INSTRUMENT CATHODE-RAY TUBE

- mono accelerator
- 10 cm diagonal rectangular flat face
- dynamic deflection defocusing correction
- internal magnetic correction for astigmatism and vertical eccentricity
- quick-heating cathode
- for portable oscilloscopes with up to 25 MHz bandwidth, and read-out devices

QUICK REFERENCE DATA

Accelerator voltage	$V_{g2(\ell)}$	2000 V	
Minimum useful scan area		70 x 56 mm	
Deflection coefficient			
horizontal	M_x	36 V/cm	
vertical	M_y	23 V/cm	

OPTICAL DATA

Screen			
type	GY, colour green		
persistence	medium		
Useful screen area		$\geqslant$ 70 x 56 mm	
Useful scan area		$\geqslant$ 70 x 56 mm	
Spot eccentricity			
in horizontal direction		$\leqslant$ 6 mm	
in vertical direction		$\leqslant$ 3 mm	note 2, last page

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 drawing)

Overall length (socket included)	⩽ 240 mm
Faceplate dimensions	82 ± 1 mm x 69 ± 1 mm
Net mass	approx. 450 g
Base	12 pin, all glass, JEDEC B12-246

Mounting

The tube can be mounted in any position. It must not be supported by the base alone or near the base region and under no circumstances should the socket be allowed to support the tube.

Accessories

Socket with solder tags	type 55589/55594
Socket with printed-wiring pins	type 55595

FOCUSING	electrostatic
DEFLECTION	double electrostatic
x-plates	symmetrical
y-plates	symmetrical

If use is made of the full deflection capabilities of the tube the deflection plates will block part of the electron beam, hence a low impedance deflection plate drive is desirable.

DYNAMIC DEFLECTION DEFOCUSING CORRECTION

The tube has a special electrode, positioned between the x and y-plates, for dynamic correction of deflection defocusing, to improve the uniformity of the extremely good line width up to the screen edges. If use is made of this dynamic correction, a negative voltage proportional to, and approx. 50% of, the negative horizontal deflection plate voltage should be applied to this electrode (grid 6).
The correction-circuit impedance must be $\leqslant 100$ kΩ. To prevent distortion, the output impedances of the x-amplifiers should be $\leqslant 10$ kΩ.
If no correction is required, grid 6 should be connected to mean x-plate potential ($V_{g2(\ell)}$).

Angle between x and y-traces	90 ± 1^{o}
Angle between x-trace and x-axis of the face plate	$\leqslant 5^{o}$*

CAPACITANCES (approx. values)

x_1 to all other elements except x_2	$C_{x1(x2)}$	4,5 pF
x_2 to all other elements except x_1	$C_{x2(x1)}$	4,5 pF
y_1 to all other elements except y_2	$C_{y1(y2)}$	3,5 pF
y_2 to all other elements except y_1	$C_{y2(y1)}$	3,5 pF
x_1 to x_2	C_{x1x2}	2 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	2,7 pF

* The tube has a trace rotation coil, fixed onto the lower cone part. The coil has 1000 turns and a typical resistance of 165 Ω at 20 °C (max. 250 Ω at 80 °C). Approx. 5 mA causes 1^{o} trace rotation. Thus maximum required voltage is approx. 11 V for tube tolerances ($\pm 5^{o}$) and earth magnetic field with reasonable shielding ($\pm 2^{o}$).

DIMENSIONS AND CONNECTIONS

Dimensions in mm

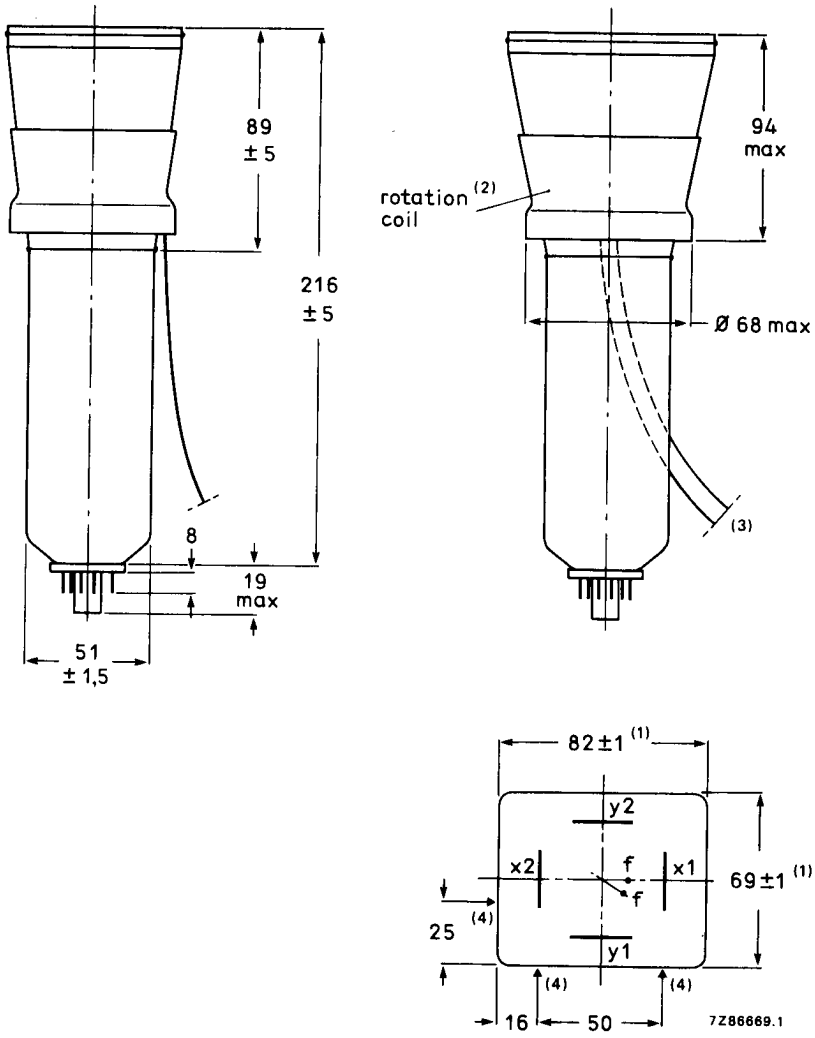

Fig. 1 Outlines; for notes see bottom of opposite page.

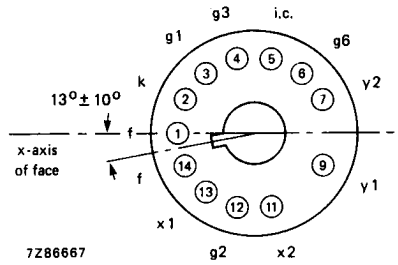

Fig. 2 Pin arrangement; bottom view.

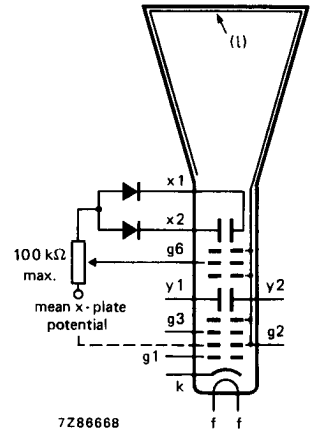

Fig. 3 Electrode configuration.

Notes to the drawing on opposite page.

1. Dimensions of face plate only. The complete assembly of face plate 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 the connecting leads of the rotation coil is min. 350 mm.
4. Reference points on face plate for screen alignment.

TYPICAL OPERATION*

Conditions (note 1)

Accelerator voltage	$V_{g2(\ell)}$		2000	V	
Astigmatism control voltage	$\Delta V_{g2(\ell)}$		0	V	note 2
Focusing electrode voltage	V_{g3}		220 to 360	V	
Cut-off voltage for visual extinction of focused spot	$-V_{g1}$		22 to 65	V	

Performance

Useful scan					
horizontal		$\geqslant$	70	mm	
vertical		$\geqslant$	56	mm	
Deflection coefficient					
horizontal	M_x		36	V/cm	
		$\leqslant$	39	V/cm	
vertical	M_y		23	V/cm	
		$\leqslant$	25,5	V/cm	
Line width at 10 μA beam current	l.w.	$\approx$	0,2	mm	note 3
Deviation of linearity of deflection		$\leqslant$	2	%	note 4
Geometry distortion		see note 5			
Grid drive for 10 μA screen current	V_d	$\approx$	10	V	

LIMITING VALUES (Absolute maximum rating system)

Accelerator voltage	$V_{g2(\ell)}$	max.	2200	V
Focusing electrode voltage	V_{g3}	max.	2200	V
Voltage between accelerator electrode and grid 6	$V_{g2/g6}$	max.	± 500	V
Voltage between accelerator electrode and any deflection plate	$V_{g2/x/y}$	max.	± 500	V
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
Grid drive, averaged over 1 ms	V_d	max.	20	V
Screen dissipation	W_ℓ	max.	3	mW/cm^2
Control grid circuit resistance	R_{g1}	max.	1	MΩ

* Notes are on the next page.

NOTES

1. The mean x-plate potential and the mean y-plate potential should be equal to $V_{g2(\ell)}$.
2. The tube features internal magnetic correction for spot shaping (astigmatism) and vertical eccentricity calibration. Correction is obtained at V_{g2} = 1800 to 2200 V; optimum at V_{g2} = 2000 V.
3. Measured with the shrinking raster method within the useful scan under typical operating conditions, adjusted for optimum focus and dynamic correction applied.

   As the construction of the tube does not permit a direct measurement of the beam current, this current should be determined as follows:

   a) Under typical operating conditions, apply a small raster display (no overscan), adjust V_{g1} for a beam current of approx. 10 μA and adjust V_{g3} for smallest spot size at the centre of the screen. When measuring the beam current, grid 6 should be connected to g2-potential and the diodes should be disconnected from the x-plates.

   b) Under these conditions, but without raster, the deflection plate voltages should be changed to: $V_{y1} = V_{y2}$ = 2000 V; V_{x1} = 1300 V; V_{x2} = 1700 V, thus directing the total beam current to x_2. Measure the current on x_2 and adjust V_{g1} for I_{x2} = 10 μA.

   c) Set again for the conditions under a), without touching the V_{g1} control. The screen current of the resulting raster display is now 10 μA.
   Adjust V_{g3} for optimum focus in the centre of the screen and apply dynamic correction to grid 6 for optimum vertical line width.
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 70 mm x 56 mm and 68,4 mm x 54,4 mm is aligned with the face plate (using the reference points). With optimum trace rotation correction, horizontal and vertical lines will fall between these rectangles.