
INSTRUMENT CATHODE-RAY TUBE

- 14 cm diagonal rectangular flat face
- domed mesh post-deflection acceleration
- improved spot quality for character readout
- high precision by internal permanent magnetic correction system
- internal graticule
- low heater power consumption
- for compact oscilloscopes with up to 100 MHz bandwidth

QUICK REFERENCE DATA

| | | |
|---------------------------|-------------|----------------|
| Final accelerator voltage | $V_{g7(l)}$ | 16 kV |
| First accelerator voltage | V_{g4} | 2 kV |
| Minimum useful scan area | | 100 mm x 80 mm |
| Deflection coefficient | | |
| horizontal | M_x | 7.7 V/cm |
| vertical | M_y | 3.6 V/cm |

OPTICAL DATA

| | |
|--------------------|---------------------------|
| Screen | metal-backed phosphor |
| type | GH |
| colour | green |
| persistence | medium short |
| Useful screen area | ≥ 102 mm x 82 mm (note 1) |
| Useful scan area | ≥ 100 mm x 80 mm |
| Internal graticule | type 123 (see Fig.4) |

HEATING

| | | |
|---|-------|-------|
| Heater voltage indirect by AC or DC * | V_f | 6.3 V |
| Heater current | I_f | 0.1 A |
| Heating time to attain 10% of the cathode current at equilibrium conditions (approx.) | | 7 s |

* not to be connected in series with other tubes.

MECHANICAL DATA

Dimensions and connections (see also outline drawings)

| | |
|-----------------------------------|----------------------------|
| Overall length (including socket) | ≤ 344 mm |
| Faceplate dimensions | 118 ± 0.5 mm x 98 ± 0.5 mm |

Net mass approx. 1 kg

Base 12 pin, all glass, JEDEC B12-246

Final Accelerator Contact JEDEC J1-21

Mounting

The tube can be mounted in any position. It must not be supported by the socket and not by the base region alone. The reference points on adjoining edges of the faceplate (see Fig.4) enable the tube to be positioned accurately in the front panel, for optimum alignment of the internal graticule.

Accessories

| | |
|---------------------------------------|---|
| Pin protector (required for shipping) | supplied with tube |
| Socket with solder tags | type 55594 |
| Socket with printed-wiring pins | type 55595 |
| Final accelerator contact connector | type 55466 (JEDEC J1-21) |
| Mu-metal shield | type 55458/55459 with end rubber 55460 |

FOCUSING electrostatic

DEFLECTION double electrostatic

x-plates symmetrical

y-plates symmetrical

CAPACITANCES

| | | |
|---|----------------|--------|
| x_1 to all other elements except x_2 | $C_{x_1(x_2)}$ | 4.8 pF |
| x_2 to all other elements except x_1 | $C_{x_2(x_1)}$ | 3.6 pF |
| y_1 to all other elements except y_2 | $C_{y_1(y_2)}$ | 3.0 pF |
| y_2 to all other elements except y_1 | $C_{y_2(y_1)}$ | 3.0 pF |
| x_1 to x_2 | $C_{x_1x_2}$ | 3.3 pF |
| y_1 to y_2 | $C_{y_1y_2}$ | 1.4 pF |
| Control grid to all other elements | C_{g_1} | 7.2 pF |
| Cathode to all other elements | C_k | 3.6 pF |
| Focusing electrode to all other elements | C_{g_3} | 9 pF |
| Final accelerator electrode to all other elements | C_{g_7} | 480 pF |

DIMENSIONS AND CONNECTIONS

Dimensions in mm

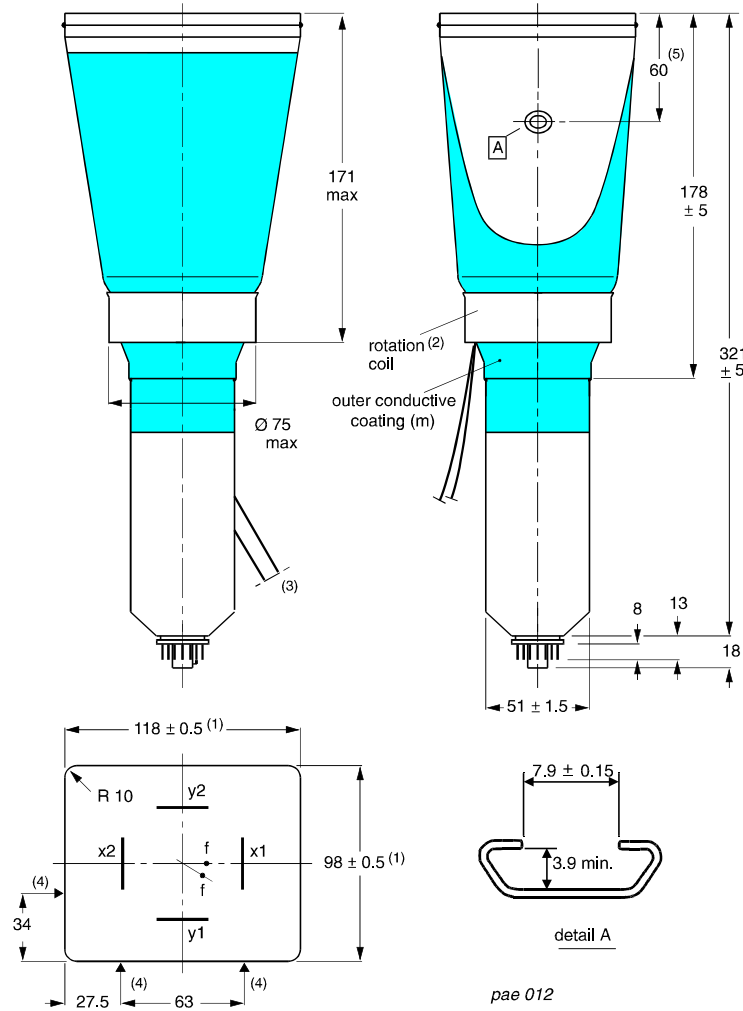


Fig.1 Mechanical outlines.

- (1) Dimensions of faceplate only. The complete assembly of faceplate and cone (frit seal included) will pass through an opening of 122 mm x 102 mm (diagonal 153 mm).
- (2) The coil is fixed to the envelope with resin and adhesive tape.
- (3) The length of the rotation coil connecting leads is minimum 350 mm.
- (4) Reference points on faceplate for graticule alignment (see Fig.4)
- (5) The centre of the final accelerator contact is situated within a square of 10 mm x 10 mm around the indicated position.

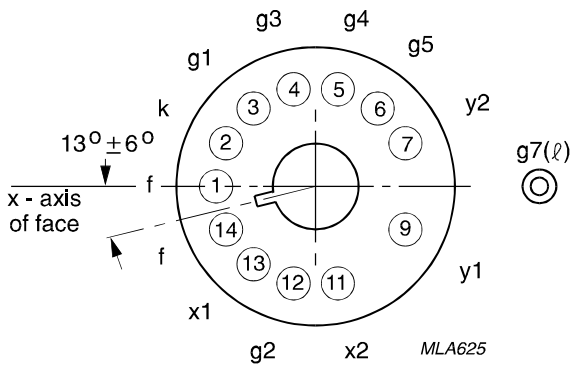


Fig.2 Pin arrangement, bottom view.

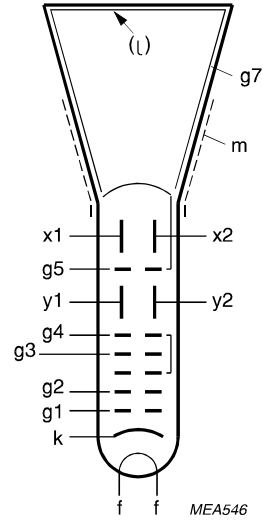


Fig.3 Electrical configuration.

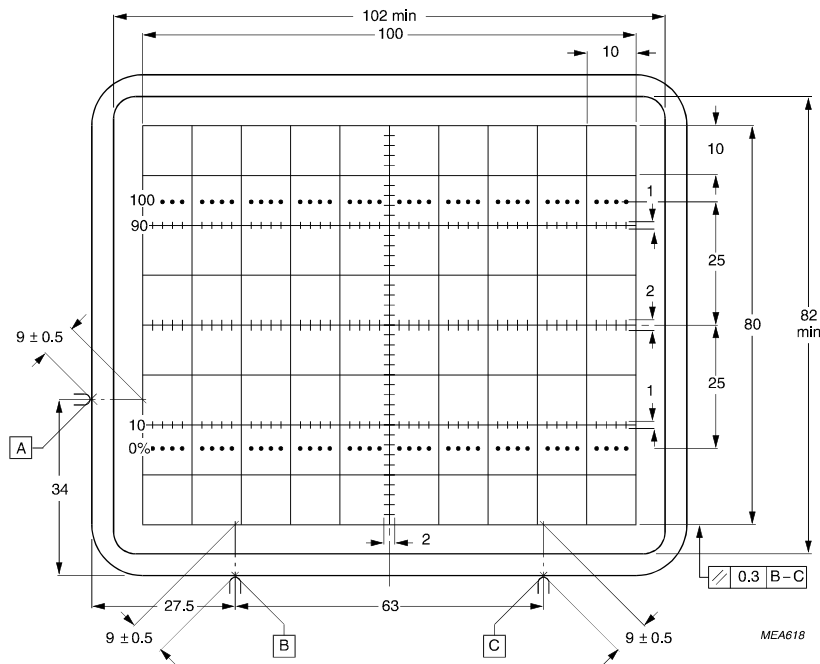


Fig 4. Front view of tube with internal graticule, type 123.

Reference points A,B and C are for aligning the graticule with the faceplate. Line thickness = 0.18 mm; dot diameter = 0.38 mm; colour: red.

TYPICAL OPERATION (voltages with respect to cathode)

Conditions

| | | | |
|---|-------------|--------------|--------|
| Final accelerator voltage | $V_{g7(l)}$ | 16 kV | |
| Mean deflection plate potential | | 2 Kv | note 2 |
| Shield voltage for optimum geometry | V_{g5} | 2 kV | note 3 |
| First accelerator and astigmatism control voltage | V_{g4} | 2 kV | note 3 |
| Focusing voltage | V_{g3} | 440 to 560 V | |
| Grid 2 voltage | V_{g2} | 2 kV | note 9 |
| Cut-off voltage for visual extinction of focused | V_{g1} | 55 to 100 V | note 9 |

Outer conductive coating (m) and mu-metal shield to be earthed.

PERFORMANCE

| | | | |
|--|-------|--------------------|-----------|
| Deflection coefficient | | | |
| horizontal | M_x | 7.7 V/cm \pm 10% | |
| vertical | M_y | 3.6 V/cm \pm 5% | |
| Deviation of deflection linearity | | \leq 2% | note 4 |
| Geometry distortion | | | notes 5,6 |
| Eccentricity of undeflected spot | | | |
| in horizontal direction | | \leq 4 mm | |
| in vertical direction | | \leq 2 mm | |
| Angle between x- and y- traces | | 90 \pm 0.5° | note 5 |
| Angle between x-trace and x-axis of internal graticule | | \leq 5° | note 7 |
| Luminance reduction with respect to screen centre | | | |
| x-axis, outer graticule line | | \leq 30% | |
| y-axis, outer graticule line | | \leq 30% | |
| any corner | | \leq 50% | |
| Grid drive for 10 μ A screen current | V_d | approx. 30 V | Fig.5 |
| Line width | l.w. | approx. 0.3 mm | note 8 |

LIMITING VALUES (Absolute maximum rating system)

| | | | |
|---|------------------------|---------------------------|--------|
| Final accelerator voltage | $V_{g7(l)}$ | max. 18 kV | Fig. 6 |
| Shield voltage | V_{g5} | max. 3.3 kV | |
| First accelerator and astigmatism control voltage | V_{g4} | max. 3.3 kV | |
| Focusing electrode voltage | V_{g3} | max. 2.5 kV | |
| Grid 2 voltage | V_{g2} | max. 2.5 kV | |
| Control grid voltage | $-V_{g1}$ | max. 200 V min. 0 V | |
| Cathode to heater voltage | | | |
| positive | V_{kf} | max. 125 V | |
| negative | $-V_{kf}$ | max. 125 V | |
| Heater voltage | | | |
| | V_f | max. 6.6 V min. 5.7 V | |
| Voltage between g_2 and g_4 | $\Delta V_{g2,g4}$ | max. 2 kV | |
| Voltage between g_4, g_5 and any deflection plate | $\Delta V_{g4,g5,x,y}$ | max. 500 V | |
| Grid drive, averaged over 1 ms | V_d | max. 25 V | |
| Screen dissipation | W_I | max. 8 mW/cm ² | |
| Control grid circuit resistance | R_{g1} | max. 1 M Ω | |

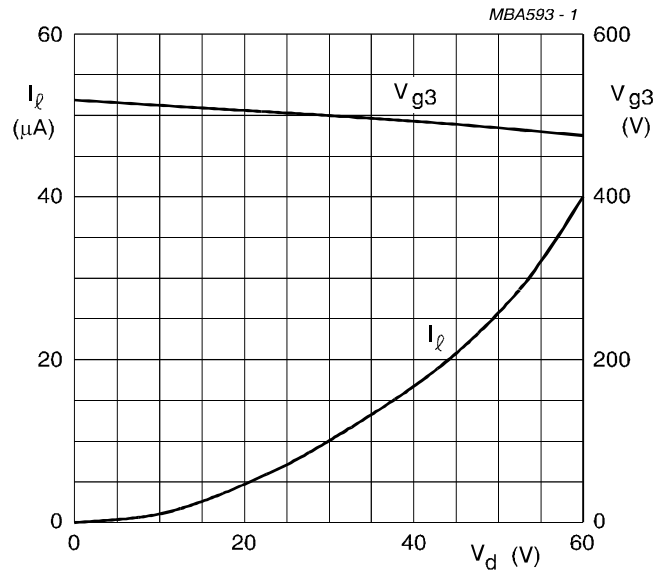


Fig.5 Screen current(I_l) and focusing voltage (V_{g3}) as a function of grid drive voltage (V_d) at $V_{g7} = 16 \text{ kV}$, $V_{g5} = 2 \text{ kV}$; typical curves.

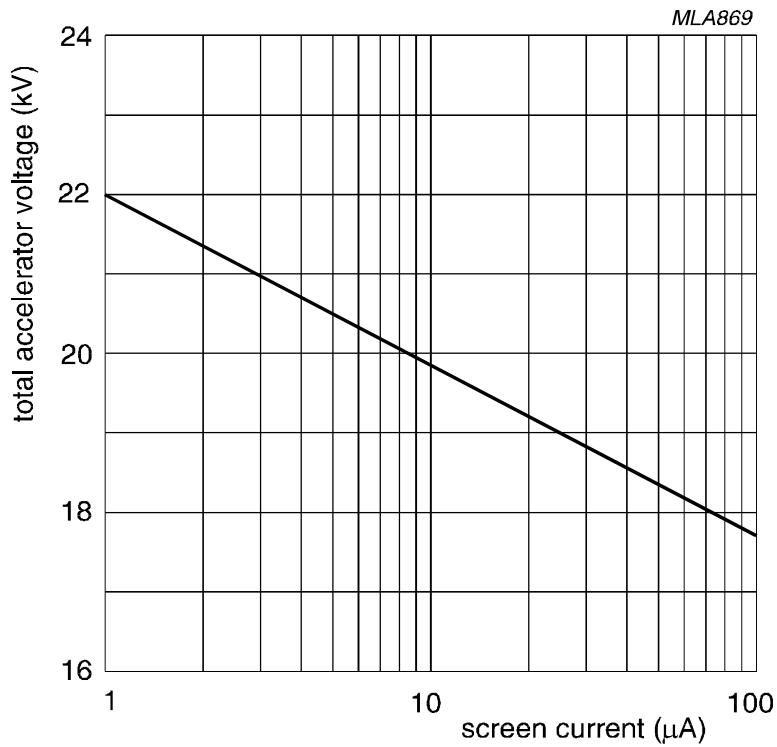


Fig. 6 0.5 mR/h isosexposure-rate limit curve. Measured according to EIA standard RS-502 , March 1989 (formerly TEPAC 104).

NOTES

1. Because the frit seal is visible through the faceplate, and is not necessarily aligned with the internal graticule, application of an external mask, or bezel, with an open area of max. 102 mm x 82 mm is recommended. The internal graticule is aligned with the faceplate by using the faceplate reference points (see Fig.4).
2. The deflection plates must be operated symmetrically; floating mean x- or y-potentials will result into non-uniform line width and geometry distortion. The mean x- and y-potentials should be equal; under this condition the tube will be within the specification without corrections for astigmatism and geometry (see also note 5).
3. For some applications a mean x-potential up to 50 V positive with respect to mean y-potential is inevitable. In this case V_{g5} must be made equal to mean x-potential, and a range of 0 to -25 V with respect to mean y-potential will be required on g_4 for astigmatism correction. The circuit resistance for V_{g4} should be $\leq 10 \text{ k}\Omega$ and $\leq 25 \text{ k}\Omega$ for V_{g5} .
4. The sensitivity at a deflection of less than 75% of the useful scan will not differ from the sensitivity at a deflection of 25% of the useful scan by more than the indicated value.
5. The tube is adjusted by internal permanent magnets for optimum geometry (orthogonality, trapezium and barrel/pin-cushion), brightness uniformity, eccentricity of undeflected spot and astigmatism.
6. A graticule consisting of concentric rectangles of 100 mm x 80 mm and 98.4 mm x 78.6 mm is aligned with the internal graticule. With optimum trace rotation correction the edges of a raster will fall between these rectangles.
7. The tube has a trace rotation coil, fixed onto the lower cone part. The coil has a maximum resistance of 260Ω at $80 \text{ }^\circ\text{C}$. The maximum required voltage is approx. 13 V for tube tolerances and earth magnetic field with reasonable shielding ($\pm 2^\circ$).
8. Measured with the shrinking raster method in the centre of the screen under typical operating conditions, adjusted for optimum spot size at a beam current $I = 10 \mu\text{A}$.
9. Grid 2 voltage (V_{g2}) may be used to adjust the cut-off voltage, otherwise it should be connected to V_{g4} . The V_{g1} range changes approximately proportional to V_{g2} .

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