

QUICK REFERENCE DATA (nominal values)

For use in equipment where mechanical vibration and shocks are unavoidable.

Maintaining voltage	150	V
Cathode current range	5 to 30	mA
Regulation voltage	3	V
Ignition delay time	10	s

This data should be read in conjunction with GENERAL OPERATIONAL RECOMMENDATIONS—VOLTAGE STABILISER AND REFERENCE LEVEL TUBES and the GENERAL NOTES—SPECIAL QUALITY VOLTAGE STABILISER AND REFERENCE TUBES which precede this section of the handbook. The index numbers are used to indicate where reference should be made to a specific note.

CHARACTERISTICS AND RANGE VALUES FOR EQUIPMENT DESIGN measured at an ambient temperature of between 20 and 30°C unless otherwise stated.

The values given state the range over which the tube will operate both initially and during life. No allowance has been made for supply voltage and component variations.

Initial values

Minimum voltage necessary for ignition (Note A)	165	V
Ignition delay time	See page C1	
Maintaining voltage (all tubes) over the range 5 to 30mA		
Maximum	154	V
Minimum	143	V
Increase in maintaining voltage as cathode current is increased from 5 to 30mA (regulation voltage)		
Maximum	5.0	V
Average	3.0	V

Life performance (Note B)

	$I_k = 20\text{mA}$ $T_{\text{bulb}} = 150^\circ\text{C}$ $t = 500\text{hrs}$	$I_k = 30\text{mA}$ $T_{\text{amb}} = 20 \text{ to } 30^\circ\text{C}$ $t = 1000\text{hrs}$	
Minimum voltage necessary for ignition (Note A)	165	165	V
Maintaining voltage			
Maximum ($I_k = 30\text{mA}$)	155	156	V
Minimum ($I_k = 5.0\text{mA}$)	142	139	V
Typical maximum variation of maintaining voltage	± 2	± 1	%
Increase in maintaining voltage as cathode current is increased from 5 to 30mA (regulation voltage)			
Maximum	8.0	8.0	V
Typical	3.0	3.0	V
Maximum altitude		120,000	ft

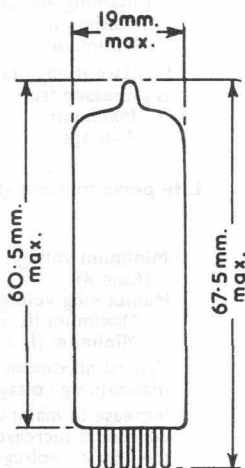
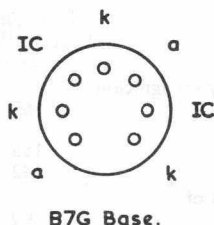
ABSOLUTE MAXIMUM RATINGS¹

Cathode current		
Maximum for continuous operation	30	mA
Maximum surge (Note C)	75	mA
Minimum	5.0	mA
Maximum negative anode voltage	125	V
Minimum bulb temperature ($I_k = 0\text{mA}$)	-55	°C
Maximum bulb temperature		
For operation	+150	°C
For storage	+100	°C
Maximum vibrational acceleration (page D4)	2.5	g
Maximum shock (short duration) page D4	900	g

OPERATING NOTES

- This value holds good over life in light or darkness. See graph on page C1.
- These figures apply only when the tube is operated continuously at the currents stated.
- To be restricted for long life to approximately 30 seconds in each 8 hours use.

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The bulb and base dimensions of this tube are in accordance with BS448
Section B7G

TEST CONDITIONS (unless otherwise specified)

$R_a = 1k\Omega$ $T_{amb} = 20 \text{ to } 25^\circ\text{C}$

Test	Test Conditions	AQL ² (%)	Min	Max	Individuals ³
GROUP A					
Ignition voltage	Illumination = 50 to 500lux	..	..	165	V
Maintaining voltage (1)	$I_k = 30\text{mA}$..	..	144	153	V
Maintaining voltage (2)	$I_k = 5.0\text{mA}$..	..	144	153	V
Regulation	$I_k = 5.0$ to 30mA ..	..	..	± 5	V
Group quality level ⁷	.. ..	..	..	—	—
GROUP B					
Continuity and short	.. ..	..	..	—	—
Microphonic noise	Note a, $I_k = 30\text{mA}$..	0.4	..	5	mV
Oscillation	$V_{sig} = 100\text{mV}$, $I_k = 5.0$ to 30mA ..	1.0	..	—	—
Voltage jumps	$I_k = 5.0$ to 30mA ..	2.5	..	600 mV _{pk-pk}	s
Ignition	$V_a = 165\text{V}$, Total darkness, Note b	2.5	..	20	—
Leakage current	$V_a = 50\text{V}$, $R_a = 3\text{k}\Omega$..	2.5	..	5	μA
Maintaining voltage (3)	$I_k = 20\text{mA}$..	2.5	144	153	V
Repeatability	$I_k = 10\text{mA}$, Note c ..	2.5	..	600	mV
Low pressure voltage breakdown	Note d, $I_k = 20\text{mA}$, Pressure = $3.1 \pm 0.2\text{mm Hg}$	6.5	..	—	—
Vibration	$I_k = 20\text{mA}$, $R_a = 10\text{k}\Omega$, Acceleration = 2.5g, $f = 25\text{c/s}$, Note e	2.5	..	100	mV



GROUP C

Shock¹²

No applied voltage, 1000g

Post shock tests

Vibration	..	..	..	..	..	100	V
Ignition voltage	..	..	..	..	..	165	V
Maintaining voltage (1)	..	..	..	..	..	155	V
Maintaining voltage (2)	..	..	..	..	..	142	V
Regulation	..	..	..	..	..	155	V
Continuity and short	..	..	..	..	..	±5	V
Sub-group quality level ⁷	..	..	..	..	..	—	—
Fatigue ¹¹	..	..	..	..	..	—	—

No applied voltage, 2.5g peak acceleration,
f = 50c/s, for 32 hours in each of 3 mutually
perpendicular directions

Post fatigue tests

Vibration	..	..	..	..	..	100	mV
Ignition voltage	..	..	..	..	..	165	V
Maintaining voltage (1)	..	..	..	..	..	155	V
Maintaining voltage (2)	..	..	..	..	..	142	V
Regulation	..	..	..	..	..	155	V
Continuity and short	..	..	..	..	..	±5	V
Sub-group quality level ⁷	..	..	..	..	..	—	—
Base strain ⁹	..	..	..	..	..	—	—
Glass strain ^{8A}	..	..	..	..	..	—	—

GROUP D

Stability life test

I_k = 20mA, 1hr

Stability life test end point

Change in maintaining voltage(3)

Survival rate life test

I_k = 20mA, 100hrs

Survival rate life test end point

Continuity and short

Change in maintaining voltage(3)

Change in maintaining voltage(3)	..	..	..	..	..	1.0	V
Survival rate life test	..	..	..	..	..	2.0	V
Survival rate life test end point	..	..	..	..	..	—	—
Continuity and short	..	..	..	..	..	—	—
Change in maintaining voltage(3)	..	..	..	..	..	0.65	V
	..	..	..	..	..	1.0	V

Test	Test Conditions	Permitted Rejects	Individuals ³ Min	Max
<i>Intermittent life test</i>				
<i>Intermittent life 500hrs end point tests</i>				
$I_k = 20\text{mA}$, $T_{\text{bulb min}} = 150^{\circ}\text{C}$, note f				
Inoperatives ¹³	.. ..	.. ..	—	—
Regulation	.. ..	.. ..	1	±6
Maintaining voltage (1)	$I_k = 5.0$ to 30mA	.. ..	—	155
Maintaining voltage (2)	$I_k = 30\text{mA}$	.. ..	142	155
Maintaining voltage (3)	$I_k = 5.0\text{mA}$	.. ..	142	155
Change in maintaining voltage (3)	$I_k = 20\text{mA}$	.. ..	142	155
Ignition voltage	$I_k = 20\text{mA}$	.. ..	—	6
Total rejects	as in group A	.. ..	—	165
<i>Intermittent life 1000hrs end point tests</i>				
Inoperatives ¹³	.. ..	.. ..	—	—
Regulation	.. ..	.. ..	2	±5
Maintaining voltage (1)	$I_k = 5.0$ to 30mA	.. ..	—	158
Maintaining voltage (2)	$I_k = 30\text{mA}$	.. ..	140	158
Maintaining voltage (3)	$I_k = 5.0\text{mA}$	.. ..	140	158
Change in maintaining voltage (3)	$I_k = 20\text{mA}$	.. ..	140	158
Ignition voltage	$I_k = 20\text{mA}$	.. ..	—	8
Total rejects	as in group A	.. ..	—	165

NOTES

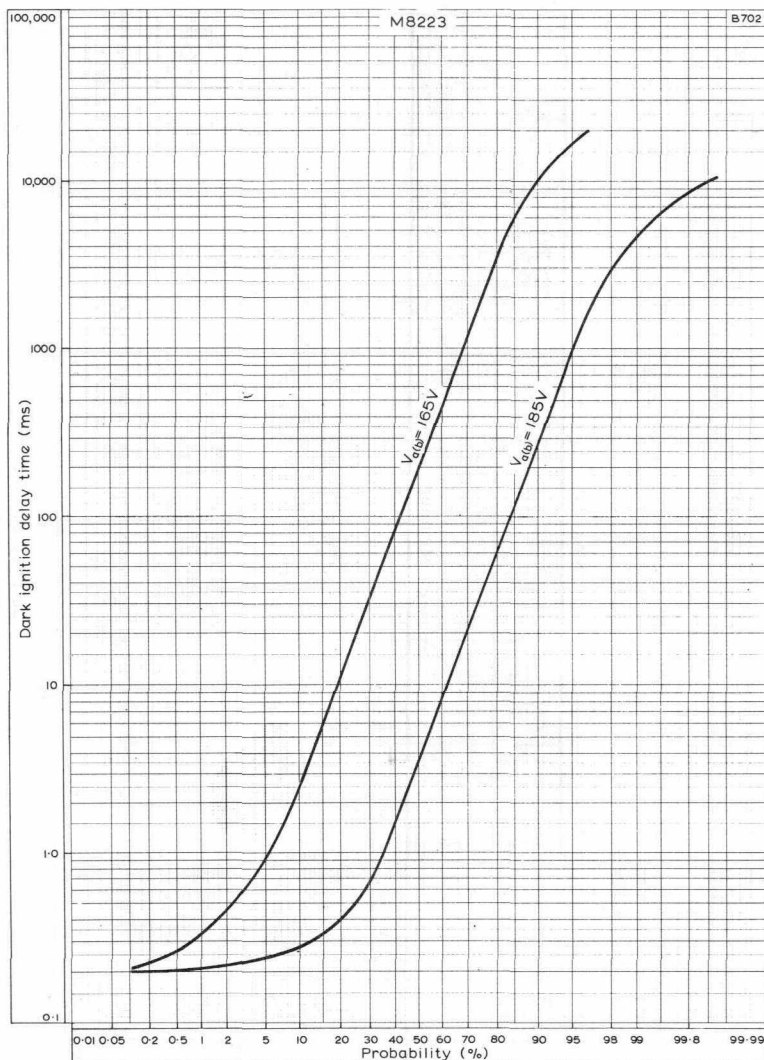
- The tube is tapped with a specified hammer and the output observed on a meter of specified dynamic response.
- The tube is held non-conducting and in total darkness for the 24 hours immediately prior to the test.
- The maintaining voltage at the specified cathode current is measured. The tube is then switched off for one minute. It is then restarted and operated at the specified cathode current for one minute, and the maintaining voltage remeasured. The on-off cycle is repeated a minimum of five times and the maximum difference in maintaining voltage taken as a measure of repeatability.
- With the tube operating under the stated conditions there must be no corona at the pins of the tube.
- The tube is operated during vibration for 60 seconds in each of two lateral directions and the output voltage measured. After the vibration the tube is checked for shorts.
- This test is performed on 20 tubes per lot.



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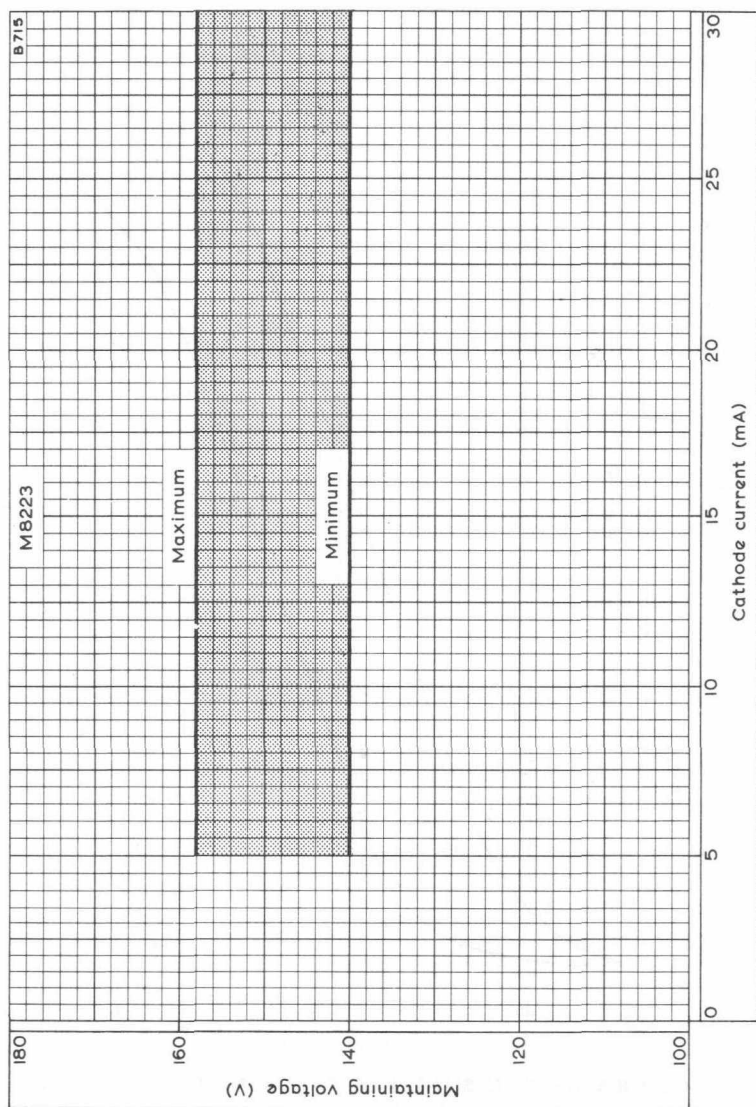
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CUMULATIVE DISTRIBUTION OF DARK IGNITION DELAY TIME

These curves show the probability that a tube will ignite in less than the time shown. This will be to some extent dependent on the supply voltage. In general an increase in the supply voltage will reduce the ignition delay time.



MAXIMUM VARIATION OF MAINTAINING VOLTAGE WITH CATHODE CURRENT (All tubes over life)