

Hi-Bri COLOUR PICTURE TUBE

- 90° deflection
- In-line gun, electrostatic bi-potential focus
- 29,1 mm neck diameter
- Hi-Bri screen with pigmented phosphor featuring high brightness and increased contrast performance
- Soft-Flash technology offering improved set reliability
- Slotted shadow mask optimized for minimum moiré
- Fine pitch over entire screen
- Phosphor lines follow glass contour
- Quick-heating cathodes
- Internal magnetic shield
- Tension band implosion protection; push through
- When combined with an appropriate hybrid saddle toroidal deflection unit (e.g. AT1200 or AT1205), it forms a self-converging assembly; dynamic convergence is not required.

QUICK REFERENCE DATA

Deflection angle	90°
Face diagonal	37 cm
Overall length	340 mm
Neck diameter	29,1 mm
Heating	6,3 V, 685 mA
Focusing voltage	20% of anode voltage

ELECTRON-OPTICAL DATA

Electron gun system	unitized triple-aperture electrodes
Focusing method	electrostatic
Focus lens	bi-potential
Deflection method	magnetic
Deflection angles	
diagonal	approx. 90°
horizontal	approx. 78°
vertical	approx. 60°

ELECTRICAL DATA

Capacitances		
anode to external		max. 1600 pF
conductive coating including rimband	$C_{a(m+m')}$	min. 800 pF
grid 1 to all other electrodes	C_{g1}	15 pF
cathode of each gun to all other electrodes	C_{kR}, C_{kG}, C_{kB}	5 pF
focusing electrode to all other electrodes	C_{g3}	6 pF
Heating		indirect by a.c. or d.c.
heater voltage	V_f	6,3 V
heater current	I_f	685 mA

OPTICAL DATA

Screen	metal-backed vertical phosphor stripes; phosphor lines follow glass contour
Screen finish	polished
Useful screen dimensions	
diagonal	min. 335,4 mm
horizontal axis	min. 280,8 mm
vertical axis	min. 210,6 mm
area	min. 580 cm ²
Phosphors	
red	pigmented europium activated rare earth sulphide type
green	pigmented sulphide type
blue	
Centre-to-centre distance of vertical identical colour phosphor stripes, at screen centre	0,65 mm
Light transmission of face glass at centre	68%

MECHANICAL DATA (see also the figures on the following pages)

Overall length	340,1 ± 5 mm
Neck diameter	29,1 $\begin{matrix} +1,4 \\ -0,7 \end{matrix}$ mm *
Bulb dimensions	
diagonal	max. 368 mm
width	max. 317 mm
height	max. 248 mm
Base	12-pin base JEDEC B12-262
Anode contact	small cavity contact J1-21, IEC 67-III-2
Mounting position	anode contact on top
Net mass	approx. 6 kg

Handling

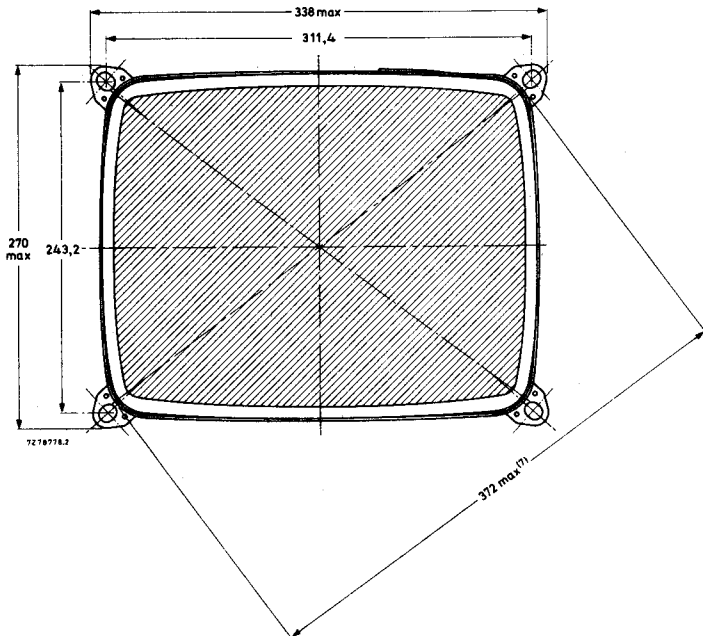
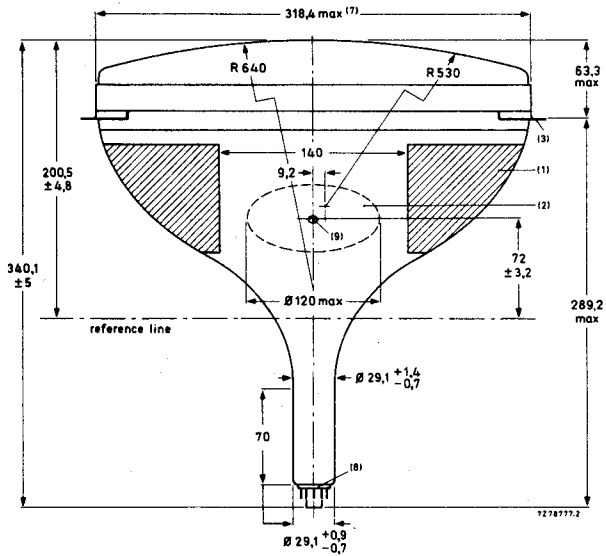
During shipment and handling the tube should not be subjected to accelerations greater than 35 g in any direction.

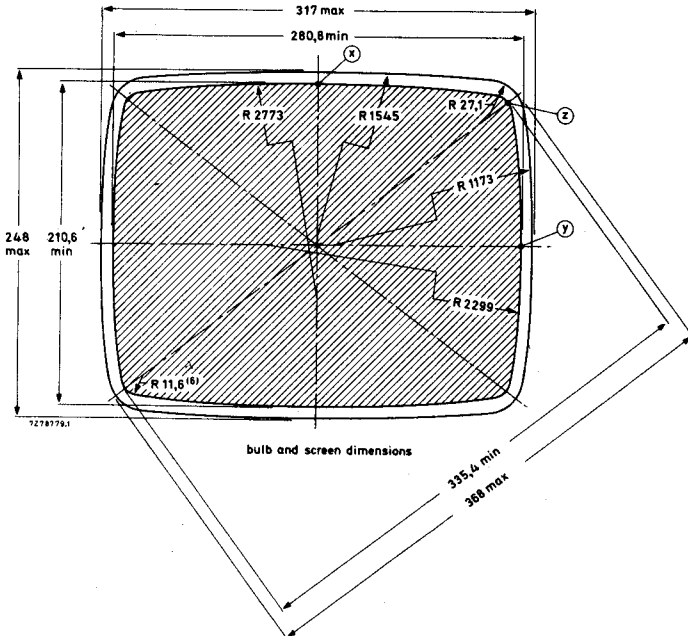
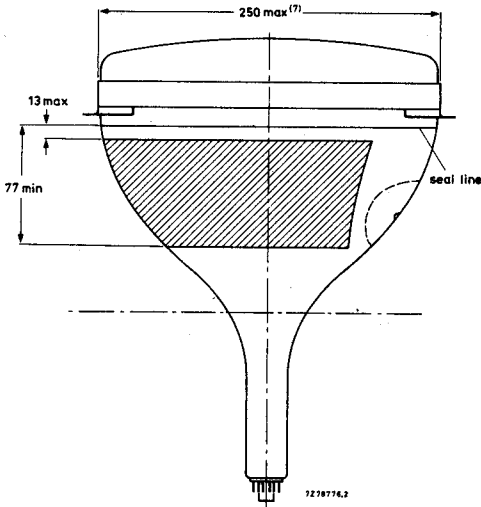
* In the region of 70 mm from the neck end, the maximum diameter is 30 mm.

MECHANICAL DATA (continued)

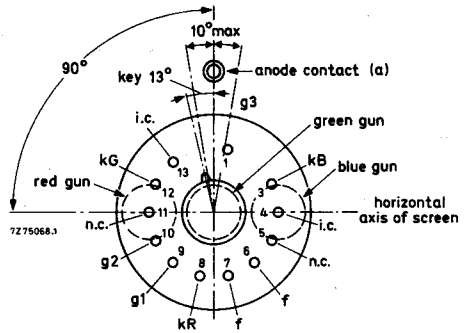
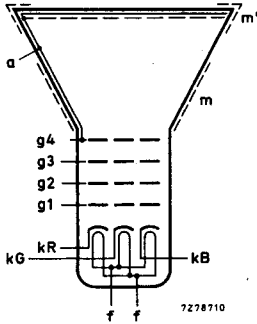
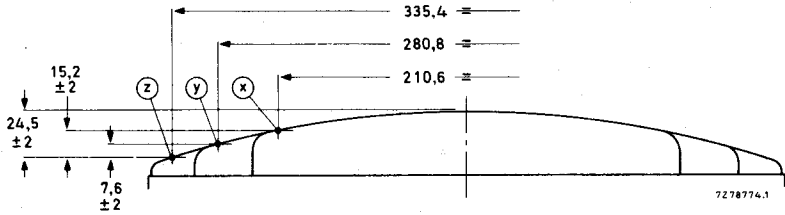
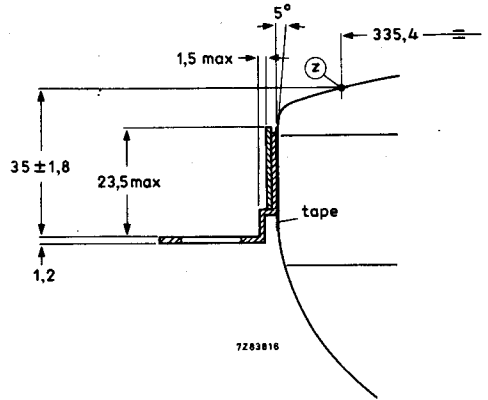
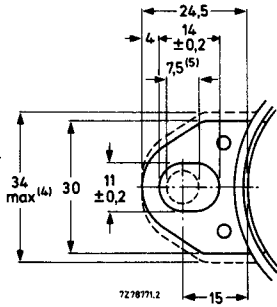
Dimensions in mm

Notes are given after the drawings.





MECHANICAL DATA (continued)

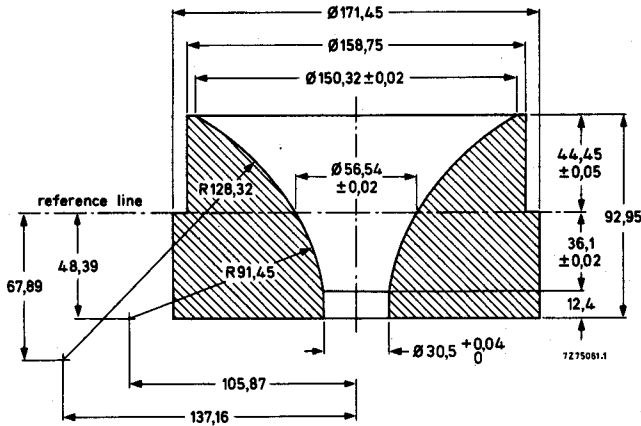


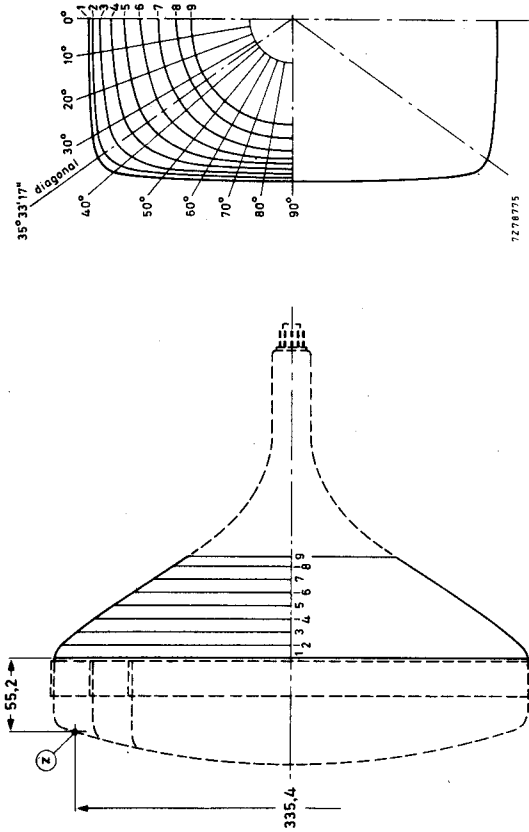
i.c. = internally connected (not to be used)
n.c. = not connected

Notes to outline drawings on the preceding pages

1. Configuration of outer conductive coating may be different, but will contain the contact area as shown in the drawing.
2. To clean this area, wipe only with a soft lintless cloth.
3. The displacement of any lug with respect to the plane through the three other lugs is max. 2 mm.
4. Minimum space to be reserved for mounting lug.
5. The position of the mounting screw in the cabinet must be within a circle of 7,5 mm diameter drawn around the true geometrical positions, i.e. the corners of a rectangle of 311,4 mm x 243,2 mm.
6. Co-ordinates for radius R = 11,6 mm: x = 126,98 mm, y = 90,76 mm.
7. Maximum dimensions in plane of lugs.
8. The socket for this base should not be rigidly mounted: it should have flexible leads and be allowed to move freely. The bottom circumference of base will fall within a circle concentric with the tube axis and having a diameter of 50 mm.
9. Small cavity contact J1-21, IEC 67-III-2,

Reference line gauge; GR90CJ4



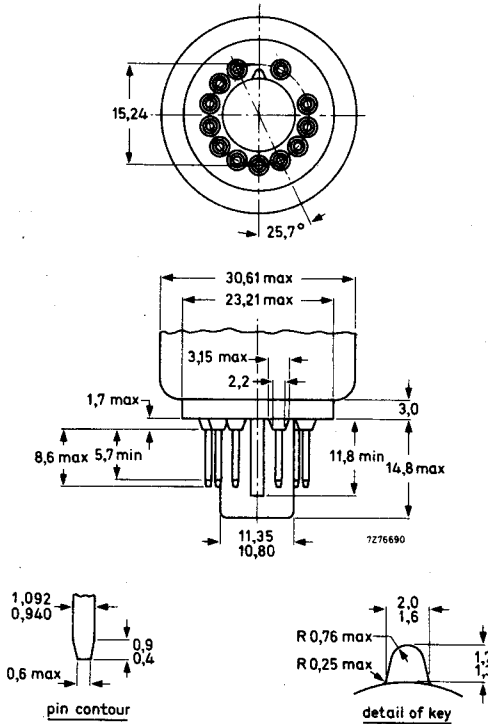


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Maximum cone contour

sec- tion	nom. distance from section 1	distance from centre (max. values)														
		0°	10°	20°	25°	30°	32° 30'	diag. axes	37° 30'	40°	45°	50°	60°	70°	80°	90°
1	0	157,2	159,4	166,3	171,7	178,2	181,2	183,6	183,3	180,0	167,9	156,5	140,0	129,8	124,2	122,4
2	10	154,7	156,9	163,5	168,5	174,1	176,6	178,1	177,7	174,8	164,4	153,7	137,8	127,9	122,4	120,7
3	20	148,8	150,7	156,3	160,0	163,5	164,6	165,0	164,4	162,6	156,0	147,7	133,6	124,4	119,3	117,7
4	30	140,4	142,1	146,2	148,6	150,5	151,0	151,1	150,7	149,6	145,6	140,0	128,6	120,3	115,7	114,2
5	40	130,3	131,3	134,0	135,4	136,5	136,8	136,8	136,6	136,1	134,1	130,8	122,7	115,9	111,7	110,3
6	50	118,2	118,8	120,1	120,9	121,6	121,8	122,0	122,0	121,9	121,2	119,8	115,4	110,5	107,0	105,8
7	60	104,9	104,7	105,1	105,5	106,0	106,2	106,5	106,7	106,9	107,1	107,0	105,6	103,1	100,8	99,8
8	70	90,6	89,9	89,8	90,0	90,4	90,6	90,9	91,1	91,4	91,9	92,3	92,5	91,7	90,4	89,7
9	77	79,9	79,1	79,0	79,1	79,4	79,6	79,9	80,1	80,4	80,9	81,4	81,8	81,4	80,5	79,9

12-pin base; JEDEC B12-262



TYPICAL OPERATING CONDITIONS

The voltages are specified with respect to grid 1.

Anode voltage	$V_{a,g4}$	25 kV
Grid 3 (focusing electrode) voltage	V_{g3}	4.7 to 5.5 kV
Grid 2 voltage for a spot cut-off voltage $V_k = 120$ V	V_{g2}	310 to 560 V
Luminance at the centre of the screen *	L	175 cd/m ²

* Tube settings adjusted to produce white of 6500K + 7 M.P.C.D. ($x = 0,313$, $y = 0,329$), focused raster, current density $0,4 \mu\text{A}/\text{cm}^2$.

EQUIPMENT DESIGN VALUES

The values are valid for anode voltages between 20 and 27,5 kV.
The voltages are specified with respect to grid 1.

Grid 3 (focusing electrode) voltage	V_{g3}	18,8 to 22% of anode voltage
Grid 2 voltage and cathode voltage for visual extinction of focused spot	V_{g2} and V_k	see cut-off design chart *
Difference in cut-off voltages between guns in any tube	ΔV_k	lowest value > 80% of highest value
Video drive characteristics		see graphs **
Grid 3 (focusing electrode) current	I_{g3}	-5 to +5 μA
Grid 2 current	I_{g2}	-5 to +5 μA
Grid 1 current under cut-off conditions	I_{g1}	-5 to +5 μA
To produce white of 6500K + 7 M.P.C.D. (CIE co-ordinates x = 0,313, y = 0,329)		
Percentage of the total anode current supplied by each gun (typical)		
red gun		38,3%
green gun		35,8%
blue gun		25,9%
Ratio of anode currents		
red gun to green gun		min. 0,7 average 1,1 max. 1,4
red gun to blue gun		min. 1,1 average 1,5 max. 2,0
blue gun to green gun		min. 0,5 average 0,7 max. 1,0

* The common V_{g2} should be adjusted as follows:

Set the cathode voltage, V_k , for each gun at 120 V. Increase the V_{g2} from about 300 V to the value at which the raster of one of the guns becomes just visible. Now decrease the V_k of the remaining guns so that the rasters of these guns also become visible.

** For optimum picture performance it is recommended that the cathodes are not driven below +10 V.

LIMITING VALUES (Design maximum rating system unless otherwise stated)

The voltages are specified with respect to grid 1.

Anode voltage	$V_{a,g4}$	max. min.	27,5 kV 20 kV	notes 1, 2, 3 notes 1 and 4
Long-term average current for three guns	I_a	max.	750 μ A	note 5
Grid 3 (focusing electrode) voltage	V_{g3}	max.	7 kV	
Grid 2 voltage, peak	V_{g2p}	max.	1000 V	
Cathode voltage				
positive	V_k	max.	400 V	
positive operating cut-off	V_k	max.	200 V	
negative	$-V_k$	max.	0 V	
negative peak	$-V_{kp}$	max.	2 V	
Heater voltage	V_f	max. min.	7,2 V 5,4 V	note 6
Heater-cathode voltage				
heater negative with respect to cathode				
during equipment warm-up period				
not exceeding 15 s	V_{kf}	max.	450 V	note 1
after equipment warm-up period	V_{kf}	max.	250 V	
heater positive with respect to cathode	$-V_{kfp}$	peak	200 V	note 1
	$-V_{kf}$	max.	0 V	
			(d.c. component value)	

Notes

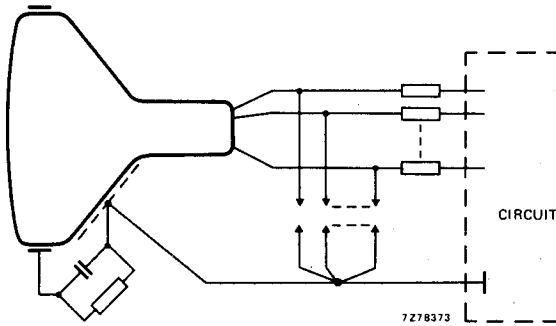
1. Absolute maximum rating system.
2. The X-ray dose rate remains below the acceptable value of 0,5 mR/h, measured with ionization chamber when the tube is used within its limiting values.
3. During adjustment on the production line this value is likely to be surpassed considerably. It is therefore strongly recommended to first make the necessary adjustments for normal operation without picture tube.
4. Operation of the tube at lower voltages impairs the luminance and resolution.
5. The short-term average anode current should be limited by circuitry to 1000 μ A.
6. For maximum cathode life and optimum performance, it is recommended that the heater supply be regulated at 6,3 V.

FLASHOVER PROTECTION

With the high voltage used with this tube (max. 27,5 kV) internal flashovers may occur. As a result of the Soft-Flash technology these flashover currents are limited to approx. 60 A offering higher set reliability, optimum circuit protection and component savings.

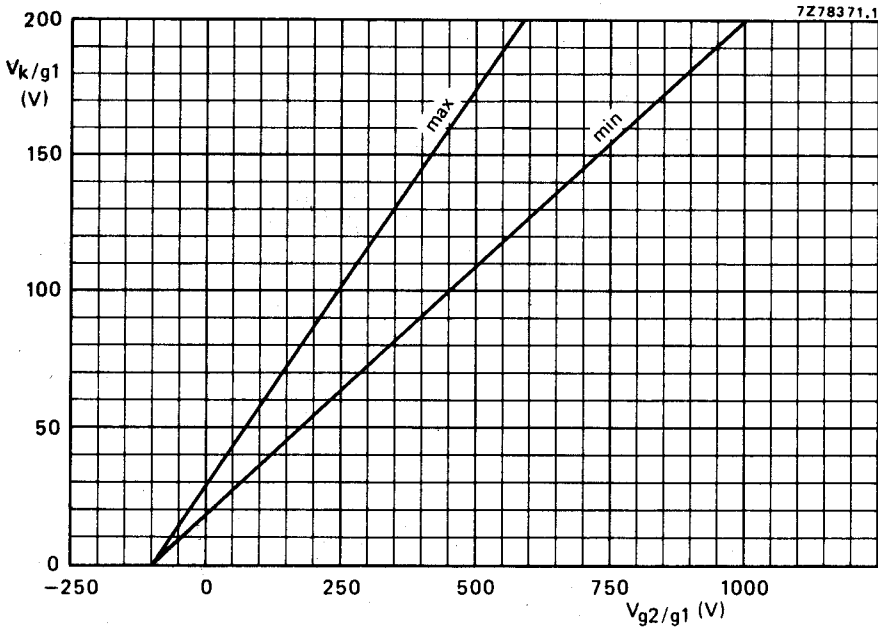
Primary protective circuitry using properly grounded spark gaps and series isolation resistors (preferably carbon composition) is still necessary to prevent tube damage. The spark gaps should be connected to all picture tube electrodes at the socket according to the figure below; they are not required on the heater pins. No other connections between the outer conductive coating and the chassis are permissible. The spark gaps should be designed for a breakdown voltage at the focusing electrode (g3) of 8,5 kV ($1,5 \times V_{g3}$ max. at $V_{a,g4} = 25$ kV), and at the other electrodes of 1,5 to 2 kV.

The values of the series isolation resistors should be as high as possible (min. 1,5 kΩ) without causing deterioration of the circuit performance. The resistors should be able to withstand an instantaneous surge of 20 kV for the focusing circuit and 12 kV for the remaining circuits without arcing. Additional information is available on request.

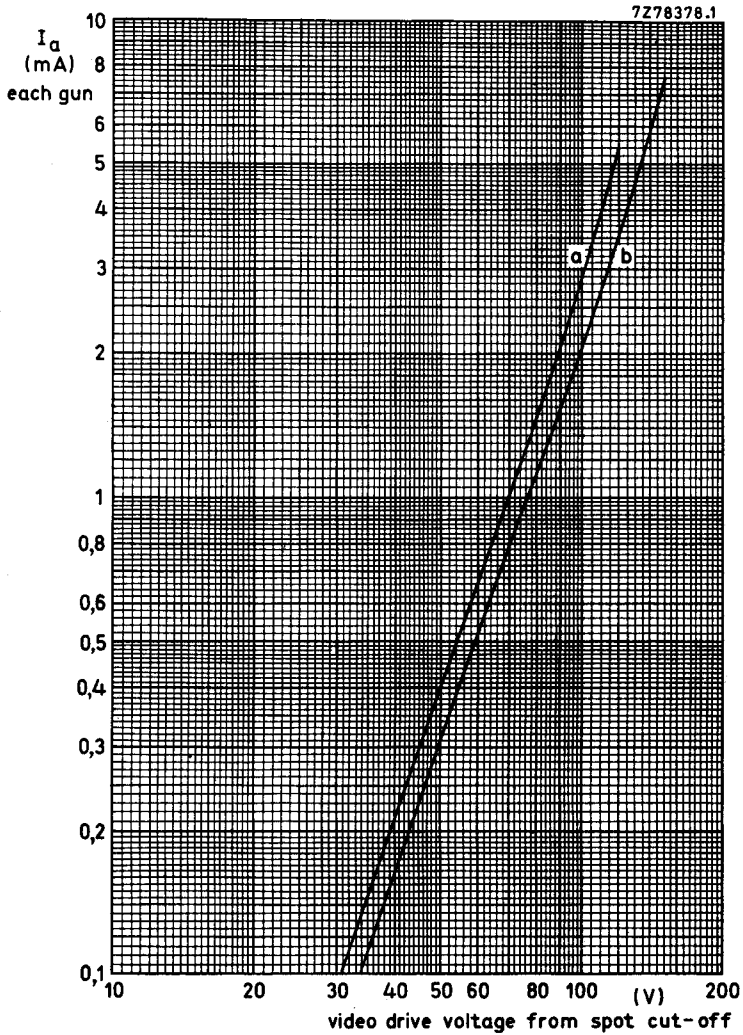


BEAM CORRECTIONS

Maximum required correction for register, as measured at the centre of the screen in any direction	0,08 mm
Displacements, measured at centre of screen	
centre convergence displacement in any direction of the blue and red beams	4 mm
centre convergence displacement in any direction between green beam and converged blue and red beams	2 mm
Maximum centring error in any direction after colour purity, static convergence, and horizontal centre line correction, measured with deflection coils in nominal position	5 mm



Spot cut-off design chart (cathode drive), V_{g3} adjusted for focus, $V_{a,g4} = 20$ to 27,5 kV.



Typical cathode drive characteristics.

$V_f = 6,3$ V;

$V_{a,g4} = 25$ kV;

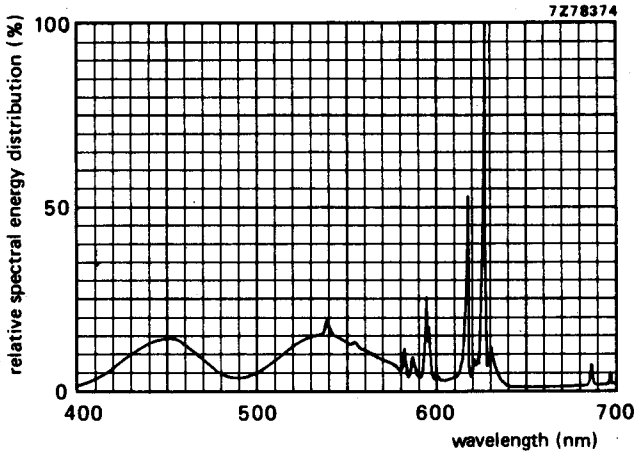
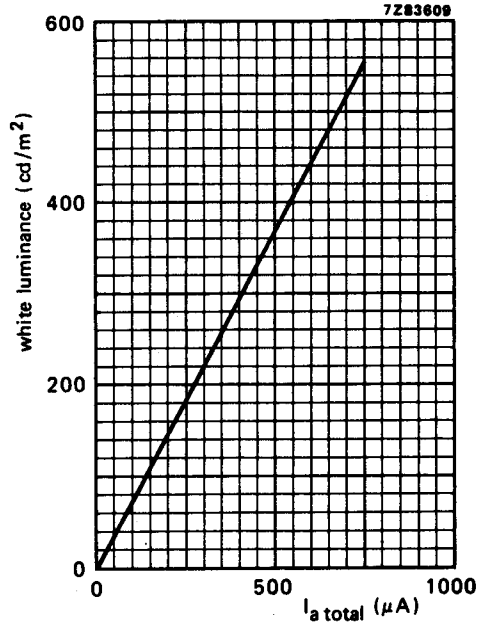
V_{g3} adjusted for focus;

V_{g2} adjusted to provide spot cut-off for desired fixed V_k .

curve a = spot cut-off = 120 V;

curve b = spot cut-off = 150 V.

Luminance at the centre of the screen
 as a function of I_{total} :
 $V_{a,g4} = 25$ kV, $V_f = 6,3$ V, V_{g3} adjusted
 for optimum focus.
 Scanned area = 280,8 mm x 210,6 mm;
 CIE co-ordinates $x = 0,313$, $y = 0,329$.

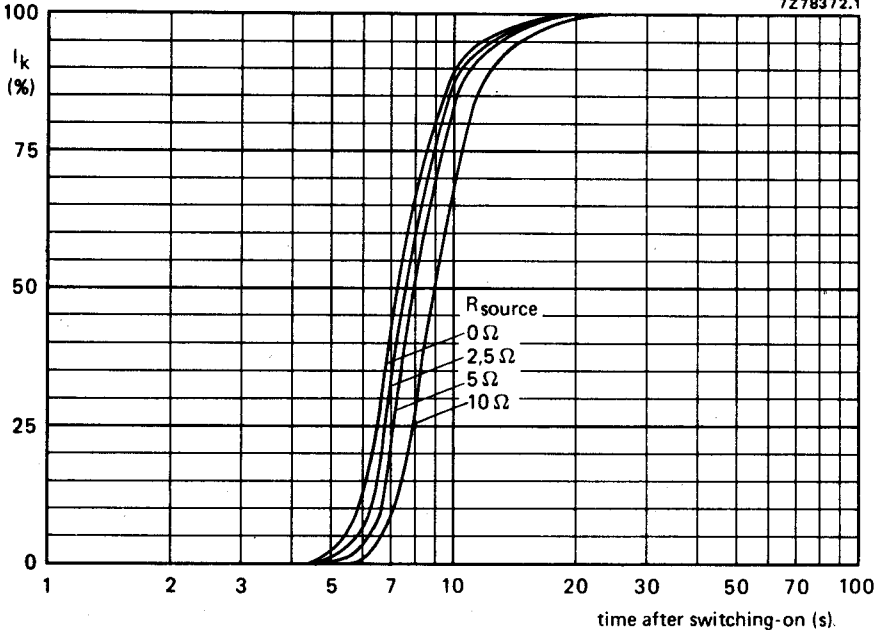


Simultaneous excitation of red, green and blue phosphor, measured in a tube, to produce white of $x = 0,313$, $y = 0,329$. Exact shape of the peaks depends on the resolution of the measuring apparatus.

Colour co-ordinates:

	x	y
red	0,635	0,340
green	0,315	0,600
blue	0,150	0,060

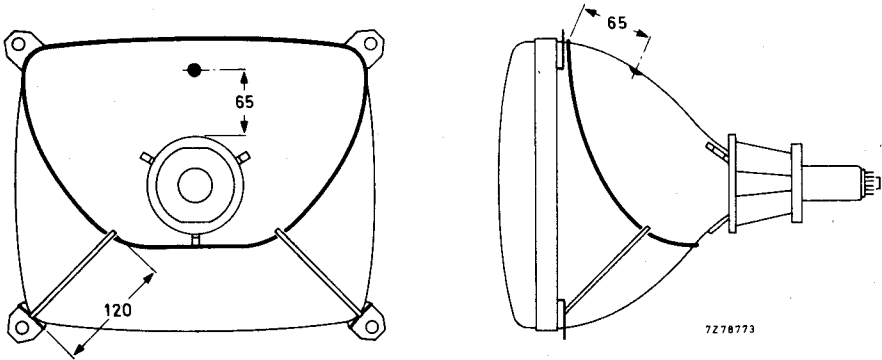
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Cathode heating time after switching on, measured under typical operating conditions.

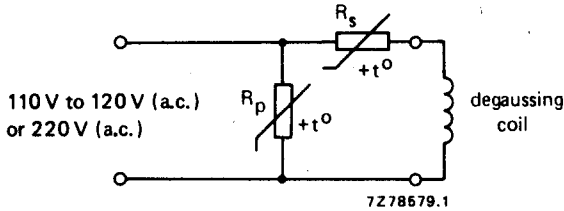
DEGAUSSING

The picture tube is provided with an internal magnetic shield. This shield and the shadow mask with its suspension system may be provided with an automatic degaussing system, consisting of one magnetic coil winding mounted on the cone of the picture tube.



Position of degaussing coil on the picture tube; dimensions are given in mm.

For proper degaussing an initial magnetomotive force (m.m.f.) of 600 ampere-turns is required in the coil. This m.m.f. has to be gradually decreased by appropriate degaussing circuitry. In the steady state, no significant m.m.f. should remain in the coil ($\leq 0,6$ ampere-turns). If single-phase power rectification is employed in the t.v. circuitry, provision should be included to prevent asymmetric distortion of the a.c. voltage applied to the degaussing circuit due to high d.c. inrush currents. An example of a degaussing circuit and coil data for various mains voltages are given below.



Degaussing circuit using dual PTC thermistor.

Data of degaussing coil

	110 V (a.c.) mains	220 V (a.c.) mains
Circumference	90 cm	90 cm
Number of turns	70	120
Copper-wire diameter	0,45 mm	0,3 mm
Resistance	6,7 Ω	25,9 Ω
Catalogue number of appropriate dual PTC thermistor	8222 298 73091	2322 662 98009