

## INDICATOR TUBE

Long-life cold-cathode ten-digit indicator tube for side viewing.

QUICK REFERENCE DATA			
Numeral height		approx.	14 mm
Numerals			0 1 2 3 4 5 6 7 8 9
Decimal point			to the left of the numerals
Supply voltage	$V_{ba}$	min.	170 V
Anode current, average	$I_a$		2,5 mA
peak	$I_{ap}$	max.	12 mA

## GENERAL

The numerals are 14 mm high and appear on the same base line allowing in-line read out.

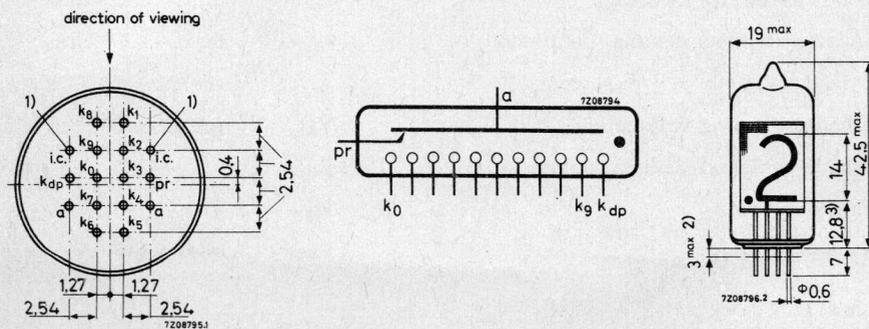
## PRINCIPLE OF OPERATION

The tube contains ten cathodes in the form of ten numerals and one in the form of a decimal point, a primer, and one common anode. By applying a suitable voltage between the anode and one of the cathodes the corresponding numeral or the decimal point will be covered by a red neon glow.

The primer allows ionization without delay in strobe type or blanking applications.

## DIMENSIONS AND CONNECTIONS

Dimensions in mm



1) Length of i. c. pins max. 2,8 mm.

2) Not tinned.

3) Standard deviation 0,13 mm.

The deviations of the axis of the pins with respect to the true geometrical position cover an area of max. 0.3 mm diameter. The pin configuration is compatible with the reference grid for printed wiring according to IEC Publication 97 (0.1 in).

Mounting position: Any

Soldering

The pins may be dip-soldered at a solder temperature of max. 240 °C for maximum 10 seconds up to a point 5 mm from the seals.

Natural frequency

The natural frequencies of the numeral cathodes lie within the range from 300 Hz to 800 Hz.

**ACCESSORIES**

55701 Printed wiring mounting board (19 x 100 mm) on which the ZM1000 can be soldered; afterwards the combination can be mounted on a vertical printed wiring board carrying, e.g., the drive circuit. Can also be used with the snap-fit tube holder 55703.

55702 Tube socket (for 0.1 in grid). Phenolic. Tinned contacts.

55703 Snap-fit tube holder.

55704 Set of one left-hand and one right-hand end piece to complete the snap-fit indicator tube assembly.

**CHARACTERISTICS AND OPERATING CONDITIONS**

Ignition voltage	$V_{ign}$	max. 170 V
Maintaining voltage	$V_m$	see page 4
Anode current for coverage	$I_a$	min. 1.5 mA
(with or without decimal point and $V_{kk} = V_{kk_{min}} - V_{fl}$ , see page 5)	$I_a$	max. 4.5 mA
Cathode selecting voltage	$V_{kk}$	see page B9
Cathode resistor, decimal point	$R_{dp}$	100 $k\Omega \pm 10\%$ <sup>1)</sup>
Primer resistor	$R_{pr}$	10 $M\Omega \pm 10\%$
Extinction voltage	$V_{ext}$	min. 118 V

1) Lower values of this resistor are permitted. The anode current should be increased by the increase of decimal point current resulting from the decrease of this resistor.

Typical operation over full temperature range 0 °C to +70 °C.

D.C. operation see pages B8 B9, B10 and B11.

Pulse operation

Peak currents up to 12 mA can be allowed provided the average current value does not exceed 2.5 mA.

To avoid excessive glow on "off" cathodes, the cathode selecting voltage should exceed 65 V. Minimum pulse duration 100 μs.

For further information consult the manufacturer.

**LIFE EXPECTANCY** at  $I_a = 2.5 \text{ mA}$

This tube is manufactured on the same physical principles as other tubes in this category and it is expected that the life will be comparable, viz:

sequentially changing the display from one digit to the others every 1000 h or less	100 000 h
Mean time between failures	min. 200 000 h

**LIMITING VALUES** (Absolute max. rating system)

Anode voltage necessary for ignition	$V_a$	min.	170 V
Anode current,			
average during any conduction period	$I_a$	min.	1.5 mA
average ( $T_{av} = 20 \text{ ms}$ )	$I_a$	max.	4.5 mA
peak	$I_{a_p}$	max.	12 mA
Cathode selecting voltage	$V_{kk}$		see page B9
Bias voltage between anode and "off" cathodes	$V_{bias}$	max.	$V_{floating}$
Ambient temperature	$t_{amb}$	min.	-50 °C <sup>1)</sup>
	$t_{amb}$	max.	+70 °C

**SHOCK AND VIBRATION**

An indication for the ruggedness of the tube is the fact that 95% of the items sampled from the normal production line pass the shock and vibration tests specified below without perceptible damage.

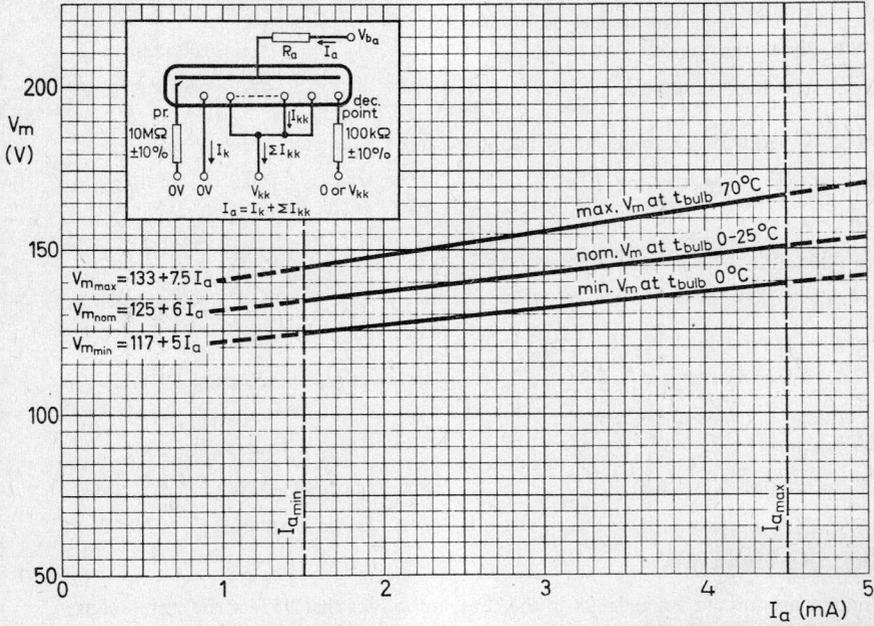
Shock: 25  $g_{peak}$ , 1000 shocks in one of the three positions of the tube.

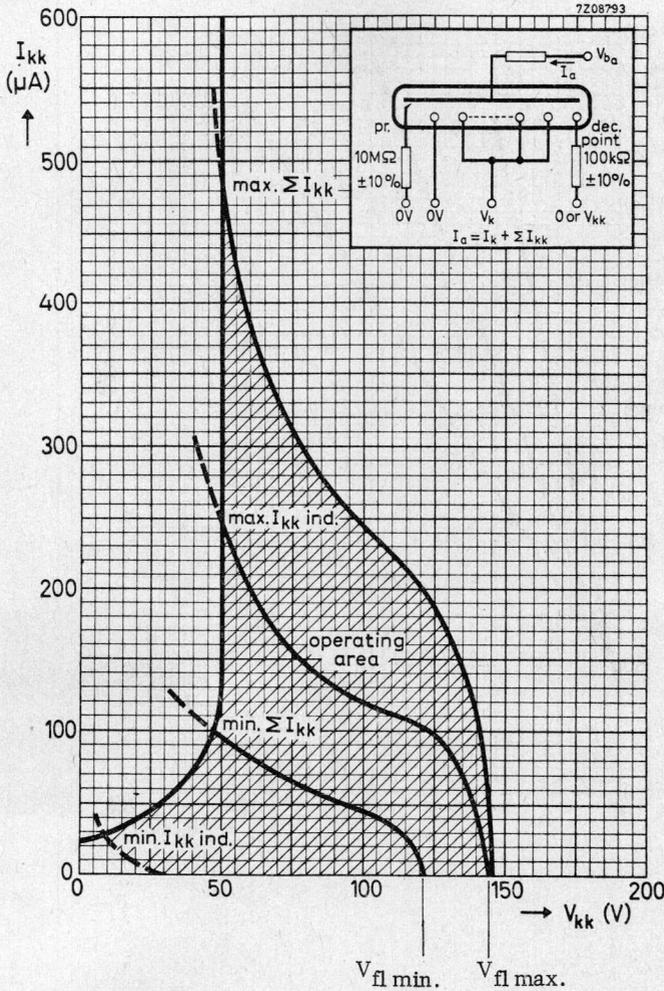
Vibration: 2.5  $g_{peak}$ , 50 Hz, during 32 hours in each of the three positions of the tube.

<sup>1)</sup> Bulb temperatures below 10 °C result in a reduced life expectancy and changes in characteristics (see page B8).

For equipment to be used over a wide temperature range, "constant current operation" (high supply voltage with a high anode series resistor) is recommended.

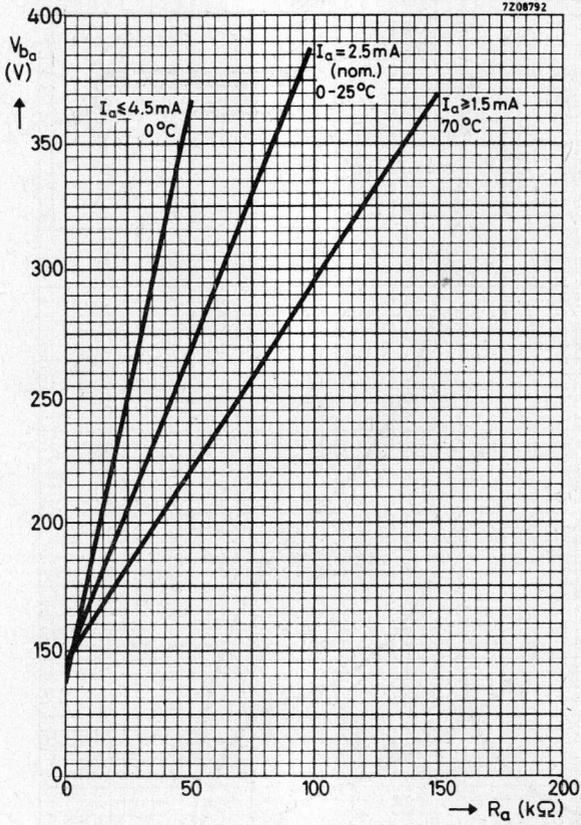
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$I_{kk}$  individual and  $\Sigma I_{kk}$  versus cathode selecting voltage  $V_{kk}$  at  $I_a = 2.5 \text{ mA}$ .  
 $I_{kk}$  and  $\Sigma I_{kk}$  are proportional to the anode current within the operating range of  $I_a$   
 and with  $V_{kk} = 0 \text{ V}$  to  $100 \text{ V}$ .

The curves are valid for instantaneous values and for average values of anode current.



Graph denoting the relationships of D.C. anode supply voltage and required anode resistor to remain within the recommended operating region.

