SPECIAL QUALITY PENTODE

M8196

Special quality dual control pentode for use in equipment where 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_h[1]	6.3	V
I_h	175	mA

MOUNTING POSITION

Any

CAPACITANCES[2] (measured with an external shield)

c_{a-g1}	<20	mpF
c_{in}	4.2	pF
c_{out}	3.2	pF

CHARACTERISTICS[3]

V_a	120	120	V
V_{g2}	120	120	V
V_{g3}	−3.0	0	V
I_a	3.5	5.1	mA
I_{g2}	4.8	3.5	mA
V_{g1}	−2.0	−2.0	V
$g_{m(g1-a)}$	2.0	3.2	mA/V
$g_{m(g3-a)}$	660	450	μA/V
r_a	—	150	kΩ
$V_{g1}(I_a = 100\mu A)$	—	<−7.5	V
$V_{g3}(I_a = 20\mu A)$	−10	<−15	V
R_k	0	0	Ω

ABSOLUTE MAXIMUM RATINGS[4]

$V_{a(b)}$ max.	400	V
V_a max.	200	V
V_{g3} max.	30	V
$-V_{g3}$ max.	55	V
$V_{g2(b)}$ max.	310	V
V_{g2} max.	155	V
p_a max.	1.65	W
p_{g2} max.	550	mW
R_{g1-k} max.	4.0	MΩ←
I_k max.	20	mA
V_{h-k} max.	100	V
Maximum acceleration (continuous operation)	2.5	g
Maximum shock (short duration)	450	g
T_{bulb} max.	165	°C

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TEST CONDITIONS (unless otherwise specified)

V_h (V)	V_a (V)	V_{g3} (V)	V_{g2} (V)	V_{g1} (V)	R_k (Ω)	V_{h-k} (V)
6.3	120	0	120	–2.0	0	0

TESTS	A.Q.L.[5] (%)	Individuals[6] Bogey[9]	Individuals[6] Min.	Individuals[6] Max.	Lot average[7] Min.	Lot average[7] Max.	Lot standard deviation[8] Max.	
GROUP A								
Heater current	0.65	175	160	190	—	—	—	mA
	—	—	—	—	168	182	4.87	mA
Heater-to-cathode leakage current $V_{h-k} = \pm 100V$	0.65	—	—	10	—	—	—	μA
Reverse grid current, $R_{g1} = 100k\Omega$	0.65	—	0	0.1	—	—	—	μA
Anode current	0.65	5.2	2.5	9.0	—	—	—	mA
	—	—	—	—	4.2	6.2	0.8	mA
Mutual conductance	0.65	3.2	2.5	4.5	—	—	—	mA/V
	—	—	—	—	2.9	3.5	0.26	mA/V
Sub-group quality level[10]	1.0	—	—	—	—	—	—	
Inoperatives[16]	0.4	—	—	—	—	—	—	
GROUP B								
Insulation								
a-rest, measured at –300V	2.5	—	100	—	—	—	—	MΩ
g_1-rest, measured at –100V		—	100	—	—	—	—	MΩ
g_3-rest, measured at –300V		—	100	—	—	—	—	MΩ

Anode current								
V_{g1} = –3V, V_{g3} = –10V	2.5	—	—	200	—	—	—	μA
V_{g1} = –3V, V_{g3} = –6V	2.5	—	5.0	—	—	—	—	μA
V_{g1} = –8V	2.5	—	—	200	—	—	—	μA
V_{g1} = –6V	2.5	—	5.0	—	—	—	—	μA
Screen-grid current	2.5	—	1.5	5.5	—	—	—	mA
Change in mutual conductance, V_h = 5.7V	2.5	—	—	15	—	—	—	%
Reverse grid current								
V_h = 7.5V, V_{g1} = –10V, R_{g1} = 100kΩ	2.5	—	0	1.0	—	—	—	μA
†R.F. noise at anode, V_{g1} = 0V, R_k = 200Ω, V_{sig} = 15mV, C_k = 0.2μF	2.5	—	—	—	—	—		
Vibration, 2.5g min. peak acceleration, f = 50c/s, R_a = 10kΩ	6.5	—	—	150	—	—	—	mV
Mutual conductance (g_{3-a}), V_{g3} = –3V	6.5	—	0.35	1.05	—	—	—	mA/V
Mutual conductance (g_{1-a}), V_{g3} = –5V	6.5	—	0.7	1.7	—	—	—	mA/V
Capacitances[2] (shielded). No applied voltages	6.5	—	—	—	—	—	—	
C_{in}	—	—	3.5	4.5	—	—	—	pF
C_{out}	—	—	2.6	3.4	—	—	—	pF
C_{a-g1}	—	—	—	20	—	—	—	mpF
Low pressure voltage breakdown Pressure = 55 ± 5mm Hg Voltage = 500$V_{r.m.s.}$. No other applied voltages.	6.5	—	—	—	—	—	—	
Microphonic noise at the anode at 50c/s, 15g min. peak acceleration, $V_{a(b)}$ = $V_{g2(b)}$ = 200V, R_a = 100kΩ, R_{g2} = 500kΩ, C_{g2} = 2μF, V_{g1} = 0V, R_k = 1kΩ, C_k = 1000μF, $V_{g(sig)}$ = 175mV	2.5	—	—	—	—	—	—	

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

TESTS	A.Q.L.[5] (%)	Individuals[6] Bogey[9]	Min.	Max.	Lot average[7] Min.	Max.	Lot standard deviation[8] Max.	
GROUP C								
Base strain test[12]	—	—	—	—	—	—	—	
Glass strain test[11B]. No applied voltages	2.5	—	—	—	—	—	—	
Fatigue[14]								
V_h = 6.3V. No other voltage 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} = ±100V	—	—	—	30	—	—	—	μA
Mutual conductance	—	—	2.2	—	—	—	—	mA/V
Reverse grid current, R_{g1} = 100kΩ	—	—	0	0.4	—	—	—	μA
Vibration as in group B	—	—	—	300	—	—	—	mV
Sub-group quality level[10]	6.5	—	—	—	—	—	—	
Shock[15]								
V_{h-k} = 100V, No other applied voltages, 500g.								
Post shock tests								
Heater-to-cathode leakage current V_{h-k} = ±100V	—	—	—	30	—	—	—	μA
Mutual conductance	—	—	2.2	—	—	—	—	mA/V
Reverse grid current, R_{g1} = 100kΩ	—	—	0	0.4	—	—	—	μA
Vibration as in group B	—	—	—	300	—	—	—	mV

GROUP D

Heater cycling life test

V_h = 7.5V 1 minute on 4 minutes off
V_{h-k} = 135V. No other applied voltages

Heater cycling life test end point

Heater to cathode leakage current V_{h-k} = ±100V	—	—	—	20	—	—	—	μA

Stability life test[14]

Running conditions. R_{g1} = 100kΩ, R_k = 130Ω, V_{a-e} = 180V, V_{g2-e} = 125V, V_{g1-e} = 0V, V_{h-k} = 135V, $T_{ambient}$ = Room temperature.

Stability life test end points

Change in mutual conductance after 1 hour	1.0	—	—	10	—	—	—	%

Intermittent life test

Running conditions. R_{g1} = 100kΩ, R_k = 130Ω, V_{a-e} = 180V, V_{g2-e} = 125V, V_{g1-e} = 0V, V_{h-k} = 135V, T_{bulb} min. = 165°C.

Intermittent life test end points

		A.Q.L.[5] (%)	Min.	Max.	
Inoperatives[6]	500 hours	—	—	—	
	1000 hours	—	—	—	
Heater current	500 hours	4.0	160	190	mA
	1000 hours	6.5	160	190	mA
Heater-to-cathode leakage current V_{h-k} = ±100V	500 hours	4.0	—	10	μA
	1000 hours	6.5	—	10	μA
Reverse grid current, R_{g1} = 100kΩ	500 hours	4.0	0	0.1	μA
	1000 hours	6.5	0	0.1	μA
Change in mutual conductance (individuals)	500 hours	4.0	—	20	%
	1000 hours	6.5	—	25	%
Change in mutual conductance, V_h = 5.7V	500 hours	6.5	—	15	%
Insulation as in group B	500 hours	6.5	50	—	MΩ
Average change in mutual conductance	500 hours	—	—	15	%
Sub-group quality level[10]	500 hours	10	—	—	
	1000 hours	15	—	—	

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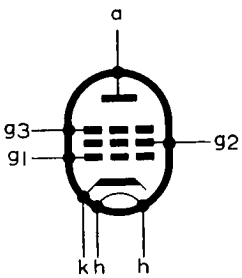
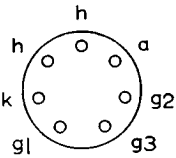
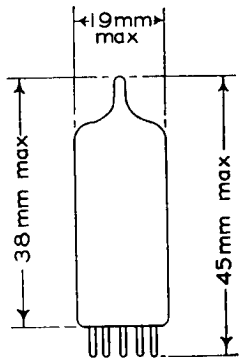
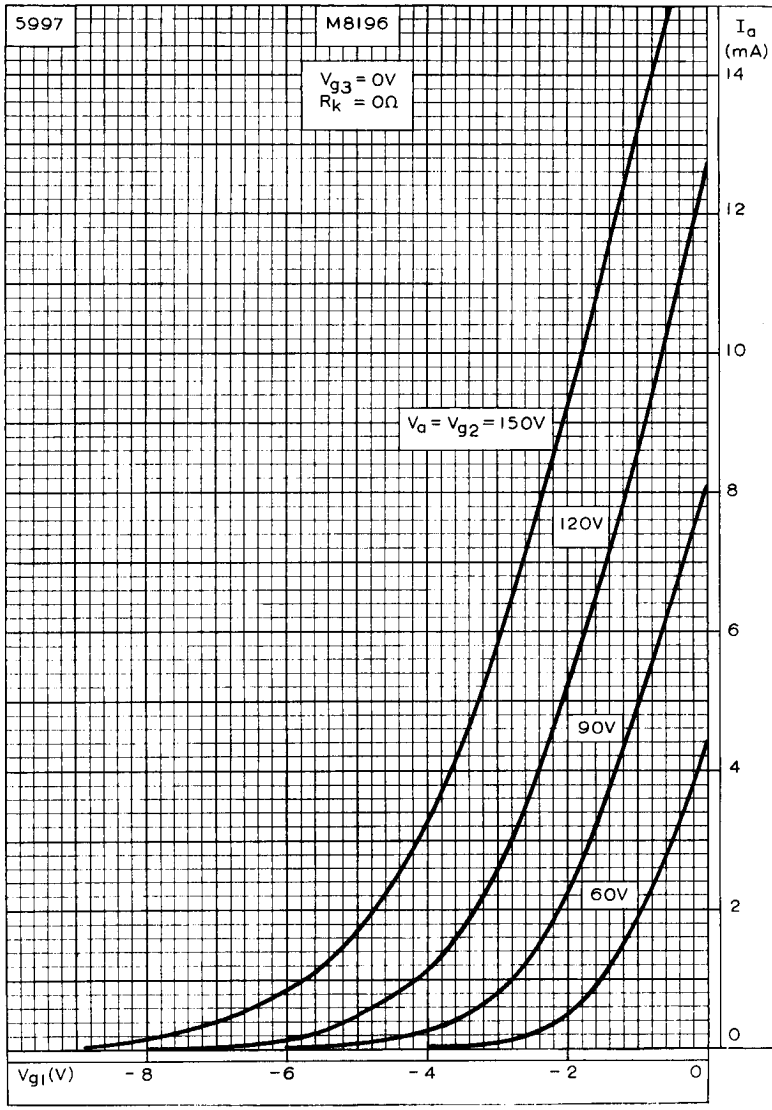




B7G Base



The bulb and base dimensions of this valve are in accordance with BS448, Section B7G.



ANODE CURRENT PLOTTED AGAINST CONTROL-GRID VOLTAGE WITH ANODE AND SCREEN-GRID VOLTAGES AS PARAMETER

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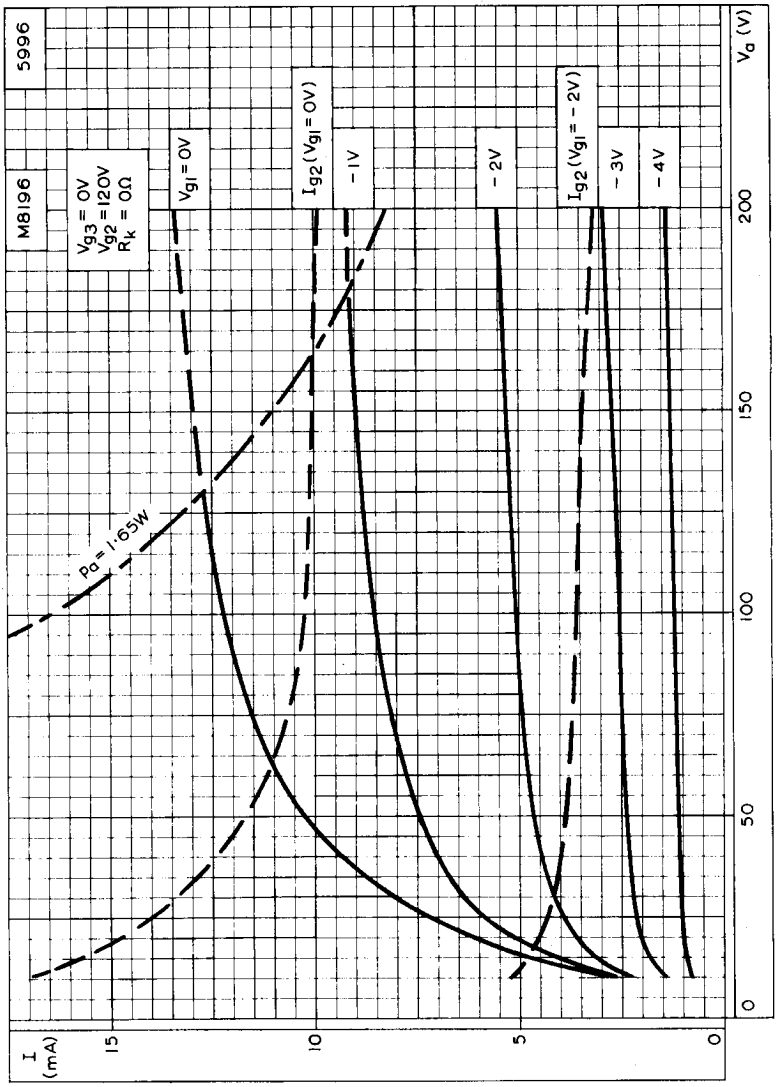
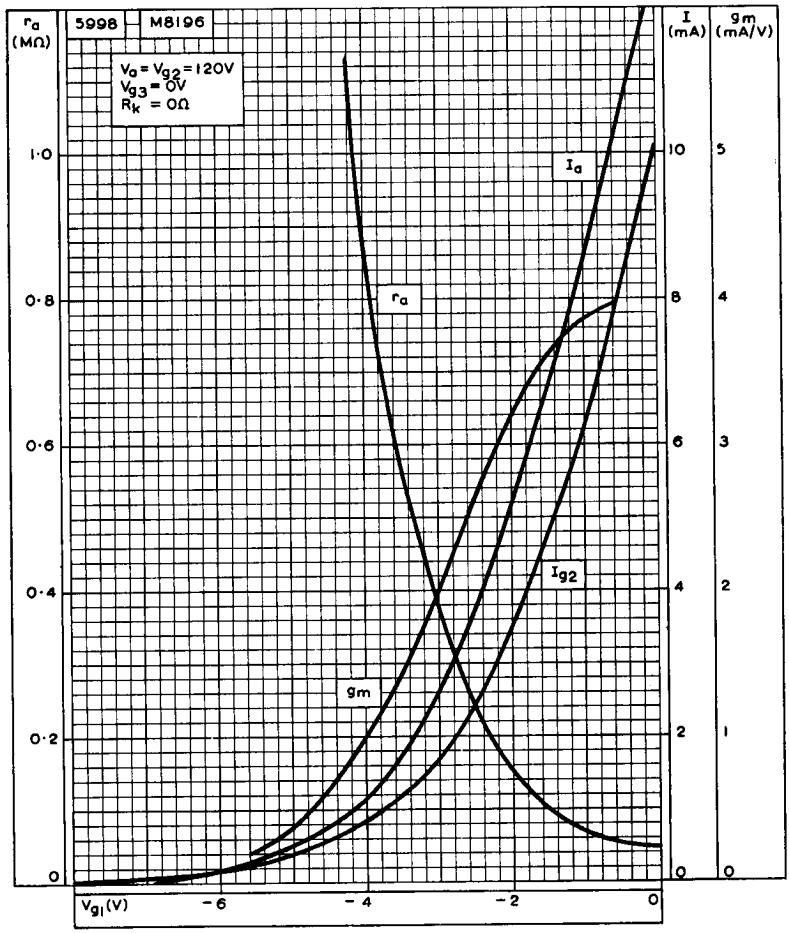


ANODE AND SCREEN-GRID CURRENTS PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER



ANODE AND SCREEN-GRID CURRENTS, MUTUAL CONDUCTANCE AND ANODE IMPEDANCE PLOTTED AGAINST CONTROL-GRID VOLTAGE

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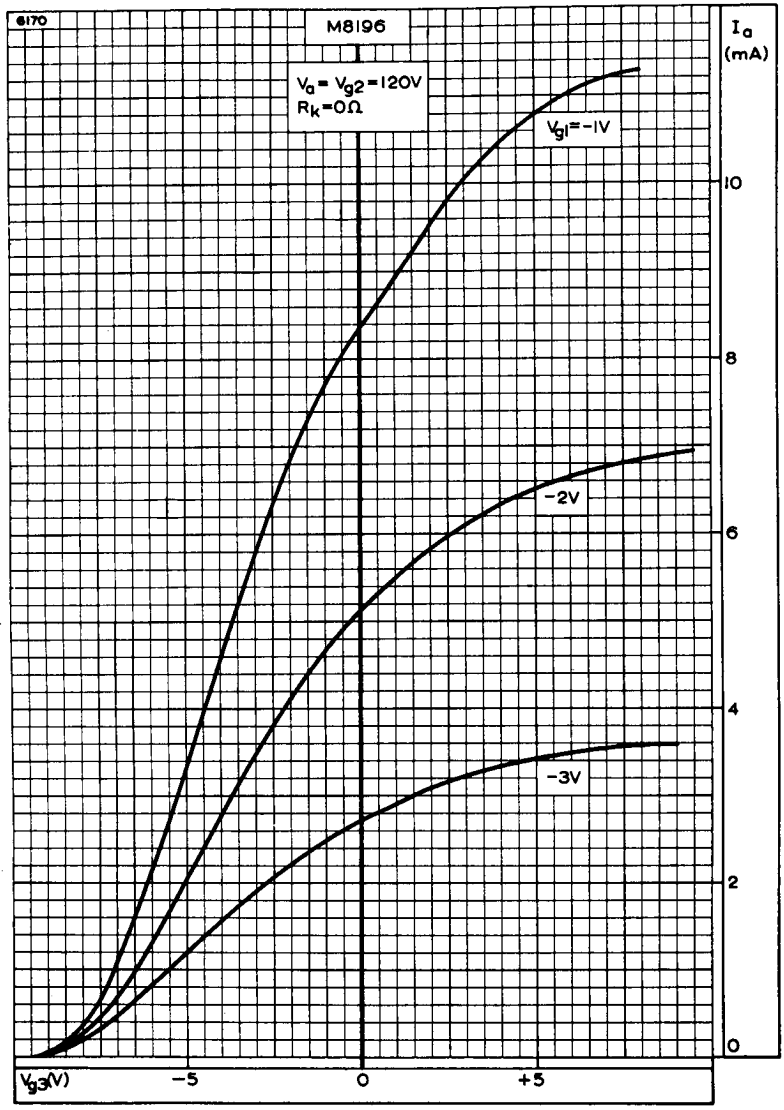
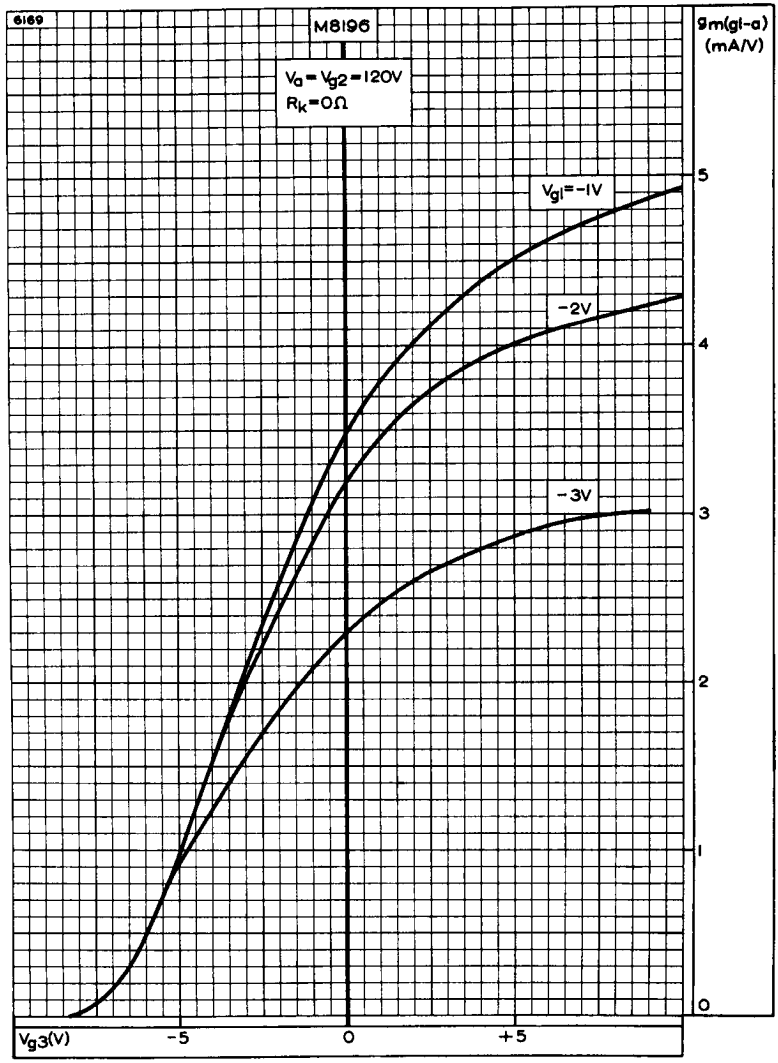
SPECIAL QUALITY PENTODE



ANODE CURRENT PLOTTED AGAINST SUPPRESSOR-GRID VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER



MUTUAL CONDUCTANCE (g_{1-a}) PLOTTED AGAINST SUPPRESSOR-GRID VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER

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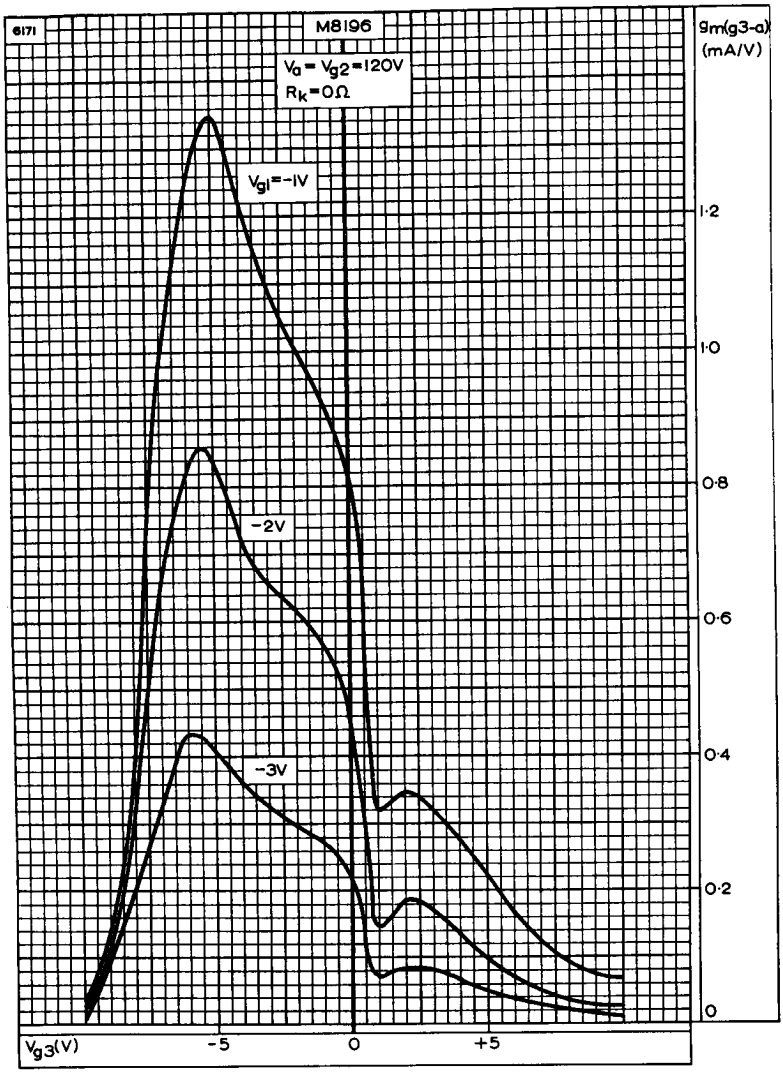
SPECIAL QUALITY PENTODE



MUTUAL CONDUCTANCE (g_{3-a}) PLOTTED AGAINST SUPPRESSOR-GRID VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER