

SPECIAL QUALITY OUTPUT PENTODE

5902

Special quality subminiature audio output pentode for use in equipment where high ambient temperatures, mechanical vibration and shocks are unavoidable and where statistically controlled major electrical characteristics are required.

This data should be read in conjunction with the GENERAL NOTES—SPECIAL QUALITY VALVES which precede this section of the handbook, and the index numbers are used to indicate where reference should be made to a specific note.

HEATER

V_{h1}	6.3	V
I_h	450	mA

MOUNTING POSITION

Any

Note—Direct soldered connections to the leads of this valve must be at least 5mm from the seal and any bending of the valve leads must be at least 1.5mm from the seal.

CAPACITANCES² (measured with an external shield)

C_{a-g1}	<200	mpF
C_{in}	6.5	pF
C_{out}	7.5	pF

CHARACTERISTICS³

V_a	100	V
V_{g2}	100	V
I_a	30	mA
I_{g2}	1.2	mA
g_m	4.2	mA/V
μ_{g1-g2}	6.0	
r_a	>10	k Ω
V_{g1}	-8.3	V
R_{ik}	0	Ω
$V_{g1} (I_a < 100\mu A)$	-40	V

LIMITING VALUES⁴ (absolute ratings)

V_h max.	6.6	V
V_h min.	6.0	V
$V_{a(b)}$ max.	330	V
V_a max.	165	V
p_a max.	3.7	W
$V_{g2(b)}$ max.	310	V
V_{g2} max.	155	V
p_{g2} max.	400	mW
$+V_{g1}$ max.	0	V
$-V_{g1}$ max.	55	V
I_k max.	50	mA
R_{g1-k} max.	550	k Ω
V_{h-k} max.	200	V
Maximum acceleration (continuous operation)	2.5	g
Maximum shock (short duration)	500	g
T_{bulb} max.	220	$^{\circ}C$

TEST CONDITIONS (unless otherwise specified)

V_{b1}	V_{a-e}	V_{g2-e}	V_{g1-e}	R_k	C_k	V_{h-k}
(V)	(V)	(V)	(V)	(Ω)	(μF)	(V)
6.3	110	110	0	270	1000	0

TESTS

A.Q.L.⁵Individuals⁶Lot average⁷Lot standard
deviation⁸
Max.

(%)

Bogey⁹

Min.

Max.

Min.

Max.

GROUP A

Heater current

{ 0.65
—

450

420

480

—

432

468

—

12.5

mA

mA

Heater-to-cathode leakage current

 $V_{h-k} = \pm 100V$

0.65

—

—

15

—

—

—

 μA

Reverse grid current

 $R_{g1} = 1.0M\Omega$

0.65

—

0

1.0

—

—

—

 μA

Anode current

{ 0.65
—

30

23

37

—

27

—

33

—

2.8

mA

mA

Anode current

 $V_{g1} = -40V, R_k = 0\Omega$

0.65

—

—

100

—

—

—

 μA

Power output

 $V_{in(r.m.s.)} = 6.4V, R_a = 3.0k\Omega$

0.65

—

750

—

—

—

—

mW

Sub-group quality level¹⁰

1.0

—

—

—

—

—

—

Inoperatives¹⁶

0.4

—

—

—

—

—

—

GROUP B

Insulation

a-rest, measured at -300V	} 2.5 {	—	50	—	—	—	MΩ
g ₁ -rest, measured at -100V		—	50	—	—	—	MΩ

Change in power output

$V_h = 5.7V$, $V_{in(r.m.s.)} = 6.4V$, $R_a = 3.0kΩ$	2.5	—	—	15	—	—	%
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Screen-grid current	2.5	—	0	4.0	—	—	mA
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Mutual conductance

}	2.5	4.2	3.5	4.9	—	—	mA/V
	—	—	—	—	3.85	4.55	0.33 mA/V

Reverse grid current $V_h = 7.5V$, $V_{g1} = -40V$,
 $R_{g1} = 1.0MΩ$, $R_k = 0Ω$. Measured after 5
minutes preheat at $V_h = 7.5V$, $V_{a-e} = V_{g2-e}$
 $= 100V$, $R_k = 220Ω$, $R_{g1} = 470kΩ$

	2.5	—	0	2.0	—	—	μA
--	-----	---	---	-----	---	---	----

†A.F. noise at anode, $V_{g2(b)} = 110V$, $V_{g1} = -8.7V$,
 $R_k = 0Ω$, $R_{g1} = 500kΩ$, $R_{g2} = 10kΩ$, $R_a =$
 $2.0kΩ$, $C_{g2} = 4.0μF$

	2.5	—	—	150	—	—	mV
--	-----	---	---	-----	---	---	----

Anode impedance

	6.5	—	10	—	—	—	kΩ
--	-----	---	----	---	---	---	----

Capacitances² (shielded). No applied voltages

	6.5	—	—	—	—	—	
C_{in}	—	—	5.5	7.5	—	—	pF
C_{out}	—	—	6.5	8.5	—	—	pF
C_{a-g1}	—	—	—	200	—	—	mpF

Low pressure voltage breakdown

Pressure = 55 ± 5 mm Hg.

Voltage = $300V_{r.m.s.}$. No other applied
voltages

	6.5	—	—	—	—	—	
--	-----	---	---	---	---	---	--

Microphonic noise at the anode at 50c/s,
15g min. peak acceleration, $R_a = 2.0kΩ$

	2.5	—	—	100	—	—	mV (r.m.s.)
--	-----	---	---	-----	---	---	----------------

†The valve is tapped with a specified hammer and the output observed on a meter of specified dynamic response.

TESTS

A.Q.L.⁵Individuals⁶Lot average⁷Lot standard
deviation⁸

(%)

Bogey⁹

Min.

Max.

Min.

Max.

Max.

GROUP C

Lead fragility test^{13B}. 4 arcs

2.5

—

—

—

—

—

—

Fatigue¹⁴

$V_h = 6.3V$. No other voltages applied. 2.5g
min. peak acceleration, fixed frequency
 $f = 25c/s$ min. 60c/s max. for 32 hours in
each of 3 mutually perpendicular planes

Post fatigue tests

Heater-to-cathode leakage current

 $V_{h-k} = \pm 100V$

Change in power output

Microphonic noise as in group B

} 6.5 {

—

—

40

—

—

— μA
— %
— mV
(r.m.s.)**Shock¹⁵** $V_{h-k} = 100V$ (cathode negative), $R_{g1} = 100k\Omega$, 500g**Post shock tests**

Heater-to-cathode leakage current

 $V_{h-k} = \pm 100V$

Change in power output

Microphonic noise as in group B

} 20 {

—

—

40

—

—

— μA
— %
— mV
(r.m.s.)Glass strain test^{11B}. No applied voltages

6.5

—

—

—

—

—

—

GROUP D

Heater cycling life test $V_h = 7.0V$, 1 minute on, 4 minutes off $V_{h-k} = 140V_{r.m.s.}$ (continuous). No other applied voltages

2.5

— — — — —

Heater cycling life test end pointHeater-to-cathode leakage current $V_{h-k} = \pm 100V$ —— — 40 — — — μA **Stability life test¹⁴**Running conditions $R_{g1} = 470k\Omega$, $R_k = 220\Omega$, $V_a = V_{g2} = 100V$, $V_{h-k} = 200V$ (cathode negative), $T_{ambient} = \text{Room temperature}$ **Stability life test end point**

Change in power output after 1 hour

1.0

— — 10 — — — %

Survival rate life test¹⁴Running conditions $R_{g1} = 470k\Omega$, $R_k = 220\Omega$, $V_{h-k} = 200V$ (cathode negative), $T_{ambient} = \text{Room temperature}$ **Survival rate life test end points (100 hours)**

Inoperatives

0.65

— — — — —

Power output

1.0

— 650 — — — mW

A.Q.L.⁵
(%)

Min.

Max.

Intermittent life testRunning conditions, $R_{g1} = 470k\Omega$, $R_k = 220\Omega$, $V_a = V_{g2} = 100V$, $V_{h-k} = 200V$ (cathode negative), $T_{bulb \text{ min.}} = 220^\circ C$ **Intermittent life test points (500 hours)**Inoperatives¹⁶ 4.0

Heater current 6.5 414 492 mA

Heater-to-cathode leakage current $V_{h-k} = \pm 100V$ 6.5 — 60 μA Reverse grid current $R_{g1} = 1.0M\Omega$ 4.0 0 2.0 μA

Change in power output (individuals) 4.0 — 20 %

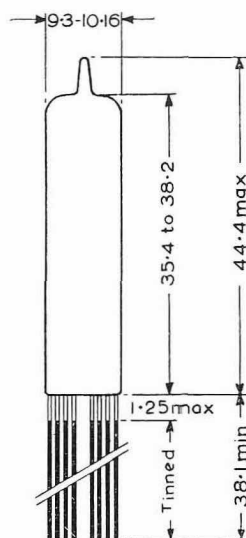
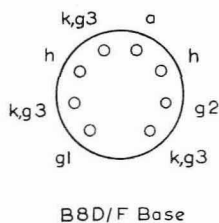
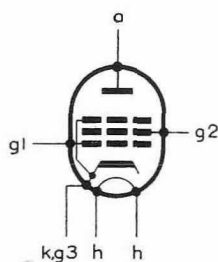
Change in power output $V_h = 5.7V$ 6.5 — 15 %Insulation as in group B. 6.5 25 — $M\Omega$

Average change in power output — — 15 %

Sub-group quality level¹⁰ 10 — —

5902

SPECIAL QUALITY OUTPUT PENTODE



5326

All dimensions in mm

The bulb and base dimensions of this valve are in accordance with BS448, Section B8D/F.