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

- side contacts to deflection plates

- for compact oscilloscopes with up to 200 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	$\geq$ 102 mm x 82 mm (note 1)
Useful scan area	$\geq$ 100 mm x 80 mm
Internal graticule	type 123 (see Fig.5)

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)	$\leq$ 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.5) 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)
Side contact connector for Ø 0.65 mm pin (4 required)	type 55596 (AMP 87313)
Mu-metal shield	type 55458/55459 with end rubber 55460

FOCUSING	electrostatic

DEFLECTION	double electrostatic
x-plates	symmetrical
y-plates	symmetrical

CAPACITANCES

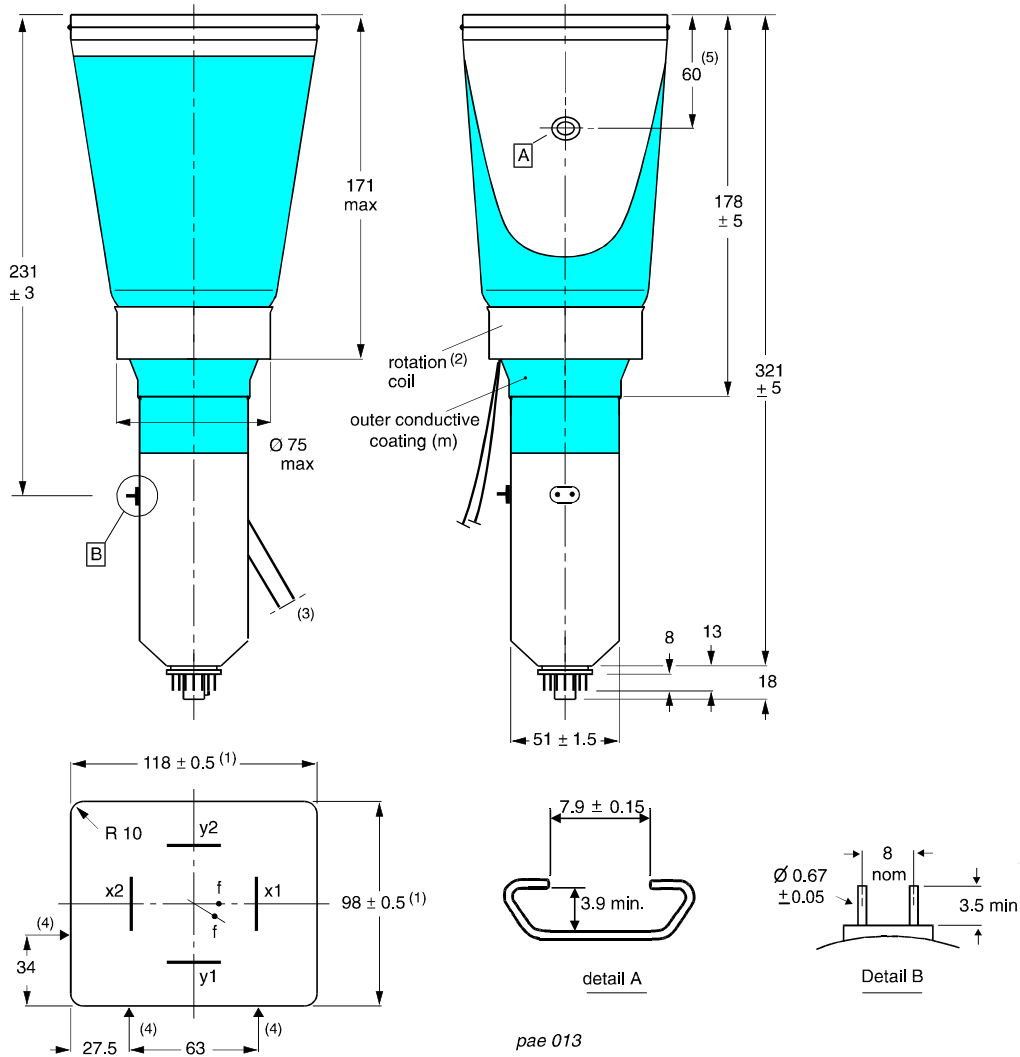|		
x_1 to all other elements except x_2	$C_{x1(x2)}$	2.4 pF
x_2 to all other elements except x_1	$C_{x2(x1)}$	2.5 pF
y_1 to all other elements except y_2	$C_{y1(y2)}$	1.9 pF
y_2 to all other elements except y_1	$C_{y2(y1)}$	2.0 pF
x_1 to x_2	C_{x1x2}	3.2 pF
y_1 to y_2	C_{y1y2}	1.5 pF
Control grid to all other elements	C_{g1}	7.2 pF
Cathode to all other elements	C_k	3.6 pF
Focusing electrode to all other elements	C_{g3}	9 pF
Final accelerator electrode to all other elements	C_{g7}	480 pF

DIMENSIONS AND CONNECTIONS   Dimensions in mm

171 max

231 ± 3

rotation (2) coil

outer conductive coating (m)

Ø 75 max

(3)

(5)
60

178 ± 5

321 ± 5

8   13
18

51 ± 1.5

118 ± 0.5 (1)

R 10   y2

x2   f   x1   98 ± 0.5 (1)
          f

(4)
34

y1

(4)   (4)
27.5   63

7.9 ± 0.15

3.9 min.

detail A

Ø 0.67 ±0.05   8 nom

3.5 min

Detail B

pae 013

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.5)
(5)   The centre of the final accelerator contact is situated within a square of 10 mm x 10 mm around the indicated position.
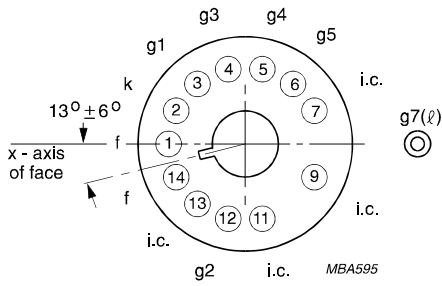
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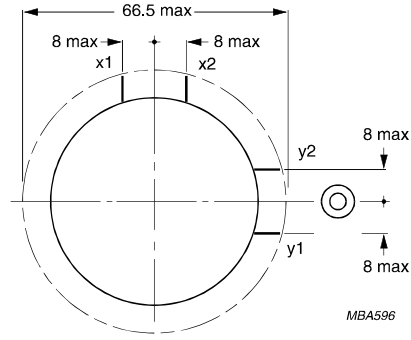
Fig.2 Pin arrangement, bottom view.
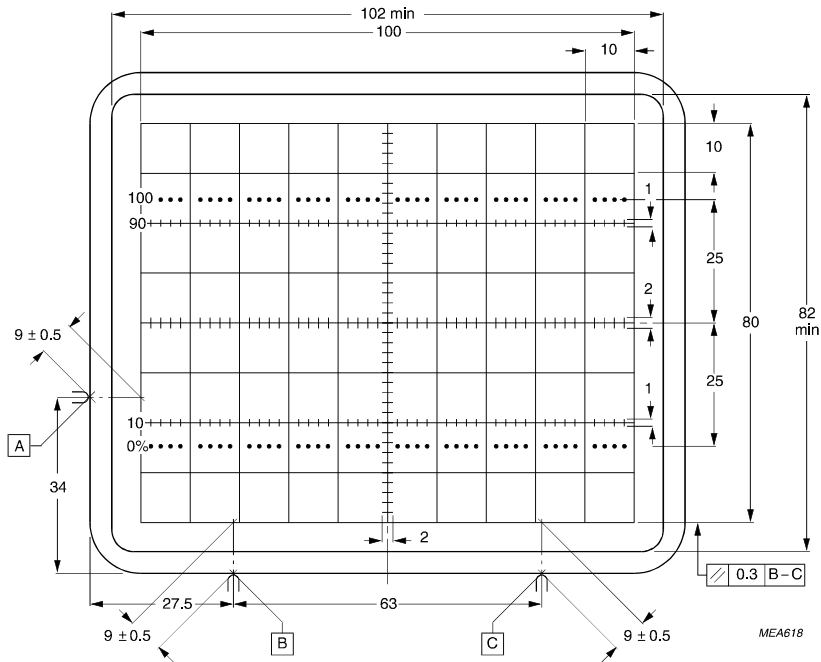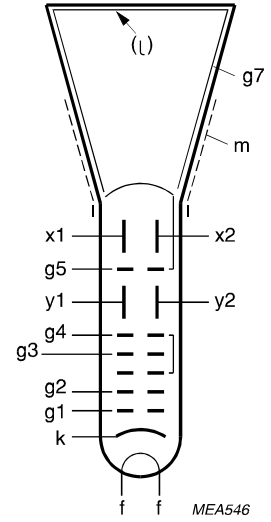
Fig.3 Side contact arrangement; bottom view

Fig 5. 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 ± 10%	
vertical	M_y	3.6 V/cm ± 5%	
Deviation of deflection linearity		≤ 2%	note 4
Geometry distortion			notes 5,6
Eccentricity of undeflected spot			
in horizontal direction		≤ 4 mm	
in vertical direction		≤ 2 mm	
Angle between x- and y- traces		90 ± 0.5°	note 5
Angle between x-trace and x-axis of internal graticule		≤ 5°	note 7
Luminance reduction with respect to screen centre			
x-axis, outer graticule line		≤ 30%	
y-axis, outer graticule line		≤ 30%	
any corner		≤ 50%	
Grid drive for 10 μA screen current	V_d	approx. 30 V	Fig.6
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. 7
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	$\triangle V_{g2,g4}$	max. 2 kV	
Voltage between g_4,g_5 and any deflection plate	$\triangle V_{g4,g5,x,y}$	max. 500 V	
Grid drive, averaged over 1 ms	V_d	max. 25 V	
Screen dissipation	WI	max. 8 mW/cm^2	
Control grid circuit resistance	R_{g1}	max. 1 MΩ	
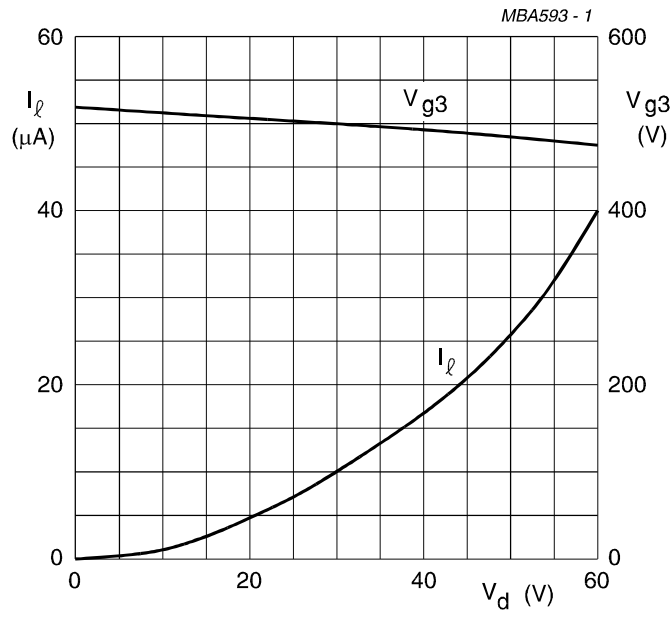
Fig.6 Screen current(I_l) and focusing voltage (V_{g3}) as a function of grid drive voltage (Vd) at V_{g7} = 16 kV, V_{g5} = 2 kV; typical curves.
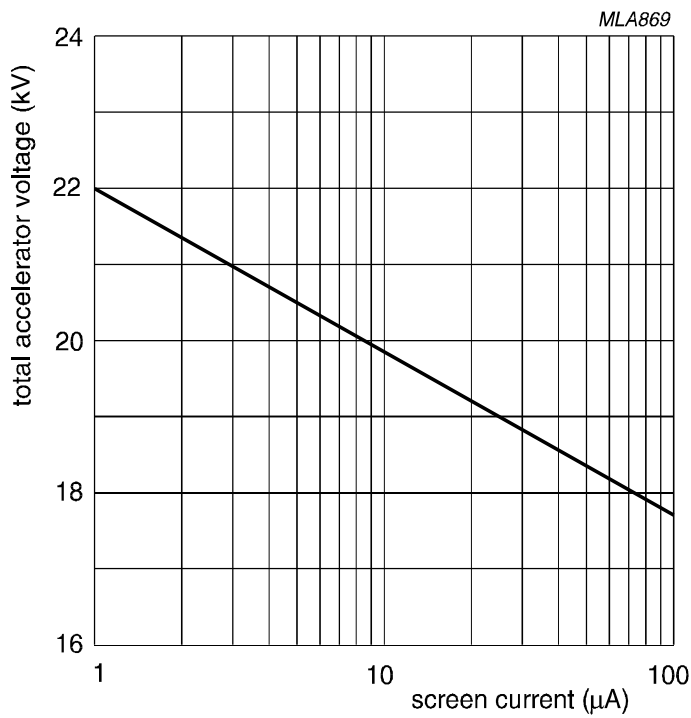

Fig. 7 0.5 mR/h isoexposure-rate limit curve.
Measured according to EIA standard RS-502 , March 1989 (formerly TEPAC 104).

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.5).

2. The deflection plates must be operated symmetrically; floating mean x- or y-potentials will resultinto 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 isinevitable. 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 kΩ and $\leq$ 25 kΩ 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 isaligned 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 260 Ω at 80 °C. The maximum required voltage is approx. 13 V for tube tolerances and earth magnetic field with reasonable shielding ($\pm$ 2°).

8. Measured with the shrinking raster method in the centre of the screen under typical operatingconditions, adjusted for optimum spot size at a beam current II = 10μA.

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}.