# INSTRUMENT CATHODE-RAY TUBE

13 cm diameter flat faced monoaccelerator oscilloscope tube primarily intended for use in inexpensive oscilloscopes and read-out devices.

| QUICK REFERENCE DATA | | | |
|---|---|---|---|
| Accelerator voltage | $V_{g_2,g_4,g_5(\ell)}$ | 2000 | V |
| Display area | | 100 x 80 | $mm^2$ |
| Deflection coefficient, horizontal | $M_x$ | 31.3 | V/cm |
| vertical | $M_y$ | 14.4 | V/cm |

**SCREEN**

| | colour | persistence |
|---|---|---|
| D13-480GH | green | medium short |
| D13-480GM | yellowish green | long |

| | | | |
|---|---|---|---|
| Useful screen diameter | min. | 114 | mm |
| Useful scan | | | |
| horizontal | min. | 100 | mm |
| vertical | min. | 80 | mm |

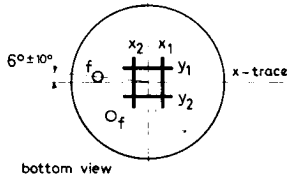
The useful scan may be shifted vertically to a max. of 6 mm with respect to the geometric centre of the faceplate.

**HEATING:** Indirect by AC or DC; parallel supply

| | | | |
|---|---|---|---|
| Heater voltage | $V_f$ | 6.3 | V |
| Heater current | $I_f$ | 300 | mA |

## MECHANICAL DATA

Dimensions in mm



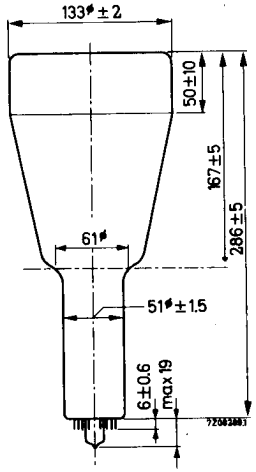




Fig. 1 Outlines.

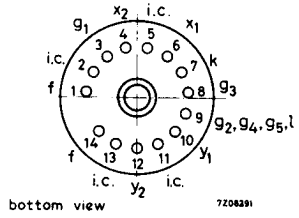



Fig. 2 Pin arrangement.

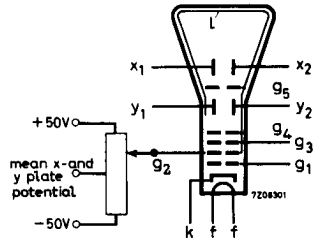



Fig. 3 Electrode configuration.

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.

Dimensions and connections

See also outline drawing

| | | | |
|---|---|---|---|
| Overall length | max. | 310 | mm |
| Face diameter | max. | 135 | mm |

Base 14 pin all glass

| | | | |
|---|---|---|---|
| Net weight | approx. | 650 | g |

Accessories

| | | |
|---|---|---|
| Socket (supplied with tube) | type | 55566 |
| Mu-metal shield | type | 55580 |

**CAPACITANCES**

| | | | |
|---|---|---|---|
| $x_1$ to all other elements except $x_2$ | $C_{x1(x2)}$ | 4 | pF |
| $x_2$ to all other elements except $x_1$ | $C_{x2(x1)}$ | 4 | pF |
| $y_1$ to all other elements except $y_2$ | $C_{y1(y2)}$ | 3.5 | pF |
| $y_2$ to all other elements except $y_1$ | $C_{y2(y1)}$ | 3 | pF |
| $x_1$ to $x_2$ | $C_{x1x2}$ | 1.6 | pF |
| $y_1$ to $y_2$ | $C_{y1y2}$ | 1.1 | pF |
| Control grid to all other elements | $C_{g1}$ | 5.5 | pF |
| Cathode to all other elements | $C_k$ | 4 | 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 under typical operating conditions, adjusted for optimum spot size at a beam current $I_\ell$ = 10 $\mu$A.1)

| | | | |
|---|---|---|---|
| Line width | l.w. | 0.30 | mm |

As the construction of this 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 $\mu$A and adjust $V_{g3}$ and $V_{g2,g4,g5,\ell}$ for optimum spot quality at the centre of the screen.
b) under these conditions, but no 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 x2.
Measure the current on $x_2$ and adjust $V_{g1}$ for $I_{x2} = 10$ $\mu$A (being the beam current $I_\ell$)
c) set again for the conditions under a), without touching the $V_{g1}$ control. Now a raster display with a true 10 $\mu$A screen current is achieved.
d) focus optimally in the centre of the screen (do not adjust the astigmatism control) and measure the line width.

**TYPICAL OPERATING CONDITIONS** see note 3

| | | | | |
|---|---|---|---|---|
| Accelerator voltage | $V_{g_2, g_4, g_5, \ell}$ | 2000 | V | |
| Astigmatism control voltage | $\Delta V_{g_2, g_4, g_5, \ell}$ | ± 50 | V | see note 1 |
| Focusing electrode voltage | $V_{g_3}$ | 220 to 370 | V | |
| Control grid voltage for visual extinction of focused spot | $V_{g_1}$ | max. -65 | V | |
| Grid drive for 10 μA screen current | | approx. 10 | V | |
| Deflection coefficient, horizontal | $M_x$ | 31.3<br>max. 33 | V/cm<br>V/cm | |
| vertical | $M_y$ | 14.4<br>max. 15.5 | V/cm<br>V/cm | |
| Deviation of linearity of deflection | | max. 1 | % | see note 2 |
| Geometry distortion | | see note 4 | | |
| Useful scan, horizontal | | min. 100 | mm | |
| vertical | | min. 80 | mm | |

**LIMITING VALUES** (Absolute max. rating system)

| | | | | |
|---|---|---|---|---|
| Accelerator voltage | $V_{g_2, g_4, g_5, \ell}$ | max. 2200<br>min. 1500 | V<br>V | |
| Focusing electrode voltage | $V_{g_3}$ | max. 2200 | V | |
| Control grid voltage, negative | $-V_{g_1}$ | max. 200<br>min. 0 | V<br>V | |
| Cathode to heater voltage | $V_{kf}$<br>$-V_{kf}$ | max. 125<br>max. 125 | V<br>V | |
| Grid drive, average | | max. 20 | V | |
| Screen dissipation | $W_\ell$ | max. 3 | $mW/cm^2$ | |
| **Control grid circuit resistance** | $R_{g1}$ | **max. 1** | MΩ | |

**Notes**

1. All that will be necessary when putting the tube into operation is to adjust the astigmatism control voltage once for optimum spot shape in the screen centre. The control voltage will always be in the range stated, provided the mean x and certainly the mean y plate potential was made equal to $V_{g_2, g_4, g_5, \ell}$ with zero astigmatism correction.
2. 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.
3. The mean x and certainly the mean y plate potential should be equal to $V_{g_2, g_4, g_5, \ell}$ with astigmatism adjustment set to zero.
4. A graticule, consisting of concentric rectangles of 70 mm x 85 mm and 68.8 mm x 83 mm as aligned with the electrical x-axis of the tube. The edges of a raster will fall between these ractangles.