DEVELOPMENT DATA

This data sheet contains advance information and
specifications are subject to change without notice.

D18-190GH/127

INSTRUMENT CATHODE-RAY TUBE

- 18 cm diagonal rectangular flat face
- domed mesh post-deflection acceleration
- internal magnetic lens system for correction of orthogonality, astigmatism and eccentricity
- quick-heating cathode
- internal graticule
- high sensitivity and high brightness
- short overall length
- for oscilloscopes and general display up to 100 MHz bandwidth

QUICK REFERENCE DATA

Final accelerator voltage	$V_{g7(\ell)}$	16 kV
First accelerator voltage	V_{g4}	2 kV
Minimum useful scan area		120 mm x 96 mm
Deflection coefficient		
horizontal	M_x	6,4 V/cm
vertical	M_y	3,4 V/cm

OPTICAL DATA

Screen	metal-backed phosphor
type	GH
colour	green
persistence	medium short
Useful screen area	$\geqslant$ 124 mm x 100 mm; note 1
Useful scan area	$\geqslant$ 120 mm x 96 mm
Internal graticule	type 127; see Fig. 4

HEATING

Indirect by AC or DC*

Heater voltage	V_f	6,3 V
Heater current	I_f	240 mA
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)	≤ 348 mm
Faceplate dimensions	142 ± 0,5 mm x 118 ± 0,5 mm
Net mass	approx. 1,3 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. 4) 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
Socket with solder tags	type 55594
Socket with printed-wiring pins	type 55595
Final accelerator contact connector	type 55569/55597
Mu-metal shield	to be established
FOCUSING	electrostatic
DEFLECTION	double electrostatic
x-plates	symmetrical
y-plates	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	$C_{x2(x1)}$	3,6 pF
y_1 to all other elements except y_2	$C_{y1(y2)}$	3,0 pF
y_2 to all other elements except y_1	$C_{y2(y1)}$	3,0 pF
x_1 to x_2	C_{x1x2}	3,3 pF
y_1 to y_2	C_{y1y2}	1,4 pF
Control grid to all other elements	C_{g1}	6,5 pF
Cathode to all other elements	C_k	3,2 pF
Focusing electrode to all other elements	C_{g3}	8 pF

DEVELOPMENT DATA
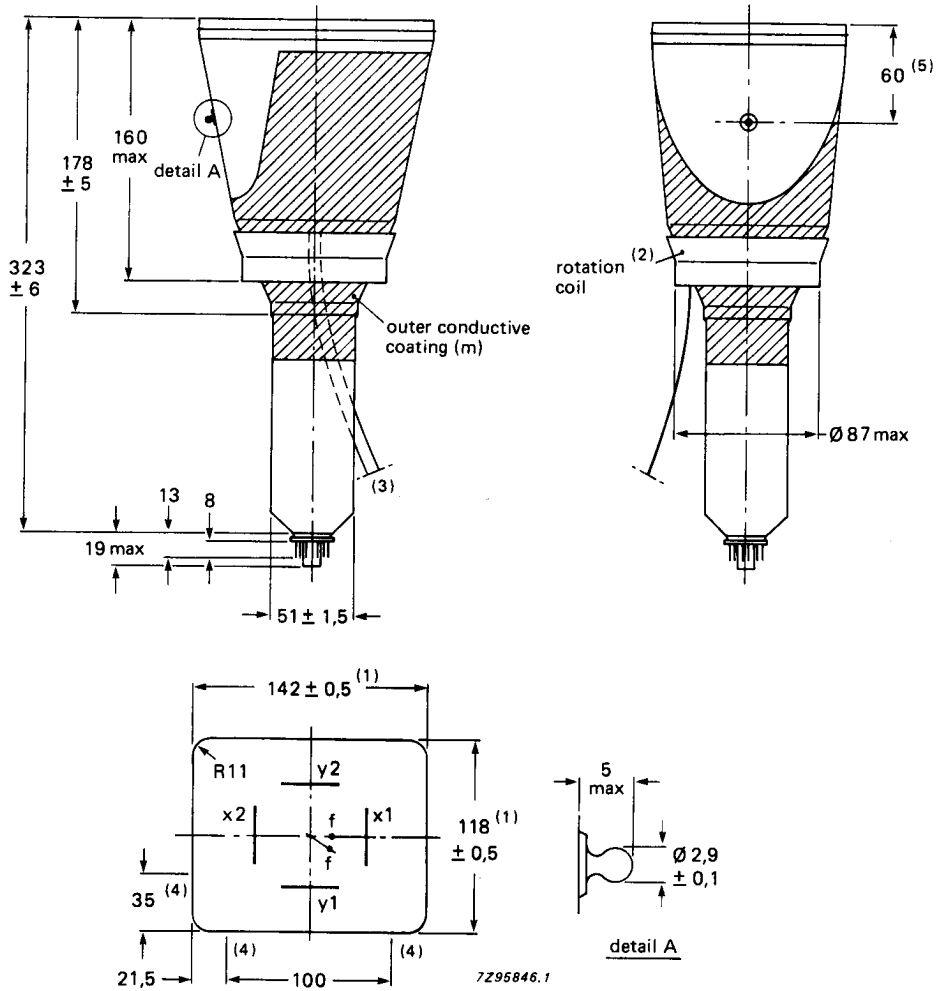
DIMENSIONS AND CONNECTIONS

Dimensions in mm

Fig. 1 Outlines.

1. Dimensions of faceplate only. The complete assembly of faceplate and cone (frit seal included) will pass through an opening of 146 mm x 122 mm (diagonal 182 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. 4).

5. The centre of the final accelerator contact is situated within a square of 10 mm x 10 mm around the indicated position.

DIMENSIONS AND CONNECTIONS (continued)

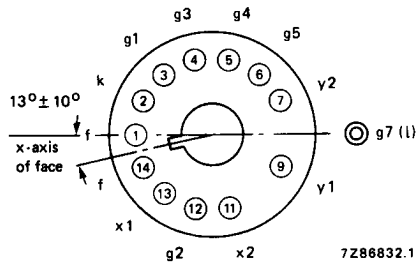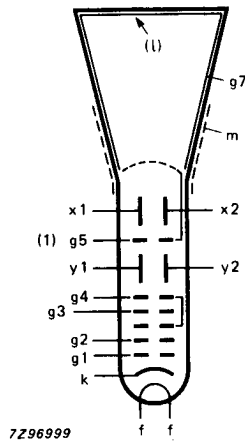Fig. 2 Pin arrangement; bottom view.

(1) G5 impedance to all other elements 25 kΩ maximum.
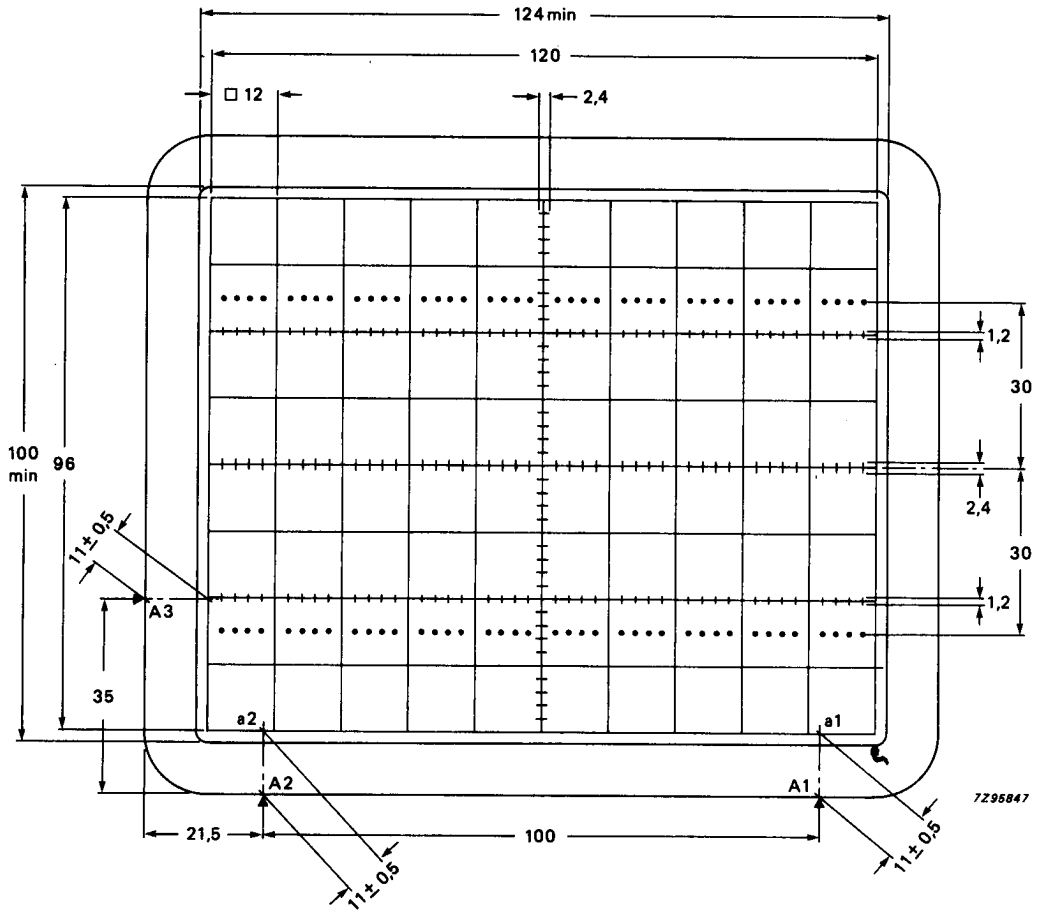
Fig. 3 Electrode configuration

Fig. 4 Front view of tube with internal graticule, type 129. The faceplate reference points A1, A2 and A3 are used for aligning the graticule with the faceplate.
|a1 - a2| ≤ 0,4 mm.
Line thickness = 0,2 mm; dot diameter = 0,4 mm; colour: red.

DEVELOPMENT DATA

TYPICAL OPERATION (voltages with respect to cathode) *

Conditions

Final accelerator voltage	$V_{g7(\ell)}$	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}	400 to 800	V
Grid 2 voltage	V_{g2}	2	kV
Cut-off voltage for visual extinction of focused spot	$-V_{g1}$	45 to 90	V

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

Performance

Horizontal deflection coefficient	M_x		6,4 V/cm ± 10%
Vertical deflection coefficient	M_y		3,4 V/cm ± 5%
Deviation of deflection linearity		≤ 2%	note 4
Geometry distortion			note 5
Eccentricity of undeflected spot			
in horizontal direction		≤ 4 mm	
in vertical direction		≤ 2 mm	
Angle between x- and y-traces		90°	note 2
Angle between x-trace and x-axis of tube/graticule		≤ 5°	note 6
Luminance reduction with respect to screen centre			
x-axis, ± 60 mm scan		≤ 30%	
y-axis, ± 48 mm scan		≤ 30%	
any corner		≤ 50%	
Grid drive for 10 µA screen current	V_d	approx. 20 V	
Line width	l.w.	approx. 0,35 mm	note 7

LIMITING VALUES (Absolute maximum rating system)

Final accelerator voltage	$V_{g7(\ell)}$	max.	18	kV note 8
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.	3,3	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 g2 and g4	$\Delta V_{g2,g4}$	max.	2	kV
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.	25	V
Screen dissipation	W_ℓ	max.	8	mW/cm²
Control grid circuit resistance	R_{g1}	max.	1	MΩ

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. 124 mm x 100 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.

   The tube features internal magnetic correction for orthogonality between x- and y-traces, spot shaping (astigmatism) and eccentricity calibration.

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 g4 for astigmatism correction. The circuit resistance for V_{g4} should be $\leqslant 10\,k\Omega$.

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. A graticule consisting of concentric rectangles of 120 mm x 96 mm and 117,4 mm x 93,4 mm is aligned with the internal graticule. With optimum trace rotation correction the edges of a raster will fall between these rectangles.

6. The tube has a trace rotation coil, fixed onto the lower cone part. The coil has a maximum resistance of 240 Ω at 80 °C. The maximum required voltage is approx. 13 V for tube tolerances ($\pm\,5^o$) and earth magnetic field with reasonable shielding ($\pm\,2^o$).

7. 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 $I_\varrho = 10\,\mu A$.

8. The X-ray dose rate remains below the acceptable value of 36 pA/kg (0,5 mR/h), when the tube is used within its limiting values (beam current $I_\varrho \leqslant 100\,\mu A$).

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