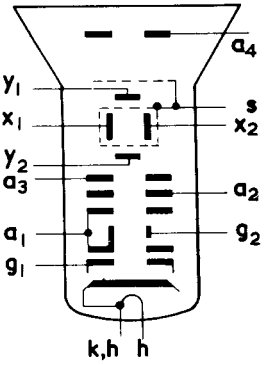
D10-210..

Oscilloscope Tube

GENERAL

This is a very short 7 x 5 cm^2 rectangular tube with high deflection sensitivity designed for general purpose and portable oscilloscopes. The mesh p.d.a. system allows the tube to be transistor driven for medium bandwidth applications without additional electrode voltages. A means of beam blanking at anode potential which avoids d.c. coupling to the grid is incorporated.

Heater voltage	V_h	11	V
Heater current	I_h	75	mA



ABSOLUTE RATINGS

		Max	Min	
Fourth anode voltage	V_{a4}	10	5.0	kV
Third anode voltage	V_{a3}	1.25	0.5	kV
Second anode voltage	V_{a2}	1.0	0	kV
First anode voltage	V_{a1}	1.25	0.5	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})		10:1	-	

All voltages referred to cathode unless otherwise stated.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D10-210GH) giving a green trace of medium short persistence. Other phosphors can be made available to special order.

INTER-ELECTRODE CAPACITANCES

Grid 1 to all	$c_{g1\text{-all}}$	10	pF
Grid 2 to all	$c_{g2\text{-all}}$	11	pF
Grid 2 to Grid 1	$c_{g2\text{-}g1}$	0.7	pF
Grid 1 to x_1, x_2, y_1 and y_2 plates	$c_{g1\text{-}x1,x2,y1,y2}$	1.2	pF
Heater and cathode to all	$c_{h,k\text{-all}}$	3.5	pF
x_1 plate to x_2 plate	$c_{x1\text{-}x2}$	1.9	pF
y_1 plate to y_2 plate	$c_{y1\text{-}y2}$	0.9	pF
x_1 plate to all, less x_2 plate	$c_{x1\text{-all, less } x2}$	5.7	pF
x_2 plate to all, less x_1 plate	$c_{x2\text{-all, less } x1}$	5.7	pF
y_1 plate to all, less y_2 plate	$c_{y1\text{-all, less } y2}$	5.4	pF
y_2 plate to all, less y_1 plate	$c_{y2\text{-all, less } y1}$	5.1	pF
x_1, x_2 plates to y_1, y_2 plates	$c_{x1,x2\text{ - }y1,y2}$	0.4	pF

TYPICAL OPERATION - voltages with respect to cathode

Fourth anode voltage	V_{a4}	6.0	10	kV
Mean deflector plate potential		600	1000	V
Third anode voltage for optimum astigmatism correction	V_{a3}	475 to 600	875 to 1000	V
Second anode voltage for optimum focus	V_{a2}	100 to 220	160 to 380	V
First anode voltage	V_{a1}	600	1000	V
Shield voltage for optimum raster shape	V_s	600 to 725	1000 to 1125	V
Beam blanking voltage for cut-off	V_{g2}	550†	920†	V
Control grid voltage for cut-off	V_{g1}	-30 to -55	-50 to -90	V
x plate deflection coefficient	D_x	11.2 to 13.8	18.6 to 23	V/cm
y plate deflection coefficient	D_y	8.0 to 10	13.4 to 16.6	V/cm
Minimum screen area		7 x 5	7 x 5	cm^2
Line width at centre	at 5μA beam current	0.65	0.6	mm
Line width at edge	at 5μA beam current	1.0	0.95	mm
Line width at centre measured by shrinking raster	at 5μA beam current	0.35	0.32	mm

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

RASTER DISTORTION AND ALIGNMENT

The undeflected spot will fall in a circle 5 mm radius from the geometric centre of the tube face.

The total scanned area is 7 cm x 5 cm measured about a point ± 3 mm from the centre of the tube face. The edges of a test raster will fall between two concentric rectangles 7 cm x 5 cm and 6.75 cm x 4.8 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 and should not extend more than 100 mm from the face. 40 ampere turns will suffice with provision for reversing the current if necessary.

The deflection coefficient (for both x and y plates) at 75% deflection of the useful scan shall not differ by more than 2% from the deflection coefficient over 10% deflection.

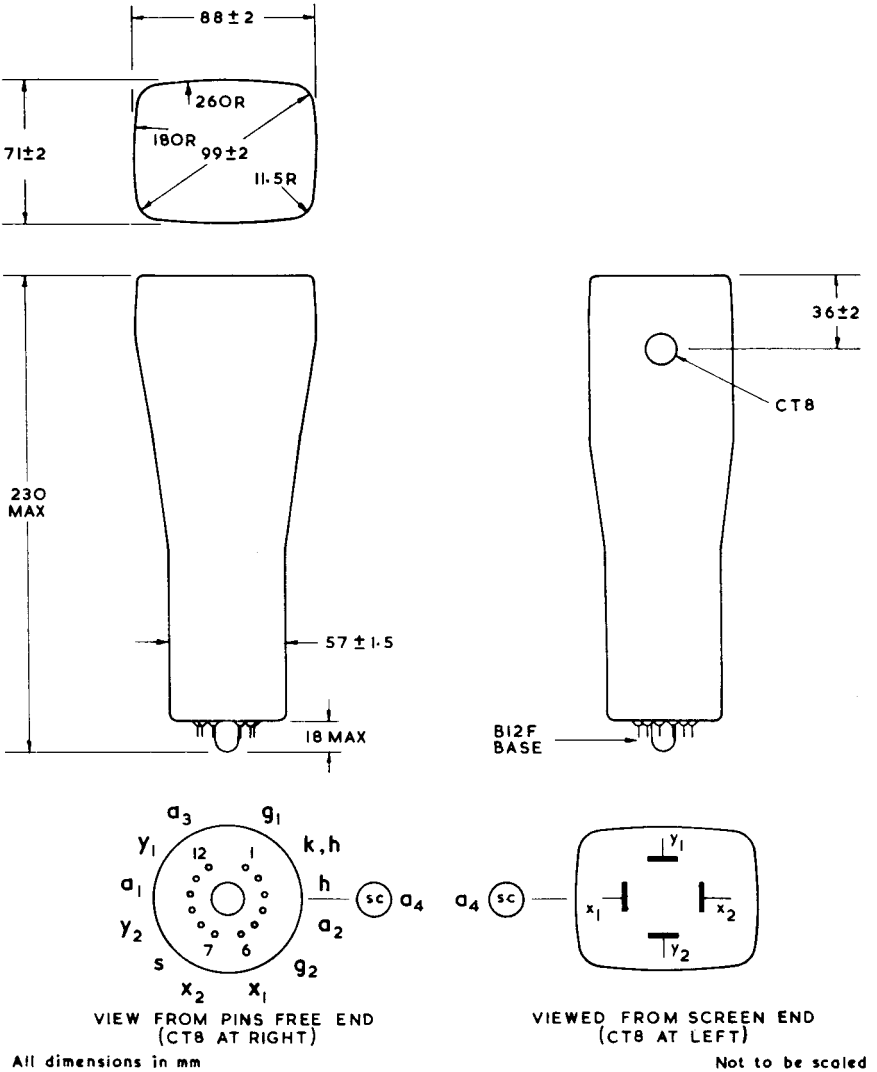
It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. Under no circumstances should the mean y plate potential differ from the mean x plate potential by more than 50 V.

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) - 500 g

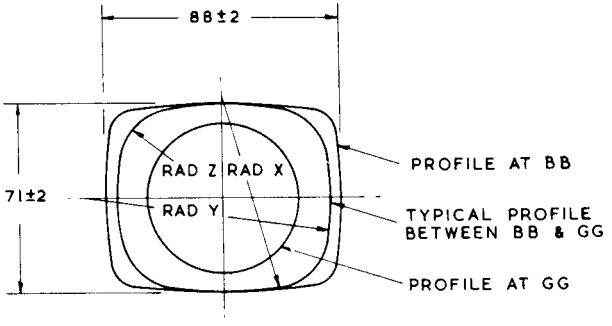
MOUNTING POSITION - unrestricted

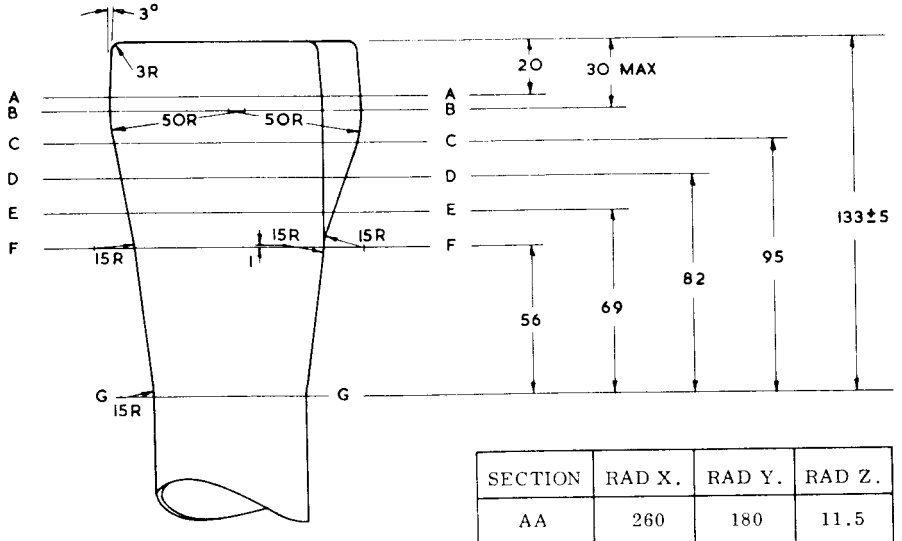


All dimensions in mm

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.

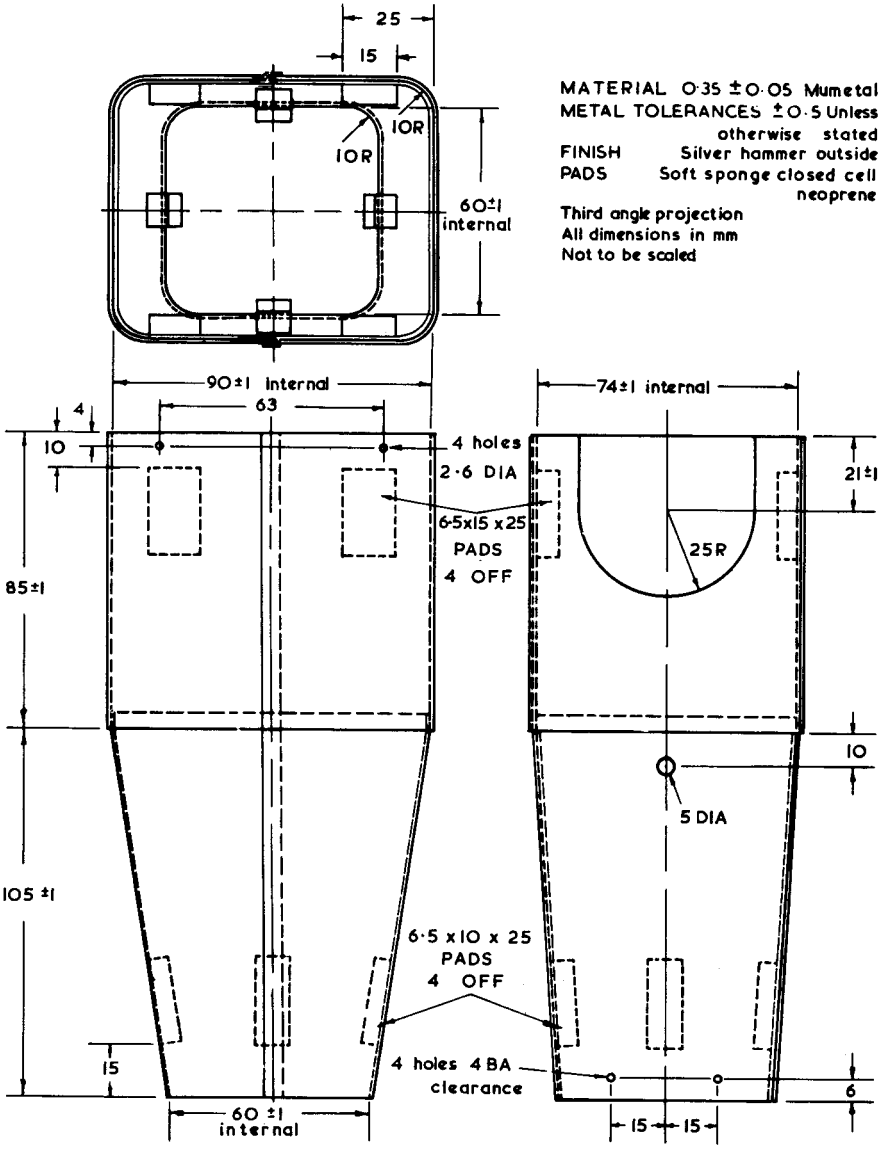




SECTION	RAD X.	RAD Y.	RAD Z.
AA	260	180	11.5
BB	260	180	11.5
CC	220	140	15.4
DD	159	91	22.3
EE	116	55.2	30.1
FF	35.5	35.5	35.5
GG	28.5	28.5	28.5

Magnetic Shield MS6

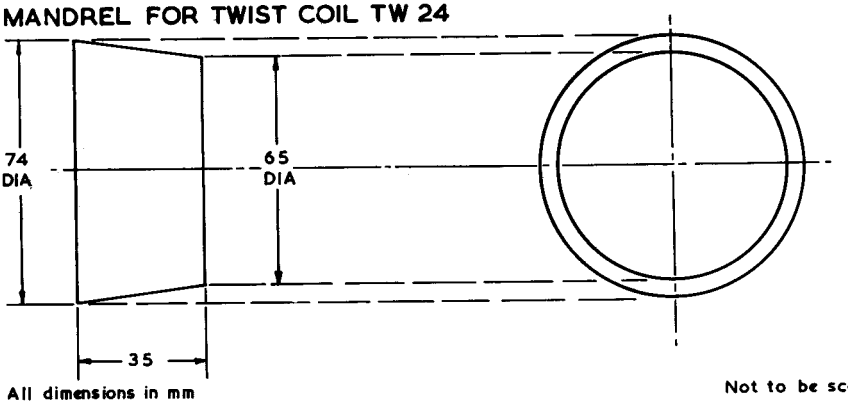
D10-210..



BRIMAR

Tube Coil TW24

MANDREL FOR TWIST COIL TW 24



All dimensions in mm

Not to be scaled

MANDREL

Shaped from wood in the form of a truncated circular cone, dimensions as above.

SHIELD

This twist coil is designed to be used in conjunction with magnetic shield MS6 for D10-210..

WINDING

900 turns of 0.125 mm Lewmex Grade 1 or 2 wire, or approved alternative, layer wound on the adhesive side of adhesive backed crepe paper to give 5 mm margins between the coil and each edge of the mandrel.
Start and finish of winding to be brought out on 450 mm long thin flexible lead wires from smaller end of winding.
Varnish, if necessary, cover with adhesive backed crepe paper and ensure that the edges of the coil are sealed in place.

ELECTRICAL CHARACTERISTICS

Resistance approx. 270 Ω. Twist coefficient approximately 5.5 mA/degree measured on typical D10-210.. with V_{a4} = 10 kV and V_{a1} = 1.0 kV.

FITTING

The completed twist coil should be pushed hard onto the tube with the lead-out wires in the middle of the short side of the tube on the same side as the cavity cap and sealed to the tube with suitable adhesive tape.