



Mullard
Technical
handbook

BOOK

2

Valves and tubes

Part 3

Gasfilled tubes

January 1971

NUMERICAL INDICATOR TUBES

**ZM1174
ZM1175
ZM1176
ZM1177**

QUICK REFERENCE DATA

Cold cathode, neon filled, side viewing numerical indicator tubes with long life expectancy. These tubes are similar to the ZM1172, but incorporate a decimal point. The four types are electrically identical, but differ in the position of the decimal point and the inclusion of a red filter to improve the contrast of display.

ZM1174 - Decimal point on left hand side. Red contrast filter.

ZM1175 - Decimal point on left hand side. No red filter.

ZM1176 - Decimal point on right hand side. Red contrast filter.

ZM1177 - Decimal point on right hand side. No red filter.

Numeral height	15.5	mm
Minimum distance between mounting centres	19	mm
Numerals	1 2 3 4 5 6 7 8 9 0	
Numeral cathode current	2.5	mA
Decimal point cathode current (nom.)	0.5	mA
Minimum supply voltage	170	V

Unless otherwise stated, data is applicable to all types

CHARACTERISTICS AND OPERATING CONDITIONS (measured at 20 to 50°C)

Minimum anode-to-cathode voltage necessary for ignition	170	V
Anode-to-cathode maintaining voltage	See page 4	
Anode-to-cathode voltage below which all tubes will extinguish	115	V
Numeral cathode current		
Maximum peak	12	mA
Maximum average		
(averaged over any 10ms)	3.5	mA
Minimum average (see notes 1 and 2)		
(averaged over any 10ms)	0.8	mA
Minimum average (see notes 1 and 2)		
(averaged over any conduction period)	1.5	mA
Recommended average		
(during any d.c. conduction period)	2.5	mA

Decimal point cathode current (see note 3)		
Maximum peak	2.5	mA
Minimum average		
(averaged over any conduction period)	0.05	mA
Recommended average		
(during any d. c. conduction period)	0.15	mA ←
Minimum pulse duration (pulsed operation)	100	μs

LIFE EXPECTANCY at recommended operating conditions and room temperature (see note 4)

Continuous display of one numeral	> 5000	h
Sequentially changing the display from one numeral to another, every 100 hours or less	> 30 000	h

RATINGS (ABSOLUTE MAXIMUM SYSTEM)

Numeral cathode current (each digit)		
Maximum average		
(averaged over any 10ms)	3.5	mA
Maximum peak	12	mA
Minimum average		
(averaged over any conduction period)	1.5	mA
Bulb temperature		
Maximum	+70	°C
Minimum (see note 4)	-50	°C

MOUNTING POSITION

Any. The numerals and the decimal point are viewed through the side of the envelope. The numerals will appear upright (within $\pm 3^\circ$) when the tube is mounted vertically, base down.

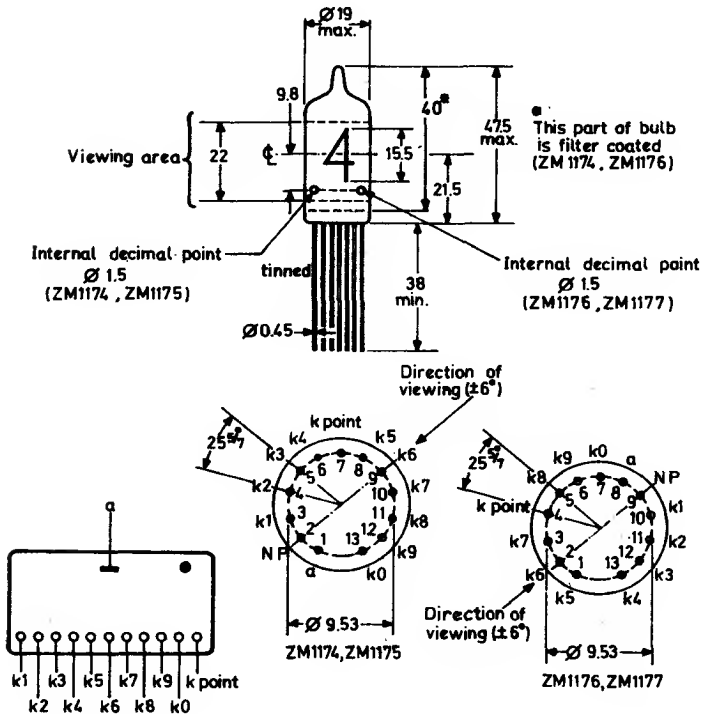
OPERATING NOTES

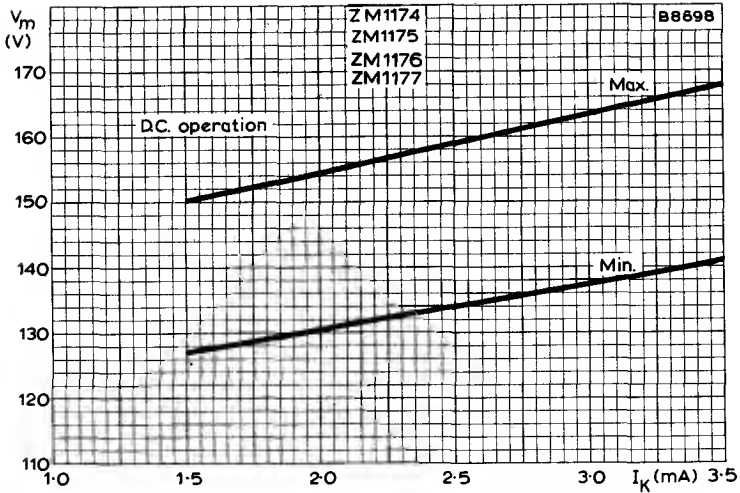
1. This value applies, irrespective of whether the decimal point is running or not.
2. The minimum average current (averaged over any 10ms) of 0.8mA is necessary for adequate light output without flicker in applications other than d. c. The minimum average (averaged over any conduction period) of 1.5mA is necessary to ensure adequate cathode coverage, initially and throughout life.
3. In order to ensure that the decimal point cathode ignites it should be ← returned to a negative supply of 10V minimum with respect to the numeral cathode carrying the main discharge. This condition is required when the numeral peak current is less than 8mA. Above 8mA peak current the decimal point cathode may be directly connected to the potential of the numeral cathode carrying the main discharge.
4. For bulb temperatures below 0°C the life expectancy of the tube is substantially reduced.

NUMERICAL INDICATOR TUBES

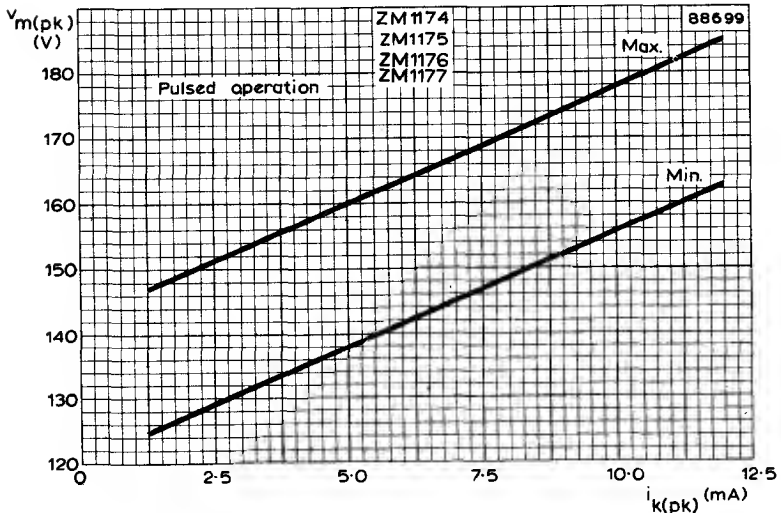
ZM1174
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5. The tube may be soldered directly into the circuit, but heat conduction to the glass-to-metal seals should be kept to a minimum by the use of a thermal shunt.
6. The leads are tinned and may be dip-soldered to a minimum of 5mm from the seals at a solder temperature of 240°C for a maximum of 10 seconds.
7. Care should be taken not to bend the leads nearer than 1.5mm from the seals.





ANODE-TO-CATHODE MAINTAINING VOLTAGE
PLOTTED AGAINST CATHODE CURRENT



PEAK ANODE-TO-CATHODE MAINTAINING VOLTAGE
PLOTTED AGAINST PEAK CATHODE CURRENT