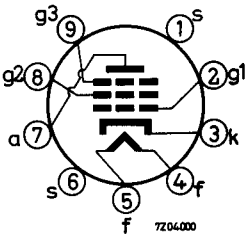
S.Q. TUBE

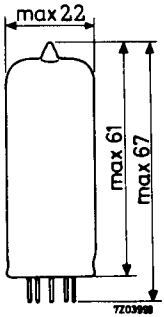
Output pentode designed for use in telephone equipment.

QUICK REFERENCE DATA			
Life test	10 000 hours		
Base	Noval		
Heating	Indirect A.C. or D.C. Series or parallel supply		
Heater voltage	V_f	18	V
Heater current	I_f	130	mA
Anode current	I_a	20	mA
Output power, Class A	W_o	1	W

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	18			V
Heater current	I_f	130	123 - 137		mA
Anode voltage	V_a	210			V
Grid No.3 voltage	V_{g_3}	0			V
Grid No.2 voltage	V_{g_2}	210			V
Cathode resistor	R_k	120			Ω
Anode current	I_a	20	17 - 23	min. 13.5	mA
Grid No.2 current	I_{g_2}	5.3	4.1 - 6.5	min. 3.1	mA
Mutual conductance	S	11	9.5 - 12.5	min. 7.8	mA/V
Internal resistance	R_i	0.3	min. 0.2		MΩ
Output power	W_o	1.0	min. 0.7		W
Load resistance $R_{a\sim} = 15$ kΩ					
Total distortion $d_{tot} = 5\%$					
Total distortion at $W_o = 0.1$ W	d_{tot}	1.2	max. 2		%
Amplification factor	$\mu_{g_2g_1}$	36			
Equivalent noise resistance (R.F.)	R_{eq}	1.2			kΩ
Negative grid current	$-I_{g_1}$		max. 0.5	max. 1.0	μA
Cut-off voltage	$-V_{g_1}$		max. 8.5		V
Anode current	I_a	0.5			mA
Hum voltage	V_{g_1}		max. 0.2		mV_{RMS}
$R_{g_1} = 0.5$ MΩ					
Heater centre earthed					
Insulation resistance between two electrodes	R_{ins}		min. 100		MΩ

CHARACTERISTICS (continued)

		I	II	
Leakage current between cathode and heater	I_{kf}		max. 24	μA
Voltage between cathode and heater V_{kf} = 120 V				
Cathode heating time		16	max. 22	sec
Cathode cooling time		15	min. 7	sec

CAPACITANCES

Anode to grid No2, grid No.3, cathode, heater and screen	Ca/g_2g_3kfs	6.5	5.8 - 7.2	pF
Grid No.1 to grid No.2, grid No.3, cathode, heater and screen	C_{g_1}/g_2g_3kfs	11.2	10 - 12.4	pF
Grid No.1 to grid No.2, grid No.3, cathode, heater and screen	C_{g_1}/g_2g_3kfs	14.3		pF
Cathode current I_k = 25 mA				
Anode to grid No.1	C_{ag_1}		max.0.02	pF
Grid No.1 to heater	C_{g_1f}		max. 0.2	pF
Cathode to heater	C_{kf}	4.2		pF
Radiation capacitance: Anode to surrounding box, inner dia. 52 mm, height 98 mm	C_{ra}		max.0.06	pF
Radiation capacitance: Grid No.1 to surrounding box, inner dia. 52 mm, height 98 mm	C_{rg_1}		max.0.12	pF

LIFE

Production samples are tested to be within the end of life values (column III) during 10 000 hours.

LIMITING VALUES (Design centre rating system)

Anode voltage	V_{a_o}	max. 550	V
	V_a	max. 210	V
Anode dissipation	W_a	max. 4.5	W
Grid No.2 voltage	$V_{g_{2_o}}$	max. 550	V
	V_{g_2}	max. 210	V
Grid No.2 dissipation	W_{g_2}	max. 1.2	W
Cathode current	I_k	max. 30	mA
Voltage between cathode and heater	V_{kf}	max. 120	V
Bulb temperature	t_{bulb}	max. 170	°C
Grid resistor, automatic bias	R_{g_1}	max. 0.5	MΩ
fixed bias	R_{g_1}	max. 0.25	MΩ

OPERATING CHARACTERISTICS

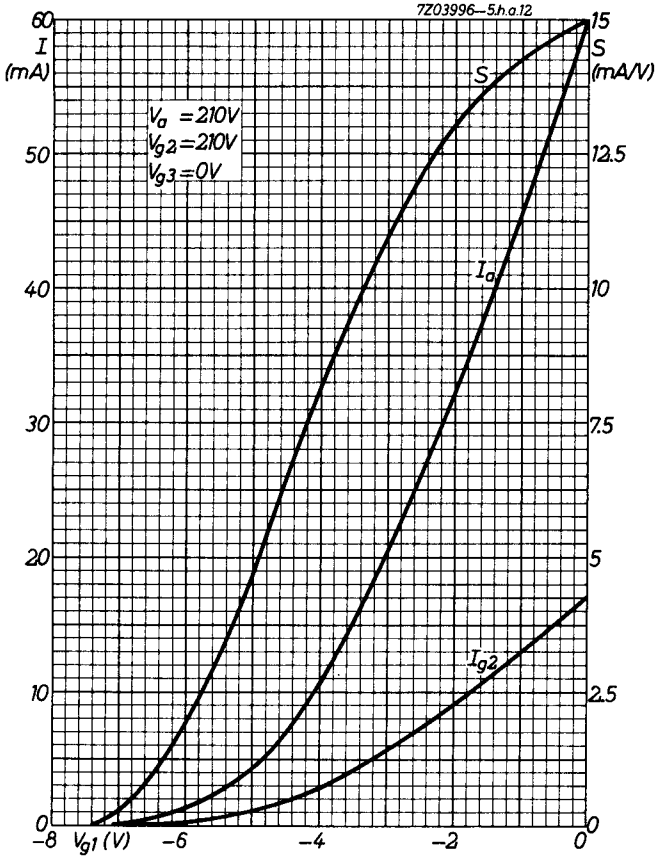
As pre-amplifier

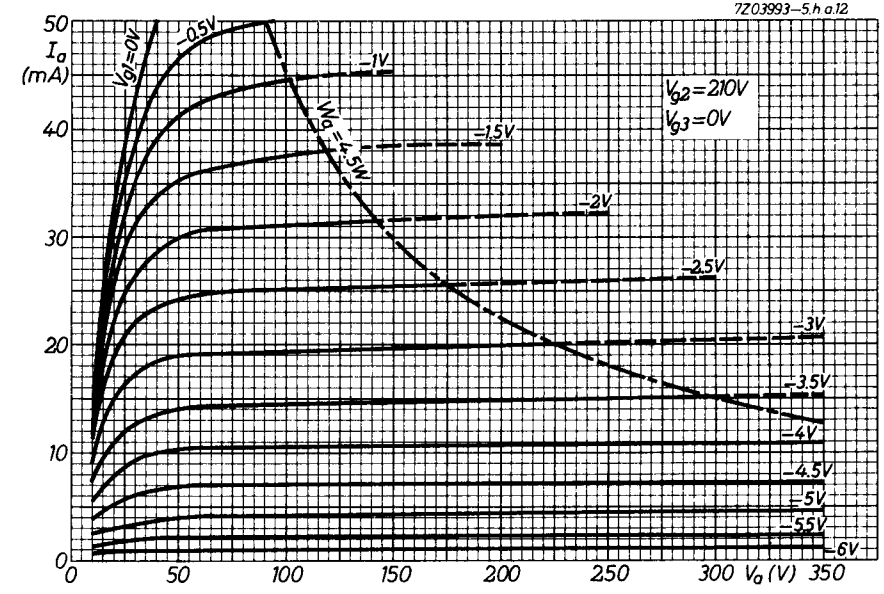
Anode voltage	V_a	210	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 voltage	V_{g_2}	210	V
Cathode resistor	R_k	180	Ω
Anode resistance	$R_{a\sim}$	20	kΩ
Anode current	I_a	15	mA
Grid No.2 current	I_{g_2}	4	mA
Mutual conductance	S	10	mA/V
Internal resistance	R_i	0.4	MΩ
Voltage gain	g	5.15	Neper

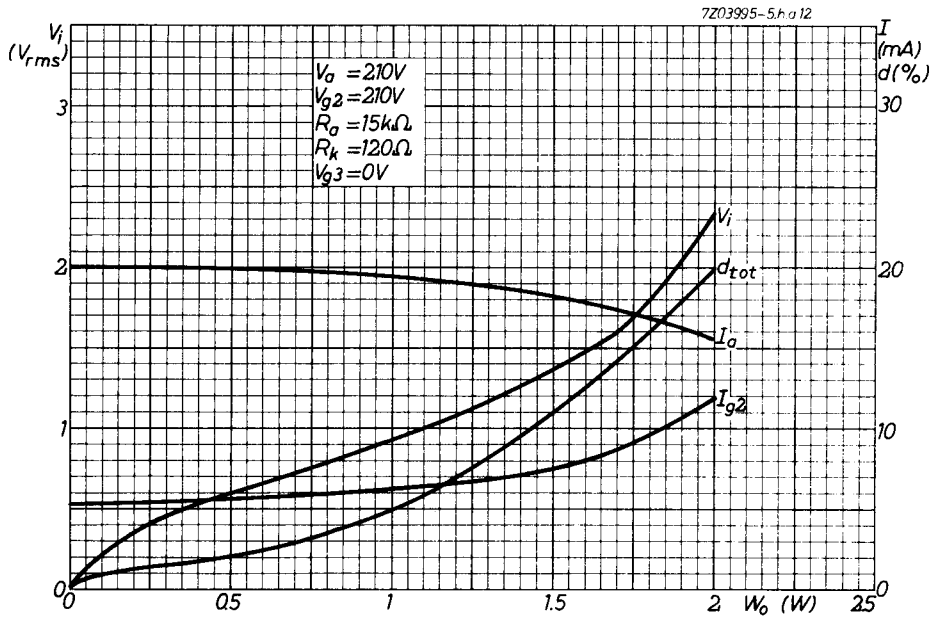
OPERATING CHARACTERISTICS (continued)

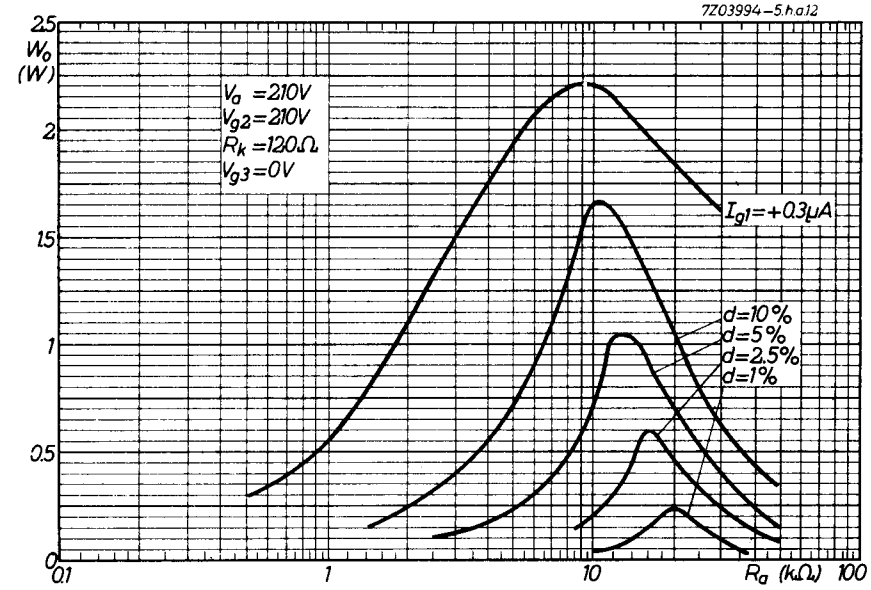
As output tube class A

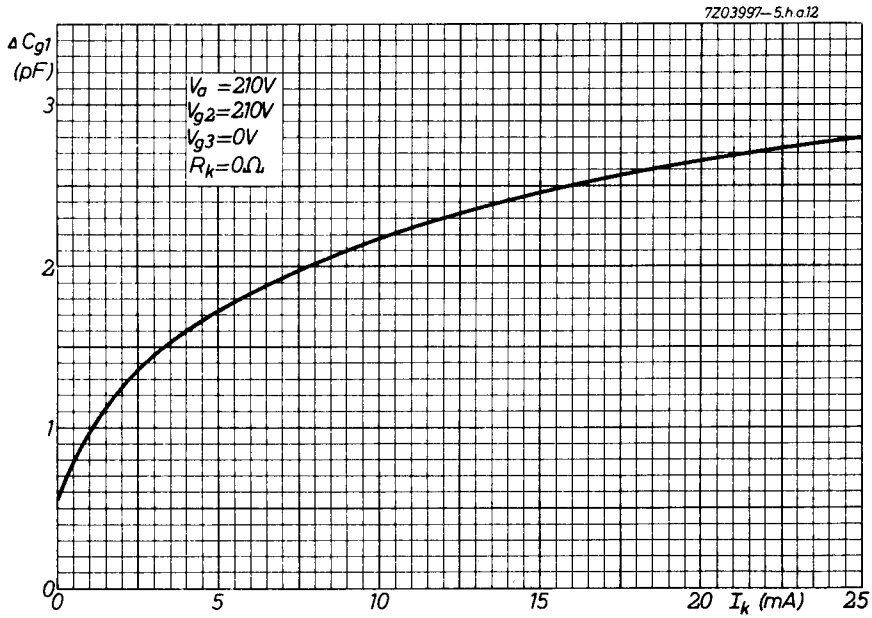
Anode voltage	V_a	210	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 voltage	V_{g_2}	210	V
Cathode resistor	R_k	120	Ω
Anode current	I_a	20	mA
Grid No.2 current	I_{g_2}	5.3	mA
Mutual conductance	S	11	mA/V
Internal resistance	R_i	0.3	MΩ
Anode resistance	$R_{a\sim}$	15	kΩ
Input voltage	V_i	0.95	V_{RMS}
Output power	W_o	1	W
Total distortion	d_{tot}	5	%


7Z03996—5.h.a.12
60
I
(mA)
50
40
30
20
10
0
15
S
(mA/V)
12.5
10
7.5
5
2.5
0
V_a =210V
V_{g2}=210V
V_{g3}=0V
S
I_a
I_{g2}
−8
V_{g1} (V)
−6
−4
−2
0


7Z03993-5.h a.12
I_a (mA)
V_{g1}=0V
-0.5V
-1V
-1.5V
-2V
-2.5V
-3V
-3.5V
-4V
-4.5V
-5V
-5.5V
-6V
V_a=4.5V
V_{g2}=210V
V_{g3}=0V
V_a (V)


7Z03995-5.h a.12
V_i (V_{rms})
I (mA)
d(%)
V_a =210V
V_{g2}=210V
R_a =15kΩ
R_k =120Ω
V_{g3}=0V
V_i
d_{tot}
I_a
I_{g2}
W_o (W)


7Z03994–5.h.a12
W_o (W)
V_a =210V
V_{g2}=210V
R_k =120Ω
V_{g3}=0V
I_{g1}=+0.3μA
d=10%
d=5%
d=2.5%
d=1%
R_a (kΩ)


7Z03997–5.h.a12
Δ C_{g1} (pF)
V_a =210V
V_{g2}=210V
V_{g3}=0V
R_k=0Ω
I_k (mA)

PHILIPS

Data handbook

Electronic components and materials

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