# INDICATOR TUBE

Long-life cold-cathode ten-digit indicator tube for side viewing.
The tube is designed for time-sharing (pulse) applications.

| 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 | $V_{b_a}$(pulse) | min. | 170 | V |
| Anode current, peak | $I_{a_p}$ | min. | 6 | mA |
| | $I_{a_p}$ | max. | 20 | mA |
| average | $I_a$ | max. | 2.5 | mA |

## GENERAL

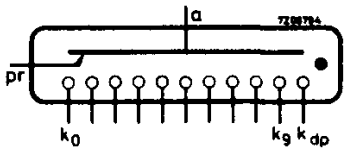
The numerals are 14 mm high and appear on the same base line allowing in-line read-out. The ZM1005R is provided with a red contrast filter. The ZM1005 is identical to the ZM1005R but has no filter.

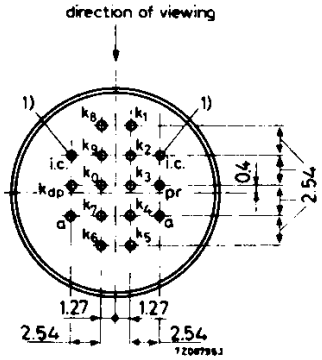
## PRINCIPLE OF OPERATION

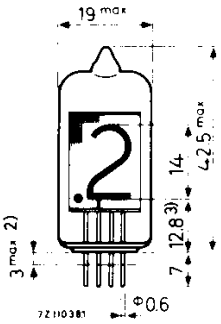
The tube contains ten cathodes in the form of ten numerals and one in the form of a decimal point; a primer, and one common anode. By applying a suitable voltage between the anode and one of the cathodes the corresponding numeral or the decimal point will be covered by a red neon glow.
The primer allows ionization without delay in strobe type or blanking applications.

## DIMENSIONS AND CONNECTIONS

Dimensions in mm




The deviation of the axes of the pins with respect to the true geometrical position cover an area of 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 3 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 mm x 100 mm) on which the ZM1005 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.

1) i.c. pins max. length 2.8 mm
2) Not tinned
3) Standard deviation 0.13 mm

## CHARACTERISTICS AND OPERATING CONDITIONS

| | | | | |
|---|---|---|---|---|
| Ignition voltage | $V_{ign}$ | max. | 170 | V |
| Maintaining voltage | $V_m$ | see page 4 | | |
| Anode current, average ($T_{av}$ = max. 20 ms) | $I_a$ | max. | 2.5 | mA |
| peak | $I_{ap}$ | min. | 6 | mA |
| (with or without decimal point) | $I_{ap}$ | max. | 20 | mA |
| Pulse duration | $T_{imp}$ | min. | 50 | μs 1) |
| Cathode selecting voltage (see also page 4) | $V_{kk}$ | min. | 70 | V 2) |
| | $V_{kk}$ | max. | 115 | V |
| Cathode resistor, decimal point | $R_{dp}$ | | 10 | kΩ±10% 3) |
| Primer resistor (anode to primer supply voltage min. 170 V) | $R_{pr}$ | | 10 | MΩ±10% |
| Extinguishing voltage | $V_{ext}$ | min. | 118 | V |

**LIFE EXPECTANCY** at $I_a$ = 2 mA

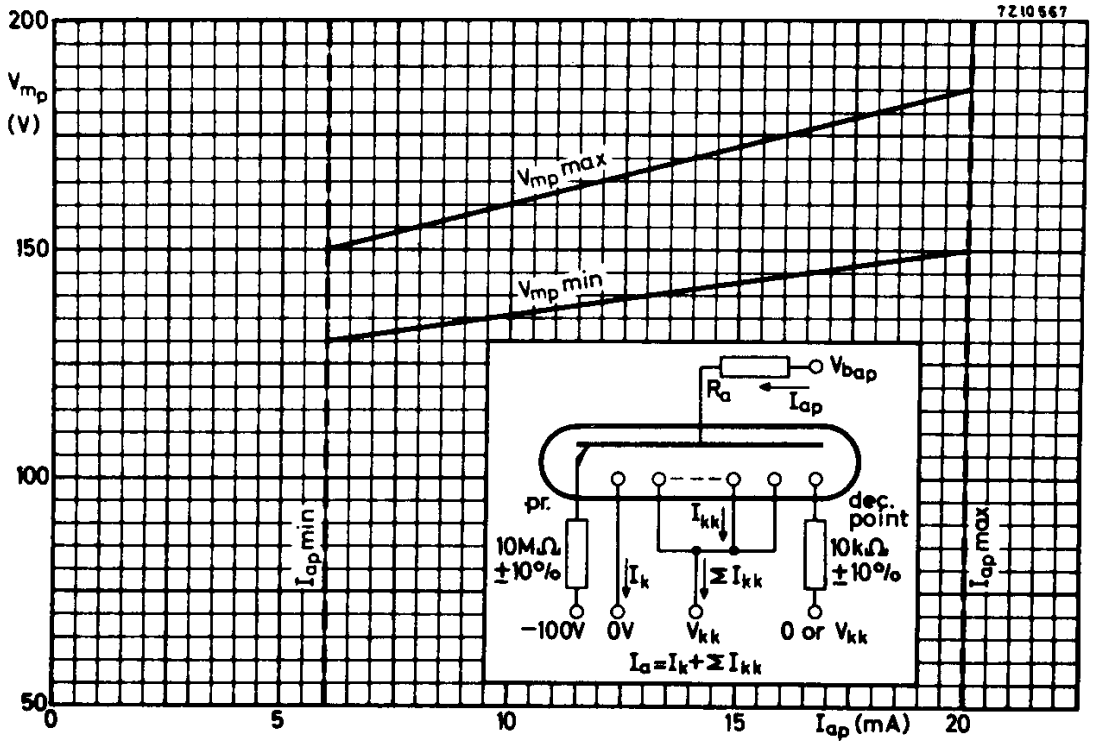
The life expectancy is dependent on the instantaneous and average values of anode current:

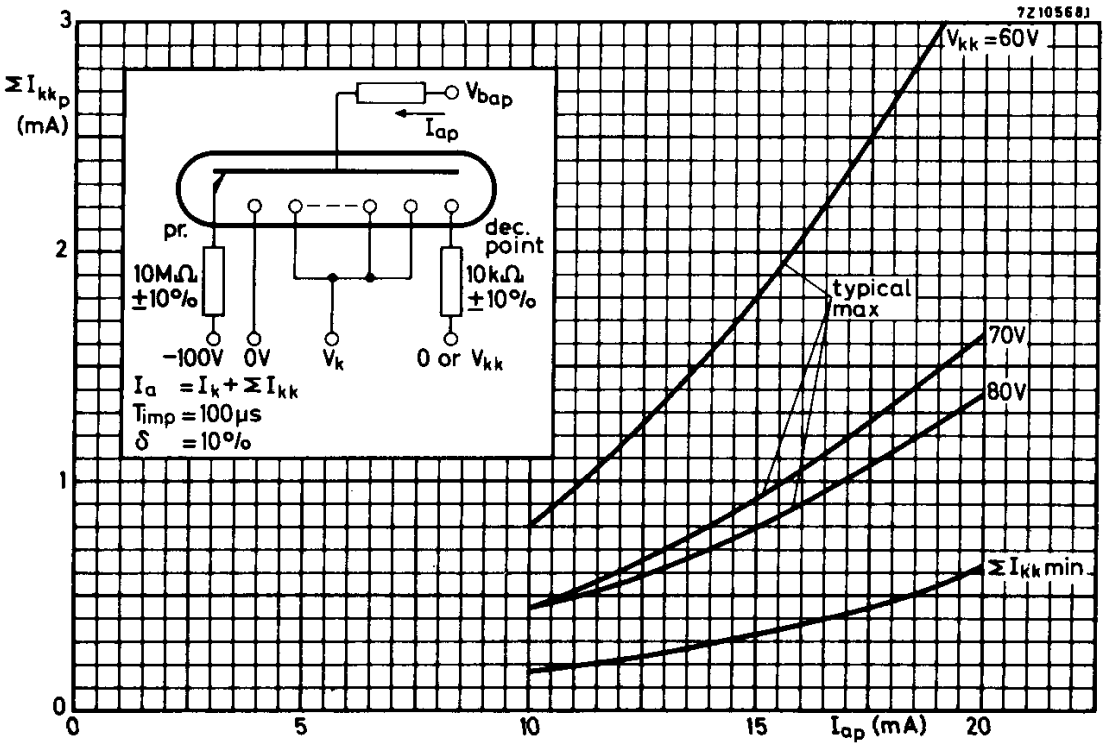
| | | |
|---|---|---|
| sequentially changing the display from one digit to the others every 100 h or less, $I_{ap}$ = 10 mA | 100 000 | h |
| $I_{ap}$ = 20 mA | 20 000 | h |
| Mean time between failures | min. 200 000 | h |

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

| | | | | |
|---|---|---|---|---|
| Anode voltage necessary for ignition, pulse | $V_{ap}$ | min. | 170 | V |
| Anode current, average ($T_{av}$ = 20 ms) | $I_a$ | max. | 2.5 | mA |
| peak | $I_{ap}$ | min. | 6 | mA |
| | $I_{ap}$ | max. | 20 | mA |
| Pulse duration | $T_{imp}$ | min. | 10 | μs |
| Cathode selecting voltage | $V_{kk}$ | min. | 70 | V |
| | $V_{kk}$ | max. | 115 | V |
| "Off" anode voltage | $V_{a"off"}$ | max. | 115 | V |
| Ambient temperature | $t_{amb}$ | min. | -50 | °C 4) |
| | $t_{amb}$ | max. | +70 | °C |

1) Pulse durations down to 10 μs are allowed provided the minimum peak anode current is not less than 10 mA.
2) Lower values of $V_{kk}$ result in increasing background glow impairing readability.
3) The decimal point cathode may not be operated without extra current limiting resistor unless a numeral cathode is operated simultaneously.
4) Bulb temperatures below 10 °C result in a reduced life expectancy and changes in characteristics.
For equipment to be used over a wide temperature range, "constant current operation" is recommended.


7Z10567
200
$V_{mp}$
(V)
150
100
50
0
5
10
15
$I_{ap}$ (mA)
20
$V_{mp}$ max
$V_{mp}$ min
$I_{ap}$ min
$I_{ap}$ max
$V_{bap}$
$R_a$
$I_{ap}$
pr.
dec. point
$I_{kk}$
10MΩ ±10%
10kΩ ±10%
$I_k$
$\Sigma I_{kk}$
−100V
0V
$V_{kk}$
0 or $V_{kk}$
$I_a = I_k + \Sigma I_{kk}$


7Z10568J
3
$\Sigma I_{kkp}$
(mA)
2
1
0
0
5
10
15
$I_{ap}$ (mA)
20
$V_{kk}$ = 60V
70V
80V
typical max
$\Sigma I_{kk}$ min
$V_{bap}$
$I_{ap}$
pr.
dec. point
10MΩ ±10%
10kΩ ±10%
−100V
0V
$V_k$
0 or $V_{kk}$
$I_a = I_k + \Sigma I_{kk}$
$T_{imp}$ = 100μs
δ = 10%