

SPECIAL QUALITY TETRODE THYRATRON

M8204

100mA special quality tetrode xenon thyatron with negative control characteristic for use in equipment where mechanical vibration and shocks are unavoidable and where statistically controlled major electrical characteristics are required.

PRELIMINARY DATA

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

LIMITING VALUES³ (absolute ratings, not design centre)

It is important that these limits are never exceeded and such variations as mains fluctuations, component tolerances and switching surges must be taken into consideration in arriving at actual valve operating conditions.

	Relay service and grid-controlled rectifier	Pulse modulator service	
*Max. anode supply voltage	—	500	V
Max. peak anode voltage			
Inverse	1300	100	V
Forward	650	500	V
Max. cathode current			
Peak	0.5	10	A
Average (max. averaging time 30s)	100	10	mA
Surge (fault protection max. duration 0.1s)	10	10	A
Max. negative control-grid voltage			
Before conduction	100	100	V
During conduction	10	10	V
Max. average positive control-grid current for anode voltage more positive than -10V (averaging time 30s)	10	—	mA
Max. peak positive control-grid current during the time that the anode voltage is more positive than -10V	50	20	mA
Max. peak positive control-grid current during the time that the anode voltage is more negative than -10V	30	—	μA
Max. control-grid resistor	10	0.5	MΩ
Recommended min. control-grid resistor	100	—	kΩ
Max. negative shield-grid voltage			
Before conduction	100	50	V
During conduction	10	10	V

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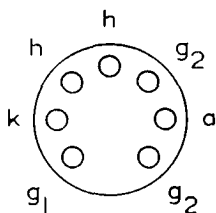
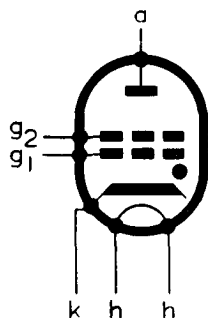
Max. average positive shield-grid current for anode voltage more positive than -10V (averaging time 30s)	10	—	mA
Max. shield-grid resistor	—	25	kΩ
Max. peak heater to cathode voltage			
Cathode negative	25	0	V
Cathode positive	100	0	V
Heater voltage	6.3V ± 10%	6.3V +10% -5%	
Min. valve heating time	20	20	s
Ambient temperature limits	-75 to +90	-75 to +90	°C
Max. pulse duration	—	5.0	μs
*Max. pulse repetition frequency	—	500	c/s
Max. duty cycle	—	0.001	
Max. rate of rise of current pulse	—	100	A/μs

*After completion of a pulse a 20μs delay is required before a positive voltage of more than 10V is applied to the anode.

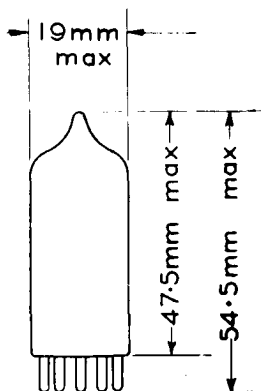
CAPACITANCES*

Anode to control-grid	—	0.03	pF
Control-grid to cathode and shield- grid	—	2.5	pF

4087



B7G Base



The bulb and base dimensions of this valve are in accordance with BS 448, Section B7G



TEST CONDITIONS (unless otherwise specified)

V_h
(V) 6.3

V_{e2}
(V) 0

**TESTS
GROUP A**

Heater current	..	..	..	..	..	A.Q.L. ⁴ (%)	Bogey ⁸	Individuals ⁵ Min.	Max.	Lot average ⁶ Min.	Max.	
Heater to cathode leakage current												
V_{h-k} = 25V cathode negative						0.65	600	540	660	567	633	mA
V_{h-k} = 100V cathode positive						0.65	—	—	—	—	—	mA
*Grid 1 voltage V_a = 460V r.m.s., R_{g1} = 100k Ω , R_a = 3.0k Ω						0.65	—3.7	—2.9	—4.5	—3.4	—4.0	μ A
*Grid 1 voltage V_a = 460V r.m.s., R_{g1} = 10M Ω , R_a = 3.0k Ω						0.65	—4.2	—	—5.6	—	—	μ A
*Anode voltage V_{g1} = 0V, R_{g1} = 100k Ω , R_a = 1.0k Ω						0.65	22	—	38	—	—	V
Anode voltage V_h = 0V, V_{g1} = -100V, R_a = 1.0k Ω						0.65	—	—	—	—	—	V
No breakdown must occur						0.65	—	—	—	—	—	V
Operation. I_{load} (pulse)						0.65	—	—	—	—	—	V
Measured at $V_{a(b)}$ = 500V, $V_{a(pk)}$ = 1.0kV, $V_{g1(pk)}$ = 100V, V_{g1} = -50V, R_{g1} = 10k Ω , R_{g2} = 25k Ω .						0.65	—	650	—	—	—	A
p.r.f. = 500pps, t_p = 2 $\pm$ 0.2 μ s.						0.65	—	16	—	—	—	A

Modulator line impedance Z_o = 25 Ω .

Load resistance = 20 Ω , Min. P.I.V. = 100V.

Pulse rise time = 0.2 μ s max.

Pulse fall time = 0.4 μ s max.

A.Q.L. ⁴ (%)	Bogey ⁸	Individuals ⁵		Lot average ⁶	
		Min.	Max.	Min.	Max.
{ 0.65 —	—	—	76	—	65
1.0	—	—	—	—	—
0.4	—	—	—	—	—
2.5	—	760	—	—	—
{ 2.5 —	—	—	50	—	45
6.5	4.6	—	-6.4	—	—
6.5	2.45	1.85	3.05	—	—
6.5	—	—	—	—	—

Pulse emission $V_h = 6.3V$, $V_a = V_{g2} = V_{g1} = 180 \pm 9V$,
min. P.I.V. = 100V, $t_p = 5 \pm 0.25 \mu s$, pulse rise
time = $0.5 \mu s$ max., pulse fall time = $1.0 \mu s$ max.,
p.r.f. = 100 ± 5 pps. Pulse applied across valve and
 10Ω resistor in series.
Voltage measured across valve

Group quality level⁹

*Adjust voltage to initiate conduction

GROUP B

Inoperatives¹⁴

GROUP C

Insulation

g_2 -a measured at V_a - $g_2 = \pm 380V$

*Anode voltage. $V_h = 5.7V$, $V_{g1} = 0V$, $R_{g1} = 100k\Omega$,
 $R_a = 1.0k\Omega$

*Grid 1 voltage. $V_h = 7.0V$, $V_a = 460V$ r.m.s.,
 $R_{g1} = 10M\Omega$, $R_a = 3.0k\Omega$

(Following special pre-heat condition)

*Grid 2 voltage. $V_a = 150V$ r.m.s., $R_a = 1.0k\Omega$,
 $R_{g1} = 2.5k\Omega$ V_{g1} supply in phase with V_a supply,
 V_{g2} in antiphase: r.m.s. voltage

Vibration. No applied voltages. Vibrate for 60s at
25c/s 2.5g then repeat Group B test

*Adjust voltage to initiate conduction

GROUP E

Heater cycling life test $V_h = 7.5V$, 1 minute on, 1 minute off, 2000 cycles. $V_{h-k} = 100V$ cathode positive. No other applied voltages

Heater cycling life test end points

Heater to cathode leakage current

$V_{h-k} = 25V$ cathode negative

$V_{h-k} = 100V$ cathode positive

Intermittent life¹²

Running conditions as grid controlled rectifier 500 hours

$V_a = 460V$ r.m.s., $I_k = 80mA$ (d.c.) $R_{g1} = 50k\Omega$,

$I_{k(pk)} = 0.5A$, Cathode heating time $= 20 \pm 0$ s

Room temperature

Intermittent life test end points

Inoperatives¹⁴

Heater to cathode leakage current

$V_{h-k} = 25V$ cathode negative

$V_{h-k} = 100V$ cathode positive

Anode voltage as in Group A ($V_{g1} = 0V$)

Pulse emission as in Group A

Insulation g_{2-a} as in Group C

Continuous life, 200 hours' duration¹²

Adjust $v_{a(pk)}$ for I_{load} pulse $= 20A$ initially

Running conditions, pulse modulator service

$V_{a(b)} = 250V$, $v_{a(pk)} = 500V$, $v_{g1(pk)} = 100V$,

$V_{g1} = -50V$, $V_{g2} = 0V$, $R_{g1} = 10k\Omega$, $R_{g2} = 25k\Omega$,

p.r.f. = 1000pps, modulator line impedance

$Z_0 = 12.5\Omega$, load resistance $= 7.5\Omega$, $t_p = 2-0.2\mu s$

Life test end points

I_{load} pulse

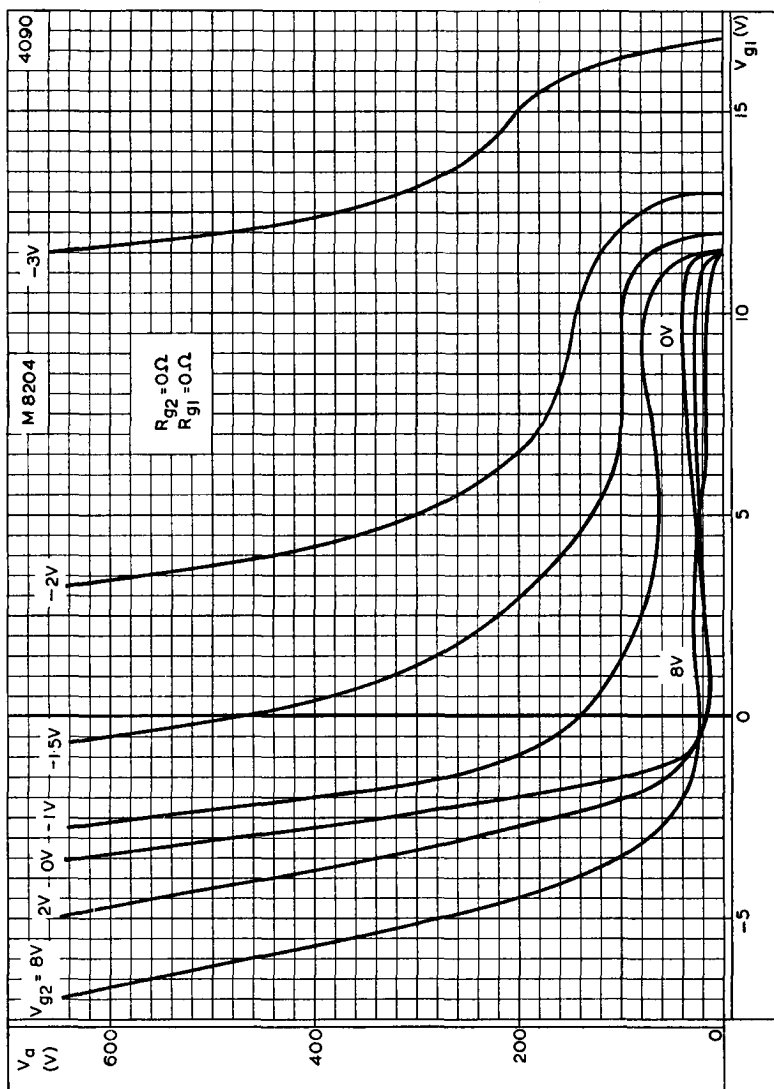
Average life

Pulse emission as in Group A

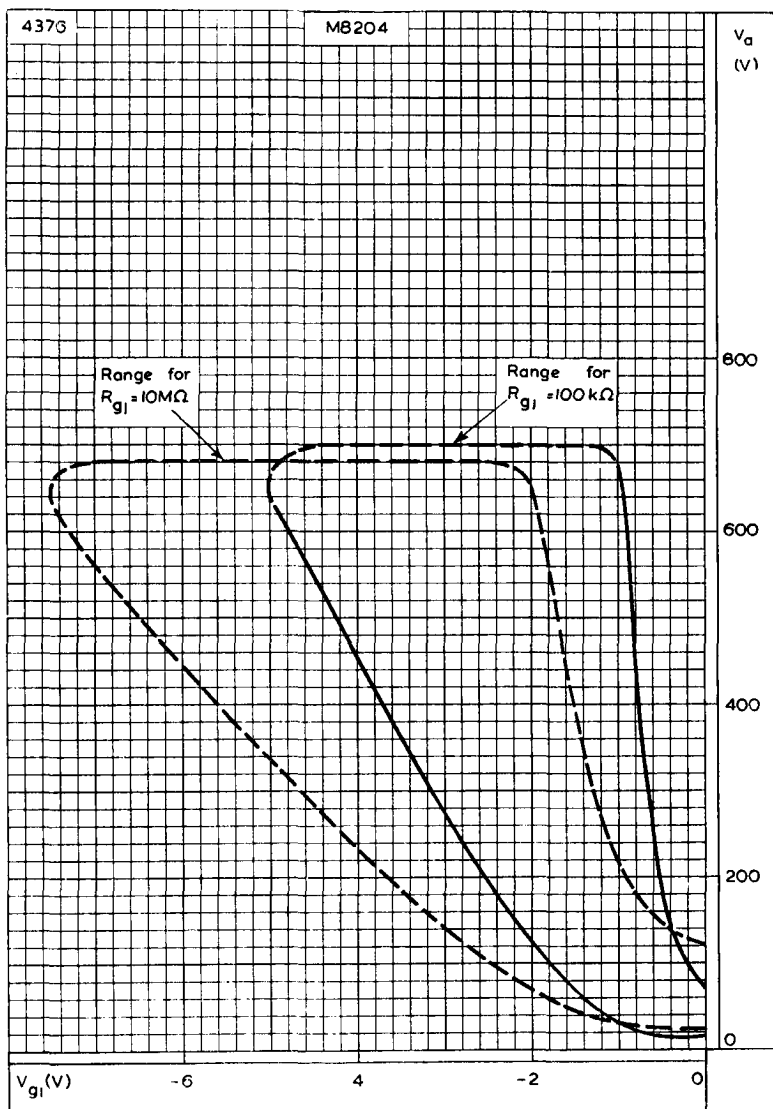
A.Q.L. ¹ (%)	Individuals ⁵ Min.	Max.
1.0	—	—
—	—	20
—	—	20

20 μA
20 μA
50 V
100 V
— M Ω
380

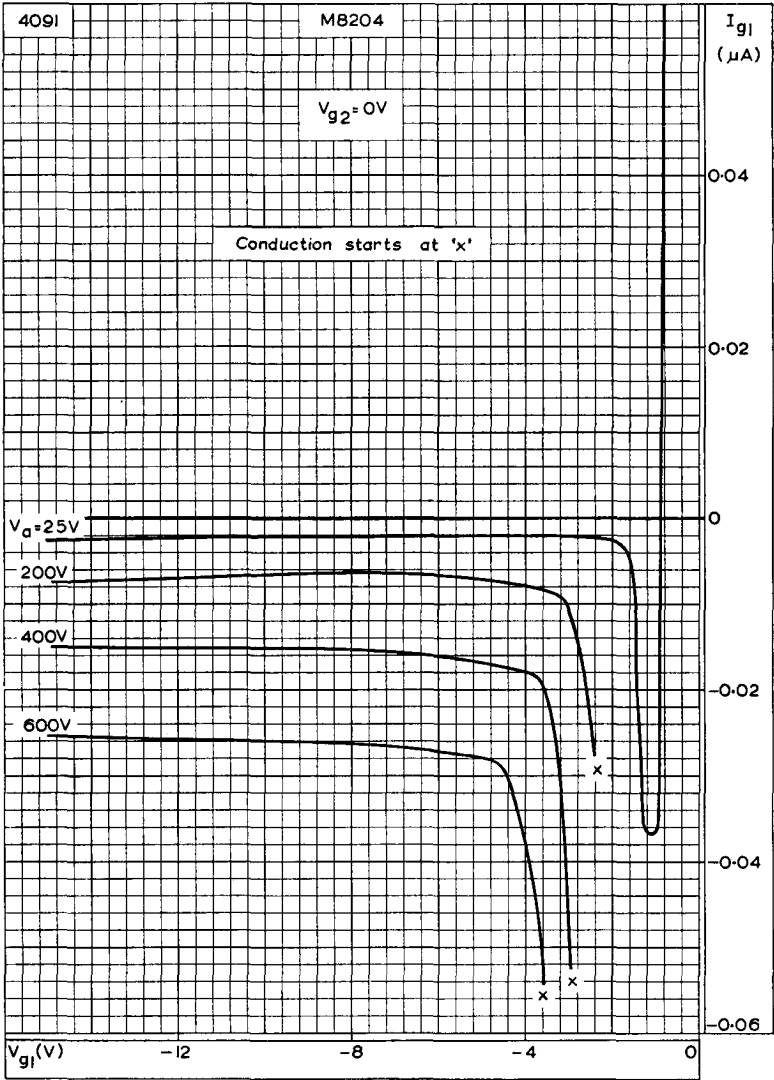
16 A
180 hrs
— V
100



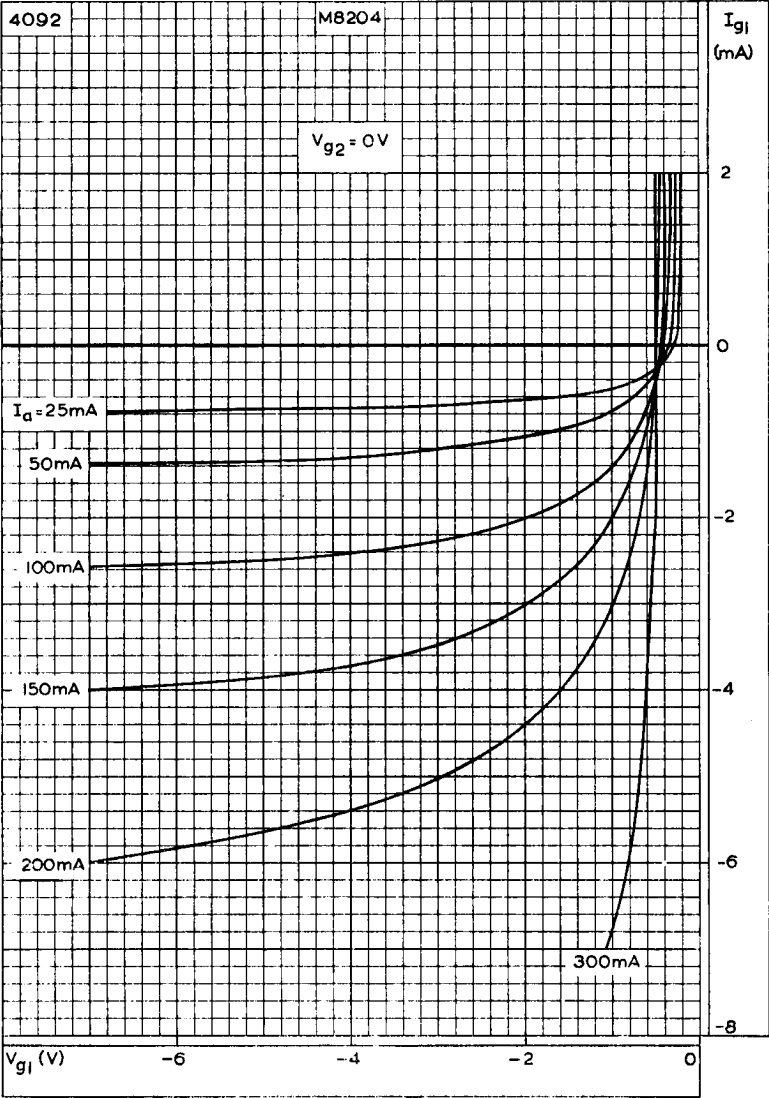
CONTROL CHARACTERISTIC



OPERATING RANGE OF CRITICAL CONTROL-GRID VOLTAGE



CONTROL-GRID CURRENT PLOTTED AGAINST CONTROL-GRID VOLTAGE
BEFORE CONDUCTION



CONTROL-GRID CURRENT PLOTTED AGAINST CONTROL-GRID VOLTAGE
DURING CONDUCTION