OSCILLOSCOPE TUBE with flat face, post deflection acceleration by means of a helical electrode, side contacts, metal-backed screen and high sensitivity for high frequency and high writing-speed applications

SCREEN

| Type | Fluorescence | Phosphorescence | Persistence |
|---|---|---|---|
| D13-21BE (DB13-79) | Blue | Blue | Medium short |
| D13-21GH (DH13-79) | Green | Green | Medium short |
| D13-21GL (DN13-79) | Yellowish green | Yellowish green | Medium short |
| D13-21GM (DP13-79) | Purplish blue | Yellowish green | Long |

Useful screen diameter min. 108 mm

Useful scan at $V_{g7}/V_{g4} = 6$

in the x direction 100 mm

in the y direction 40 mm

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

For further screen properties please refer to front of this section

HEATING

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

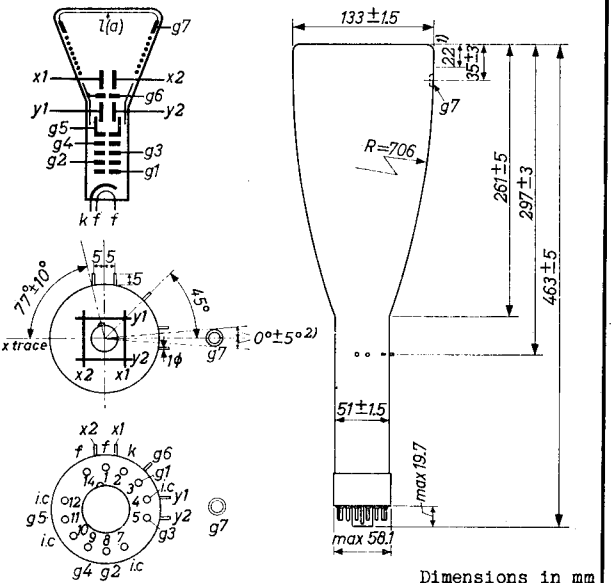
Heater voltage $V_f = 6.3$ V

Heater current $I_f = 0.3$ A

CAPACITANCES

| | | |
|---|---|---|
| Grid No.1 to all other electrodes | $C_{g_1}$ | = 6.4 pF |
| Cathode to all other electrodes | $C_k$ | = 3.9 pF |
| $x_1$ plate to all other electrodes except $x_2$ plate | $C_{x_1}$ | = 3.0 pF |
| $x_2$ plate to all other electrodes except $x_1$ plate | $C_{x_2}$ | = 3.0 pF |
| $y_1$ plate to all other electrodes except $y_2$ plate | $C_{y_1}$ | = 2.8 pF |
| $y_2$ plate to all other electrodes except $y_1$ plate | $C_{y_2}$ | = 2.8 pF |
| $x_1$ plate to $x_2$ plate | $C_{x_1-x_2}$ | = 1.9 pF |
| $y_1$ plate to $y_2$ plate | $C_{y_1-y_2}$ | = 1.5 pF |

# PHILIPS




Dimensions in mm

$g_5$ = deflection plate shield  Base: DIHEPTAL 12 p

$g_6$ = isolation shield

The post-accelerator helix is connected between $g_7$ and $g_6$. The resistance of the helix is min. 200 MΩ

MOUNTING POSITION: any

The tube should not be supported by the base alone

ACCESSORIES

| | |
|---|---|
| Socket | 5914/20 |
| Connector for side contacts | 55561 |
| Mu-metal shield | 55551 |
| Post accelerator contact connector | 55563 |

NET WEIGHT 910 g  Shipping weight 2300 g

1) Straight part of the bulb

2) Location of the recessed cavity button contact with respect to the x-trace

| | | | |
|---|---|---|---|
| FOCUSING | electrostatic | | |
| DEFLECTION | double electrostatic | | |
| x plates | symmetrical | | |
| y plates | symmetrical | | |
| Angle between x and y traces | $90^{o} \pm 1^{o}$ | | |

LINE WIDTH measured on a circle of 30 mm diameter

| | | | |
|---|---|---|---|
| Post accelerator voltage | $V_{g7}$ | = | 10 kV |
| Grid No.4 voltage | $V_{g4}$ | = | 1670 V |
| Grid No.2 voltage | $V_{g2}$ | = | 1670 V |
| Beam current | $I_{\ell}$ | = | 0.5 µA |
| Line width | l.w. | = | 0.4 mm |

OPERATING CHARACTERISTICS

| | | | |
|---|---|---|---|
| Post accelerator voltage | $V_{g7}$ | = | 10 kV |
| Isolation shield voltage | $V_{g6}$ | = | 1670 V 1) |
| Deflection plate shield voltage | $V_{g5}$ | = | 1670 V 1) |
| Second accelerator voltage | $V_{g4}$ | = | 1670 V 1) |
| Focusing electrode voltage | $V_{g3}$ | = | 180 to 590 V |
| First accelerator voltage | $V_{g2}$ | = | 1670 V |
| Grid No.1 voltage | $V_{g1}$ | = | -50 to -80 V 2) |
| Deflection factor | | | |
| horizontal | $M_x$ | = | 27-33 V/cm |
| vertical | $M_y$ | = | 5.7-7.1 V/cm |
| Deviation of linearity of deflection 1)3) | | | |
| horizontal | | | max.1.5 % |
| vertical | | | max. 1 % |
| Pattern distortion | | | 1)4) |
| Undeflected spot position | R | = | 5 mm 5) |

1)2)3)4)5) See page 4

# PHILIPS

[1]) In general the voltages on $g_6$, $g_5$, $g_4$ and the average potential of the deflection plates should be equal

Variation of the isolation shield voltage $V_{g6}$ (max. +10 % or -5 % of $V_{g4}$) serves to correct pincushion and barrel pattern distortion

Adjustment of the deflection plate shield voltage $V_{g5}$ (max. ±5 % of $V_{g4}$) provides improved linearity of vertical deflection

A small potential difference (max. ± 5 % of $V_{g4}$, obtained by varying $V_{g4}$) between the y plates and $g_4$ may be desirable for obtaining optimum sharpness

[2]) For visual extinction of the focused spot

[3]) The sensitivity for a deflection of less than 75 % of the useful scan will not differ from the sensitivity for a deflection of 25 % of the useful scan by more than the indicated values

[4]) With a raster pattern the size of which is such that the widest points of the pattern just touch the sides of a rectangle of 100x40 mm, no points of the pattern sides will be within a concentric rectangle of 98x38.8 mm

[5]) With the tube shielded the spot will be within a circle of 5 mm radius, the circle being centered with respect to the tube face

[6]) If use is made of the full deflection capabilities of the tube, the deflection plates will intercept part of the electron beam near the edge of the scan; a low impedance deflection plate drive is therefore desirable

[7]) Values to be taken into account for the calculation of the $V_{g5}$-potentiometer

LIMITING VALUES (Design centre limits)

| | | |
|---|---|---|
| Post accelerator voltage | $V_{g7}$ | = max. 12 kV<br>= min. 6 kV |
| Isolation shield voltage | $V_{g6}$ | = max. 2200 V |
| Deflection plate shield voltage | $V_{g5}$ | = max. 2100 V |
| Second accelerator voltage | $V_{g4}$ | = max. 2100 V<br>= min. 1000 V |
| Focusing electrode voltage | $V_{g3}$ | = max. 1500 V |
| First accelerator voltage | $V_{g2}$ | = max. 2100 V<br>= min. 1000 V |
| Grid No.1 voltage | | |
| negative | $-V_{g1}$ | = max. 200 V |
| positive | $+V_{g1}$ | = max. 0 V |
| peak positive | $+V_{g1\ p}$ | = max. 2 V |
| Ratio $V_{g7}/V_{g4}$ | $V_{g7}/V_{g4}$ | = max. 6 |
| Peak voltage between second accelerator and any deflection plate | $V_{g4\text{-}x\ p}$ | = max. 500 V |
| | $V_{g4\text{-}y\ p}$ | = max. 500 V |
| Voltage between cathode and heater | | |
| cathode positive | $V_{kf(k\ pos)}$ | = max. 200 V |
| cathode negative | $V_{kf(k\ neg)}$ | = max. 125 V |
| First accelerator dissipation | $W_{g2}$ | = max. 6 W |
| Screen dissipation | $W_l$ | = max. 3 mW/cm$^2$ |

CIRCUIT DESIGN VALUES

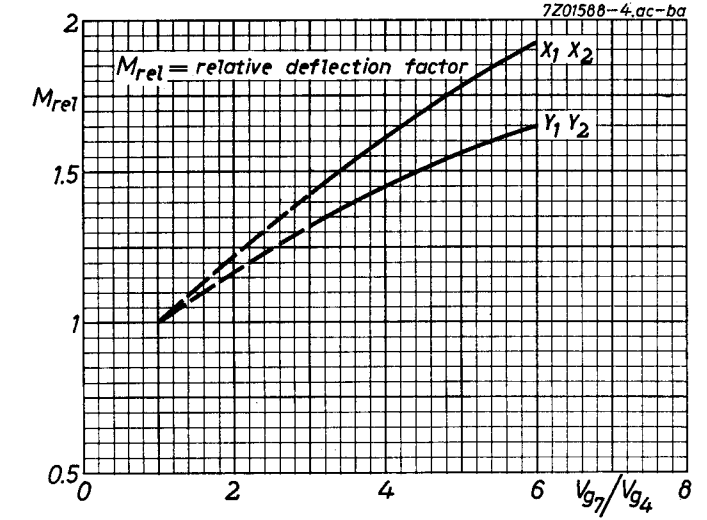
| | | | |
|---|---|---|---|
| Focusing voltage | $V_{g3}$ = | 110 to 355 V | per kV of $V_{g4}$ |
| Grid No.1 voltage [2] | $-V_{g1}$ = | 30 to 48 V | per kV of $V_{g2}$ |
| Deflection factors at $V_{g7}/V_{g4}$ = 6 | | | |
| horizontal | $M_x$ = | 16.2 to 19.8 V/cm | per kV of $V_{g4}$ |
| vertical | $M_y$ = | 3.4 to 4.25 V/cm | per kV of $V_{g4}$ |

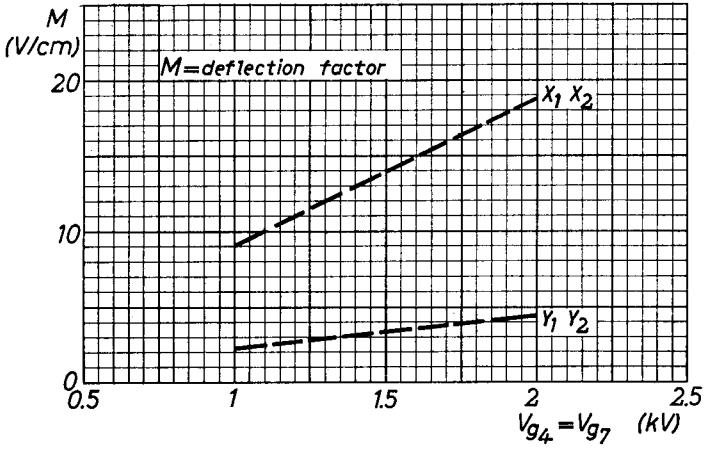
Grid No.1 circuit resistance: $R_{g_1}$ = max. 1.5 MΩ

Deflection plate resistance: $R_x = R_y$ = max. 1 MΩ [6]

Grid No.3 current: $I_{g3}$ = -15 to +10 μA [7]

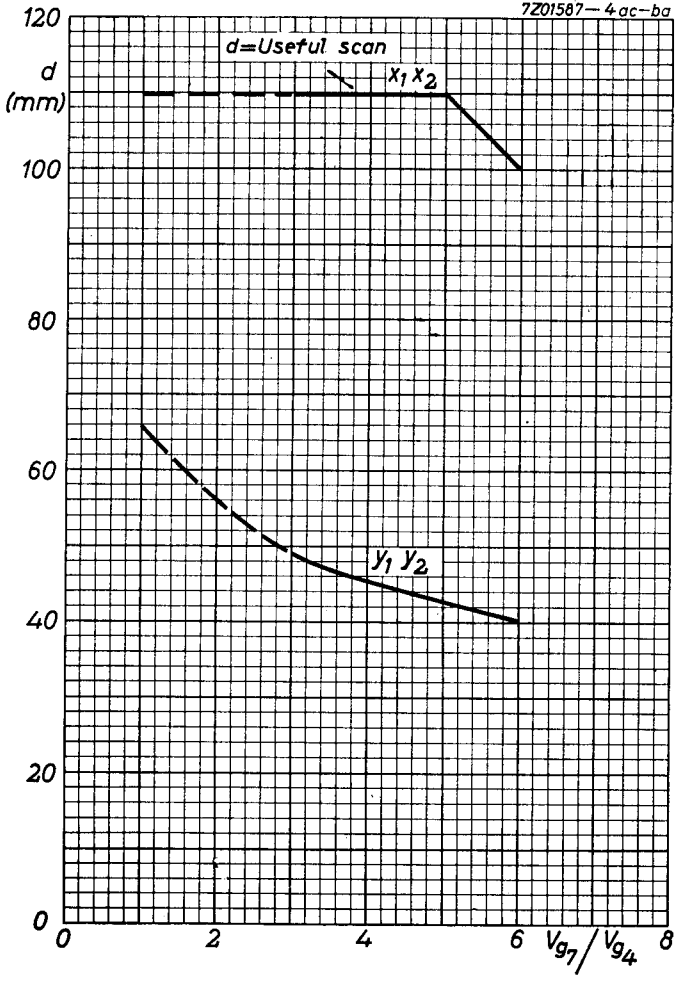
[2)6)7)] See page 4


7Z01588-4.ac-ba
$M_{rel}$ = relative deflection factor
$M_{rel}$
2
1.5
1
0.5
0
2
4
6
8
$V_{g_7}/V_{g_4}$
$X_1$ $X_2$
$Y_1$ $Y_2$


M
(V/cm)
M=deflection factor
20
10
0
0.5
1
1.5
2
2.5
$V_{g_4} = V_{g_7}$ (kV)
$X_1$ $X_2$
$Y_1$ $Y_2$

2.2.1963 A

# PHILIPS


7Z01587—4ac—ba
d=Useful scan
$x_1$ $x_2$
$y_1$ $y_2$
d
(mm)
120
100
80
60
40
20
0
0
2
4
6
8
$V_{g_7}$ / $V_{g_4}$

PHILIPS

Electronic Tube

HANDBOOK

**D13-21BE D13-21GH D13-21GL D13-21GM**

| page | sheet | date |
|---|---|---|
| 1 | 1 | 1963.02.02 |
| 2 | 2 | 1963.02.02 |
| 3 | 3 | 1963.02.02 |
| 4 | 4 | 1963.02.02 |
| 5 | 5 | 1963.02.02 |
| 6 | A | 1963.02.02 |
| 7 | B | 1963.02.02 |
| 8 | FP | 2000.01.21 |