INSTRUMENT CATHODE-RAY TUBE

14 cm diagonal, rectangular flat-faced oscilloscope tube with mesh and metal backed screen. The tube has side connections to the x- and y-plates, internal graticule and a light-conducting glassplate set in front of the face.

QUICK REFERENCE DATA			
Final accelerator voltage	$V_{g8(\ell)}$	10	kV
Display area		100 x 80	mm^2
Deflection factor, horizontal	M_x	15.2	V/cm
vertical	M_y	4.1	V/cm

Blue Binder, Tab 4

SCREEN : Metal backed phosphor

	Colour	Persistence
D14-160BE/09	blue	medium short
D14-160GH/09	green	medium short
D14-160GM/09	yellowish-green	long

Useful screen dimensions	min.	100 x 80	mm^2
Useful scan at $V_{g8(\ell)}/V_{g2,g4} = 6.7$,			
horizontal	min.	100	mm
vertical	min.	80	mm

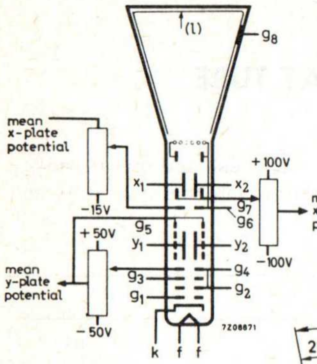
The scanned raster can be centred and aligned with the internal graticule by means of correction coils fitted around the tube by the manufacturer (see page 5).

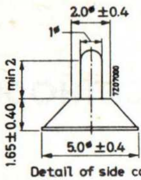
HEATING : Indirect by A.C. or D.C.; parallel supply

Heater voltage	V_f	6.3	V
Heater current	I_f	300	mA

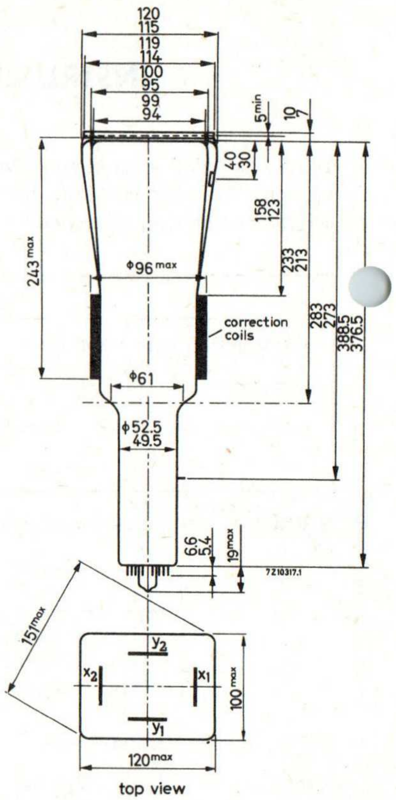
MECHANICAL DATA

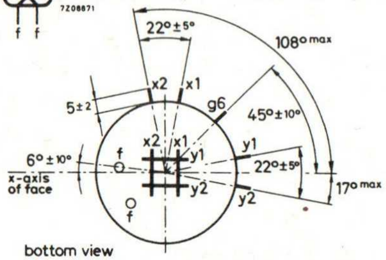
Dimensions in mm



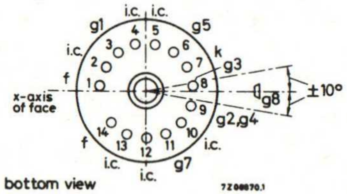


Detail of side contact



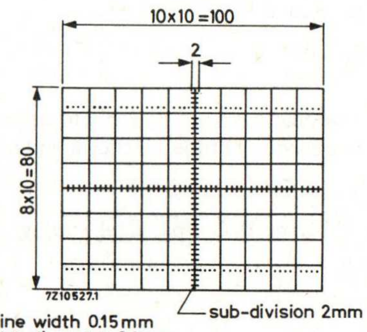


bottom view



bottom view

top view



line width 0.15 mm
dot diameter 0.3 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.

Orthogonality and shift (coils L_3 and L_4)

The current required under typical operating conditions without the mu-metal shield being used is max. 45 mA for complete correction of orthogonality and shift. It will be 30 % to 50 % lower with shield, depending on the shield diameter. The resistance of each coil is approx. 225 Ω.

Image rotation (coils L_1 and L_2)

The image rotation coils are wound concentrically around the tube neck. Under typical operating conditions 50 A turns are required for the maximum rotation of 5^o. Both coils have 850 turns. This means that a current of max. 30 mA per coil is required which can be obtained by using a 24 V supply when the coils are connected in series or a 12 V supply when they are in parallel.

Connecting the coils

The coils have been connected to the 8 soldering tags according to Fig. 2.

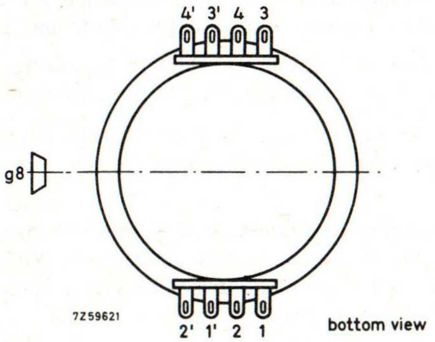


Fig. 2

With L_3 and L_4 connected in series according to Fig. 3 a current in the direction indicated will produce a clockwise rotation of the vertical trace and an anti--clockwise rotation of the horizontal trace.
With the connection according to Fig. 4 the current as indicated will produce an upward shift.

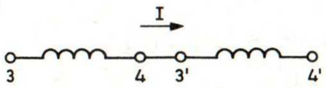


Fig. 3

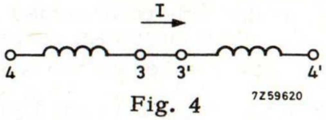


Fig. 4

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MECHANICAL DATA (continued) — Dimensions in mm

Dimensions and connections

See also outline drawing			
Overall length (socket included)	max.	417.5	mm
Face dimensions	max.	100 x 120	mm^2
Net weight	approx.	1300	g
Base	14 pin, all glass		

Accessories

Socket (supplied with tube)	type 55566	
Final-accelerator contact connector	type 55563	
Mu-metal shield	type 55585	1)

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^o

Angle between x trace and the horizontal axis of the face 0^o.
See page 5 "Correction coils".

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_ℓ = 10 μA.

Line width at the centre of the screen	l.w.		0.3	mm
over the whole screen area	l.w.	av.	0.35	mm

CAPACITANCES

x_1 to all other elements except x_2	$C_{x_1(x_2)}$	5.5	pF
x_2 to all other elements except x_1	$C_{x_2(x_1)}$	5.5	pF
y_1 to all other elements except y_2	$C_{y_1(y_2)}$	3.5	pF
y_2 to all other elements except y_1	$C_{y_2(y_1)}$	3.5	pF
x_1 to x_2	$C_{x_1x_2}$	2	pF
y_1 to y_2	$C_{y_1y_2}$	1.6	pF
Control grid to all other elements	C_{g_1}	5.5	pF
Cathode to all other elements	C_k	4	pF

1) See page 5

TYPICAL OPERATING CONDITIONS

Final accelerator voltage	$V_{g8(\ell)}$		10	kV
Geometry-control electrode voltage	V_{g7}		1500 ± 100	V [2]
Post deflection and interplate shield voltage	V_{g6}		1500	V
Background illumination control voltage	ΔV_{g6}		0 to −15	V [2]
Deflection plate shield voltage	V_{g5}		1500	V [3]
Focusing electrode voltage	V_{g3}		450 to 550	V
First accelerator voltage	$V_{g2,g4}$		1500	V
Astigmatism control voltage	$\Delta V_{g2,g4}$		±50	V [4]
Control grid voltage extinction of focused spot	V_{g1}		−25 to −60	V
Grid drive for 10 μA screen current		approx.	20	V
Deflection factor, horizontal	M_x		15.2	V/cm
		max.	16	V/cm
vertical	M_y		4.1	V/cm
		max.	4.4	V/cm
Deviation of linearity deflection		max.	2	% [5]
Geometry distortion		See note 6		
Useful scan, horizontal		min.	100	mm
vertical		min.	80	mm

LIMITING VALUES

Final accelerator voltage	$V_{g8(\ell)}$	max.	13	kV
		min.	9	kV
Post deflection and interplate shield voltage and geometry control electrode voltage	V_{g7}, V_{g6}	max.	2200	V
Deflection shield voltage	V_{g5}		2200	V
Focusing electrode voltage	V_{g3}		2200	V
First accelerator and astigmatism control electrode voltage	$V_{g2,g4}$	max.	2200	V
		min.	1350	V
Control grid voltage	$-V_{g1}$	max.	200	V
		min.	0	V
Cathode to heater voltage	V_{kf}	max.	125	V
	$-V_{kf}$	max.	125	V
Voltage between astigmatism control electrode and any deflection plate	$V_{g4/x}$	max.	500	V
	$V_{g4/y}$	max.	500	V
Grid drive, average		max.	30	V
Screen dissipation	W_ℓ	max.	3	mW/cm^2
Ratio $V_{g8(\ell)}/V_{g2,g4}$	$V_{g8(\ell)}/V_{g2,g4}$	max.	6.7	

For notes see page 5

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Notes

1) To avoid damage to the side contacts the narrower end of the Mu-metal shield should have an internal diameter of not less than 65 mm.

2) This tube is designed for optimum performance when operating at a ratio $V_{g8(\ell)}/V_{g2,g4} \leq 6.7$.
The geometry control voltage V_{g7} should be adjusted within the indicated range (values with respect to the mean x-plate potential).
A negative control voltage on g_6 (with respect to the mean x-plate potential) will cause some pincushion distortion and less background light.
By the use of the two voltages, V_{g6} and V_{g7}, it is possible to find the best compromise between background light and raster distortion.
If a fixed voltage on g_6 is required this voltage should be 10 V lower than the mean x-plate potential.

3) The deflection plate shield voltage should be equal to the mean y-plate potential. The mean x- and y-plate potentials should be equal for optimum spot quality.

4) The astigmatism control electrode voltage should be adjusted for optimum spot shape. For any necessary adjustment its potential will be within the stated range.

5) 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.

6) A graticule, consisting of concentric rectangles of 95 mm x 75 mm and 93 mm x 73.6 mm is aligned with the electrical x axis of the tube. With optimum correction potentials applied a raster will fall between these rectangles.

CORRECTION COILS

General

The D14-160../09 is provided with a coil unit consisting of: (see Fig. 1)

1. a pair of coils L_3 and L_4 which enable
   a. the angle between the x and y traces at the centre of the screen to be made exactly 90° (orthogonality correction);
   b. the scanned area to be shifted up and down (vertical shift)
2. a pair of coils L_1 and L_2 for image rotation which enable the alignment of the x trace with the x lines of the graticule.

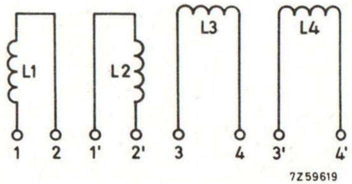

Fig. 1