

Output pentode with centre-tapped filament for use in battery operated equipment.

FILAMENT

This valve is suitable for d.c. operation only.

Series

V_f applied across the two filament sections in series, between pins 1 and 7.
 V_{g1} referred to pin 1.

Parallel

V_f applied across the two filament sections in parallel, between pin 5 and pins 1 and 7 connected together. V_{g1} referred to pin 5.

Single Section

V_f applied across one section of the filament only, between pin 5 and either pin 1 or 7.

From a parallel supply

	Series	Parallel	
V_f	2.8	1.4	V
I_f	25	50	mA

From a series supply

V_f	2.6	1.3	V
I_f	24	48	mA

The filament must be shunted to ensure the correct filament voltage across each section. If separate l.t. and h.t. batteries are employed it is recommended that each filament section is shunted separately to h.t.

If a pair of valves are used in push-pull in a 50mA series chain, then the corresponding filament sections of each valve must be connected in parallel and the pairs of sections in series. A resistor must shunt the more negative pair of sections. V_{g1} referred to pin 1.

CAPACITANCES

C_{a-g1}	< 0.4	pF
C_{in}	4.8	pF ←
C_{out}	4.4	pF ←

CHARACTERISTICS (parallel filament connection)

V_b	67.5	90	V
V_a	64	85	V
V_{g2}	64	85	V
V_{g1}	-3.3	-5.2	V
I_a	3.5	5.0	mA
I_{g2}	650	900	μ A
g_m	1.3	1.4	mA/V
μ_{g1-g2}	7.0	7.0	
r_a	170	150	k Ω
$V_{g1} \text{ max. } (I_{g1} = +0.3\mu\text{A})$		0	V

OPERATING CONDITIONS AS SINGLE VALVE CLASS "A" AMPLIFIER



Series filament connection

V_b		90	V
V_a		85	V
V_{g2}		85	V
V_{g1}		-5.2	V
I_a		4.3	mA
I_{g2}		700	μ A
R_a		15	k Ω
$V_{in(r.m.s.)}$		3.0	V
P_{out}		160	mW
D_{tot}		10	%

Parallel filament connection

V_b	67.5	90	V
V_a	64	85	V
V_{g2}	64	85	V
V_{g1}	-3.3	-5.2	V
I_a	3.5	5.0	mA
I_{g2}	650	900	μ A
R_a	15	13	k Ω
$V_{in(r.m.s.)}$	2.6	3.5	V
P_{out}	100	200	mW
D_{tot}	10	10	%

Single section of filament

V_b	67.5	90	V
V_a	64	85	V
V_{g2}	64	85	V
V_{g1}	-3.3	-5.2	V
I_a	1.75	2.5	mA
I_{g2}	330	450	μ A
R_a	30	25	k Ω
$V_{in(r.m.s.)}$	2.6	3.6	V
P_{out}	50	100	mW
D_{tot}	10	10	%

OPERATING CONDITIONS FOR TWO VALVES IN CLASS "AB" PUSH-PULL

All filament sections in parallel

V_b	67.5	90	V
* R_k	470	560	Ω
$I_{a(o)}$	2×2.3	2×3.25	mA
I_a (max. sig.)	2×3.4	2×4.75	mA
$I_{g2(o)}$	2×430	2×600	μ A
I_{g2} (max. sig.)	2×0.95	2×1.5	mA
R_{a-a}	20	20	k Ω
$V_{in(g1-g1)r.m.s.}$	11.4	15.8	V
P_{out}	220	420	mW
D_{tot}	3.0	4.0	%

*An additional 3.5mA is fed through R_k to simulate the current from previous stages.

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Single Section

V_f applied across one section of the filament only, between pin 5 and either pin 1 or 7.

From a parallel supply

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From a series supply

V_f	2.6	1.3	V
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If a pair of valves are used in push-pull in a 50mA series chain, then the corresponding filament sections of each valve must be connected in parallel and the pairs of sections in series. A resistor must shunt the more negative pair of sections. V_{g1} referred to pin 1.

CAPACITANCES

C_{a-g1}	< 0.4	pF
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CHARACTERISTICS (parallel filament connection)

V_b	67.5	90	V
V_a	64	85	V
V_{g2}	64	85	V
V_{g1}	-3.3	-5.2	V
I_a	3.5	5.0	mA
I_{g2}	650	900	μA
g_m	1.3	1.4	mA/V
μ_{g1-g2}	7.0	7.0	
r_a	170	150	kΩ
$V_{g1} \text{ max. } (I_{g1} = +0.3\mu A)$		0	V

OPERATING CONDITIONS AS SINGLE VALVE CLASS "A" AMPLIFIER



Series filament connection

V_b		90	V
V_a		85	V
V_{g2}		85	V
V_{g1}		-5.2	V
I_a		4.3	mA
I_{g2}		700	μ A
R_a		15	k Ω
$V_{in(r.m.s.)}$		3.0	V
P_{out}		160	mW
D_{tot}		10	%

Parallel filament connection

V_b	67.5	90	V
V_a	64	85	V
V_{g2}	64	85	V
V_{g1}	-3.3	-5.2	V
I_a	3.5	5.0	mA
I_{g2}	650	900	μ A
R_a	15	13	k Ω
$V_{in(r.m.s.)}$	2.6	3.5	V
P_{out}	100	200	mW
D_{tot}	10	10	%

Single section of filament

V_b	67.5	90	V
V_a	64	85	V
V_{g2}	64	85	V
V_{g1}	-3.3	-5.2	V
I_a	1.75	2.5	mA
I_{g2}	330	450	μ A
R_a	30	25	k Ω
$V_{in(r.m.s.)}$	2.6	3.6	V
P_{out}	50	100	mW
D_{tot}	10	10	%

OPERATING CONDITIONS FOR TWO VALVES IN CLASS "AB" PUSH-PULL

All filament sections in parallel

V_b	67.5	90	V
* R_k	470	560	Ω
$I_{a(o)}$	2×2.3	2×3.25	mA
I_a (max. sig.)	2×3.4	2×4.75	mA
$I_{g2(o)}$	2×430	2×600	μ A
I_{g2} (max. sig.)	2×0.95	2×1.5	mA
R_{a-a}	20	20	k Ω
$V_{in(g1-g1)r.m.s.}$	11.4	15.8	V
P_{out}	220	420	mW
D_{tot}	3.0	4.0	%

*An additional 3.5mA is fed through R_k to simulate the current from previous stages.



OPERATING CONDITIONS FOR TWO VALVES IN CLASS "B" PUSH-PULL

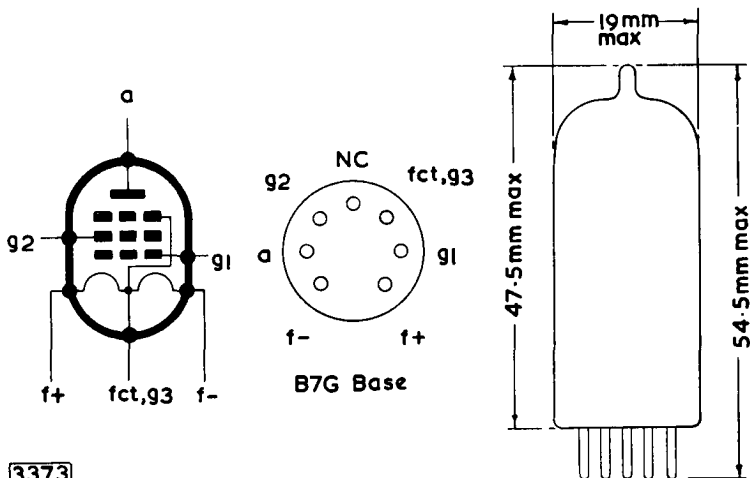
All filament sections in parallel

V_b	67.5	90	V
V_a	61.5	81.5	V
V_{g2}	61.5	81.5	V
V_{g1}	-5.8	-8.5	V
$I_{a(o)}$	2×0.75	2×1.0	mA
I_a (max. sig.)	2×3.4	2×5.0	mA
$I_{g2(o)}$	2×140	2×180	μA
I_{g2} (max. sig.)	2×0.95	2×1.3	mA
R_{a-a}	20	16	k Ω
$V_{in(g1-g1)r, m.s.}$	11.4	15.8	V
P_{out}	220	440	mW
D_{tot}	3.0	2.6	%

LIMITING VALUES

V_b max. (absolute)	110	V
V_b max.	90	V
V_a max.	90	V
p_a max.	600	mW
V_{g2} max.	90	V
p_{g2} max.	200	mW
$*I_k$ max. (parallel filament connection)	6.0	mA
R_{g1-f} max.	2.0	M Ω

* I_k max. for each 1.4V section of the filament is 3mA.



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