

## INDICATOR TUBE

Cold cathode ten digit numeral indicator tube for side viewing.

### QUICK REFERENCE DATA

|                 |                     |        |
|-----------------|---------------------|--------|
| Numeral height  | 30                  | mm     |
| Numerals        | 1 2 3 4 5 6 7 8 9 0 |        |
| Supply voltage  | $V_{ba}$ min.       | 170 V  |
| Cathode current | $I_k$               | 4.5 mA |

### GENERAL

The numerals are 30 mm high and appear on the same base line allowing in-line read out. The ZM1040 is provided with a red contrast filter.

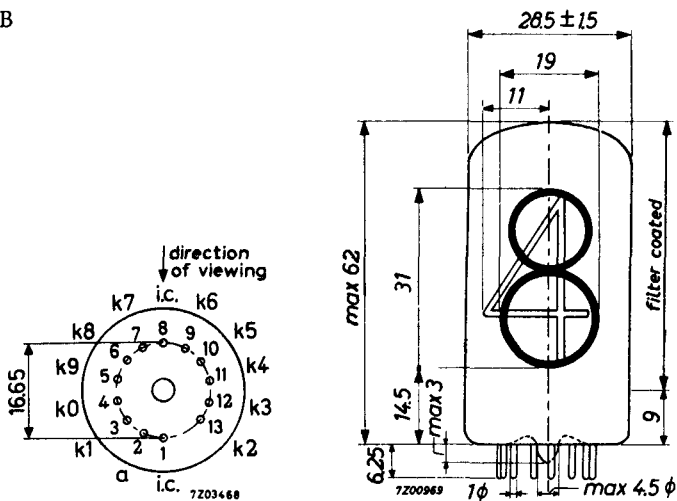
### PRINCIPLE OF OPERATION

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 numeral will be covered by a red neon glow.

### DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: B13B



7Z2 5256

Mounting position: any

The numerals are viewed through the side of the envelope. The numerals will appear upright (within  $1.5^\circ$ ) when the tube is mounted vertically.

Accessories

Socket type B870228 (B870067 or B870069)

**CHARACTERISTICS AND OPERATING CONDITIONS**

|                                             |                  |                    |     |    |
|---------------------------------------------|------------------|--------------------|-----|----|
| Ignition voltage                            | $V_{\text{ign}}$ | max.               | 160 | V  |
| Maintaining voltage                         | $V_m$            | see sheets A and B |     |    |
| Cathode current for coverage,               |                  |                    |     |    |
| average, during any conduction period       | $I_k$            | min.               | 3   | mA |
| Cathode current,                            |                  |                    |     |    |
| average ( $T_{\text{av}} = 20 \text{ ms}$ ) | $I_k$            | max.               | 6   | mA |
| peak                                        | $I_{k_p}$        | max.               | 20  | mA |
| Cathode selecting voltage                   | $V_{kk}$         | see sheets C and D |     |    |
| Extinguishing voltage                       | $V_{\text{ext}}$ | min.               | 120 | V  |

Typical operation at temperatures  $t_{\text{amb}} = 10$  to  $50^\circ \text{C}$

D.C. operation with or without  $V_{kk}$

(See fig. 1 and 3 and sheets A, C and D)

|                           |          |              |              |              |              |                 |
|---------------------------|----------|--------------|--------------|--------------|--------------|-----------------|
| Anode supply voltage      | $V_{ba}$ | 200          | 250          | 300          | 350          | V               |
| Maintaining voltage       | $V_m$    | $140 \pm 10$ | $140 \pm 10$ | $140 \pm 10$ | $140 \pm 10$ | V               |
| Anode series resistor     | $R_a$    | 15           | 27           | 39           | 47           | k $\Omega$      |
| Cathode selecting voltage | $V_{kk}$ |              |              | min.         | 60           | V <sup>1)</sup> |

A.C. half-wave rectified operation with or without  $V_{kk}$

(See fig. 2 and 4 and sheet B)

|                               |          |     |     |      |     |                 |
|-------------------------------|----------|-----|-----|------|-----|-----------------|
| Secondary transformer voltage | $V_{tr}$ | 170 | 220 | 250  | 300 | V               |
| Anode series resistor         | $R_a$    | 5.6 | 12  | 18   | 27  | k $\Omega$      |
| Cathode selecting voltage     | $V_{kk}$ |     |     | min. | 60  | V <sup>1)</sup> |

1) With low cathode selecting voltages the current  $I_{kk}$  to the "off" cathodes will increase and the readability of the "on" cathode will be affected. It is therefore recommended to use a voltage  $V_{kk}$  in excess of the stated minimum value.

7Z2 5257

**LIFE EXPECTANCY** under recommended operating conditions

|                                                                                           |          |
|-------------------------------------------------------------------------------------------|----------|
| Continuous display of one digit                                                           | 3000 h   |
| Sequentially changing the display from one digit<br>to the others every 100 hours or less | 20 000 h |

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

|                                               |            |      |                      |
|-----------------------------------------------|------------|------|----------------------|
| Anode voltage necessary for ignition          | $V_a$      | min. | 170 V                |
| Cathode current,                              |            |      |                      |
| average during any conduction period          | $I_k$      | min. | 3 mA                 |
| average ( $T_{av} = 20$ ms)                   | $I_k$      | max. | 6 mA                 |
| peak                                          | $I_{kp}$   | max. | 20 mA                |
| Cathode selection voltage                     | $V_{kk}$   | min. | 60 V                 |
| Bias voltage between anode and "off" cathodes | $V_{bias}$ | max. | 120 V                |
| Bulb temperature                              | $t_{bulb}$ | min. | 0 °C                 |
|                                               |            | max. | +70 °C <sup>1)</sup> |

<sup>1)</sup> Bulb temperatures below 0 °C result in a reduced life expectancy and changes in characteristics (see sheet E)

In designing equipment to be used over a wide temperature range the use of "constant current operation" (high supply voltage with a high anode series resistor) is recommended.

Fig.1

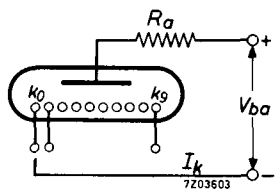


Fig.2

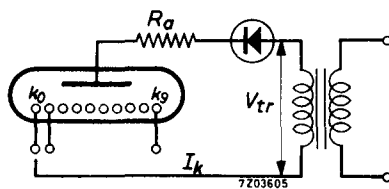


Fig.3

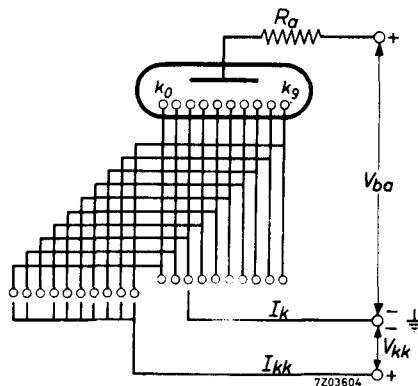


Fig.4

