

## INSTRUMENT CATHODE-RAY TUBE

13 cm diameter flat faced oscilloscope tube with metalbacked screen, distributed p.d.a. and side connections to the deflection plates.

### QUICK REFERENCE DATA

|                               |                 |           |
|-------------------------------|-----------------|-----------|
| Final accelerator voltage     | $V_{g_9(\ell)}$ | 15 kV     |
| Display area                  |                 | 6 x 10 cm |
| Deflection factor, horizontal | $M_x$ max.      | 12.5 V/cm |
| vertical                      | $M_y$ max.      | 3.5 V/cm  |

### SCREEN

|          | colour          | persistence  |
|----------|-----------------|--------------|
| D13-22BE | blue            | medium short |
| D13-22GH | green           | medium short |
| D13-22GP | bluish green    | medium short |
| D13-22GM | yellowish green | long         |

Useful screen diameter min. 114 mm

Useful scan at  $V_{g_9(\ell)}/V_{g_4} = 10$

horizontal min. 100 mm

vertical min. 60 mm

The useful scan may be shifted vertically to a max. of 3 mm with respect to the geometric centre of the faceplate.

### HEATING

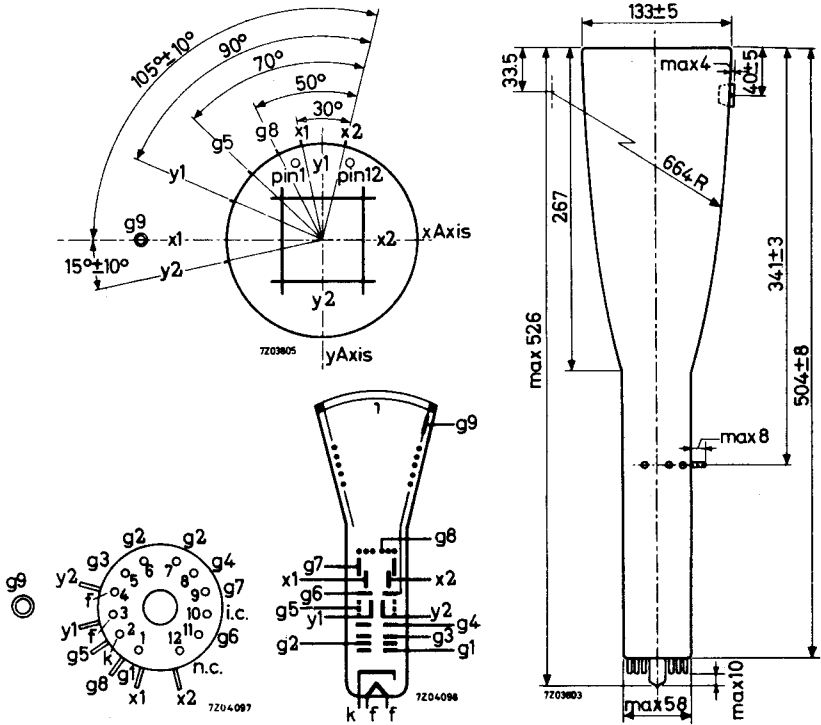
Indirect by A. C. or D. C. ; parallel supply

Heater voltage  $V_f$  6.3 V

Heater current  $I_f$  300 mA

## MECHANICAL DATA

Dimensions in mm



### Mounting position: any

The tube should not be supported by the base alone and under no circumstances should the socket be allowed to support the tube.

Base B12F

### Dimensions and connections

Overall length max. 526 mm

Face diameter max. 138 mm

Net weight approx. 1300 g

### Accessories

Socket type 55562

Final accelerator contact connector type 55563

Side contact connector type 55561

7Z2 5962

**CAPACITANCES**

|  |                |      |        |
|--|----------------|------|--------|
| $x_1$ to all other elements except $x_2$ | $C_{x_1(x_2)}$ | max. | 6.1 pF |
| $x_2$ to all other elements except $x_1$ | $C_{x_2(x_1)}$ | max. | 6.4 pF |
| $y_1$ to all other elements except $y_2$ | $C_{y_1(y_2)}$ | max. | 3.9 pF |
| $y_2$ to all other elements except $y_1$ | $C_{y_2(y_1)}$ | max. | 3.9 pF |
| $x_1$ to $x_2$                           | $C_{x_1x_2}$   | max. | 2.1 pF |
| $y_1$ to $y_2$                           | $C_{y_1y_2}$   | max. | 2.1 pF |
| Control grid to all other elements       | $C_{g_1}$      | max. | 6.2 pF |
| Cathode to all other elements            | $C_k$          | max. | 4.1 pF |

**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 intercept part of the electron beam; hence a low impedance deflection plate drive is desirable.

    Angle between x and y traces                       $90 \pm 1^\circ$

**LINE WIDTH**

Measured with the shrinking raster method in the centre of the screen.

|                                       |              |            |
|---------------------------------------|--------------|------------|
| Final accelerator voltage             | $V_{g_9}(l)$ | 15000 V    |
| Astigmatism control electrode voltage | $V_{g_4}$    | 1500 V     |
| First accelerator voltage             | $V_{g_2}$    | 1500 V     |
| Beam current                          | $I(l)$       | 25 $\mu$ A |
| Line width                            | l. w.        | 0.6 mm     |

**HELIX**

Post deflection accelerator helix resistance                      min.                      175 M $\Omega$

**TYPICAL OPERATING CONDITIONS**

|  |                 |                           |
|--|-----------------|---------------------------|
| Final accelerator voltage                                  | $V_{g_9}(\ell)$ | 15000 V                   |
| Post deflection shield voltage (w. r. t. $V_{g_7}$ )       | $V_{g_8}$       | -12 to -18 V              |
| Geometry control electrode voltage                         | $V_{g_7}$       | 1500 ± 50 V <sup>1)</sup> |
| Helix voltage lower end                                    | $V_{g_6}$       | 1500 V                    |
| Deflection plate shield voltage                            | $V_{g_5}$       | 1500 V <sup>2)</sup>      |
| Astigmatism control electrode voltage                      | $V_{g_4}$       | 1500 ± 50 V <sup>3)</sup> |
| Focusing electrode voltage                                 | $V_{g_3}$       | 250 to 500 V              |
| First accelerator voltage                                  | $V_{g_2}$       | 1500 V                    |
| Control grid voltage for visual extinction of focused spot | $-V_{g_1}$      | 45 to 85 V                |
| Deflection factor, horizontal                              | $M_x$           | 9.4 to 12.5 V/cm          |
|  | $M_y$           | 2.3 to 3.5 V/cm           |
| Deviation of linearity of deflection                       | max.            | 2 % <sup>4)</sup>         |
| Geometry distortion  |                 | see note 5                |
| Useful scan, horizontal                                    | min.            | 100 mm                    |
|  | vertical        | min. 60 mm                |

- 1) This tube is designed for optimum performance when operating at the ratio  $V_{g_9}(\ell)/V_{g_4} = 10$ . Operation at other ratio may result in changes in deflection uniformity and geometry distortion. The geometry control electrode voltage should be adjusted for optimum performance. For any necessary adjustment its potential will be within the stated range.
- 2) This voltage should be equal to the mean x- and y plates potential.
- 3) The astigmatism control electrode voltage should be adjusted for optimum spot shape. For any necessary adjustment its potential will be within the stated range.
- 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 100 mm x 60 mm and 98 mm x 58 mm is aligned with the electrical x axis of the tube. The edges of a raster will fall between these rectangles with optimum correction potentials applied.

## LIMITING VALUES (Absolute max. rating system)

|   |                       |      |                      |
|---|-----------------------|------|----------------------|
| Final accelerator voltage   | $V_{g9}(\ell)$        | max. | 17300 V              |
|   |                       | min. | 6000 V               |
| Post deflection shield voltage                                    | $V_{g8}$              | max. | 3300 V               |
|   |                       | min. | 1000 V               |
| Geometry control electrode voltage                                | $V_{g7}$              | max. | 3300 V               |
|   |                       | min. | 900 V                |
| Helix voltage, lower end  | $V_{g6}$              | max. | 3300 V               |
|   |                       | min. | 1000 V               |
| Deflection plate shield voltage                                   | $V_{g5}$              | max. | 3300 V               |
|   |                       | min. | 1000 V               |
| Astigmatism control electrode voltage                             | $V_{g4}$              | max. | 3300 V               |
|   |                       | min. | 1000 V               |
| Focusing electrode voltage  | $V_{g3}$              | max. | 1500 V               |
| First accelerator voltage   | $V_{g2}$              | max. | 1700 V               |
|   |                       | min. | 800 V                |
| Control grid voltage,   |                       |      |                      |
| negative  | $-V_{g1}$             | max. | 200 V                |
| positive  | $V_{g1}$              | max. | 0 V                  |
| Voltage between astigmatism electrode<br>and any deflection plate | $V_{g4/x}$            | max. | 500 V                |
|   | $V_{g4/y}$            | max. | 500 V                |
| Cathode to heater voltage,  |                       |      |                      |
| cathode positive  | $V_{+k/f-}$           | max. | 200 V                |
| cathode negative  | $V_{-k/f+}$           | max. | 125 V                |
| Screen dissipation  | $W_{\ell}$            | max. | 3 mW/cm <sup>2</sup> |
| Ratio $V_{g9}(\ell)/V_{g4}$                                       | $V_{g9}(\ell)/V_{g4}$ | max. | 10                   |

## CIRCUIT DESIGN VALUES

|   |            |              |                         |
|---|------------|--------------|-------------------------|
| Focusing voltage  | $V_{g3}$   | 167 to 333   | V per kV of $V_{g4}$    |
| Control grid voltage for visual extinction of focused spot      | $-V_{g1}$  | 30 to 56.7   | V per kV of $V_{g2}$    |
| Deflection factor at $V_{g9(l)}/V_{g4} = 10$                    |            |              |                         |
| horizontal  | $M_x$      | 6.3 to 8.4   | V/cm per kV of $V_{g4}$ |
| vertical  | $M_y$      | 1.53 to 2.33 | V/cm per kV of $V_{g4}$ |
| Control grid circuit resistance                                 | $R_{g1}$   | max. 1       | $M\Omega$               |
| Deflection plate circuit resistance                             | $R_x, R_y$ | max. 50      | $k\Omega$               |
| Focusing electrode current at a beam current of max. 25 $\mu A$ | $I_{g3}$   | -25 to +25   | $\mu A$ <sup>1)</sup>   |

<sup>1)</sup> Values to be taken into account for the calculation of the focus potentiometer.