩ
Vosc	=	2	2,5	3 V_{eff}
Ia	=	4,7	7,7	11 mA
Sc	=	2,9	3,5	4,1 mA/V
Ri	=	8,3	7	6,1 kΩ

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_g	=		-6,8	V
V_i	=	0	1,5	4,5 V_{eff}
I_a	=	6,5	-	9,2 mA
W_o	=	-	0,05	0,5 W
d_{tot}	=	-	-	7 %

[1]) $V_{g\ hum}$ 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

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

Operating characteristics as push-pull output tube, class B (sinusoidal 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_g	=		-6		V
V_i	=	0	0,9	4,0	V_{eff}
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_g	=		-6		V
V_i	=	0	0,9	4,0	V_{eff}
I_a	=	2 x 5	-	2 x 13,5	mA
W_o	=	-	0,05	1,5	W
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 tubes will occur
Ces valeurs ont 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

Siehe Seite 7

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	%

Limiting values (absolute limits; each section)
Caractéristiques limites (limites absolues; chaque triode)
Grenzdaten (absolute Grenzwerte; jede Triode)

V_a (cold; froid; kalt)	= max.	550 V
V_{ao} ($I_a = 0$)	= max.	400 V
V_a	= max.	250 V
W_a	= max.	1,65 W
W_a ($W_a+W_a' \leq 2{,}2$ W)	= max.	2,0 W
W_g	= max.	30 mW
$-V_g$	= max.	110 V
$-V_{gp}$ (T_{imp} = max. 200 µsec; δ = max. 0,1)	= max.	200 V
I_k	= max.	22 mA
I_{kp} (T_{imp} = max. 200 µsec; δ = max. 0,1)	= max.	110 mA
V_{kf} (k pos.; f neg.)	= max.	120 V
V_{kf} (k neg.; f pos.)	= max.	60 V
V_f	= 6,3 V ± 5 %	
t_{bulb}	= max.	165 °C

Maximum circuit values
Valeurs max. des éléments de montage
Max. Werte der Schaltungsteile

R_g { automatic bias / en polarisation automatique / automatische Gittervorspannung }	= max.	1 MΩ
R_g { fixed bias / en polarisation fixe / feste Gittervorspannung }	= max.	0,5 MΩ

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[1]) Seite 6

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_{ba}	=	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 (Absolute limits; each section)

Anode voltage in cold condition	V_{ao}	= max. 550 V
Anode voltage when anode current = 0 mA	$V_a(I_a = 0)$	= max. 400 V
Anode voltage	V_a	= max. 250 V
Anode dissipation	W_a	= max. 1.65 W
Anode dissipation	W_a	= max. 2.0 W [1]
Grid dissipation	W_g	= max. 0.03 W
Negative grid voltage	$-V_g$	= max. 110 V
Peak negative grid voltage	$-V_{gp}$	= max. 200 V [2]
Cathode current	I_k	= max. 22 mA
Peak cathode current	I_{kp}	= max. 110 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 %
Bulb temperature	t_{bulb}	= max. 165 °C

MAX.CCIRCUIT VALUES

Grid resistor with automatic bias	R_g	= max. 1 MΩ
Grid resistor with fixed bias	R_g	= max. 0.5 MΩ

[1]) When $W_a+W_{a'}$ is less than 2.2 W

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

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[1]) Page 2; Seite 2

Operation of the tube under these conditions is recommended because of the small spread in the characteristics
Le fonctionnement du tube dans ces conditions est recommandé à cause de la petite dispersion des caractéristiques
Der Betrieb der Röhre unter diesen Umständen wird mit Rücksicht auf die geringe Streuung der Kenndaten empfohlen

[2]) Page 2; Seite 2

Noise factor measured in a cascode circuit matched for minimum noise
Facteur de bruit mesuré en montage cascode adapté au bruit minimum
Rauschfaktor gemessen in einer für minimales Rauschen angepassten Kaskodenschaltung

[3]) Page 3; Seite 3

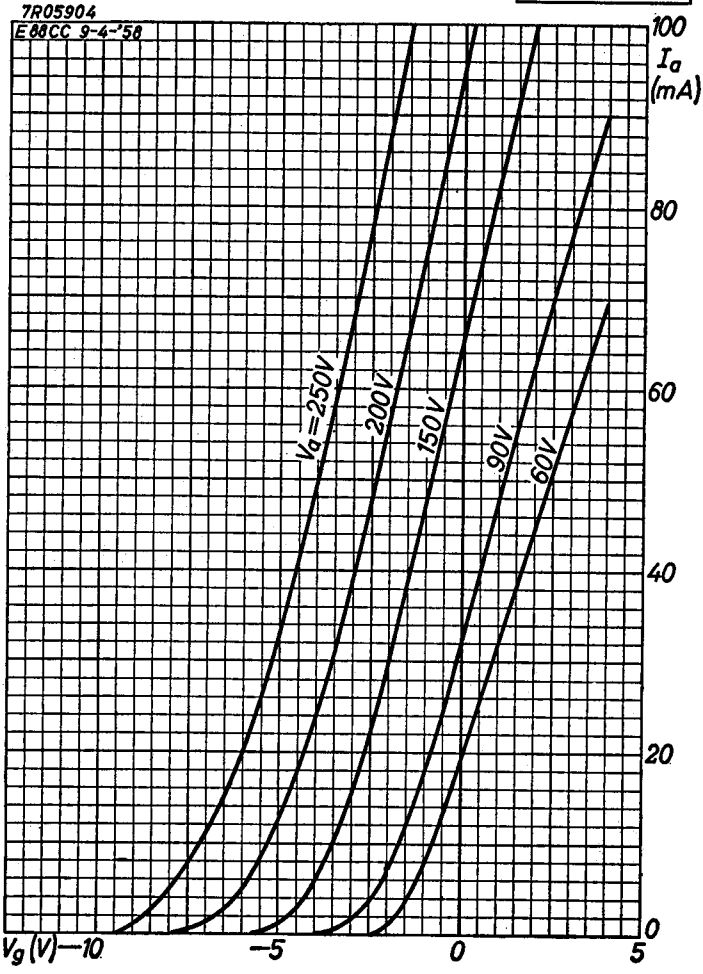
Voltage and insulation resistance between two arbitrary electrodes
If measured with respect to the cathode, the latter should be positive
Tension et résistance d'isolement entre deux électrodes quelconques
Si mesuré par rapport à la cathode, celle-ci doit être positive
Spannung und Isolationswiderstand zwischen zwei willkürlichen Elektroden
Wenn in Bezug auf die Katode gemessen wird, soll diese positiv sein

[4]) Page 4; Seite 4

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

For curves of the E188CC please refer to the E88CC
Pour les courbes du E188CC voir E88CC
Für die Kennlinien der E188CC siehe E88CC

SQ **PHILIPS** **E188CC**



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A

E188CC

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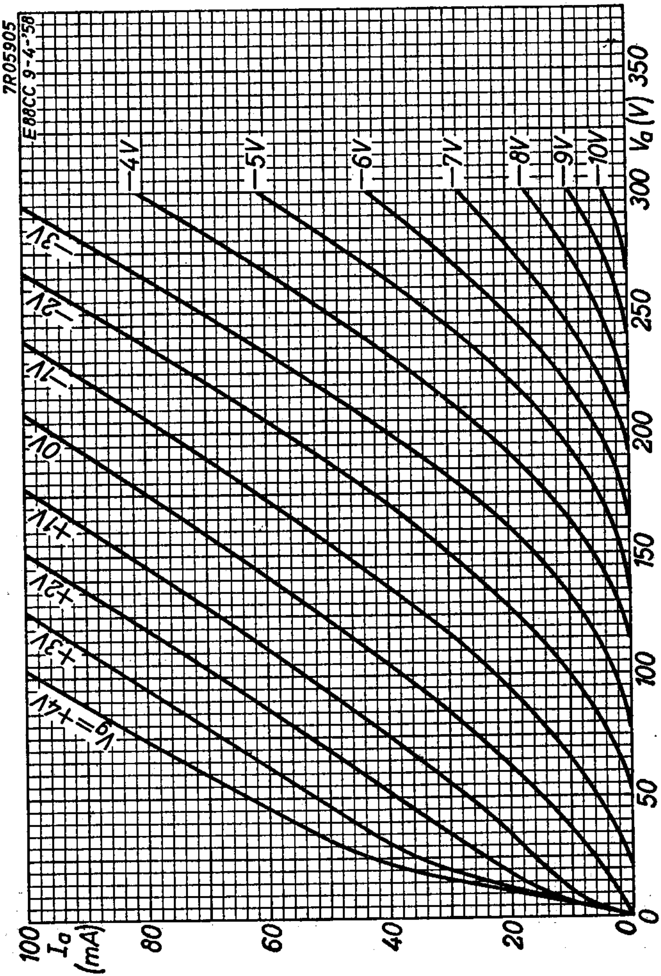
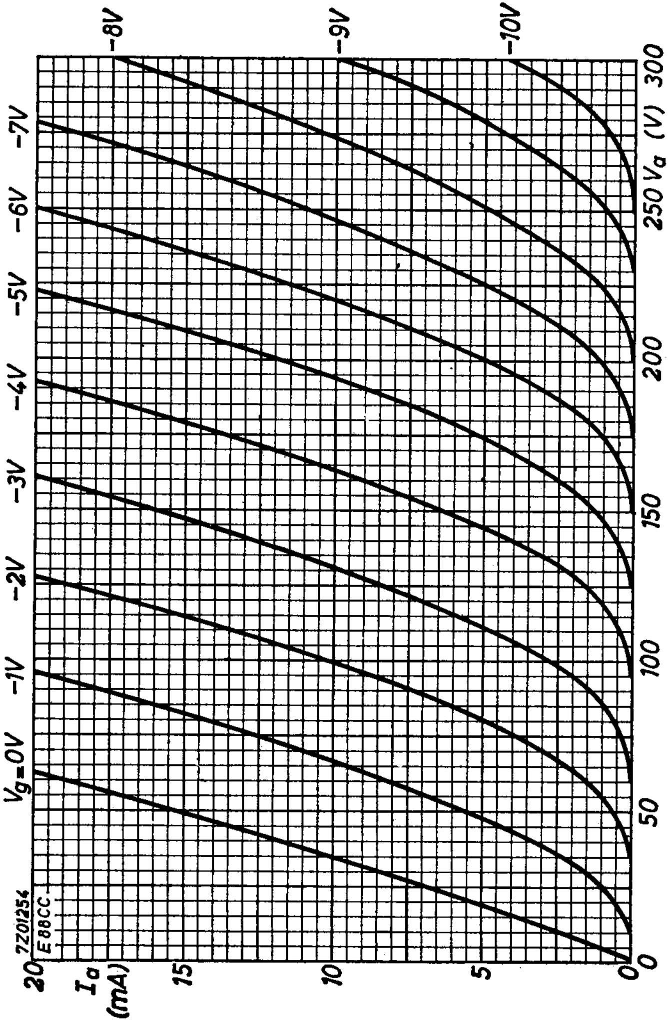


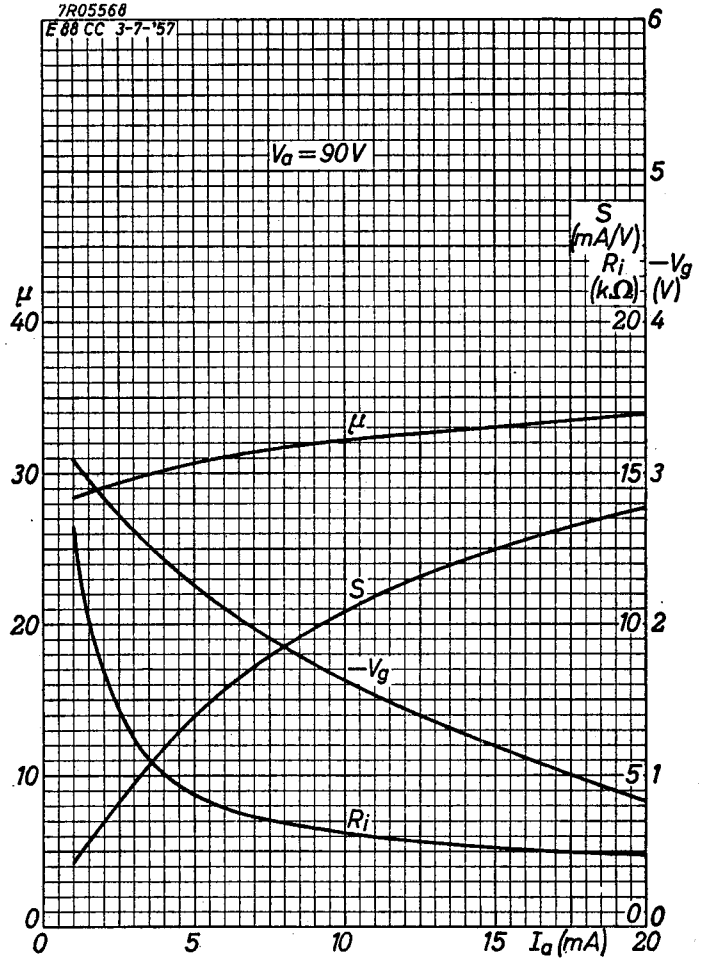
B

SQ **PHILIPS** **E188CC**



12.12.1962 C

E188CC PHILIPS SQ



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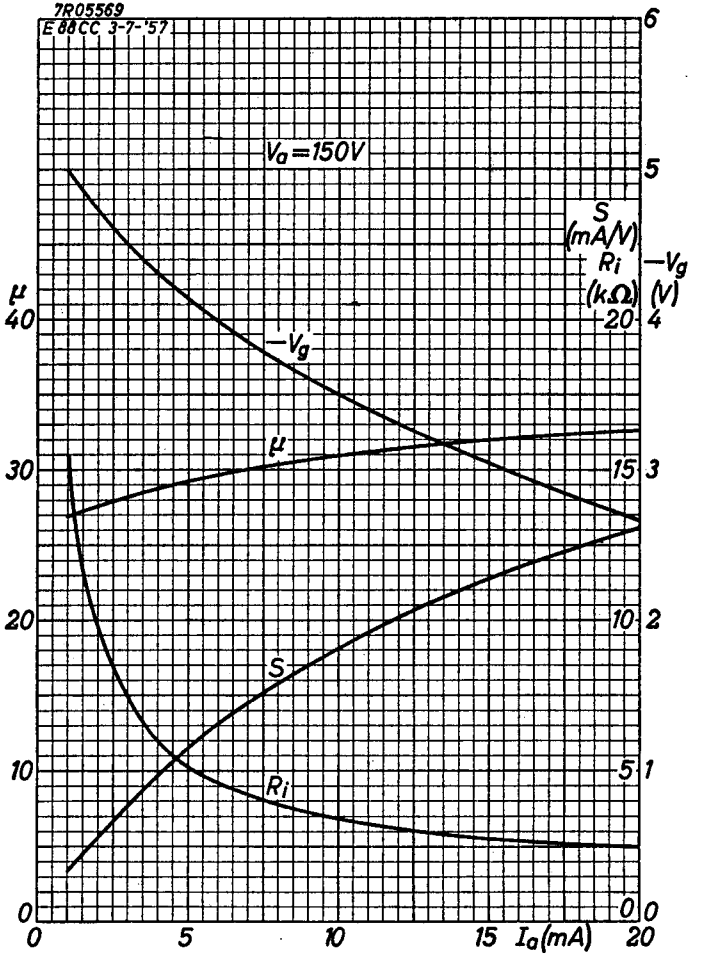

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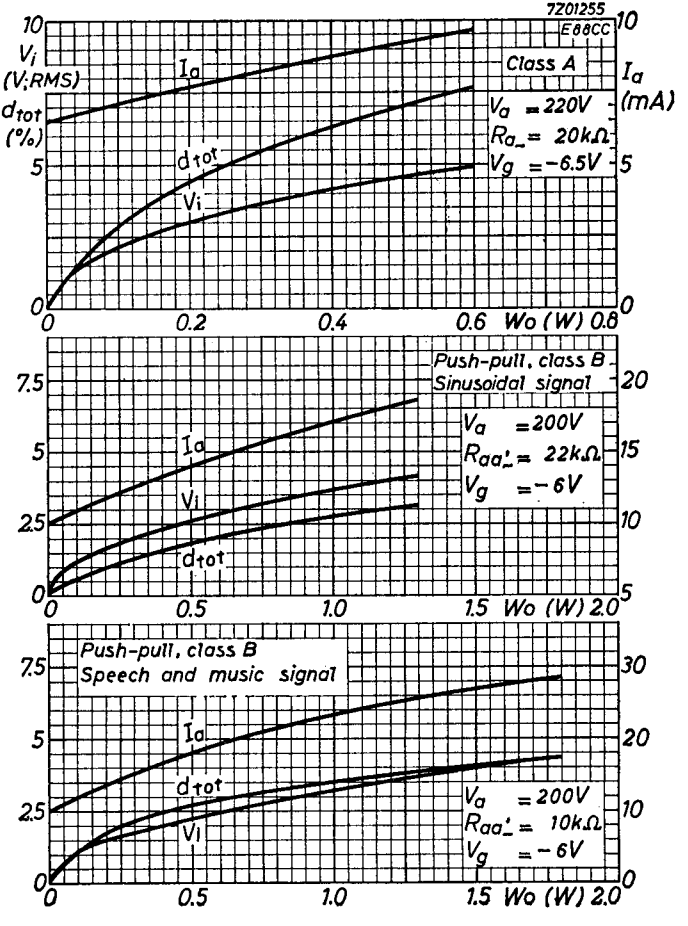
E

E188CC PHILIPS SQ



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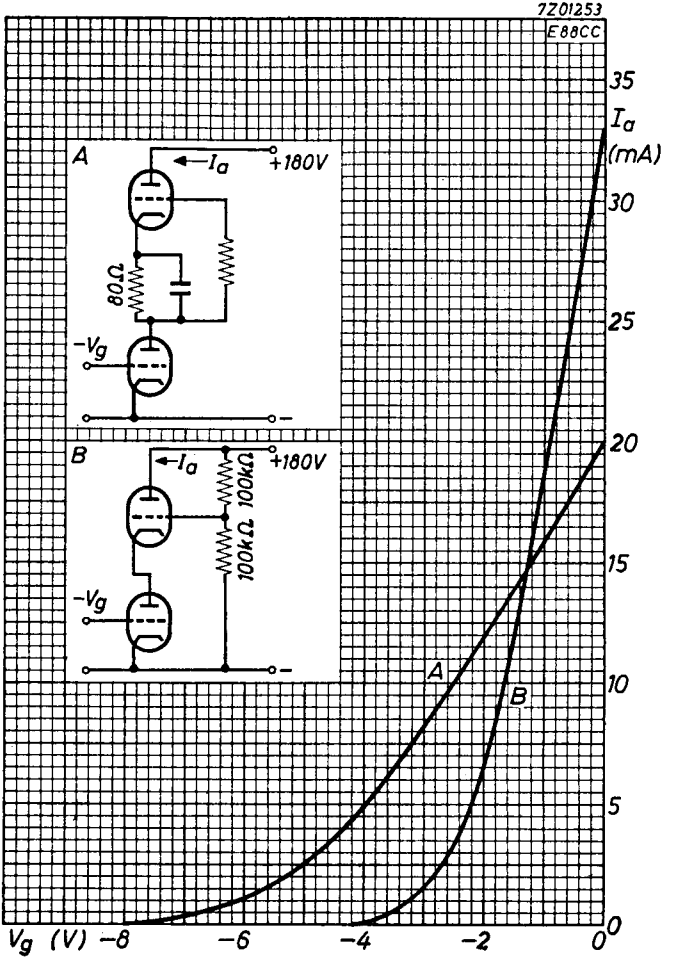

12.12.1962

G

E188CC

20	E	1962.12.12
21	F	1962.12.12
22	G	1962.12.12
23, 24	FP	2005.05.06