D66

Oscilloscope Tube

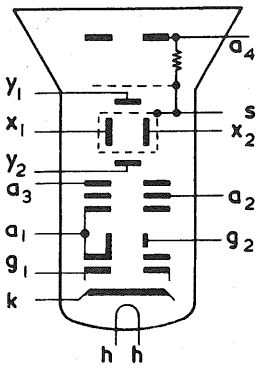
D14-200..

PRELIMINARY DATA

GENERAL

This 10 cm x 8 cm rectangular aluminised tube with electrostatic focusing and deflection uses a mesh p.d.a. to achieve high deflection sensitivity and very high brightness without additional electrode control voltages. The tube is designed for transistor deflection high bandwidth applications, and incorporates a means of beam blanking at anode potential which avoids d.c. coupling to the grid.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS

		Max.	Min.	
Fourth anode voltage	V_{a4}	16	5.0	kV
Third anode voltage	V_{a3}	1.75	0.6	kV
Second anode voltage	V_{a2}	1.0	0	kV
First anode voltage	V_{a1}	1.75	0.6	kV
Negative control grid voltage	$-V_{g1}$	200	1.0	V
Beam blanking voltage	V_{g2}	2.0	0.5	kV
Peak x-plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y-plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
x-plate to third anode resistance	R_{x-a3}	5.0	-	MΩ
y-plate to third anode resistance	R_{y-a3}	100	-	kΩ
Control grid to cathode resistance	R_{g1-k}	1.5	-	MΩ
Second anode current	I_{a2}	10	-	μA
P.D.A. ratio (V_{a4}/V_{a3})		12:1	-	
Helix resistance		-	100	MΩ

All voltages referred to cathode unless otherwise stated.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D14-200GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

BRIMAR

RASTER DISTORTION AND ALIGNMENT

The following data applies for the typical operation conditions.

The undeflected spot will fall in a circle of 8 mm radius about the centre of the tube face.

Raster distortion will not be greater than 2%. The edges of a test raster will fall between two concentric rectangles 10 cm x 8 cm and 9.80 cm x 7.84 cm.

Rectangularity of x and y axes is 90° ± 1°. The horizontal trace will be parallel with the axis of the rectangular face-plate to within ± 5°. A twist coil will be required to effect accurate alignment. This should be mounted inside the magnetic shield approximately 70 mm from the face and should not extend more than 195 mm from the face. The ampere turns required will be equal to $14\sqrt{V_{a4}}$ (where V_{a4} is quoted in kV), with provision for reversing the current if necessary. The sensitivity (for both x and y plates) at 75% deflection of the useful scan shall not differ by more than 2% from the sensitivity over 10% deflection.

It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. Under no circumstances should the mean y plate potential differ from the mean x plate potential by more than 50V.

MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

TUBE WEIGHT (approximate) - 1.3 kg

MOUNTING POSITION - unrestricted

INTER-ELECTRODE CAPACITANCES

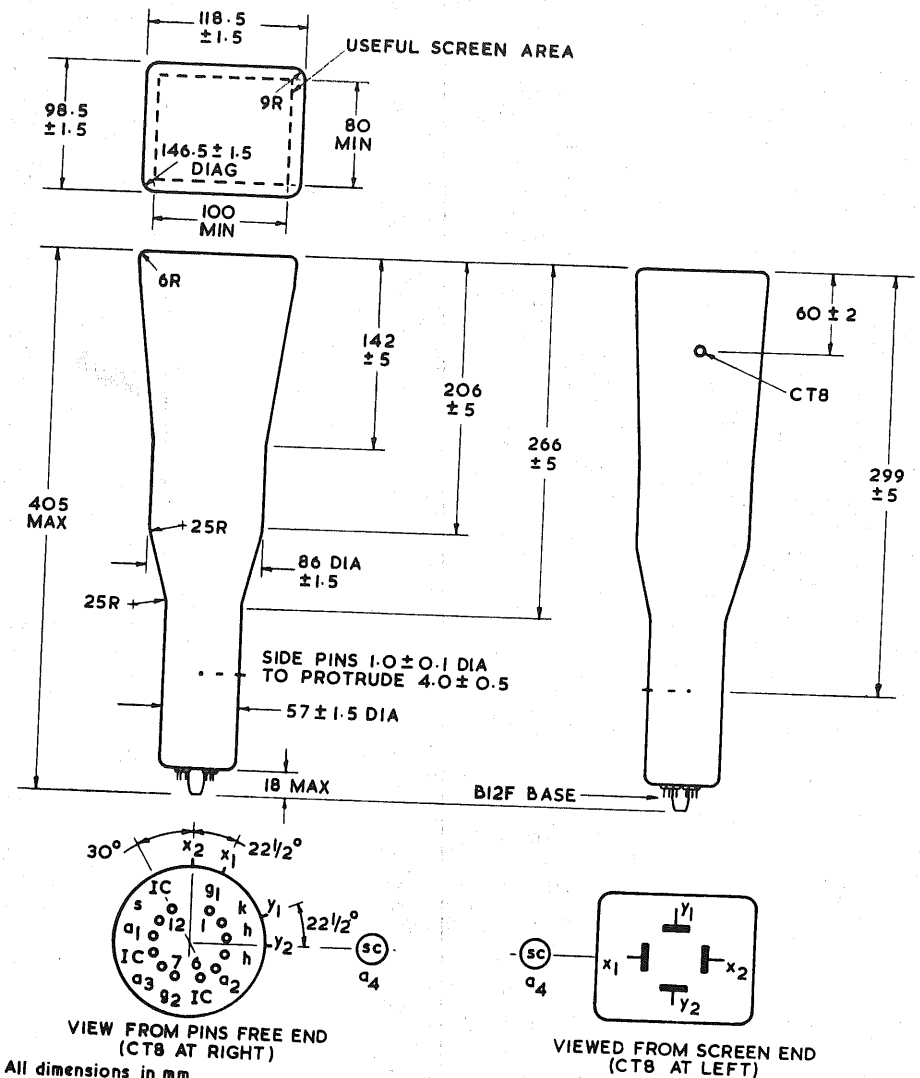
Grid 1 to all	$C_{g1\text{-all}}$	9.5	pF
Grid 2 to all	$C_{g2\text{-all}}$	8.9	pF
Heater and cathode to all	$C_{h,k\text{-all}}$	4.0	pF
x_1 plate to x_2 plate	$C_{x1\text{-}x2}$	1.9	pF
y_1 plate to y_2 plate	$C_{y1\text{-}y2}$	1.7	pF
x_1 plate to all, less x_2 plate	$C_{x1\text{-all, less x2}}$	3.9	pF
x_2 plate to all, less x_1 plate	$C_{x2\text{-all, less x1}}$	3.9	pF
y_1 plate to all, less y_2 plate	$C_{y1\text{-all, less y2}}$	2.8	pF
y_2 plate to all, less y_1 plate	$C_{y2\text{-all, less y1}}$	2.8	pF
Grid 1 to grid 2	$C_{g1\text{-}g2}$	0.7	pF
Grid 1 to x_1, x_2, y_1, y_2 plates	$C_{g1\text{-}x1,x2,y1,y2}$	0.012	pF

TYPICAL OPERATION - Voltages with respect to cathode

Fourth anode voltage	V_{a4}	10	12	15	kV
Mean deflector plate potential		1000	1200	1500	V
Third anode voltage for optimum astigmatism correction	V_{a3}	1000*	1200*	1500*	V
Second anode voltage for optimum focus	V_{a2}	25 to 180	30 to 200	40 to 250	V
First anode voltage	V_{a1}	1000	1200	1500	V
Shield voltage for optimum raster shape	V_s	970 to 1070	1170 to 1270	1470 to 1570	V
Beam blanking voltage for cut-off	V_{g2}	960 to 1040†	1150 to 1250†	1435 to 1565†	V
Control grid voltage for cut-off	V_{g1}	-40 to -75	-50 to -90	-60 to -115	V
x deflection coefficient	D_x	9.2 to 11.8	11 to 14.2	13.8 to 17.7	V/cm
y deflection coefficient	D_y	3.6 to 4.5	4.3 to 5.4	5.4 to 6.8	V/cm
Minimum screen area		10 x 8	10 x 8	10 x 8	cm^2
Line width at centre measured by shrinking raster (at 5μA beam current)		0.47	0.41	0.39	mm
Line width at centre (measured by microscope) (at 5μA beam current)		0.80	0.73	0.70	mm
Line width at edge (measured by microscope) (at 5μA beam current)		1.0	0.98	0.96	mm

* The required voltage will not differ from the quoted value by more than ± 50V.

† The beam is unblanked when $V_{g2} = V_{a1}$. This grid 2 electrode should not be used as a brilliance control.

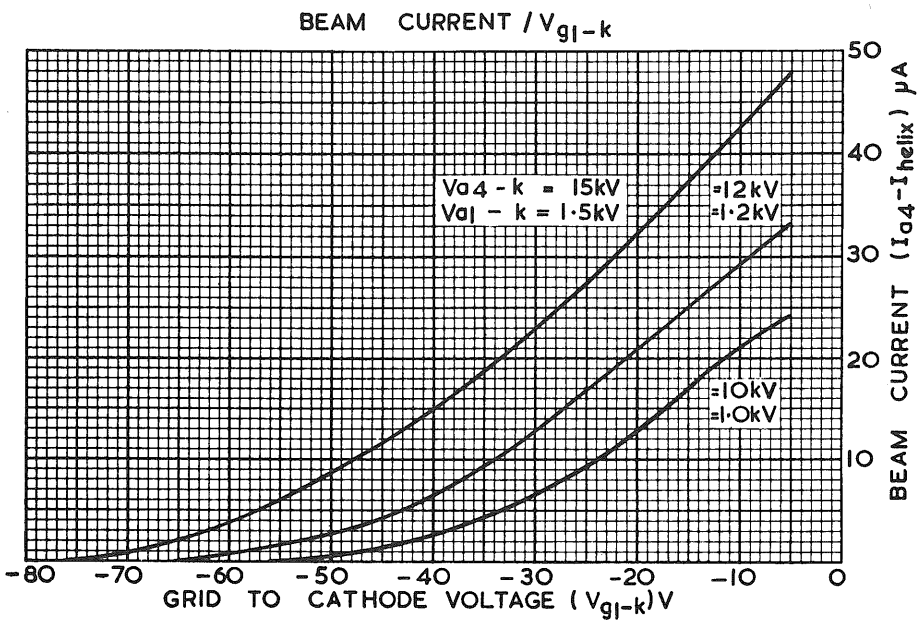


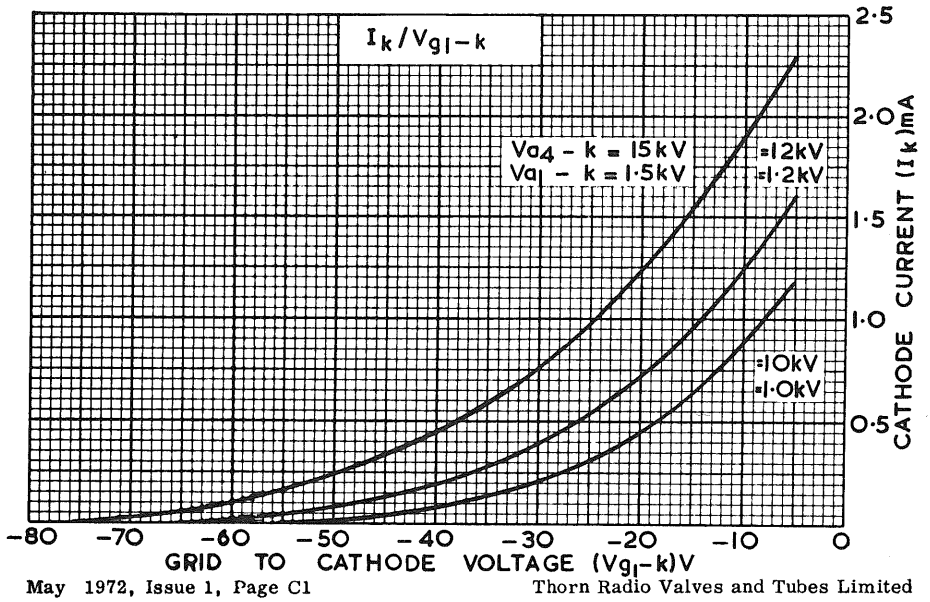
All dimensions in mm

Not to be scaled

It is advisable to support the tube near the screen, and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base. Connecting leads should not be soldered directly to the tube pins.

Tolerance on all side pin positions ± 5°.

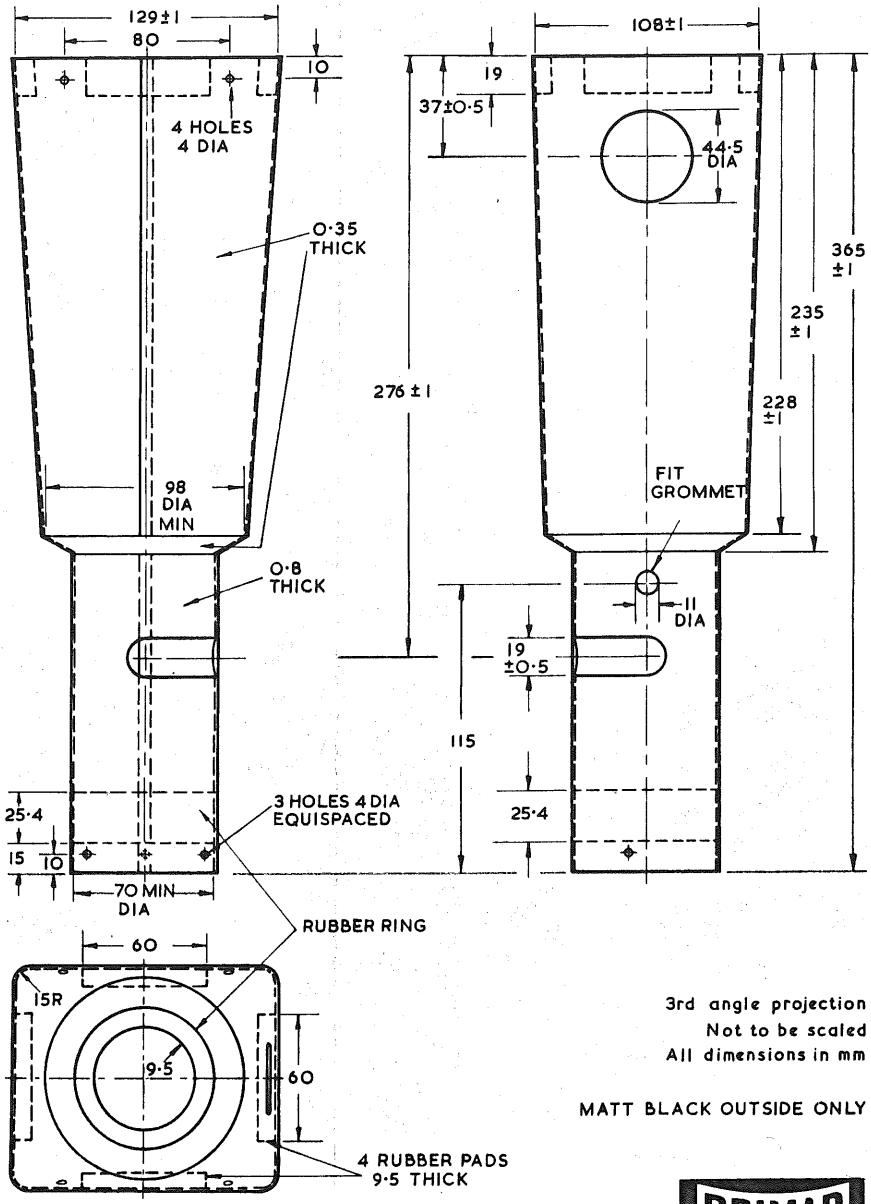

BEAM CURRENT / V_{g1-k}
V_{a4-k} = 15kV
V_{a1-k} = 1·5kV
=12kV
=1·2kV
=10kV
=1·0kV
50
40
30
20
10
BEAM CURRENT (I_{a4}-I_{helix}) μA
-80 -70 -60 -50 -40 -30 -20 -10 0
GRID TO CATHODE VOLTAGE (V_{g1-k})V


I_k / V_{g1-k}
V_{a4-k} = 15kV
V_{a1-k} = 1·5kV
=12kV
=1·2kV
=10kV
=1·0kV
2·5
2·0
1·5
1·0
0·5
CATHODE CURRENT (I_k)mA
-80 -70 -60 -50 -40 -30 -20 -10 0
GRID TO CATHODE VOLTAGE (V_{g1-k})V

Magnetic Shield MS11

D14-200..

EXAMPLE OF TYPICAL SHIELD - PRELIMINARY DATA



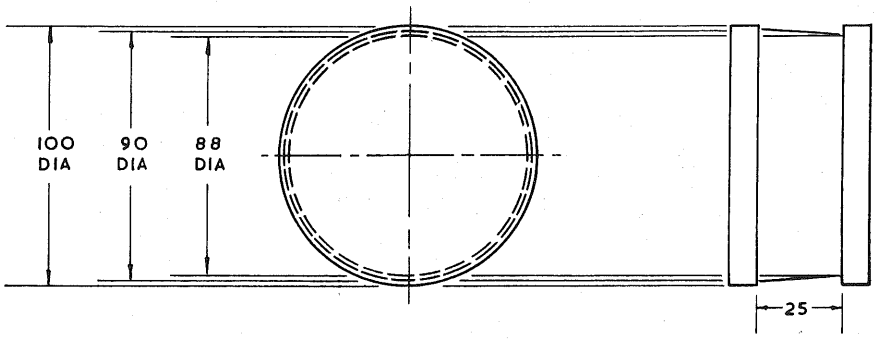
3rd angle projection
Not to be scaled
All dimensions in mm

MATT BLACK OUTSIDE ONLY

Thorn Radio Valves and Tubes Limited

Tube Coil TW29 D14-200..

MANDREL FOR TWIST COIL TW29



All dimensions in mm

Not to be scaled

MANDREL

Shaped from wood in the form of a truncated circular cone with detachable end cheeks. Dimensions as above.

SHIELD

This twist coil is designed to be used in conjunction with magnetic shield MS11 for D14-200..

WINDING

1600 turns of 39 S.W.G. Lewmex M Bond (Thermal self-bonding coated wire).

Wind 2 layers at 140 turns per layer, insert 2 soft copper tapes 0.2 mm thick by 6 mm wide, 25 mm long and 12 mm apart to a depth of 12 mm. Wind the remaining 10 layers and solder the ends of the winding to the copper tapes.

(Copper tapes to be free from burrs and sharp edges).

Bond coil to shape by passing a current of approx. 0.6A through the wire. Fix flexible lead-out wires to copper tapes and insulate with 0.05 mm Melinex tape. Wrap coil in 0.2 mm oiled silk to protect the winding.

ELECTRICAL CHARACTERISTICS

Resistance approx. 590 Ω. Twist coefficient approximately 7 mA/degree measured on typical D14-200.. with V_{a4} = 15 kV and V_{a1} = 1.5 kV.

FITTING

The completed twist coil should be pushed onto the tube and secured to tube in two places with suitable adhesive tape.