INSTRUMENT CATHODE-RAY TUBE

- 14 cm diagonal rectangular flat face
- domed mesh post-deflection acceleration
- symmetrical helix system for vertical deflection
- internal magnetic lens system for correction of orthogonality, astigmatism and eccentricity
- quick-heating cathode
- side contacts to deflection plates
- internal graticule
- high sensitivity and high brightness
- for oscilloscopes with up to 500 MHz bandwidth

QUICK REFERENCE DATA

Final accelerator voltage	$V_{g7(\ell)}$	24 kV
First accelerator voltage	V_{g2}	3 kV
Minimum useful scan area		100 mm x 80 mm
Deflection coefficient		
horizontal	M_x	7,3 V/cm (max. 8,0 V/cm)
vertical	M_y	2,9 V/cm (max. 3,0 V/cm)
Photographic writing speed	p.w.s.	min. 3 cm/ns

OPTICAL DATA

Screen	metal-backed phosphor
type	GH
colour	green
persistence	medium short
Useful screen area	$\geqslant$ 102 mm x 82 mm; note 1 (last page)
Useful scan area	$\geqslant$ 100 mm x 80 mm
Internal graticule	type 123; see Fig. 5

HEATING

Indirect by a.c. or d.c.*

Heater voltage	V_f	6,3 V
Heater current	I_f	0,24 A
Heating time to attain 10% of the cathode current at equilibrium conditions	approx.	5 s

* Not to be connected in series with other tubes.

MECHANICAL DATA

Dimensions and connections (see also outline drawings)

Overall length (socket included)	⩽ 419 mm
Faceplate dimensions	118 ± 1,0 mm x 98 ± 1,0 mm
Net mass	approx. 1,2 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 on adjoining edges of the faceplate (see Fig. 5) enable the tube to be mounted accurately in the front panel, thus providing optimum alignment of the internal graticule.

Accessories

Pin protector (required for shipping)	supplied with tube
Side pin protection band	3322 027 10200
Socket with solder tags	type 55594
Socket with printed-wiring pins	type 55595
Side contact connector for ϕ 0,65 mm pin (2 required)	type 55596 (cat. no. 9390 299 90002)
Side contact connector for ϕ 0,45 mm pin (4 required)	to be established
Final accelerator contact connector	connection to final accelerator electrode is made via an EHT cable attached to the tube
Mu-metal shield	to be established

FOCUSING

electrostatic

DEFLECTION

double electrostatic

x-plates	symmetrical
y-plates	symmetrical (helix system)
Characteristic impedance of helix system	(2 x 165 Ω) ± 3%
Bandwidth of helix system (−3 dB)	approx. 1000 MHz

CAPACITANCES

x_1 to all other elements except x_2	$C_{x1(x2)}$		3,2 pF
x_2 to all other elements except x_1	$C_{x2(x1)}$		3,2 pF
x_1 to x_2	C_{x1x2}		3,0 pF
x_1 to y_1	C_{x1y1}	<	0,2 pF
x_2 to y_1	C_{x2y1}	<	0,2 pF
x_1 to y_2	C_{x1y2}	<	0,2 pF
x_2 to y_2	C_{x2y2}	<	0,2 pF
Control grid to all other elements	C_{g1}		6,2 pF
Cathode to all other elements	C_k		3,8 pF
Focusing electrode to all other elements	C_{g3}		7,6 pF

DIMENSIONS AND CONNECTIONS

Dimensions in mm

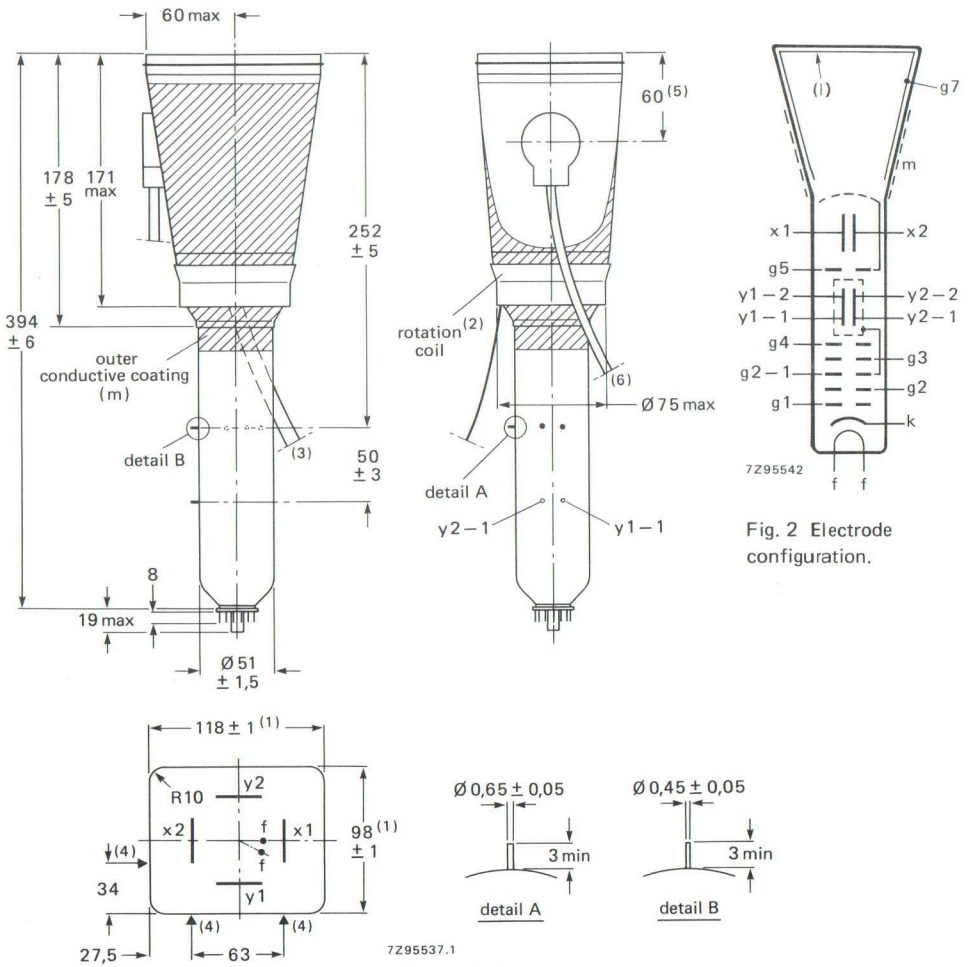

Fig. 1 Outlines.

Fig. 2 Electrode configuration.

(1) Dimensions of faceplate only. The complete assembly of faceplate and cone (frit seal included) will pass through an opening of 122 x 102 mm (diagonal 153 mm).

(2) The coil is fixed to the envelope with resin and adhesive tape.

(3) The length of the connecting leads of the rotation coil is min. 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.

(6) The length of the E.H.T. cable is min. 900 mm.

NOTES

1. As the frit seal is visible through the faceplate, and not necessarily aligned with the internal graticule, application of an external passe-partout with 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 tube features internal magnetic correction for orthogonality between x- and y-traces, spot shaping (astigmatism) and eccentricity calibration. Correction is obtained at $V_{g2\text{-}1,g4}$ = 2500 to 3300 V; optimum at $V_{g2\text{-}1,g4}$ = 3000 V.
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 −50 V with respect to mean y-potential will be required on g4 for astigmatism correction. The circuit resistance for V_{g4} should be $\leqslant$ 10 kΩ.
4. Deviation of mean y-plate potential with respect to $V_{g2\text{-}1}$ will introduce spot distortion.
5. Deviation of linearity is defined as the proportional deviation of the deflection coefficient over any division on the x-axis and y-axis from the average values over the central eight (horizontal) and central six (vertical) divisions respectively.
6. A graticule consisting of concentric rectangles of 100 mm x 80 mm and 98 mm x 78 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 1000 turns and a resistance of 185 ± 20 Ω at 20 °C, which increases by approx. 0,4%/K for rising temperature. Approx. 6,7 mA causes 1° trace rotation.
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_{ℓ} = 10 μA.

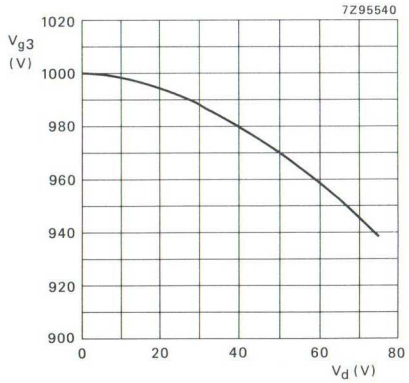

Fig. 6 Focusing voltage (V_{g3}) as a function of grid drive voltage (V_d); typical curve.

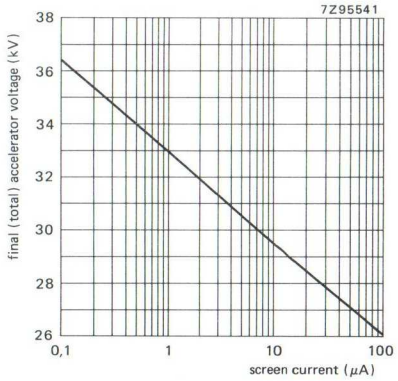

Fig. 7 0,5 mR/h isoexposure-rate limit curve, measured according to EIA standard RS-502 (formerly TEPAC104).

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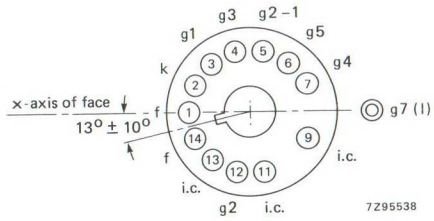

Fig. 3 Pin arrangement; bottom view.

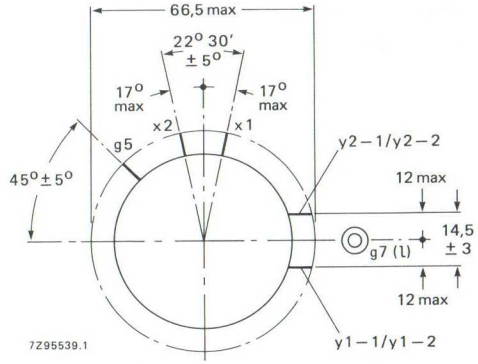

Fig. 4 Side-contact arrangement, bottom view.

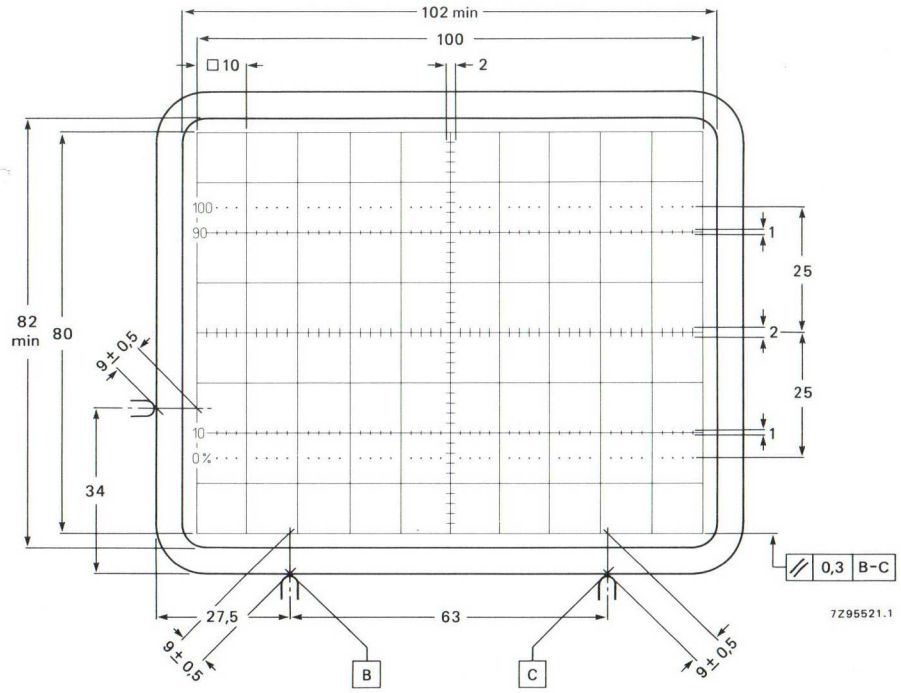

Fig. 5 Front view of tube with internal graticule, type 123 (final accelerator contact at left-hand side). The faceplate reference points are used for aligning the graticule with the faceplate.

Line thickness = 0,2 mm; dot diameter = 0,4 mm; colour: red.

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TYPICAL OPERATION (voltages with respect to cathode)*

Conditions

Final accelerator voltage	$V_{g7(\ell)}$		24	kV	
First accelerator voltage	V_{g2}		3	kV	
Second accelerator voltage	$V_{g2\text{-}1}$		3	kV	
Focusing voltage	V_{g3}	700 to 1100		V	Fig. 6
Astigmatism control voltage	V_{g4}		3	kV	note 2
Shield voltage for optimum geometry	V_{g5}		3	kV	note 3
Deviation of mean y-plate potential from $V_{g2\text{-}1}$	V_y	max.	0,5	V	note 4
Cut-off voltage for visual extinction of focused spot	$-V_{g1}$	80 to 130		V	

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

Grid g5 has two connections; the socket connection to be used for applying shield voltage V_{g5}, the side pin connection to be used for proper earthing of g5 via a spark gap.

Performance

Horizontal deflection coefficient	M_x		7,3	V/cm ± 10%	
Vertical deflection coefficient	M_y	typ.	2,9	V/cm	
		⩾	2,7	V/cm	
		⩽	3,0	V/cm	
Deviation of deflection linearity		⩽	3	%	note 5
Geometry distortion					note 6
Eccentricity of undeflected spot with respect to internal graticule					
in horizontal direction		⩽	4	mm	
in vertical direction		⩽	2	mm	note 2
Angle between x- and y-traces		90 ± 0,5°			note 2
Angle between x-trace and x-axis of internal graticule		⩽	5°		note 7
Luminance reduction with respect to screen centre					
x-axis, at a scan of ± 50 mm		⩽	30	%	
y-axis, at a scan of ± 40 mm		⩽	30	%	
any corner		⩽	50	%	
Grid drive for 10 μA screen current	V_d	approx.	20	V	
Line width	l.w.	approx.	0,37	mm	note 8
Photographic writing speed (V_d = 75 V; Polaroid 612 film; GH phosphor; F = 1,2; magnification 0,5)	p.w.s.	min.	3,0	cm/ns	

* Notes are on last page.

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LIMITING VALUES (Absolute maximum rating system)

Final accelerator voltage	$V_{g7(\ell)}$	max.	26	kV	Fig. 7
First accelerator voltage	V_{g2}	max.	3,4	kV	
Focusing electrode voltage	V_{g3}	max.	3,4	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	
Voltage between g4,g5 and any deflection plate	$\Delta V_{g4,g5,x,y}$	max.	500	V	
Grid drive, averaged over 1 ms	V_d	max.	30	V	
Screen dissipation	W_ℓ	max.	8	mW/cm²	
Control grid circuit resistance	R_{g1}	max.	1	MΩ	

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