

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<br>(DB13-79) | Blue            | Blue            | Medium short |
| D13-21GH<br>(DH13-79) | Green           | Green           | Medium short |
| D13-21GL<br>(DN13-79) | Yellowish green | Yellowish green | Medium short |
| D13-21GM<br>(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

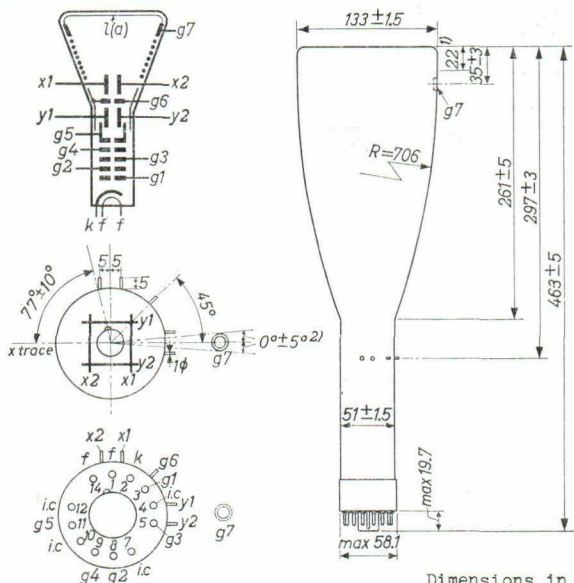
Indirect by A.C. or D.C.; parallel supply

Heater voltage  $\frac{V_f}{I_f} = 6.3 \text{ V}$

Heater current  $I_f = 0.3 \text{ A}$

### CAPACITANCES

|                                                                             |             |          |
|-----------------------------------------------------------------------------|-------------|----------|
| Grid No.1 to all other electrodes                                           | $C_{g1}$    | = 6.4 pF |
| Cathode to all other electrodes                                             | $C_k$       | = 3.9 pF |
| x <sub>1</sub> plate to all other electrodes<br>except x <sub>2</sub> plate | $C_{x1}$    | = 3.0 pF |
| x <sub>2</sub> plate to all other electrodes<br>except x <sub>1</sub> plate | $C_{x2}$    | = 3.0 pF |
| y <sub>1</sub> plate to all other electrodes<br>except y <sub>2</sub> plate | $C_{y1}$    | = 2.8 pF |
| y <sub>2</sub> plate to all other electrodes<br>except y <sub>1</sub> plate | $C_{y2}$    | = 2.8 pF |
| x <sub>1</sub> plate to x <sub>2</sub> plate                                | $C_{x1-x2}$ | = 1.9 pF |
| y <sub>1</sub> plate to y <sub>2</sub> plate                                | $C_{y1-y2}$ | = 1.5 pF |

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Dimensions in mm

g5 = deflection plate shield

Base: DIHEPTAL 12 p

g6 = isolation shield

The post-accelerator helix is connected between g7 and g6.

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  $90^\circ \pm 1^\circ$

LINE WIDTH measured on a circle of 30 mm diameter

Post accelerator voltage  $V_{g7} = 10 \text{ kV}$

Grid No.4 voltage  $V_{g4} = 1670 \text{ V}$

Grid No.2 voltage  $V_{g2} = 1670 \text{ V}$

Beam current  $I_l = 0.5 \text{ }\mu\text{A}$

Line width  $l.w. = 0.4 \text{ mm}$

### OPERATING CHARACTERISTICS

Post accelerator voltage  $V_{g7} = 10 \text{ kV}$

Isolation shield voltage  $V_{g6} = 1670 \text{ V } ^1)$

Deflection plate shield voltage  $V_{g5} = 1670 \text{ V } ^1)$

Second accelerator voltage  $V_{g4} = 1670 \text{ V } ^1)$

Focusing electrode voltage  $V_{g3} = 180 \text{ to } 590 \text{ V}$

First accelerator voltage  $V_{g2} = 1670 \text{ V}$

Grid No.1 voltage  $V_{g1} = -50 \text{ to } -80 \text{ V } ^2)$

Deflection factor

horizontal  $M_x = 27-33 \text{ V/cm}$

vertical  $M_y = 5.7-7.1 \text{ V/cm}$

Deviation of linearity of deflection  $^1)^3)$

horizontal max. 1.5 %

vertical max. 1 %

Pattern distortion  $^1)^4)$

Undelected spot position  $R = 5 \text{ mm } ^5)$

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

- 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.  $\pm 5$  % of  $V_{g4}$ ) provides improved linearity of vertical deflection  
A small potential difference (max.  $\pm 5$  % 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  $V_{g3}$ -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 | $V_{g4-x} p$            | = max. 500 V                   |
|                                                                  | $V_{g4-y} p$            | = max. 500 V                   |
| Voltage between cathode and heater                               |                         |                                |
| cathode positive                                                 | $V_{kf}(k \text{ pos})$ | = max. 200 V                   |
| cathode negative                                                 | $V_{kf}(k \text{ neg})$ | = max. 125 V                   |
| First accelerator dissipation                                    | $W_{g2}$                | = max. 6 W                     |
| Screen dissipation                                               | $W_l$                   | = max. 3 mW/cm <sup>2</sup>    |

### CIRCUIT DESIGN VALUES

|                                           |             |                   |                                  |
|-------------------------------------------|-------------|-------------------|----------------------------------|
| Focusing voltage                          | $V_{g3} =$  | 110 to 355 V      | per kV of $V_{g4}$               |
| Grid No.1 voltage <sup>2)</sup>           | $-V_{g1} =$ | 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              |             | $R_{g1} =$        | max. 1.5 M $\Omega$              |
| Deflection plate resistance               |             | $R_x = R_y =$     | max. 1 M $\Omega$ <sup>6)</sup>  |
| Grid No.3 current                         |             | $I_{g3} =$        | -15 to +10 $\mu A$ <sup>7)</sup> |

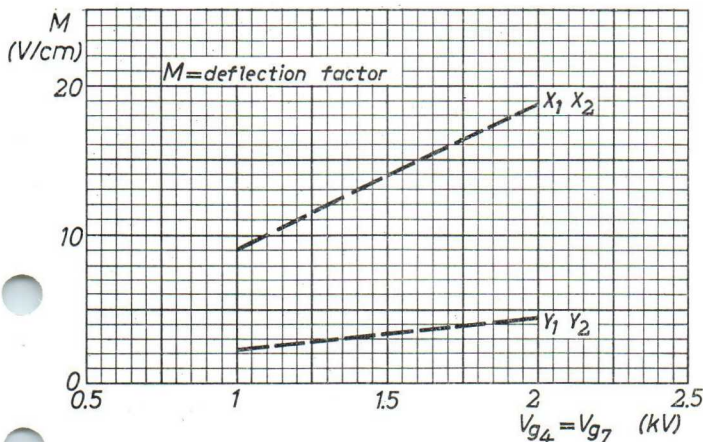
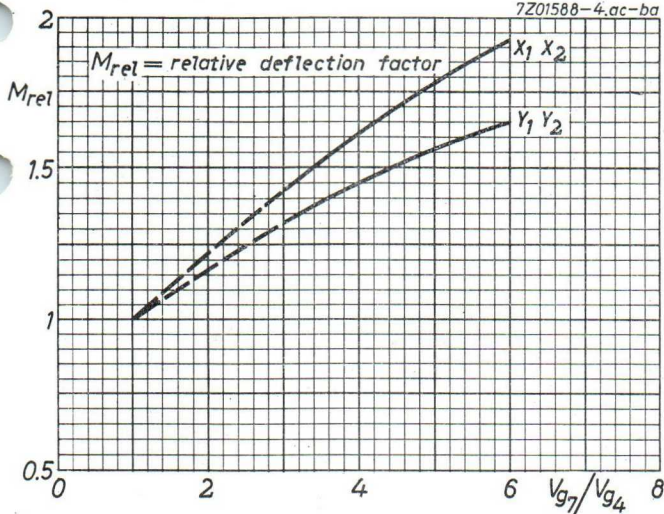
<sup>2) 6) 7)</sup> See page 4



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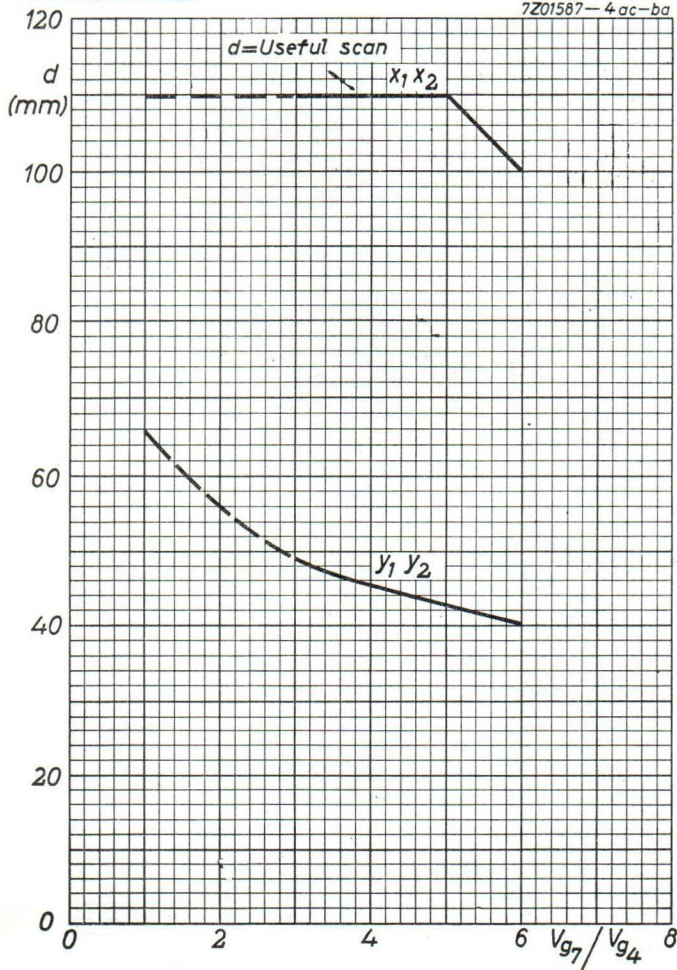
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