

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 a 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

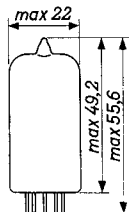
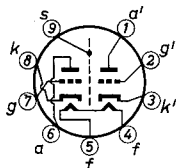
$V_f = 6,3 \text{ V}$

$I_f = 335 \text{ mA}$

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 Wertebereich 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.

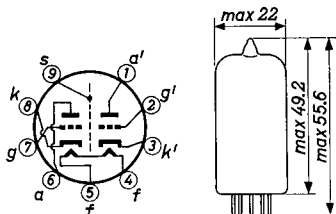
The E188CC has separate cathodes and will maintain its emission capabilities after long periods of operation under cut-off conditions.

### 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

#### Heater current

	I	II	III
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 <sup>1)</sup>
$V_{bg}$	= +9			V <sup>1)</sup>
$R_k$	= 680			$\Omega$ <sup>1)</sup>
$I_a$	= 15	14,2-15,8	13,5	mA
$S$	= 12,5	10,5-14,5	9	mA/V
$\mu$	= 33			
$R_{eq}$ ( $f = 45$ Mc/s)	= 250			$\Omega$
$F$ ( $f = 200$ Mc/s)	= 4,6			dB <sup>2)</sup>
$r_g$ ( $f = 100$ Mc/s)	= 3			k $\Omega$

<sup>1) 2)</sup> 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		$\Omega$	$-V_g =$	5,5		V
$I_a =$	12		mA	$R_a =$	1		M $\Omega$
$S =$	11,5		mA/V	$I_a =$		< 20	$\mu$ A
$V_{ba} =$	100		V				
$V_{bg} =$	+9		V				
$R_k =$	680		$\Omega$				
$R_g =$	0,1		M $\Omega$				
$-I_g =$		< 0,1	1,0 $\mu$ A				

Insulation; isolement; Isolation

	I	II	III
$V_{kf}$ (k neg.)	= 60		V
$I_{kf}$	=	< 6	12 $\mu$ A
$V_{kf}$ (k pos.)	= 120		V
$I_{kf}$	=	< 6	12 $\mu$ A
$V^3)$	= 200		V
$R_{isol}^3)$	=	> 100	20 M $\Omega$

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 k $\Omega$
$V_{ba} = V_{ba}' =$	100 V	$V_{kf} = V_{kf}' =$	60 V (k neg.)
$V_{bg} = V_{bg}' =$	+9 V	$I_a = I_a' =$	15 mA
$R_k = R_k' =$	680 $\Omega$		

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

<sup>3)</sup> 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	$R_k = 680$			$\Omega$ 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	$\mu = 33$			
Equivalent noise resistance	$R_{eq} = 250$			$\Omega$ 2)
Noise factor	$F = 4.6$			dB 3)
Input damping at $f = 100$ Mc/s	$r_g = 3$			k $\Omega$

		I	II	III
Anode supply voltage	$V_{ba} = 90$			V
Cathode resistor	$R_k = 120$			$\Omega$
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	$R_k = 80$		$\Omega$
Cathode capacitor	$C_k = 1000$		$\mu$ F
Grid resistor	$R_g = 0.5$		M $\Omega$
Hum voltage	$V_{ghum} =$		< 50 $\mu$ V

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 <sup>4)</sup>

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 <sup>4)</sup>

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 <sup>4)</sup>

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 <sup>4)</sup>

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 <sup>4)</sup>

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 <sup>4)</sup>

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 <sub>ba</sub> =	100	270 V
R <sub>a</sub> =	2	18 kΩ
V <sub>bg</sub> =	+9	0 V
R <sub>g</sub> =	-	1 MΩ
R <sub>k</sub> =	680	180 Ω
C <sub>k</sub> =	1000	50 μF

Vibration frequency  
Fréquence de la vibration  
Vibrationsfrequenz = 10-50 50-5000 c/s

Vibrational acceleration  
Accélération par la vibration = 2,5 g 0,5 g  
Vibrationsbeschleunigung

V<sub>o</sub> = max. 100 max. 140 mV

<sup>4)</sup> 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		$\Omega$
Grid resistor	$R_g =$	0.1		M $\Omega$
Negative grid current	$-I_g =$		< 0.1	1.0 $\mu$ A

Vibrational noise output

		I	II	III
Anode supply voltage	$V_{ba} =$	100		V
Anode resistor	$R_a =$	2		k $\Omega$
Grid supply voltage	$V_{bg} =$	+9		V
Cathode resistor	$R_k =$	680		$\Omega$
Cathode capacitor	$C_k =$	1000		$\mu$ F
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		k $\Omega$
Grid resistor	$R_g =$	1		M $\Omega$
Cathode resistor	$R_k =$	180		$\Omega$
Cathode capacitor	$C_k =$	50		$\mu$ F
Vibrational frequency	$f =$	50-5000		c/s
Vibrational acceleration	$=$	0.5		$g$
Vibrational noise output	$V =$		< 140	mV



Hum voltage	$V_{ba}$	=	90 V
Tension de ronflement	$R_k$	=	80 $\Omega$
Brummspannung	$C_k$	=	1000 $\mu F$
	$R_g$	=	0,5 M $\Omega$
	$I_a$	=	15 mA
	$V_{g_{hum}}$	= max.	50 $\mu V$ <sup>1)</sup>

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 k $\Omega$
$R_g$	=	1	1	1 M $\Omega$
$V_{osc}$	=	2	2,5	3 $V_{eff}$
$I_a$	=	4,7	7,7	11 mA
$S_c$	=	2,9	3,5	4,1 mA/V
$R_i$	=	8,3	7	6,1 k $\Omega$

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	k $\Omega$	
$V_g$	=	-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
$dt_{tot}$	=	-	-	7 %

<sup>1)</sup>  $V_{g_{hum}}$  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 $\mu$ A
		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 $\mu$ A

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 M $\Omega$

SHOCK RESISTANCE: about 500 g<sup>1)</sup>

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<sup>1)</sup>

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 $\Omega$
Grid resistor	$R_g = R_g'$	= 47 k $\Omega$
Voltage between cathode and heater (cathode negative)	$V_{kf} = V_{kf}'$	= 60 V

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

<sup>1)</sup> 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	k $\Omega$
$V_g$	=	-6	V
$V_1$	=	0 0,9 4,0	$V_{eff}$
$I_a$	=	2 x 5 - 2 x 9	mA
$W_o$	=	- 0,05 1,2	W
$dtot$	=	- - 3	%

Operating characteristics as push-pull output tube, class B (speech and music signals)<sup>1)</sup>

Caractéristiques d'utilisation comme tube de sortie push-pull classe B (signaux de la parole et de la musique)<sup>1)</sup>

Betriebsdaten als Gegentakt-Endröhre, Klasse B (Sprech- und Musiksignale)<sup>1)</sup>

$V_a$	=	200	V
$R_{aa\sim}$	=	10	k $\Omega$
$V_g$	=	-6	V
$V_1$	=	0 0,9 4,0	$V_{eff}$
$I_a$	=	2 x 5 - 2 x 13,5	mA
$W_o$	=	- 0,05 1,5	W
$dtot$	=	- - 4	%

<sup>1)</sup> 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 permmissible 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	k $\Omega$
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	k $\Omega$
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	k $\Omega$
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
$V_{a0}$ ( $I_a = 0$ )	= 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
$-V_{gp}$ ( $T_{imp} = \text{max. } 200 \mu\text{sec}$ ; $\delta = \text{max. } 0,1$ )	= max. 200 V
$I_k$	= max. 22 mA
$I_{kp}$ ( $T_{imp} = \text{max. } 200 \mu\text{sec}$ ; $\delta = \text{max. } 0,1$ )	= 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 $\pm$ 5 %
tbulb	= 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 M $\Omega$
$R_g$ { fixed bias en polarisation fixe feste Gittervorspannung }	= max. 0,5 M $\Omega$

<sup>1)</sup> 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 k $\Omega$
Grid resistor	$R_g$	= 1	1	1 M $\Omega$
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 k $\Omega$

LIMITING VALUES (Absolute limits; each section)

Anode voltage in cold condition	$V_{a0}$	= 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 <sup>1)</sup>
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 <sup>2)</sup>
Cathode current	$I_k$	= max.	22 mA
Peak cathode current	$I_{kp}$	= max.	110 mA <sup>2)</sup>
Heater to cathode voltage cathode positive	$V_{kf}$	= max.	150 V
Heater to cathode voltage cathode negative	$V_{kf}$	= max.	100 V
Heater voltage	$V_f$	=	6.3 V $\pm$ 5 %
Bulb temperature	$t_{bulb}$	= max.	165 $^{\circ}$ C

MAX. CCIRCUIT VALUES

Grid resistor with automatic bias	$R_g$	= max.	1 M $\Omega$
Grid resistor with fixed bias	$R_g$	= max.	0.5 M $\Omega$

<sup>1)</sup> When  $W_a + W_a'$  is less than 2.2 W

<sup>2)</sup> Pulse duration max. 200  $\mu$ sec, duty factor max. 10 %

## 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

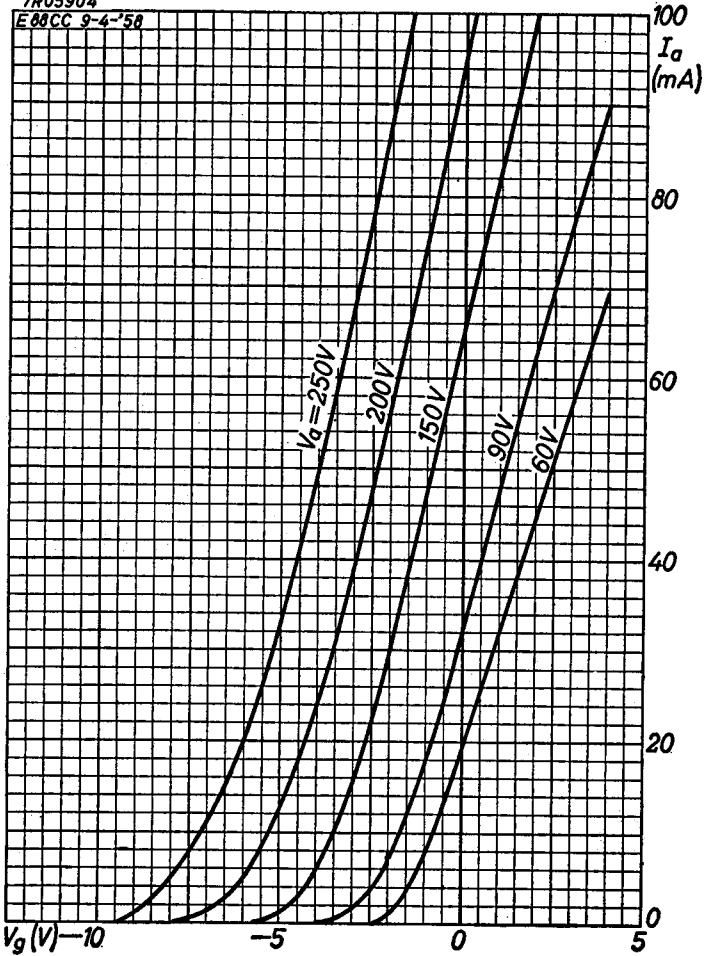
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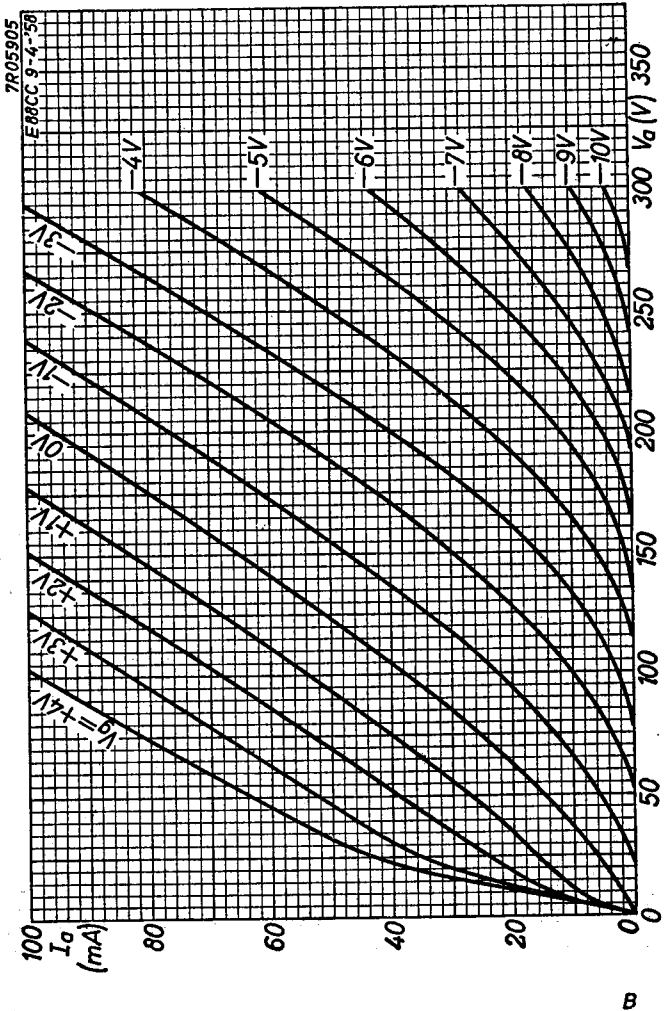
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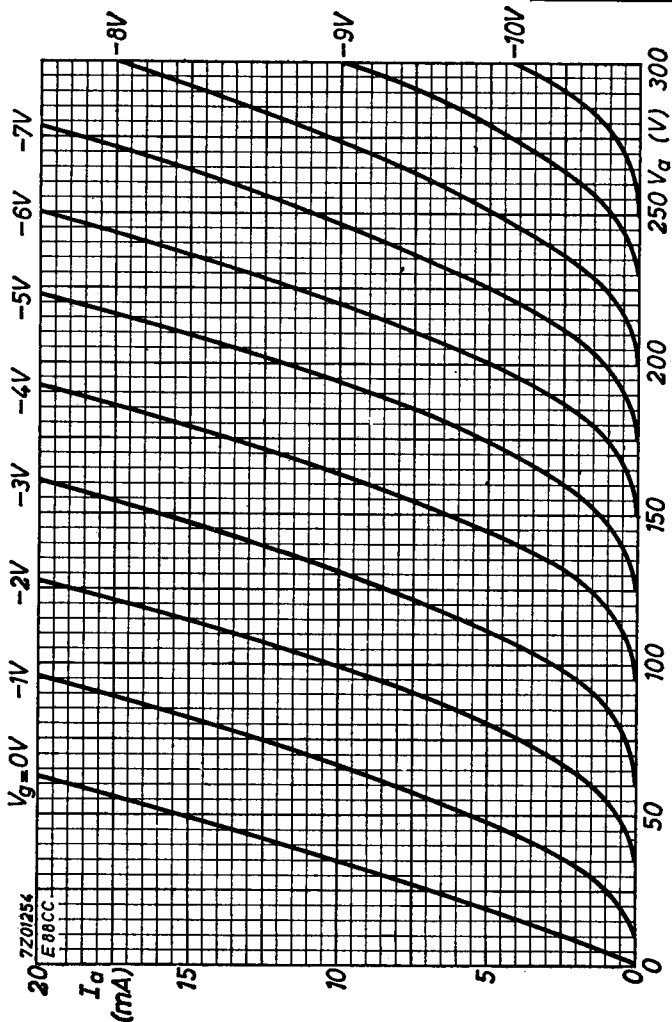
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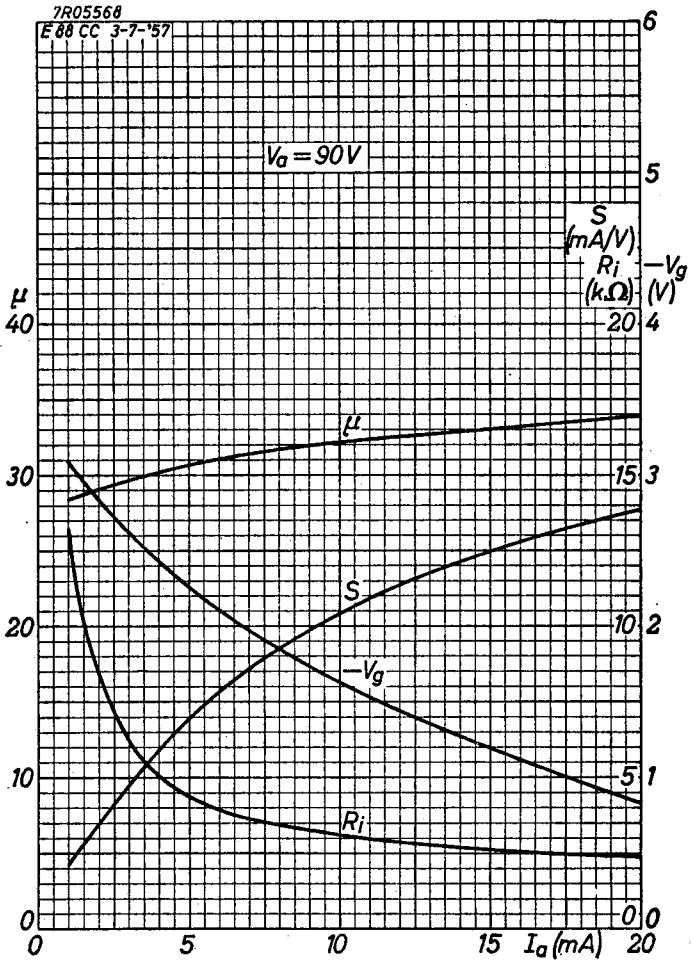
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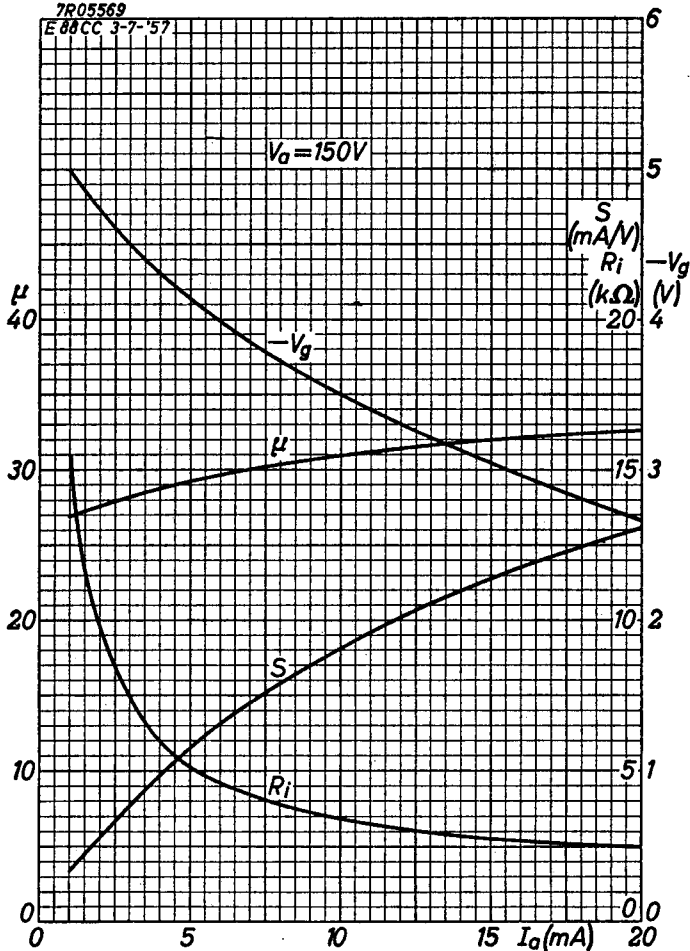
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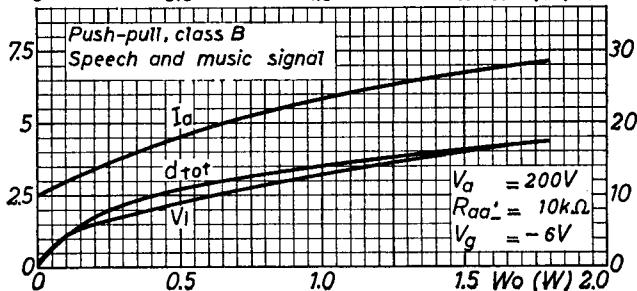
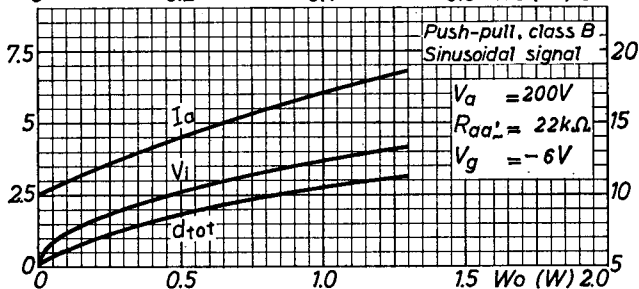
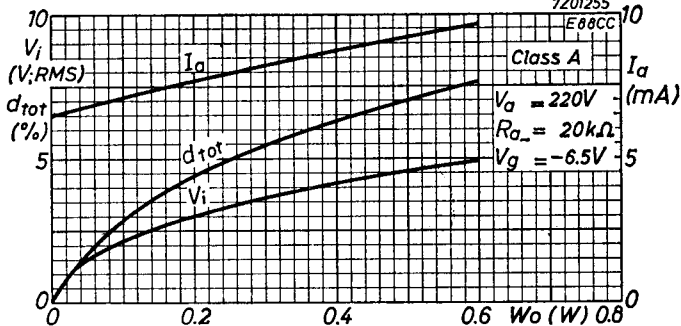
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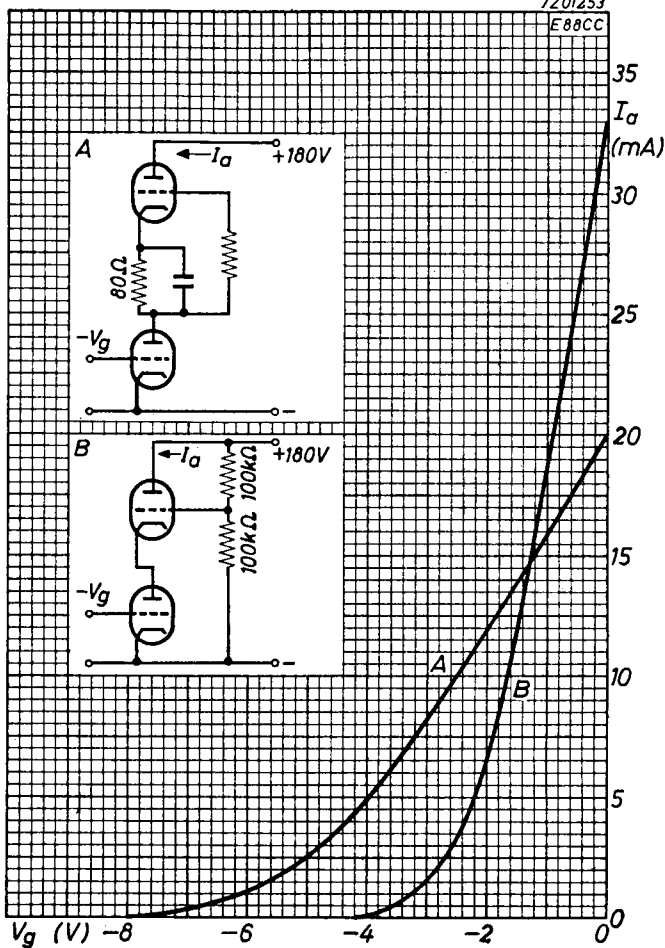
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**HANDBOOK**

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