INDICATOR TUBE

Cold cathode ten digit side viewing numeral indicator tube

QUICK REFERENCE DATA				
Numeral height			13	mm
Numerals	1 2 3 4 5 6 7 8 9 0			
Supply voltage	V_b	min.	170	V
Cathode current	I_k		2	mA
Distance between mounting centres		min.	19	mm

GENERAL

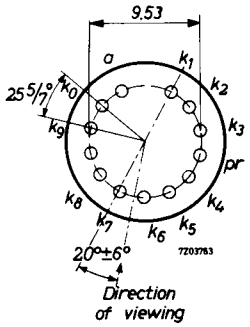
The numerals are 13 mm high and appear on the same base line allowing in-line read out. The ZM1080 is provided with a red contrast filter.
The ZM1082 is identical to the ZM1080 but has no filter.

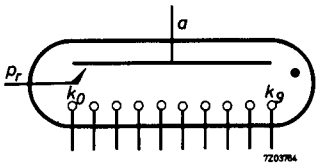
PRINCIPLE OF OPERATION

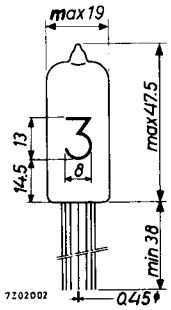
The tube contains ten cathodes in the form of ten figures and one common anode. By applying a suitable voltage between the anode and one of the ten cathodes the corresponding figure will be covered by a red neon glow.

DIMENSIONS AND CONNECTIONS

Dimensions in mm







Mounting position: any

The numbers are viewed through the side of the envelope. The numbers will appear upright (within $\pm 3^{o}$) when the tube is mounted vertically.
Care should be taken not to bend the leads nearer than 1.5 mm from the seals. The leads are tinned and may be dip soldered to a minimum of 5 mm from the seals at a solder temperature of 240 °C for a maximum of 10 seconds.
The tube may be soldered directly into the circuit but heat conducted to the glass to metal seals should be kept to a minimum by the use of a thermal shunt.

CHARACTERISTICS AND RANGE VALUES FOR EQUIPMENT DESIGN

Initially and during life at 20 °C to 50 °C unless otherwise stated.

Ignition			
Anode voltage	V_a	> 170	V
Ignition delay time		See page 4	1)
Conduction			
D.C. operation			
Cathode current 1)	I_k	< 3.5	mA
Cathode current for coverage	I_k	> 1.5	mA
Maintaining voltage at I_k = 2 mA (See also page 5)	V_m	140	V
Probe current to individual non-conducting cathodes	I_{kk}	See page 6	
Pulse operation			
Cathode current, peak	I_{kp}	< 12	mA
average, T_{av} = 20 ms	I_k	< 2.5	mA
Average cathode current for satisfactorily display	I_k	> 0.8	mA
Pulse duration	T_{imp}	< 20 > 100	ms μs
Maintaining voltage	V_m	See page 5	
Probe current to individual non-conducting cathodes	I_{kk}	See pages 6 and 7	

EXTINCTION

Anode voltage to ensure extinction	V_a	< 115	V

1) For reduced ignition delay times, a small continuous priming current may be taken from lead 4. This can be obtained from a supply voltage of -180 V with respect to the "on" cathode via a resistor of 18 MΩ.

LIFE EXPECTANCY

Under recommended operating conditions and t_{amb} = room

Continuous display of one digit [1]	> 5000	h
Sequentially changing the display from one digit to another every 100 hours or less	> 30 000	h

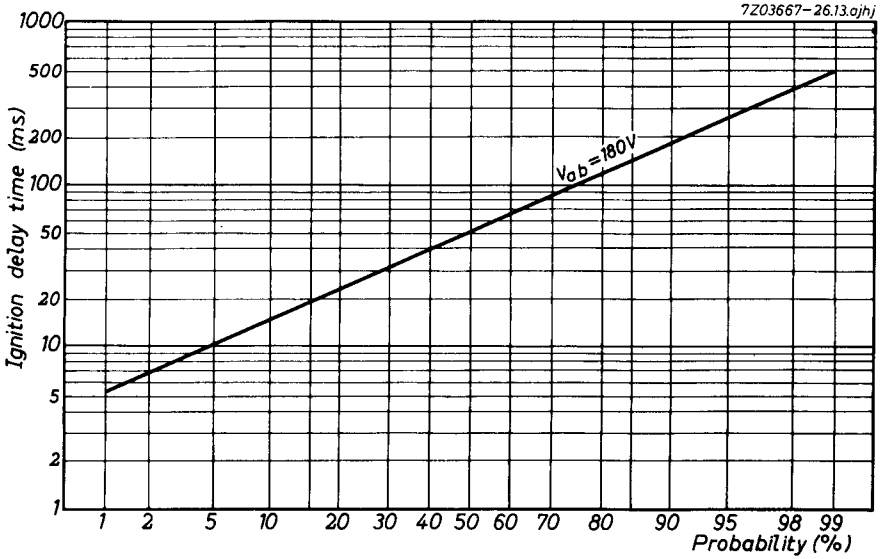
LIMITING VALUES (Absolute max. rating system)

Cathode current (each digit)

average, T_{av} = max. 20 ms	I_k	max.	3.5	mA
peak	I_{kp}	max.	12	mA
average during any conduction period	I_k	min.	1.5	mA
Bulb temperature	t_{bulb}	max.	+70	°C
		min.	−50	°C [2]
Anode voltage necessary for ignition	V_a	min.	170	V

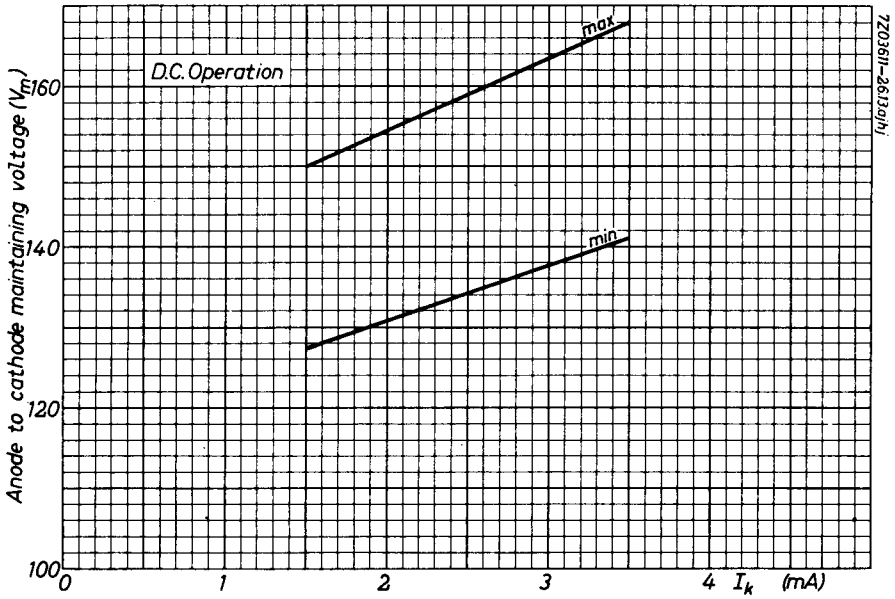
[1] The life expectancy figures given above relate to operation with d.c. cathode currents between 1.5 mA to 2.5 mA and at all permitted pulsed cathode currents.
When a d.c. cathode current range of 1.5 mA to 3.5 mA is used, the life expectancy exceeds 3000 hours with continuous display of one digit.

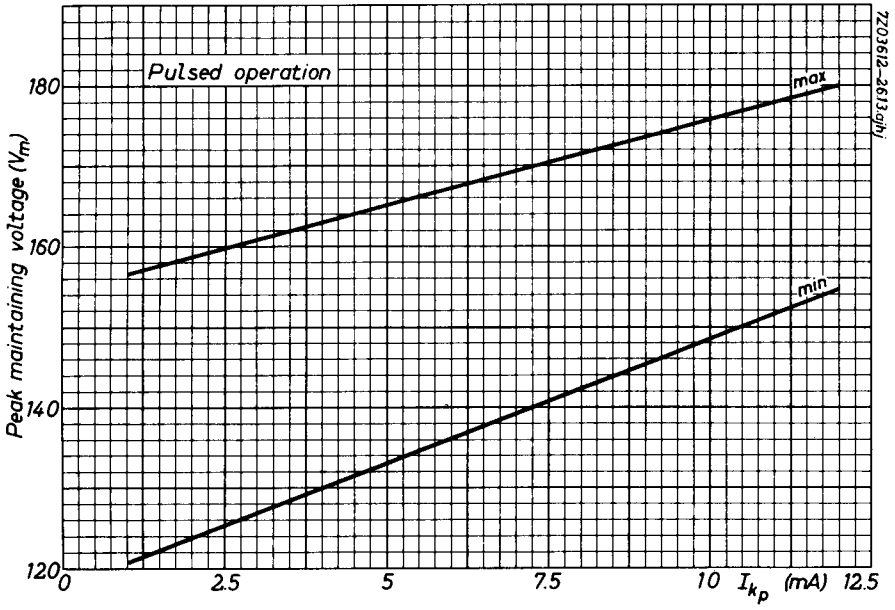
[2] For bulb temperatures below 0 °C the life expectancy of the tube is substantially reduced.

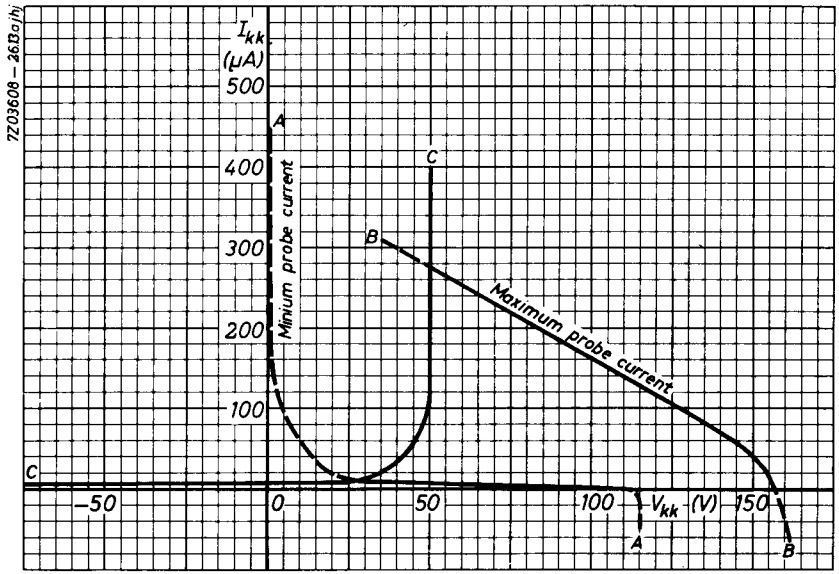


CUMULATIVE DISTRIBUTION OF IGNITION DELAY TIME

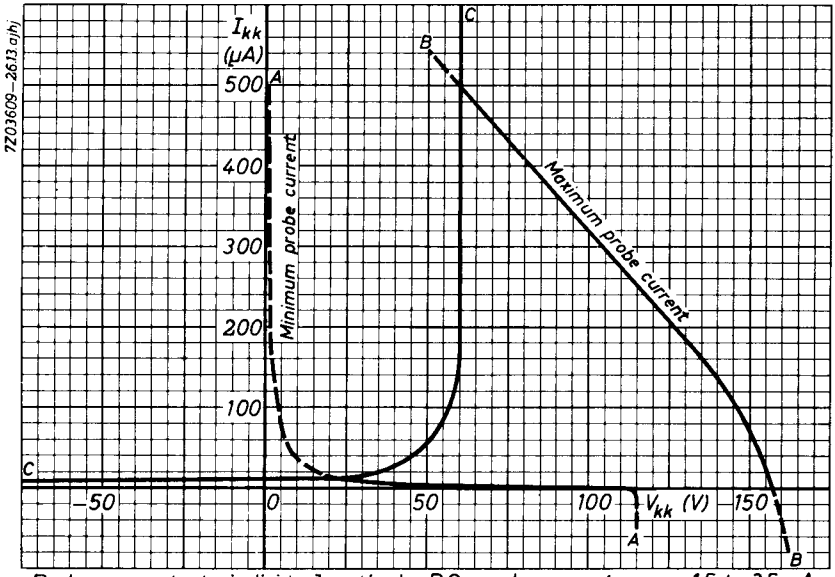
This curve shows the probability that a tube will ignite in less than the time shown after a non-conduction period of a few seconds. The ignition delay time will be appreciably reduced when the interval between conduction periods is less than 100 milliseconds. In general, an increase in the supply voltage will reduce the ignition delay time.


D.C. Operation
max
min
Anode to cathode maintaining voltage (V_m)
160
140
120
100
0
1
2
3
4
I_k (mA)
7Z03611-2613.ghj

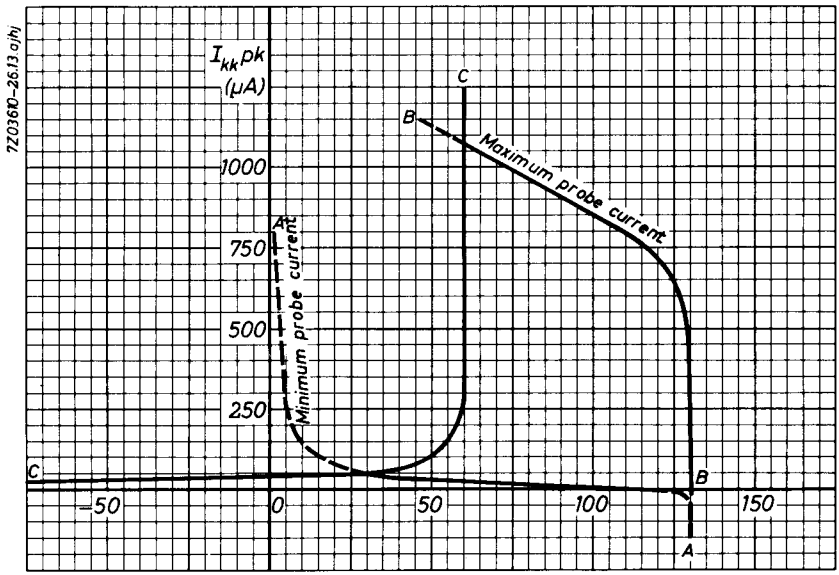

Pulsed operation
max
min
Peak maintaining voltage (V_m)
180
160
140
120
0
2.5
5
7.5
10
I_{kp} (mA)
12.5
7Z03612-2613.ghj



Probe currents to individual cathodes. D.C. anode current range 1.5 to 2.5mA



Probe currents to individual cathodes. D.C. anode current range 1.5 to 3.5mA



Peak probe currents to individual cathodes. Pulsed anode current 10mA Duty factor 01

PROBE CURRENT CURVES

The boundaries A-A and B-B of the graphs represent, for the shown anode current ranges, the range of probe currents to individual non-conducting cathodes plotted against the voltage difference between the non-conducting cathodes and the conducting cathode.

For optimum display, the probe current to any non-conducting cathode should be as low as possible. In addition, reverse probe current should not be permitted.

These conditions can be satisfied in two ways:

(1) With a low impedance voltage source connected to the non-conducting cathodes. For example, when using a current range of 1.5 to 2.5 mA and a voltage between 50 and 115 V is required.

(2) With a separate high impedance connected to each non-conducting cathode and returned to a voltage source of less than 115 V. In this case the load line of the voltage source must lie to the right of boundary C-C.