PHILIPS   D13-21..

OSCILLOSCOPE TUBE with flat face, post deflection accelera-
tion 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
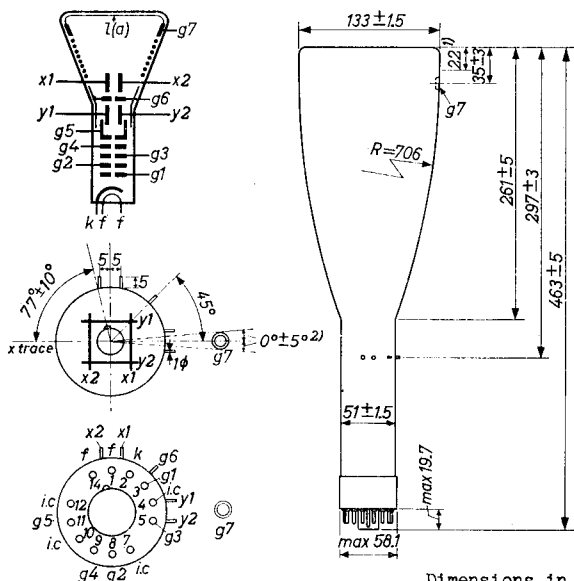
Dimensions in mm

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

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[1]) Straight part of the bulb

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

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FOCUSING	electrostatic

<u>DEFLECTION</u> double electrostatic
  x plates symmetrical
  y plates symmetrical
  Angle between x and y traces $90^o \pm 1^o$

<u>LINE WIDTH</u> 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_{ℓ}	=	0.5 µA
Line width	l.w.	=	0.4 mm

<u>OPERATING CHARACTERISTICS</u>

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

[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 ver-
   tical 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 im-
   pedance deflection plate drive is therefore desirable

[7]) Values to be taken into account for the calculation of
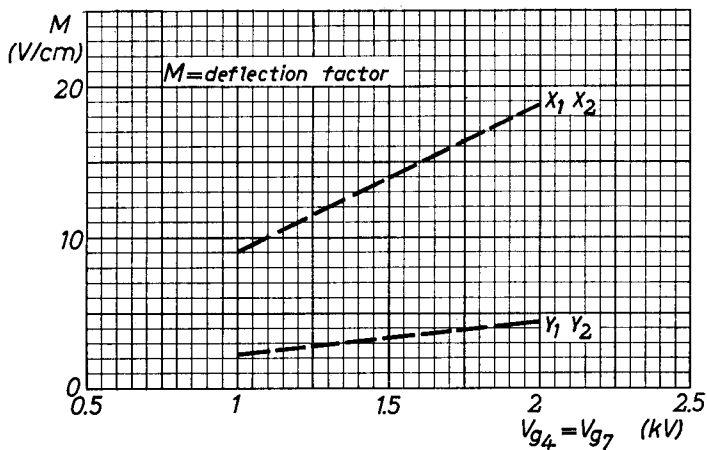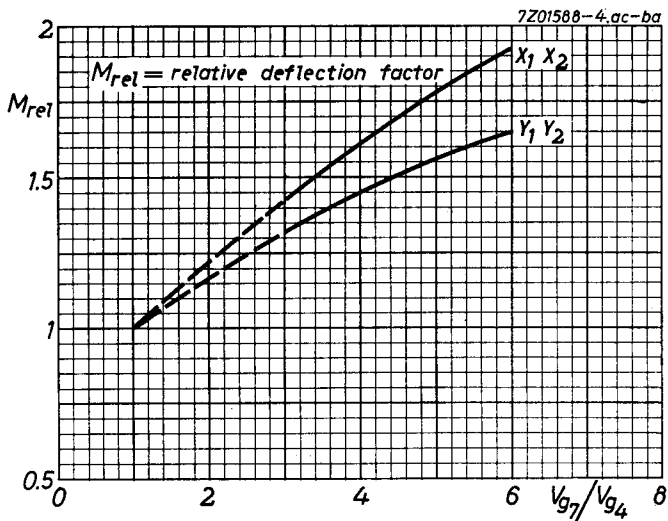   the V_{g3}-potentiometer

LIMITING VALUES (Design centre limits)

Post accelerator voltage	V_{g7}	= max.	12 kV
		= 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
		= min.	1000 V
Focusing electrode voltage	V_{g3}	= max.	1500 V
First accelerator voltage	V_{g2}	= max.	2100 V
		= 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	$V_{kf}(k\ pos)$	= max.	200 V
cathode negative	$V_{kf}(k\ neg)$	= max.	125 V
First accelerator dissipation	W_{g2}	= max.	6 W
Screen dissipation	$W\ell$	= 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_{g1} = 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

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M_{rel} = relative deflection factor

$X_1 X_2$

$Y_1 Y_2$

M_{rel}

V_{g_7}/V_{g_4}

M (V/cm)

M = deflection factor

$X_1 X_2$

$Y_1 Y_2$

$V_{g_4} = V_{g_7}$ (kV)

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PHILIPS

Electronic Tube

HANDBOOK
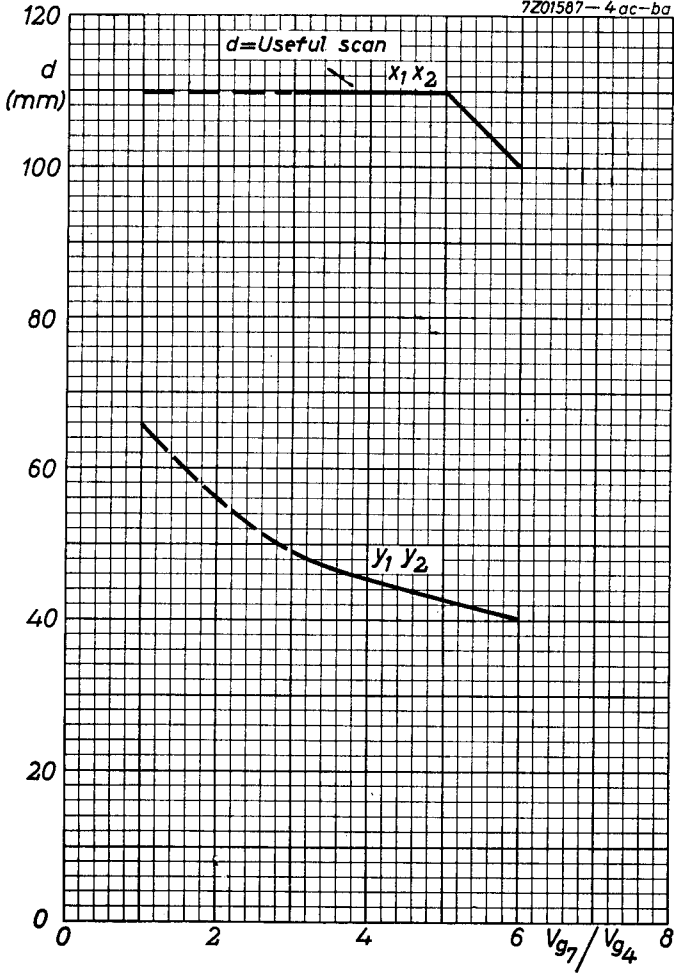
D13-21BE D13-21GH D13-21GL D13-21GM

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