

INSTRUMENT CATHODE-RAY TUBE

- mono accelerator
- 10 cm diagonal rectangular flat face
- internal magnetic lens system for correction of orthogonality, astigmatism and eccentricity
- reference points on faceplate for graticule alignment
- low heater power consumption
- high brightness, long-life GY phosphor
- for small oscilloscopes with up to 30 MHz bandwidth and read-out devices

QUICK REFERENCE DATA

Accelerator voltage	$V_{g2,g4}$	2 kV
Minimum useful scan area		70 mm x 56 mm
Deflection coefficient		
horizontal	M_x	27 V/cm (18.4 V/div)
vertical	M_y	15 V/cm (10.2 V/div)

OPTICAL DATA

Screen	
type	GY
colour	yellowish-green
persistence	medium
Useful screen area	>70 mm x 56 mm (note 1)
Useful scan area	>70 mm x 56 mm
Internal graticule	type 125 (see Fig.4)

HEATING

Indirect by AC or DC *

Heater voltage	V_f	6.3 V
Heater current	I_f	100 mA
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)	< 265 mm
Faceplate dimensions	82 ± 0.5 mm x 69 ± 0.5 mm
Net mass	approx. 0.5 kg
Base	12 pin, all glass JEDEC B12-246

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 (A1, A2 and A3) 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 with respect to the bezel.

Accessories

Socket with solder tags	type 55594
Socket with printed wiring pins	type 55595
Mu metal shield	type 55463

FOCUSING

electrostatic

DEFLECTION

x plates	double electrostatic
y plates	symmetrical
	symmetrical

CAPACITANCES *

x_1 to all other elements except x_2	$C_{x1(x2)}$	4.8 pF
x_2 to all other elements except x_1	$C_{x2(x1)}$	4 pF
y_1 to all other elements except y_2	$C_{y1(y2)}$	3.4 pF
y_2 to all other elements except y_1	$C_{y2(y1)}$	3.4 pF
x_1 to x_2	C_{x1x2}	3.3 pF
y_1 to y_2	C_{y1y2}	1 pF
Control grid to all other elements	C_{g1}	6 pF
Cathode to all other elements	C_k	3 pF

* Approximate values

DIMENSIONS AND CONNECTIONS

Dimensions in mm

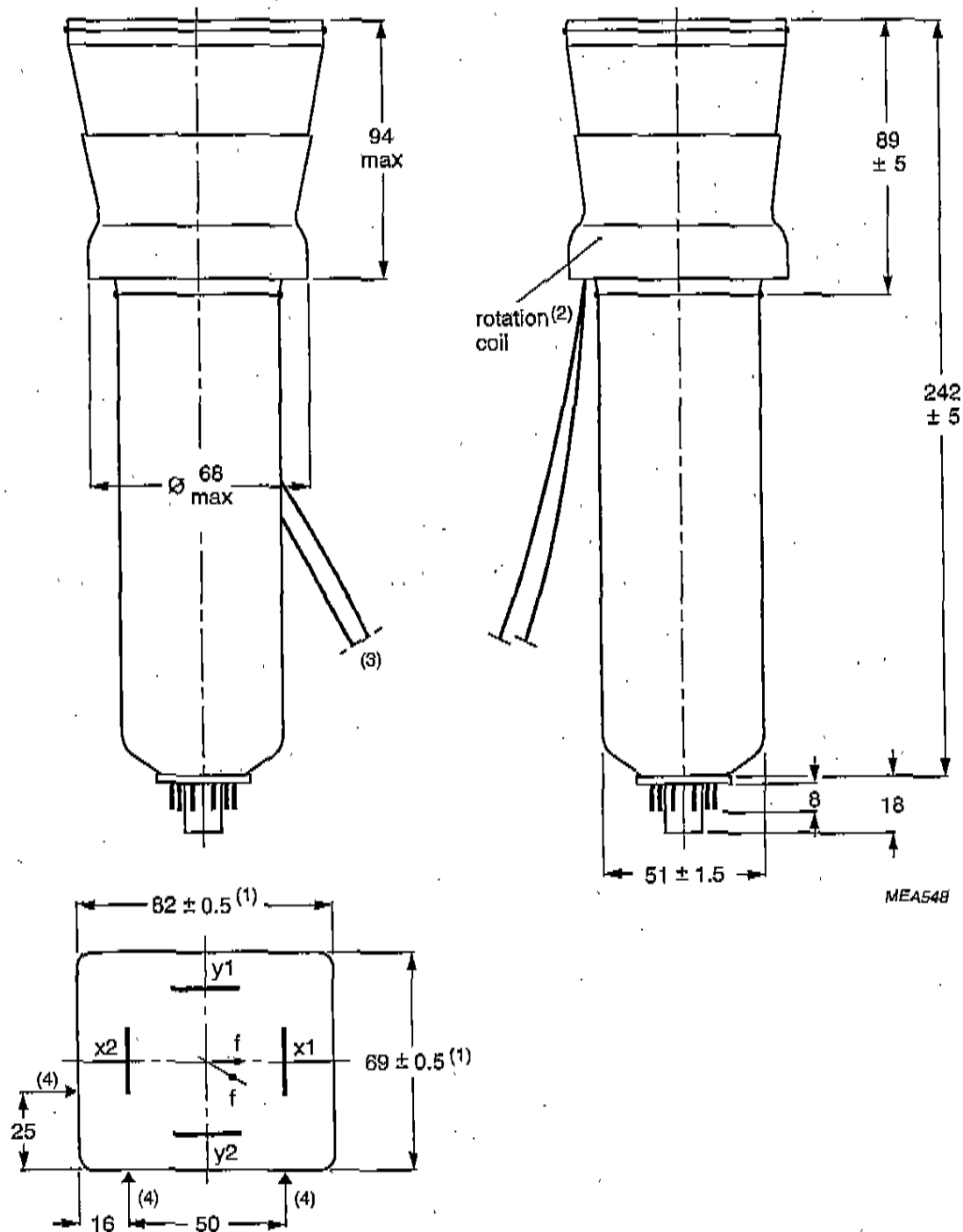


Fig.1 Mechanical outlines.

- (1) Dimensions of faceplate only. The complete assembly of faceplate and cone (frit seal included) will pass through an opening of 85 mm x 72 mm (diagonal 107 mm).
- (2) The coil is fixed to the envelope with resin and adhesive tape.
- (3) The length of rotation coil connecting leads is min. 350 mm.
- (4) Reference points on faceplate for graticule alignment.

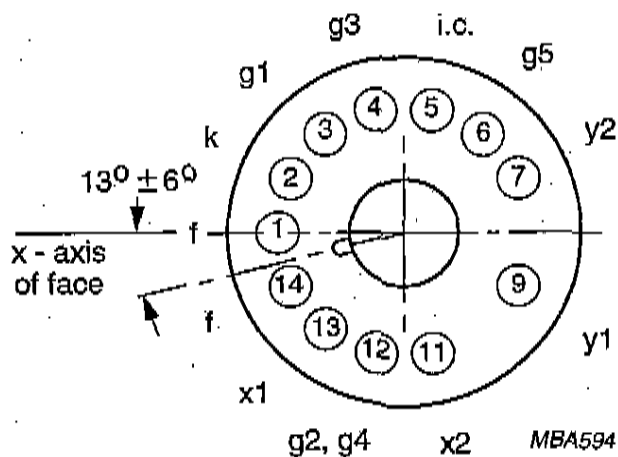


Fig.2 Pin arrangement, bottom view.

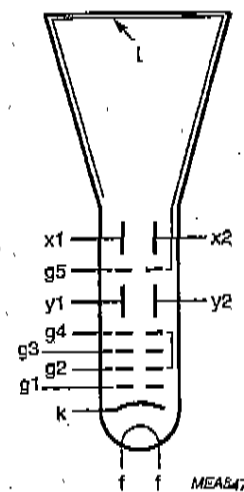


Fig.3 Electrode configuration.

Internal graticule

The internal graticule is aligned with the faceplate by using the faceplate reference points, see Fig.4 and note 1.

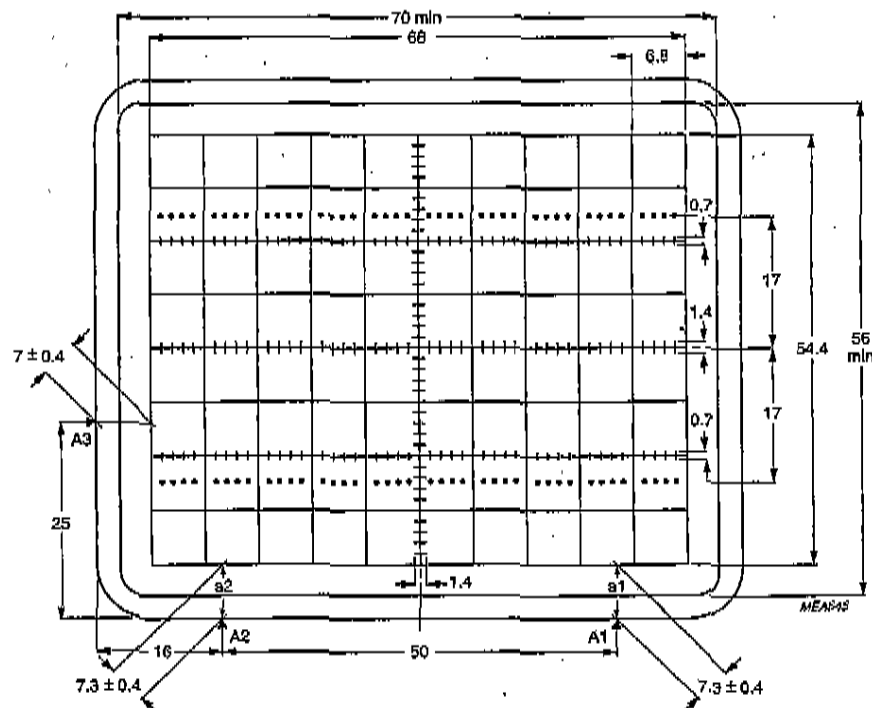


Fig.4 Front view of the tube with internal graticule, type 125.

The reference points A1, A2 and A3 are for aligning the graticule with the faceplate ($|a1 - a2| \leq 0.25$).
Line thickness = 0.15 mm; dot diameter = 0.3 mm; colour red.

TYPICAL OPERATION (voltages are with respect to the cathode)

Conditions

Mean deflection plate potential		2 kV	note 2
Shield voltage for optimum geometry	$V_{g5,(t)}$	2 kV	note 3
Accelerator and astigmatism control voltage	$V_{g2,g4}$	2 kV	note 4
Focus voltage	V_{g3}	100 to 200 V	note 5
Cut-off voltage for visual extinction of focused spot	$-V_{g1}$	22 to 65 V	note 6

PERFORMANCE

Horizontal deflection coefficient	M_x	27 V/cm $\pm$ 10%	
Vertical deflection coefficient	M_y	15 V/cm $\pm$ 10%	
Deviation of deflection linearity		< 2%	note 7
Geometry distortion			note 8
Eccentricity of undeflected spot			
in horizontal direction		< 4 mm	note 9
in vertical direction		< 2 mm	
Angle between x and y traces		90°	note 9
Angle between x-trace and x-axis of internal graticule		< 5°	note 10
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 μ A screen current	V_d	approx. 10 V	Fig.5; note 6
Line width	l.w.	approx. 0.25 mm	note 11

LIMITING VALUES (Absolute maximum rating system)

Accelerator voltage	$V_{g2,g4}$	max. 2.2 kV
Shield voltage	$V_{g5(l)}$	max. 2.2 kV
Focus electrode voltage	V_{g3}	max. 2 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. 6.0 V
Grid drive, averaged over 1 ms	V_d	max. 20 V
Screen dissipation	W	max. 3 mW/cm ²
Control grid circuit resistance	R_{g1}	max. 1 M Ω

NOTES

1. Because the frit seal is visible through the faceplate, and is not necessarily aligned with the internal graticule, application of an external passe-partout with an open area of max. 70 mm x 56 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. Asymmetric drive introduces trace distortion. It is recommended that the tube is operated with equal mean x- and y-potentials in order to minimize tube adjustments. In this event g_5 may be connected to g_2, g_4 and made equal to mean y-potential for optimum spot (see also notes 3 and 4).
A difference between mean x- and y-potentials up to 75 V is permissible. However, this may influence the specified deflection coefficients and a separate voltage on g_5 (equal to mean x-potential) will be required.
3. The tube will meet the geometry specification (see note 8) if V_{g5} is equal to mean x-potential. A range of ± 30 V around mean x-potential may be applied for further correction.
4. Optimum spot is obtained with $V_{g2,g4}$ equal to mean y-potential (see note 2). Generally, a tolerance of ± 4 V has no visible effect ($V_{g2,g4}$ tends to be lower with V_{g5} more positive). The circuit impedance $R_{g2,g4}$ should be less than 10 k Ω .
5. An actual focus range of 30 V should be provided on the front panel. V_{g3} decreases with increasing grid drive (see also Fig.5).
6. Intensity control on the front panel should be limited to the maximum useful screen current (approx. 50 μ A; see also Fig.5). It should be adjusted either by the grid drive voltage (up to 22 V) or for maximum acceptable line width. The corresponding cathode current or $I_{g2,g4}$ (up to 500 μ A) depends upon the cut-off voltage and therefore cannot be used for control settings.
7. 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.
8. A graticule consisting of concentric rectangles of 68 mm x 54.4 mm and 66.6 mm x 53 mm is aligned with the internal graticule. With optimum trace rotation correction, the raster will fall between these rectangles.
9. The tube features internal magnetic correction for orthogonality between x- and y-traces, spot shaping (astigmatism) and eccentricity calibration.
10. The tube has a trace rotation coil fixed to the lower cone part. The coil has a maximum resistance of 235 Ω at 80 $^{\circ}$ C. The maximum required voltage is approximately 11 V for tube tolerances ($\pm 5^{\circ}$) and earth magnetic field with reasonable shielding ($\pm 2^{\circ}$).
11. Measured with the shrinking raster method in the centre of the screen under typical operating conditions, adjusted for optimum spot size at beam current $I_b = 10 \mu$ A.
 I_b can be measured on g_5 or $I_{g5(0)}$.

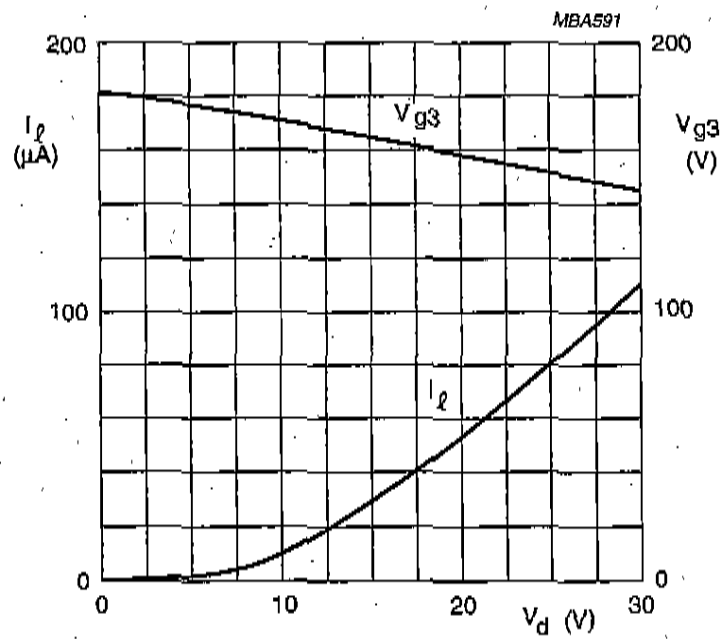


Fig.5 Typical screen current (I_s) and focus voltage (V_{g3}) curves as a function of grid drive voltage (V_d) at $V_{g2,g4,g5} = 2$ kV.