

DATA SHEET

A41EAM40..
17" triple gun
monochrome tube assembly

Product specification

2003 May 10

B/W picture tube assemblies

A41EAM40WB

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1 HIGHLIGHTS**1.1 Features**

- 'Flatter' and 'squarer' screen
- In-line, hi-bi potential ART (Aberration Reducing Triode) gun
- Hi-Bri technology
- Internal multipole
- Cd-free phosphor
- Reinforced envelope for push-through mounting
- Self-converging and raster correction-free assembly.
- Screen finish optional
- Quick-heating low-power cathodes
- Soft-flash

1.2 Quick reference data

PARAMETER	TYP.	UNIT
Deflection angle	90	deg
Nominal useful screen diagonal	41	cm
Overall length	37	cm
Glass transmission	42	%
Neck diameter	22.9	mm
Heater voltage	6.15	V
Heater current	315	mA
Anode voltage	23	kV
Focus voltage	31% of anode voltage	
Tube type A41EAM40WB01		
Horizontal frequency	16	kHz
Vertical frequency	50	Hz
Horizontal inductance	2.43	mH
Vertical resistance	12.20	Ω
Tube type A41EAM40WB14		
Horizontal frequency	16	kHz
Vertical frequency	50	Hz
Horizontal inductance	2.21	mH
Vertical resistance	17.60	Ω
Tube type A41EAM40WB20		
Horizontal frequency	16	kHz
Vertical frequency	50	Hz
Horizontal inductance	1.99	mH
Vertical resistance	17.60	Ω

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2 PRODUCT CHARACTERISTICS**2.1 Optical data**

PARAMETER	VALUE
Matrix	N.A.
Screen	
Screen finish	Optional AGAS
Nominal useful screen dimensions	
diagonal	410.7 mm
horizontal axis	330.0 mm
vertical axis	250.1 mm
area	≈820 cm ²
Phosphor (Cd-free)	
White P45 (WB)	Yttrium Oxysulfide
White P54 (WA)	Red, Green, Blue
Persistence	medium short
Centre-to-centre distance of identical colour phosphor stripes at centre of screen	N.A.
Light transmission of face glass at centre of screen	42%
Luminance at centre of screen; note 1	350 cd/m ²

Note

1. Tube settings adjusted to produce defocused raster, current density 0.4 $\mu\text{A}/\text{cm}^2$.

2.1.1 COLOUR COORDINATES

COLOUR	x	y
P45	0.245	0.320
P54	0.324	0.376

2.2 Electro-optical data

PARAMETER	VALUE
Electron gun system	unitized triple-aperture electrodes; Aberration Reducing Triode (ART)
Focus method	electrostatic
Focus lens	hi-bi potential
Deflection method	magnetic
Deflection angles	
diagonal	90°
vertical	78°
horizontal	60°

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2.3 Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are specified with respect to grid 1.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_a	anode voltage		–	27.5 ⁽¹⁾	kV
I_a	long-term average anode current for three guns		–	750	μ A
	short-term average anode current for three guns		–	1000	μ A
V_{foc}	focus voltage	note 2	–	11	kV
V_{g2}	grid 2 voltage	operating	–	1000	V
		during adjustment on the production line	–	1500	V
V_f	heater voltage	note 3	5.7	6.6	V
Cathode voltage					
V_k	positive	operating	–	250	V
		during blanking	–	400	V
V_k	positive operating cut-off		–	200	V
V_k	negative		–	0	V
V_{kp}	negative peak		–	–2	V
Cathode to heater voltage					
V_{kf}	positive		–	250	V
V_{kfp}	positive peak		–	300	V
V_{kf}	negative		–	0	V
V_{kfp}	negative peak		–	–50	V
Circuit limiting values					
R_{gfoc}	focus grid circuit resistance		–	70	M Ω
R_{g2}	grid 2 circuit resistance		–	7	M Ω
R_{g1-k}	grid 1 to cathode circuit resistance (each gun)		–	750	k Ω

Notes

1. 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 the picture tube.
2. During flashover maximum 20 kV is allowed (see "Flashover protection").
3. For maximum cathode life and optimum performance it is recommended that the heater supply is designed for 6.15 V at average beam current, for most applications this equals 6.3 V at zero beam current.

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2.4 Electrical data

SYMBOL	PARAMETER	MIN.	TYP.	UNIT
Capacitances				
$C_{a(m+m')}$	anode to external conductive coating, including rimband	1000	–	pF
C_{kR}, C_{kG}, C_{kB}	cathode of any gun to all other electrodes	–	4	pF
C_{g1}	grid 1 to all other electrodes	–	15	pF
C_{gfoc}	focus grid electrode to all other electrodes	–	4	pF
Heater				
V_f	heater voltage	–	6.15	V
I_f	heater current	–	315	mA
Resistance				
R_{rim}	between rimband and external conductive coating	50	–	M Ω

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2.5 Chassis design values

The values are valid for anode voltages between 20 and 27.5 kV. Voltages are specified with respect to grid 1. For optimum picture performance it is recommended that the cathodes are not driven below +1 V.

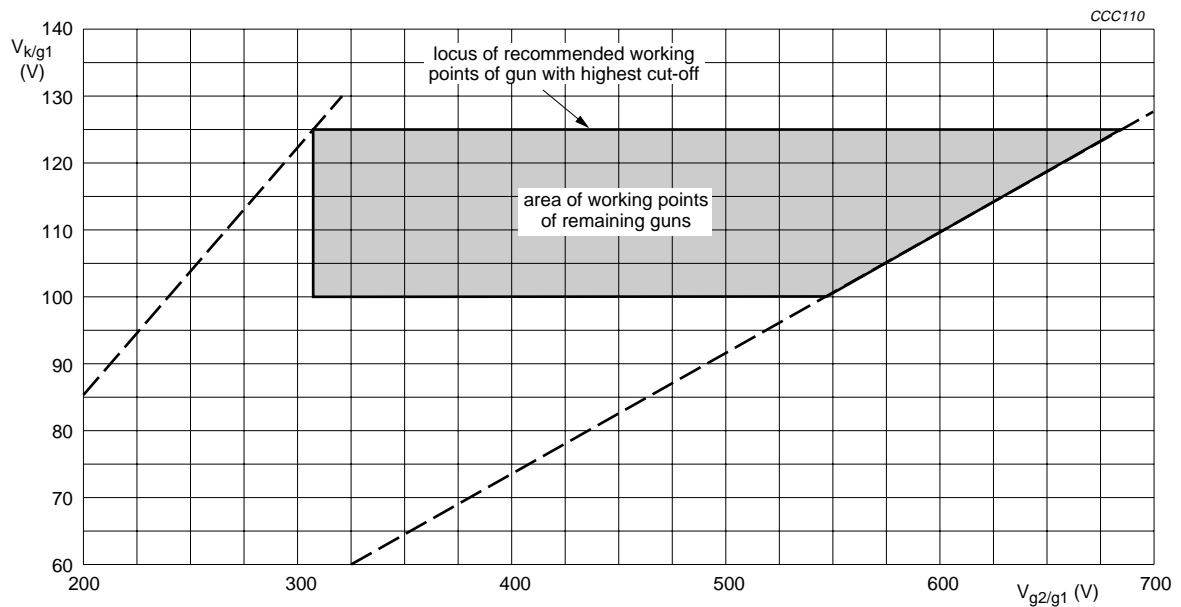
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_a	anode voltage	full screen load	20 ⁽¹⁾	–	27.5	kV
V_{foc}	focus voltage	as a percentage of anode voltage	29	–	33	%
V_{g2}	grid 2 voltage	for visual extinction of focused spot	see Fig.1			
V_k	cathode voltage					
ΔV_k	difference in cut-off voltage between guns in any tube		lowest value >80% of highest value			
	video drive characteristics		see Fig.2			
V_f	heater voltage	tube operating	–	6.15	–	V
I_{foc}	focus current		–2	–	+2	μA
I_{g2}	grid 2 current		–2	–	+2	μA
I_{g1}	grid 1 current	under cut-off conditions	–2	–	+2	μA
R_{ins}	insulation resistance	each cathode to grid 1 and heater	50	–	–	$M\Omega$
PERCENTAGE OF THE TOTAL ANODE CURRENT SUPPLIED BY EACH GUN						
	red gun		–	100	–	%
	green gun		–	100	–	%
	blue gun		–	100	–	%

Note

1. Operation of the tube at lower voltages impairs the luminance and resolution and could impair convergence.

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Grid 2 voltage (V_{g2}) adjusted for highest gun spot cut-off voltage $V_k = 125$ V.

Remaining guns adjusted for spot cut-off by means of cathode voltage.

V_{g2} range: 310 to 685 V.

V_k range: 100 to 125 V.

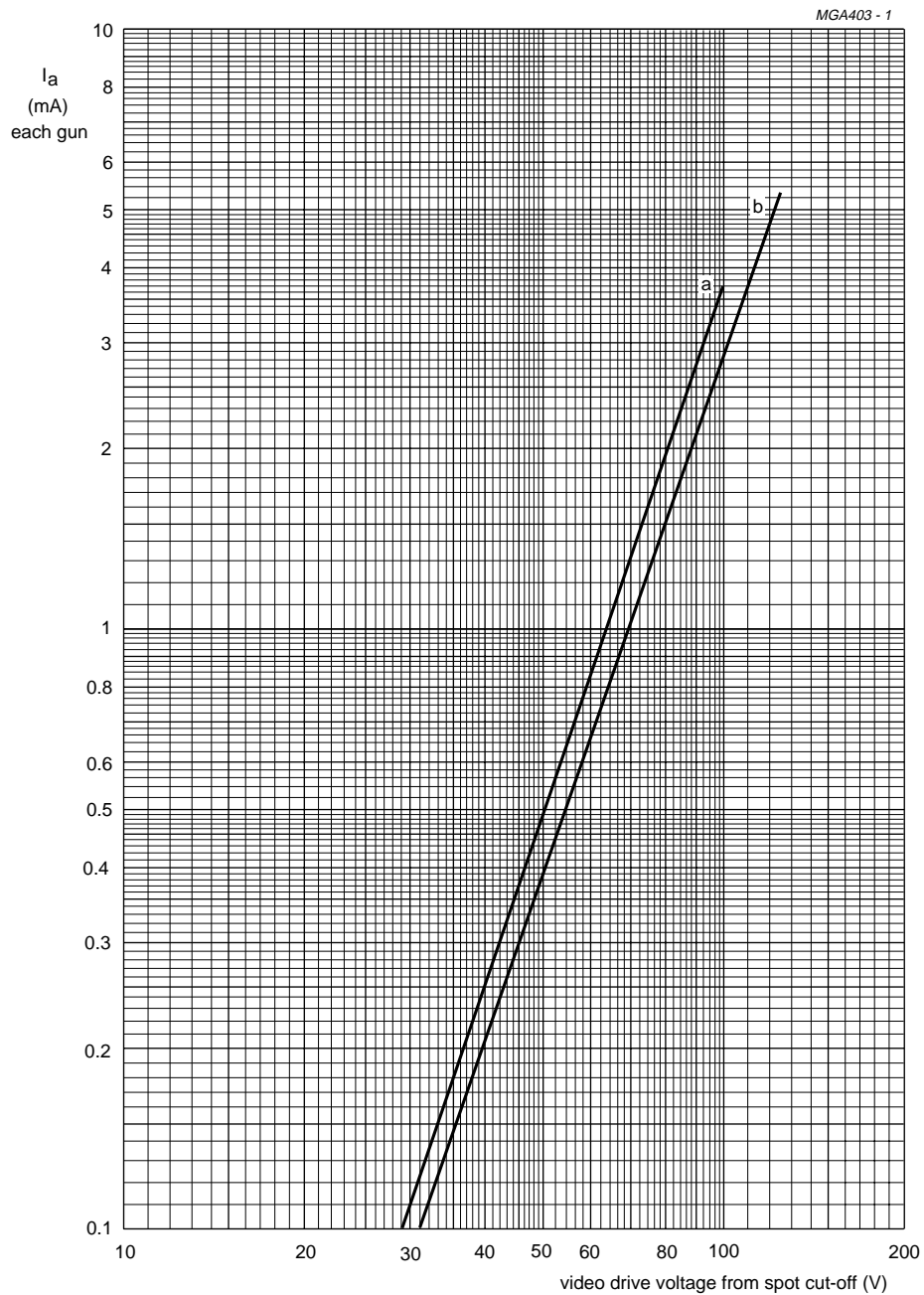
Adjustment procedure:

Set cathode voltage (V_k) for each gun at 125 V; increase the grid 2 voltage (V_{g2}) from approximately 300 V to the value at which one of the colours becomes just visible. Now decrease the cathode voltage of the remaining guns so that the other colours become visible.

Fig.1 Spot cut-off design chart.

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$V_f = 6.15$ V.

$V_a = 23$ kV.

V_{foc} adjusted for focus.

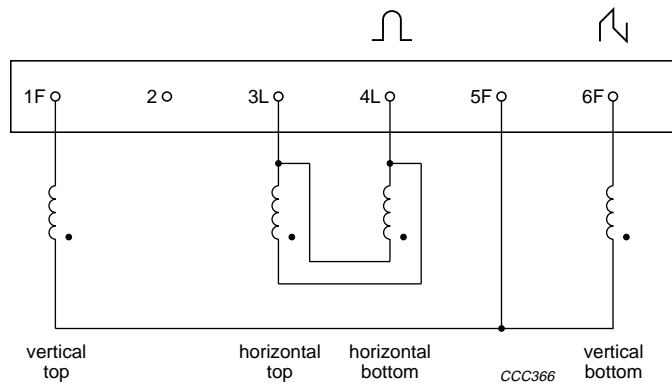
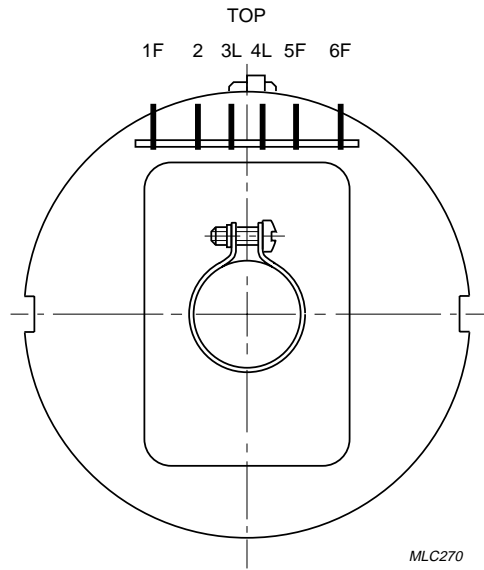
V_{g2} (each gun) adjusted to provide spot cut-off for $V_k = 100$ V (curve a) and $V_k = 125$ V (curve b).

Fig.2 Typical cathode drive characteristics.

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2.6 Deflection unit data



The beginning of the windings is indicated with •

Fig.3 Electrical diagram: deflection coil assemblies A41EAM40WB01, A41EAM40WB14 and A41EAM40WB20.

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2.6.1 TUBE TYPE A41EAM40WB01

PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Horizontal deflection coil					
Frequency		–	16	–	kHz
Inductance	1 V (RMS); 1 kHz	2.33	2.43	2.53	mH
Resistance	$T_{amb} = 25\text{ °C}$	2.89	3.21	3.53	Ω
Magnetic flux	$V_a = 23\text{ kV}$	4.96	5.09	5.22	mWb
Deflection current (peak-to-peak value)	edge-to-edge; $V_a = 23\text{ kV}$	–	2.10	–	A
Average copper temperature	measured by the resistance method	–	–	90	$^{\circ}\text{C}$
Temperature rise (ΔT)	$V_a = 23\text{ kV}$; $I_a = \text{short-term average value}$	–	25	–	$^{\circ}\text{C}$
Vertical deflection coil					
Frequency		–	50	–	Hz
Inductance	1 V (RMS); 1 kHz	23.58	26.20	28.82	mH
Resistance	$T_{amb} = 25\text{ °C}$	11.35	12.20	13.05	Ω
Deflection current (peak-to-peak value)	edge-to-edge; $V_a = 23\text{ kV}$	–	0.82	–	A
Average copper temperature	measured by the resistance method	–	–	90	$^{\circ}\text{C}$
Temperature rise (ΔT)	$V_a = 23\text{ kV}$; $I_a = \text{short-term average value}$	–	25	–	$^{\circ}\text{C}$
Deflection unit					
Insulation resistance	1 kV (DC)				
between horizontal and vertical coils		500	–	–	M Ω
between horizontal coil and yoke ring		500	–	–	M Ω
between vertical coil and yoke ring		10	–	–	M Ω
Crosstalk from horizontal to vertical coils	10 V; 500 Hz across the horizontal coils	–	–	0.2	V

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2.6.2 TUBE TYPE A41EAM40WB14

PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Horizontal deflection coil					
Frequency		–	16	–	kHz
Inductance	1 V (RMS); 1 kHz	2.12	2.21	2.30	mH
Resistance	$T_{amb} = 25\text{ °C}$	2.69	2.99	3.29	Ω
Magnetic flux	$V_a = 23\text{ kV}$	4.76	4.88	5.00	mWb
Deflection current (peak-to-peak value)	edge-to-edge; $V_a = 23\text{ kV}$	–	2.21	–	A
Average copper temperature	measured by the resistance method	–	–	90	$^{\circ}\text{C}$
Temperature rise (ΔT)	$V_a = 23\text{ kV}$; $I_a = \text{short-term average value}$	–	25	–	$^{\circ}\text{C}$
Vertical deflection coil					
Frequency		–	50	–	Hz
Inductance	1 V (RMS); 1 kHz	30.33	33.70	37.10	mH
Resistance	$T_{amb} = 25\text{ °C}$	16.37	17.60	18.83	Ω
Deflection current (peak-to-peak value)	edge-to-edge; $V_a = 23\text{ kV}$	–	0.73	–	A
Average copper temperature	measured by the resistance method	–	–	90	$^{\circ}\text{C}$
Temperature rise (ΔT)	$V_a = 23\text{ kV}$; $I_a = \text{short-term average value}$	–	25	–	$^{\circ}\text{C}$
Deflection unit					
Insulation resistance	1 kV (DC)				
between horizontal and vertical coils		500	–	–	$\text{M}\Omega$
between horizontal coil and yoke ring		500	–	–	$\text{M}\Omega$
between vertical coil and yoke ring		10	–	–	$\text{M}\Omega$
Crosstalk from horizontal to vertical coils	10 V; 500 Hz across the horizontal coils	–	–	0.2	V

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2.6.3 TUBE TYPE A41EAM40WB20

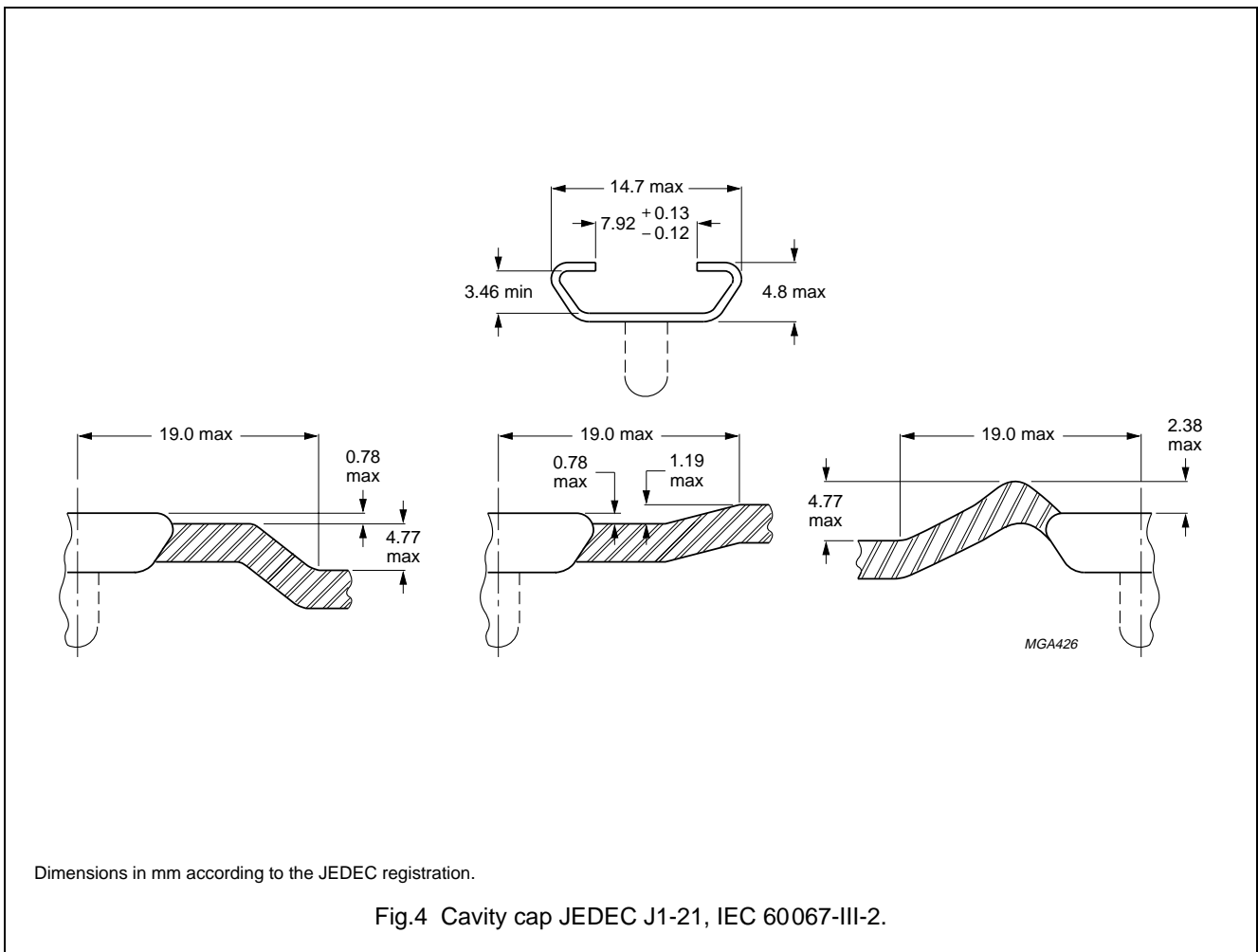
PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Horizontal deflection coil					
Frequency		–	16	–	kHz
Inductance	1 V (RMS); 1 kHz	1.91	1.99	2.07	mH
Resistance	$T_{amb} = 25\text{ °C}$	2.44	2.71	2.98	Ω
Magnetic flux	$V_a = 23\text{ kV}$	4.65	4.77	4.89	mWb
Deflection current (peak-to-peak value)	edge-to-edge; $V_a = 23\text{ kV}$	–	2.40	–	A
Average copper temperature	measured by the resistance method	–	–	90	$^{\circ}\text{C}$
Temperature rise (ΔT)	$V_a = 23\text{ kV}$; $I_a = \text{short-term average value}$	–	25	–	$^{\circ}\text{C}$
Vertical deflection coil					
Frequency		–	50	–	Hz
Inductance	1 V (RMS); 1 kHz	30.33	33.70	37.10	mH
Resistance	$T_{amb} = 25\text{ °C}$	16.37	17.60	18.83	Ω
Deflection current (peak-to-peak value)	edge-to-edge; $V_a = 23\text{ kV}$	–	0.73	–	A
Average copper temperature	measured by the resistance method	–	–	90	$^{\circ}\text{C}$
Temperature rise (ΔT)	$V_a = 23\text{ kV}$; $I_a = \text{short-term average value}$	–	25	–	$^{\circ}\text{C}$
Deflection unit					
Insulation resistance	1 kV (DC)				
between horizontal and vertical coils		500	–	–	$\text{M}\Omega$
between horizontal coil and yoke ring		500	–	–	$\text{M}\Omega$
between vertical coil and yoke ring		10	–	–	$\text{M}\Omega$
Crosstalk from horizontal to vertical coils	10 V; 500 Hz across the horizontal coils	–	–	0.2	V

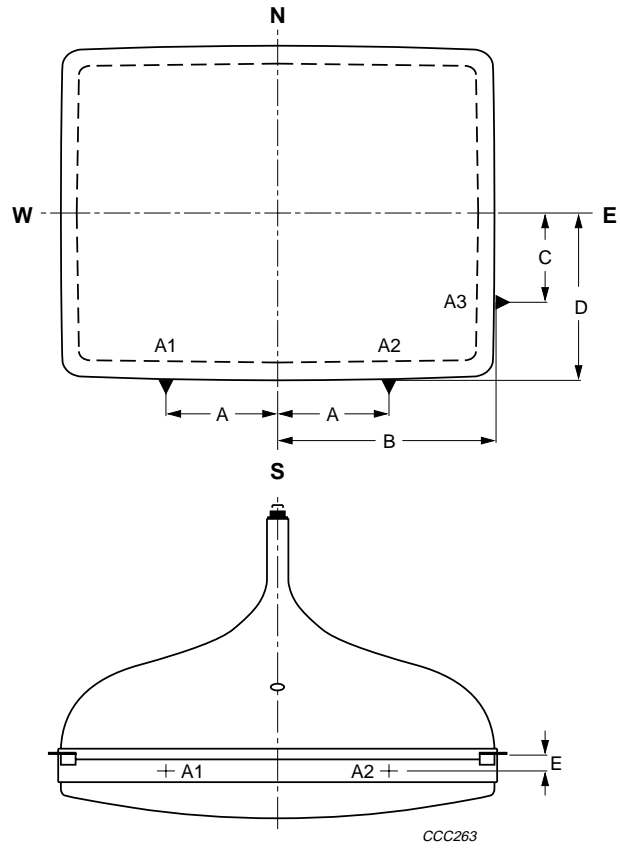
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2.7 Mechanical data

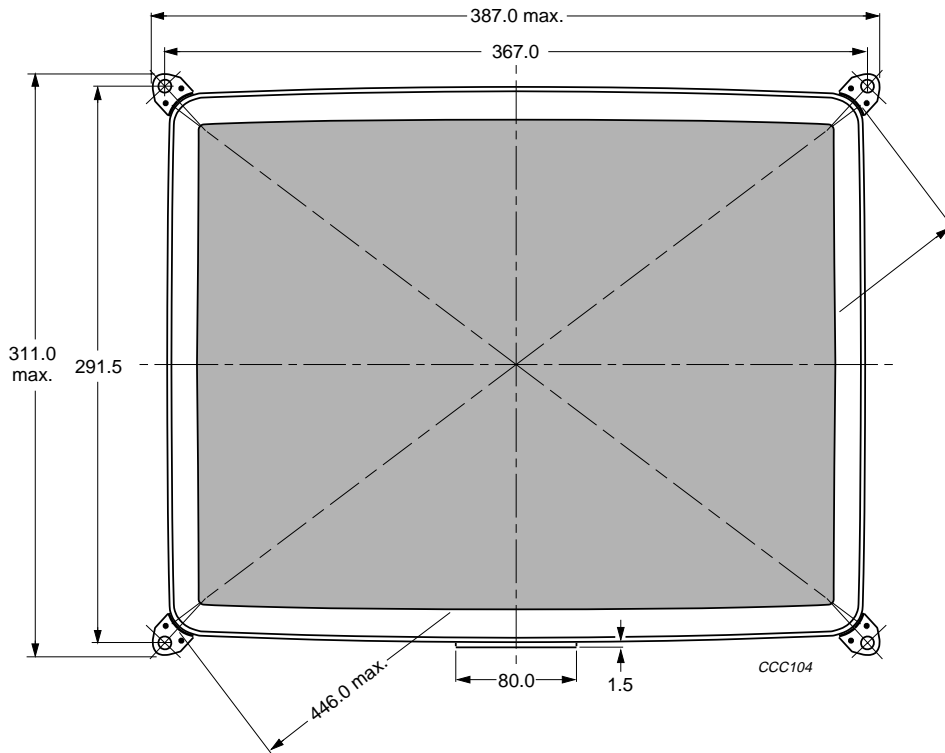
PARAMETER	VALUE
Base	JEDEC B8-294
Anode contact	small cavity contact; JEDEC J1-21; IEC 60067-III-2
Mounting position	anode contact on top
Implosion protection	push-through rimband
Mass including deflection unit	≈10 kg





- A = 139.40 mm.
- B = 181.94 mm.
- C = 100.0 mm.
- D = 142.24 mm.
- E = 29.20 mm.

Fig.7 Mechanical reference points.

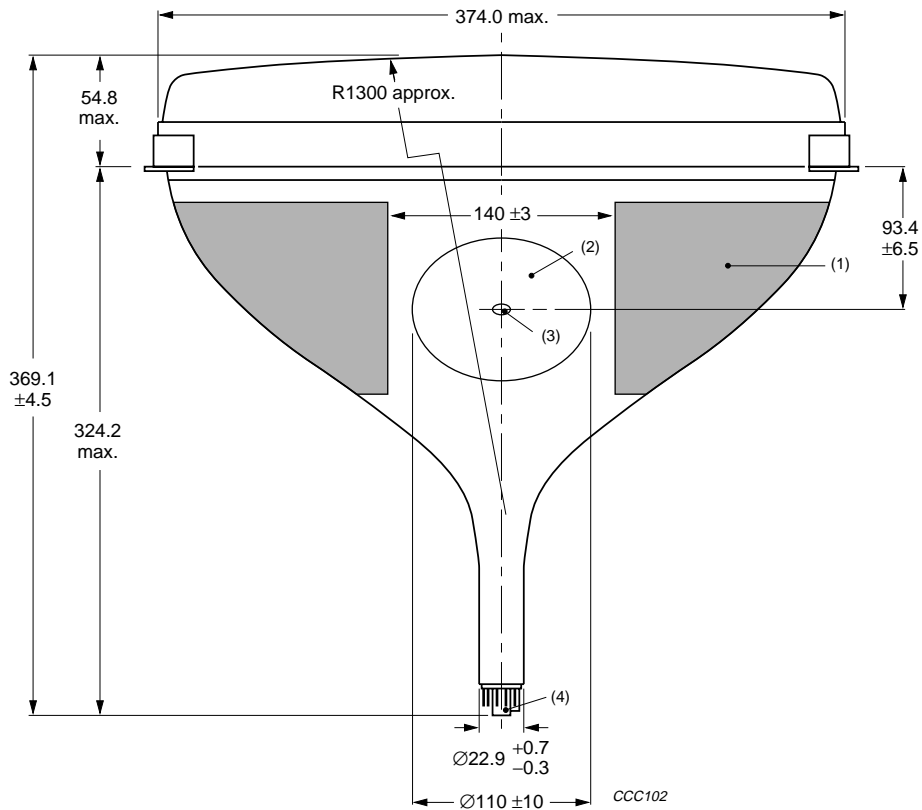


Dimensions in mm.

Fig.8 Tube dimensions; front view.

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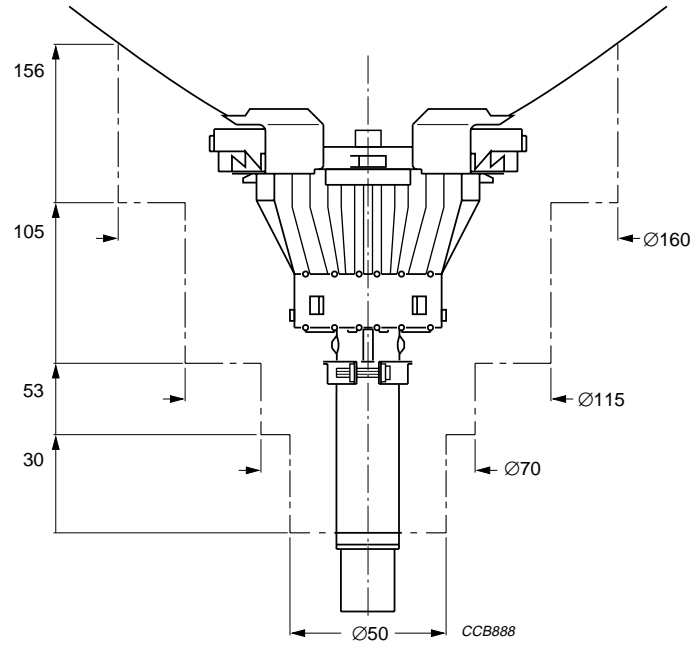
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Dimensions in mm.

- (1) The configuration of the outer conductive coating may differ, but will contain the contact area as shown.
- (2) To clean this area, wipe only with a soft lint-free cloth.
- (3) Small cavity contact JEDEC J1-21; IEC 60067-III-2.
- (4) The socket for this base should not be rigidly mounted, it should have flexible leads and be allowed to move freely. After mounting the tube in the cabinet, note that the position of the base can fall within a circle having a diameter of max. 30 mm concentric with an imaginary tube axis.

Fig.9 Tube dimensions; top view.

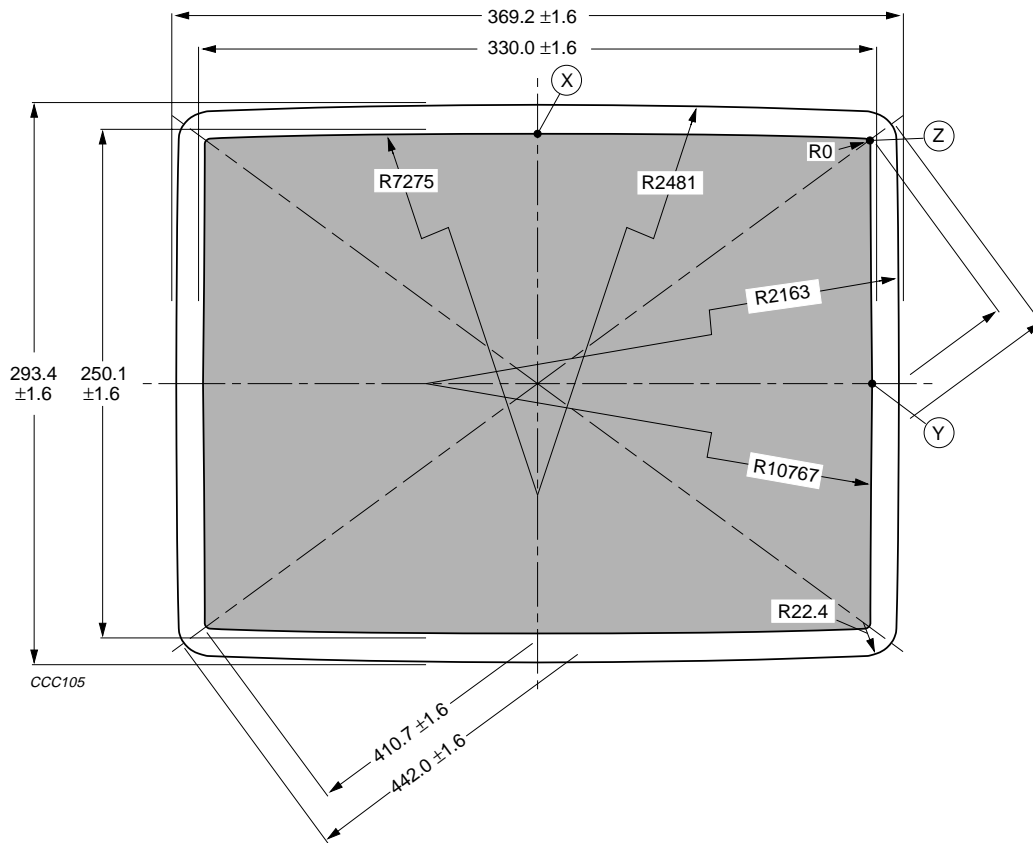


Dimensions in mm.

Fig.10 Yoke clearance.

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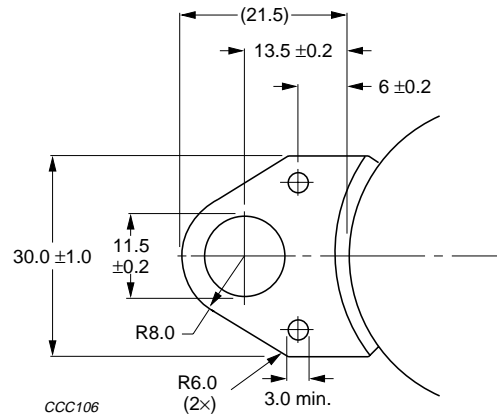


Dimensions in mm.

Fig.11 Phosphor dimensions.

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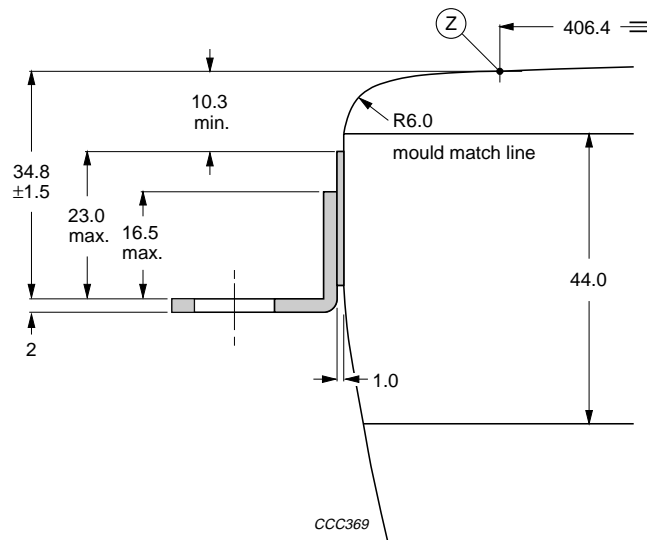
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Dimensions in mm.

The position of the mounting screw in the cabinet must be within a circle of 8 mm diameter drawn around the true geometrical positions, i.e. the corners of a rectangle of 367.0 mm × 291.5 mm.

Fig.12 Lug dimensions.



Dimensions in mm.

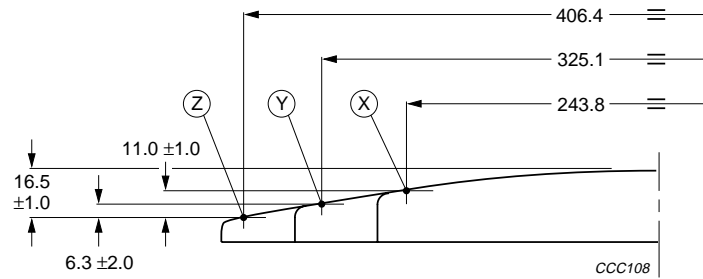
The maximum displacement of any lug with respect to the plane through the other 3 lugs is maximum 1.5 mm. The 1.5 mm tolerance is incorporated in this deviation.

Fig.13 Lug position.

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2.7.1 BEZEL CONTOUR



Dimensions in mm.

The X, Y and Z reference points are located on the outside surface of the faceplate at the intersection of the minor, major and diagonal screen axis respectively.

The distance Z from any point on the screen to the centre can be calculated using the following formula:

$$R_1 = 1370$$

$$R_2 = 1100$$

$$X_A = 90.01$$

$$X_B = 17.74$$

$$X_X = \sqrt{X^2 + Y^2}$$

$$X_B = X_A - \frac{R_2}{R_1} \times X_A$$

$$Z_A = R_1 - \sqrt{R_1^2 - X_A^2}$$

$$Z_B = R_1 - R_2 - Z_C$$

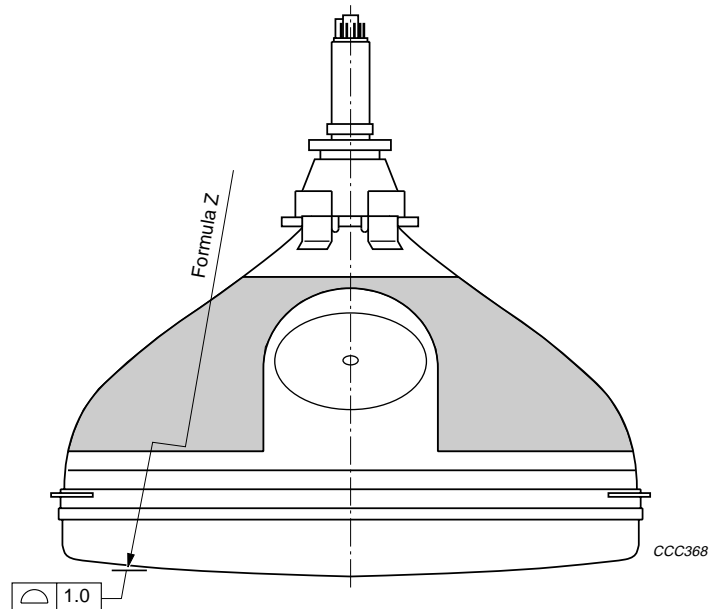
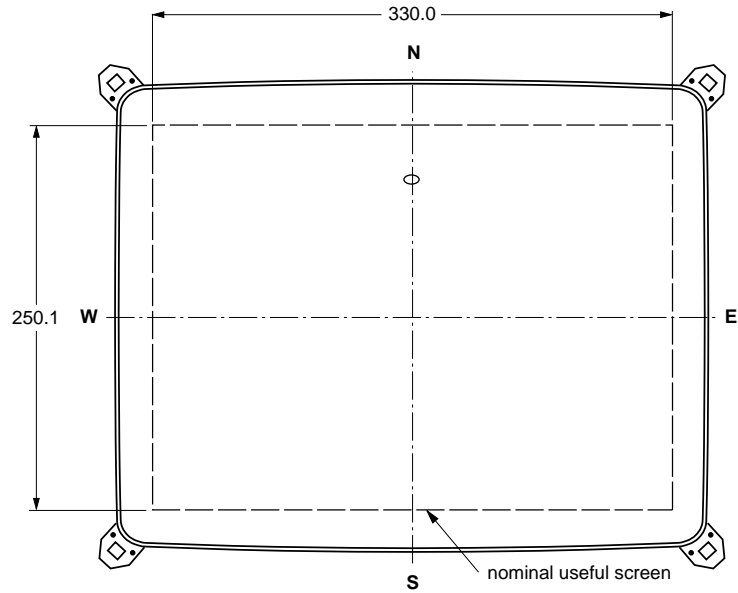
$$Z_C = (R_1 - Z_A) \times \frac{X_B}{X_A}$$

$$\text{if } X_X < X_A \text{ then } Z = R_1 - \sqrt{R_1^2 - X_X^2} \text{ else } Z = Z_B + R_2 - \sqrt{R_2^2 - (X_X - X_B)^2}$$

Fig.14 Screen reference points.

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Dimensions in mm.

Fig.15 Bezel contour details.

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2.7.2 BEZEL CONTOUR DATA

Sagittal heights of the useful screen measured with respect to the end of the diagonal axis.

NOMINAL USEFUL SCREEN (NUS)			3 mm INSIDE NUS			5 mm OUTSIDE NUS		
COORDINATES		SAGITTAL HEIGHT (mm)	COORDINATES		SAGITTAL HEIGHT (mm)	COORDINATES		SAGITTAL HEIGHT (mm)
X (mm)	Y (mm)		X (mm)	Y (mm)		X (mm)	Y (mm)	
0.0 ⁽¹⁾	125.1	10.9	0.0	122.1	10.5	0.0	130.1	11.6
10.0	125.1	10.8	10.0	122.1	10.4	10.0	130.1	11.5
20.0	125.0	10.7	20.0	122.0	10.3	20.0	130.0	11.4
30.0	125.0	10.5	30.0	122.0	10.1	30.0	130.0	11.2
40.0	125.0	10.3	40.0	122.0	9.8	40.0	130.0	11.0
50.0	124.9	9.9	50.0	121.9	9.5	50.0	129.9	10.6
60.0	124.8	9.5	60.0	121.9	9.1	60.0	128.8	10.2
70.0	124.7	9.0	70.0	121.7	8.5	70.0	129.7	9.7
80.0	124.6	8.4	80.0	121.6	8.0	80.0	129.6	9.1
90.0	124.5	7.7	90.0	121.5	7.3	90.0	129.5	8.4
100.0	124.4	6.9	100.0	121.4	6.5	100.0	129.4	7.6
110.0	124.2	6.1	110.0	121.2	5.7	110.0	129.2	6.8
120.0	124.1	5.2	120.0	121.1	4.8	120.0	129.1	5.9
130.0	123.9	4.1	130.0	120.9	3.7	130.0	128.9	4.8
140.0	123.7	3.0	140.0	120.7	2.6	140.0	128.7	3.7
150.0	123.5	1.9	150.0	120.5	1.5	150.0	128.5	2.5
160.0	123.3	0.6	160.0	120.3	0.2	160.0	128.3	1.3
164.3 ⁽²⁾	123.2	0.0	161.3	120.3	0.0	169.2	128.1	0.0
164.3	120.0	0.3	–	–	–	169.3	120.0	0.8
164.4	110.0	1.2	161.4	110.0	1.0	169.4	110.0	1.8
164.5	100.0	2.1	161.5	100.0	1.8	169.5	100.0	2.7
164.6	90.0	2.9	161.6	90.0	2.6	169.6	90.0	3.4
164.7	80.0	3.6	161.7	80.0	3.3	169.7	80.0	4.1
164.8	70.0	4.2	161.8	70.0	3.9	169.8	70.0	4.8
164.8	60.0	4.8	161.8	60.0	4.5	169.8	60.0	5.3
164.9	50.0	5.2	161.9	50.0	4.9	169.9	50.0	5.7
164.9	40.0	5.6	161.9	40.0	5.3	169.9	40.0	6.1
164.9	30.0	5.9	161.9	30.0	5.5	169.9	30.0	6.4
165.0	20.0	6.1	162.0	20.0	5.8	170.0	20.0	6.6
165.0	10.0	6.2	162.0	10.0	5.9	170.0	10.0	6.7
165.0 ⁽³⁾	0.0	6.2	162.0	0.0	5.9	170.0	0.0	6.7

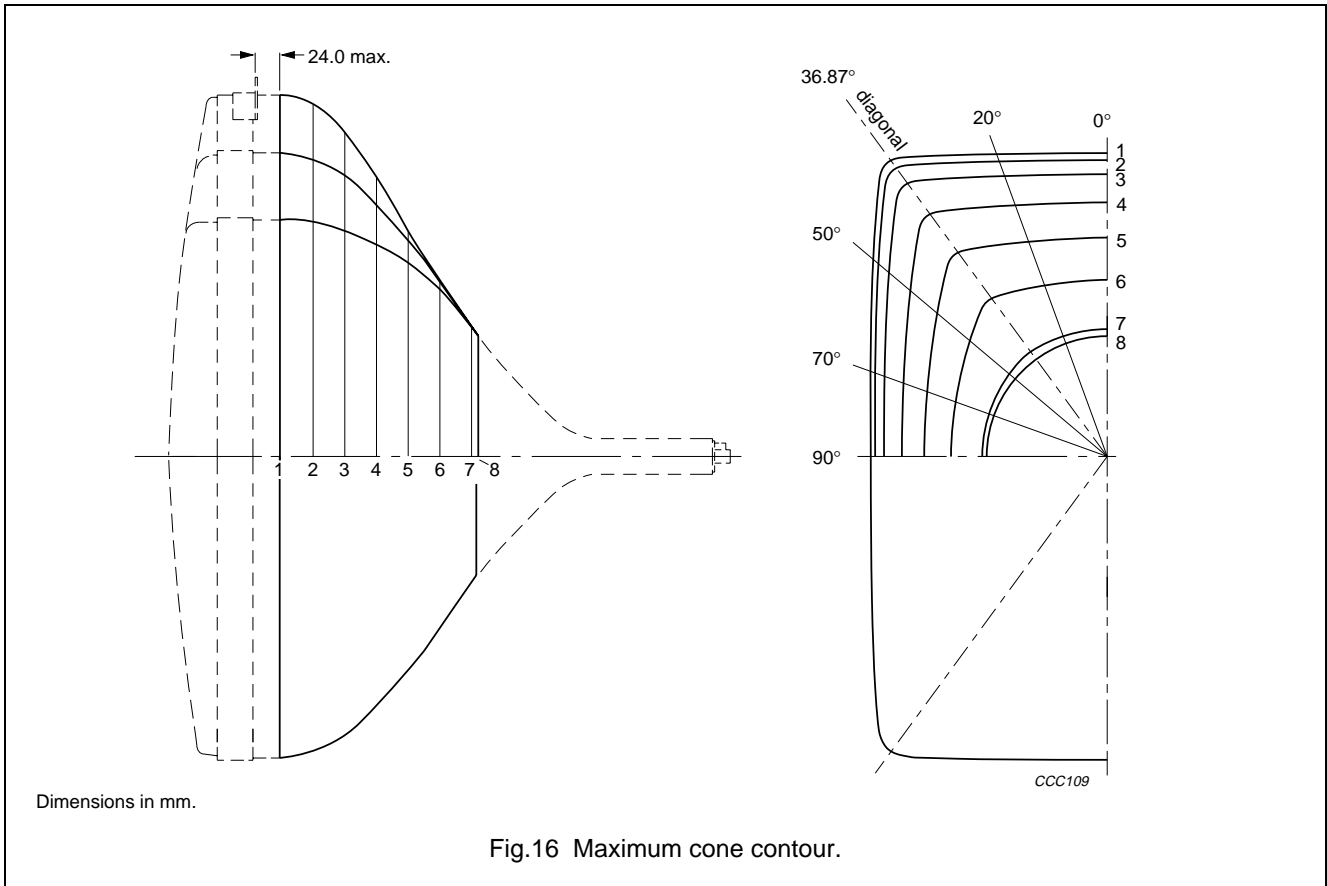
Notes

1. End of short axis.
2. End of diagonal axis.
3. End of long axis.

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2.7.3 CONE CONTOUR



2.7.4 CONE CONTOUR DATA

SECTION	NOMINAL DISTANCE FROM SECTION 1 (mm)	MAXIMUM DISTANCE FROM TUBE AXIS (mm)										
		0°	10°	20°	30°	36.87°	40°	50°	60°	70°	80°	90°
1	0.0	184.3	186.9	195.1	210.0	221.0	217.9	187.3	167.2	154.9	148.2	146.1
2	20.0	179.8	182.1	189.2	201.1	209.6	207.2	181.5	162.5	150.6	144.1	142.1
3	40.0	169.9	171.6	176.4	183.5	186.6	185.2	169.0	153.5	143.2	137.4	135.5
4	60.0	154.8	155.8	158.5	161.7	162.0	160.9	152.4	142.1	134.3	129.6	128.1
5	80.0	134.1	134.7	136.1	137.1	136.6	135.9	132.2	127.2	122.6	119.5	118.4
6	100.0	109.9	110.2	110.6	110.6	110.3	110.0	108.6	106.9	105.1	103.7	103.2
7	120.0	82.4	82.5	82.7	82.7	82.6	82.6	82.3	81.9	81.5	81.1	80.9
8	124.8	75.4	75.4	75.4	75.5	75.5	75.4	75.4	75.3	75.3	75.2	75.2

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3 APPLICATION CONDITIONS**3.1 Flashover protection**

With the high voltage used with this tube (max. 27.5 kV) internal flashovers may occur. As a result of Soft-flash technology these flashover currents are limited to approximately 60 A offering higher 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 in accordance with Fig.17; 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 focus electrode (g_{foc}) of 12 kV ($1.5 \times V_{gfoc}$ max. at $V_a = 25$ kV), and 2 kV at the other electrodes, at an atmospheric pressure of 100 kPa.

The values of the series isolation resistors should be as high as possible (min. 1.5 k Ω) 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.

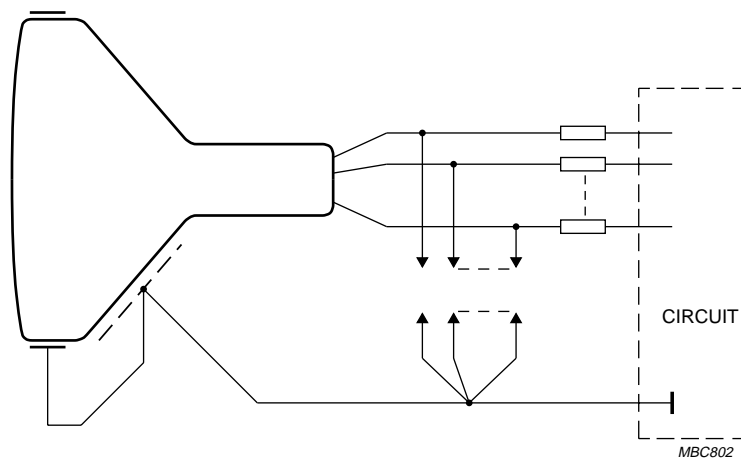


Fig.17 Flashover protection circuit.

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4 PERFORMANCE SPECIFICATION**4.1 Test conditions**

All voltages are measured with respect to grid 1 ($V_{g1} = 0$ V) and apply to all tests unless otherwise stated.

The tube must be preheated ($V_f = 6.15$ V) for a minimum of 30 minutes before measurement unless otherwise stated.

SYMBOL	PARAMETER	VALUE
COL	colour	white ($x = 0.245$, $y = 0.320$)
V_f	heater voltage	6.15 V
V_k	cathode voltage	100 to 125 V
V_{g2}	grid 2 voltage	310 to 685 V; nom. = 500 V
V_{gfoc}	focus grid voltage	to be adjusted for focus in east and west, using a crosshatch pattern, when beam current (black background) is adjusted to 5 mA (p-p) for white
V_a	anode voltage	23 kV
T_{amb}	ambient temperature	25 ± 5 °C
	magnetic field	local field, facing east
	test pattern	crosshatch; 350 μ A (p-p) for each gun

4.2 Electrical tests

TEST	CONDITIONS	REQUIREMENTS
Heater current		270 to 350 mA
Inter-electrode insulation: - $g_1g_2/+kfg_{foc}$ - $g_1g_{foc}/+kfg_2$	insulation test voltage = 450 V; $R_{series} = 10$ M Ω ; leakage current measured on each gun separately	≤ 10 μ A ≤ 10 μ A
Cathode to heater insulation	insulation test voltage = -150 to +250 V; $R_{series} = 3.3$ M Ω ; each gun measured separately	≥ 50 M Ω
Grid 2 leakage current	$V_k = 200$ V	-4 to +4 μ A
Focus grid leakage current	$V_k = 200$ V	-4 to +4 μ A
Stray emission	measured on line; $V_k = 200$ V; ambient light level at tube face ≈ 1 lux	no annoying stray emission
Flashover	V_k adjusted for $I_a = 3 \times 10$ μ A; flashovers occurring during setting-up should be ignored	not more than 1 flashover within 1 minute or not more than 2 flashovers within 15 minutes after setting-up; if more than 2 flashovers occur, test is extended for 15 minutes during which 2 flashovers are permitted
Voltage breakdown	$V_k = 400$ V; $V_{g2} = 1200$ V; $V_{gfoc} = 7.8$ kV; $V_a = 25$ kV	no continuous external arcing
Focus voltage (V_{gfoc})		6.7 to 7.6 kV
Difference in focus voltage between red, green and blue guns		≤ 300 V
Sharpness (halo)		≤ 1.0 mm on horizontal line at screen centre

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TEST	CONDITIONS	REQUIREMENTS
Cut-off voltage (V_{g2})	$V_k = 120$ V; V_{g2} adjusted for spot just cut-off; each gun measured separately	310 to 650 V
Cathode voltage ratio ($V_{k\ max}/V_{k\ min}$)	V_k adjusted for spot just cut-off on screen; $V_{g2} = 500$ V	≤ 1.25
Cathode emission (I_k)	I_k is measured after reducing $V_k = 51$ V; each gun measured separately	≥ 700 μ A
Cathode warm-up time	$V_k = 70$ V; tube has been in operation for at least 1 hour during previous 10 hours; no preheating	≤ 10 s (50% of I_k after 2 minutes)
Static convergence drift after switching on	V_k adjusted for $I_a = 350$ μ A (peak) (crosshatch pattern); tube has been in operation for at least 1 hour during previous 10 hours	≤ 0.4 mm
Raster shift	V_k adjusted for spot just visible; position of undeflected green spot measured with respect to screen centre	$\leq \pm 3$ mm
Centring error	V_k adjusted for spot just visible; position of undeflected green spot measured with respect to screen centre	$\leq \pm 4$ mm
White colour uniformity	V_k adjusted for $I_{a\ (total)} \approx 60\%$ of long term average value, measured 15 minutes after switching on; V_{gfoc} adjusted for focus; viewing distance = $5 \times$ screen height in ambient light of ≈ 1 lux; ensure adequate degaussing; colour uniformity of individual rasters should also be considered	no distinct colour differences
Gas value (I_a)	V_k adjusted for $I_{gfoc} = 400$ μ A; $V_{g2} = 250$ V; $V_{gfoc} = 250$ V; $V_a = -80$ V; tube is operated as an ionization gauge according to stated conditions	$I_a \leq -40$ nA

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4.3 Blemish specification**4.3.1 QUALITY OF FACEPLATE AND OF UNACTIVATED SCREEN**

Measurable blemishes are faults in the screen glass or phosphor layer, having clearly defined edges and are clearly visible immediately (within 5 seconds) at the viewing distance, or show up as high contrast in the "Philips Graticule" (catalogue number 7322 991 00882).

The size of a measurable blemish is given by:

$$\frac{L+W}{2} \text{ (for } L < 4W \text{) or,}$$

$$\frac{L}{20} + 2W \text{ (for } L \geq 4W \text{),}$$

where:

L = length of the blemish

W = width of the blemish.

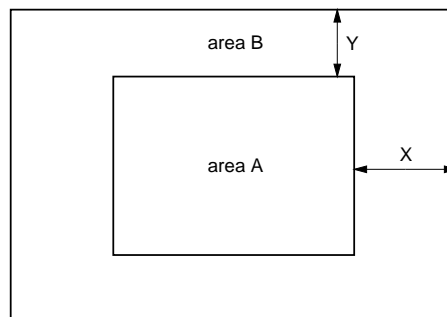
In those size categories where a minimum enclosing circle is indicated, the blemishes lying within this circle shall be regarded as one fault equal in size to the sum of the individual blemish sizes.

The quality assessment is performed at a viewing distance ≥ 1 m, in a diffused ambient light of 1000 lux maximum.

The useful screen area is bounded by the edge of the phosphor screen. This area is divided into areas A and B, located as shown in Fig.19.

4.3.2 MAXIMUM PERMISSIBLE NUMBER OF BLEMISHES FOR GLASS AND OF UNACTIVATED SCREEN
(see Fig.19 for area definitions)

BLEMISH SIZE (mm)	MAXIMUM PERMISSIBLE NUMBER OF BLEMISHES		DIAMETER OF MINIMUM ENCLOSING CIRCLE (mm)
	AREA A	AREA B	
>1.0	0	0	–
>0.6 to 1.0	0	2	30
>0.4 to 0.6	2	5	30
≤ 0.4	limited only by cloud		–



MGA105

X = 80 mm.

Y = 60 mm.

Fig.19 Dimensions of areas A and B.

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4.3.3 MAXIMUM PERMISSIBLE LENGTH OF SCRATCHES ON THE FACEPLATE

WIDTH OF SCRATCHES (mm)	MAXIMUM PERMISSIBLE LENGTH OF SCRATCHES (mm)
>0.15	none
>0.1 to ≤0.15	10
>0.05 to ≤0.1	40
≤0.05	no limit

4.3.4 QUALITY OF ACTIVATED SCREEN

Measurable blemishes are faults affecting the illuminance of the phosphor layer, which are clearly visible immediately (within 5 seconds) at viewing distance.

The size of a measurable blemish is given by:

$$\frac{L+W}{2} \text{ (for } L < 4W \text{) or,}$$

$$\frac{L}{20} + 2W \text{ (for } L \geq 4W \text{),}$$

where:

L = length of the blemish.

W = width of the blemish.

Blemishes are classified according to contrast degree:

- High contrast:
 - Blemishes which are clearly visible immediately (within 5 seconds). Missing or unlit green phosphor stripes fall into this category.
- Medium contrast:
 - Blemishes which are just visible. Missing or unlit blue and/or red phosphor stripes fall into this category.

To determine the contrast category it is advisable to use the "Philips Graticule". This graticule is held at arms length over the blemish and then moved from the 0.7 to the 1.3 filter. The following criteria are used to determine the contrast categories:

- High contrast:
 - Blemishes which are visible through the 0.7 filter and are immediately visible upon entering the 1.3 filter.
- Medium contrast:
 - Blemishes which are visible through the 0.7 filter but disappear momentarily upon entering the 1.3 filter.

In those size categories where a minimum enclosing circle is indicated, the blemishes lying within this circle shall be regarded as one fault equal in size to the sum of the individual blemish sizes.

If blemishes falling under different contrast categories are visible simultaneously, apply the larger minimum enclosing circle rule and treat all such enclosed blemishes as being in the lower contrast category, provided that the individual blemishes are within the limits for their own contrast category.

If blemishes falling under different size categories are visible simultaneously, then the total quantity of blemishes should not exceed the maximum number of blemishes allowable for the least critical of these categories.

The quality assessment should take place at nominal conditions. The beam current is adjusted to 60% of the long term average value. The assessment is performed at a viewing distance of approximately 5 × screen height, in an ambient light of approximately 1 lux, using a white raster.

The useful screen area is bounded by the edge of the phosphor screen. The area is divided into areas A and B, located as shown in Fig.19.

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4.3.5 ACCEPTANCE LIMITS AND CLASSIFICATION OF BLEMISHES

Maximum permissible number of blemishes for activated screen (see Fig.19 for area definitions).

BLEMISH SIZE (mm)	MAXIMUM PERMISSIBLE NUMBER OF BLEMISHES				DIAMETER OF MINIMUM ENCLOSING CIRCLE (mm)
	HIGH CONTRAST		MEDIUM CONTRAST		
	AREA A	AREA A + B	AREA A	AREA A + B	
>2.5	0	0	0	0	–
>1.8 to 2.5	0	0	1	2	30
>1.2 to 1.8	0	0	2	3	30
>1.0 to 1.2	0	0	4	6	30 (high contrast)
>0.6 to 1.0	0	2			10 (medium contrast)
>0.4 to 0.6	2	5			
≤0.4	limited only by cloud				–

4.4 White uniformity

White uniformity is the uniformity of colour and brightness of the luminescent screen when viewed with a white raster

The assessment of screen uniformity should take place at nominal conditions (see "Test conditions") and a total beam current of approximately 60% of the published long term average value. The assessment should be made after the tube has been operated for 15 minutes under the stated conditions. The tube should be thoroughly degaussed and properly adjusted with respect to the convergence and colour purity.

The screen should be viewed at a distance of approximately 5 × screen height and in an ambient light of approximately 1 lux.

A tube should be accepted if no distinct colour differences are immediately visible within 5 s.

The colour uniformity of individual rasters should also be considered.

4.5 Convergence specification

Misconvergence is the distance between centres of the red, green and blue lines at the screen using rectangular coordinates.

Anode and/or focus voltage may affect the static convergence performance.

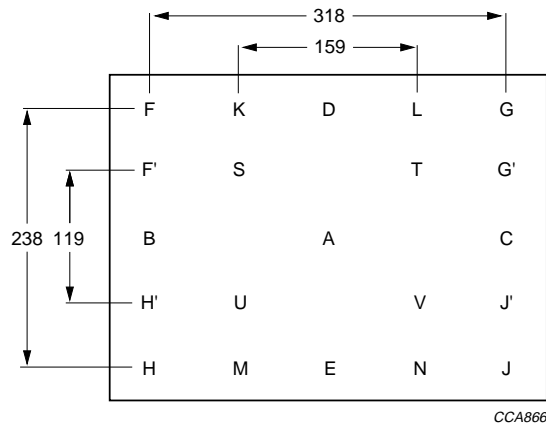
All measurements are carried out with the tube facing east and after 15 minutes operation.

4.5.1 MAXIMUM MISCONVERGENCE AFTER 15 MINUTES OPERATION

LOCATION (see Fig.20)	MAXIMUM ERROR BETWEEN ANY COLOUR (mm)
A	0.3
B, C, D, E	0.8
F, G, H, J	1.3
K, L, M, N	1.0
F', G', H', J'	1.0
S, T, U, V	0.9

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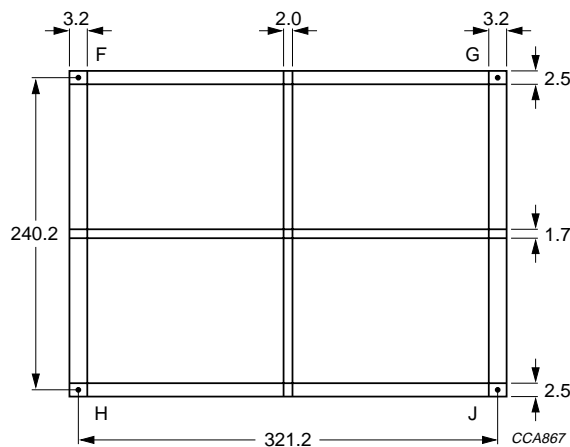
CCA866

Dimensions in mm.
 Maximum centring error is 4 mm.
 Diameter of test circles at measuring points is 10 mm.

Fig.20 Convergence test points.

4.6 Raster distortion

Raster lines of a matched tube/coil combination should fall within the area defined in Fig.21.



CCA867

Dimensions in mm.
 Total pattern distortion measured with east-west correction.

Fig.21 Total pattern distortion.

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5 ERGONOMIC, ENVIRONMENTAL DATA

5.1 X-radiation

Maximum anode voltage at which the X-radiation emitted will not exceed 1 $\mu\text{Sv/h}$ when operated at 27.5 kV and 1 mA.

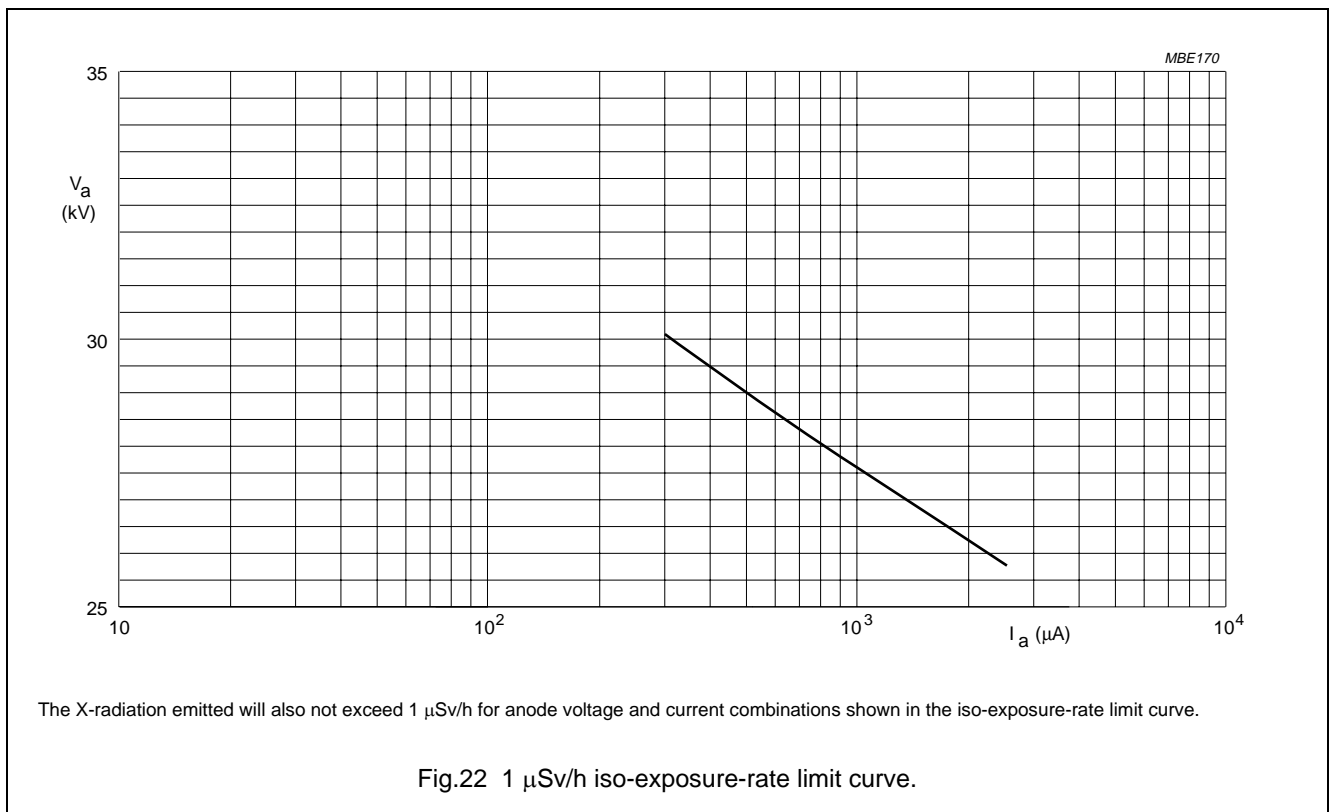
PARAMETER	TYP.	UNIT
Entire tube; note 1	30	kV

Note

- This rating applies only if the anode connector used by the set maker provides the necessary attenuation to reduce the X-radiation from the anode contact by a factor equal to the difference between the anode button iso-exposure-rate limit curve and the iso-exposure-rate limit curve for the entire tube.

WARNING

The cathode ray tube is intrinsically safe in accordance with "Appendix III Röntgenverordnung".
Eigensichere Kathodenstrahlröhre nach "Anlage III Röntgenverordnung".



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5.2 Electrical safety

The high voltage at which the tube is operated may be very dangerous. The TV-set should include safeguards to prevent the user from coming into contact with the high voltage.

Remember when replacing or servicing the tube assembly that a residual electrical charge may be carried by the anode contact and also by the external coating if not earthed. Before removing the tube assembly from the equipment, earth the external coating and short the anode contact to the coating. Extreme care should be taken in servicing or adjustment of any high voltage circuit.

Discharging the high voltage to isolated metal parts such as cabinets and control brackets may produce a shock hazard.

5.3 Handling

Although all picture tubes are provided with integral implosion protection, which meets the intrinsic safety requirements stipulated in the relevant part of "IEC 65000", care should be taken not to scratch or knock any part of the tube. The tube assembly should never be handled by the neck, deflection unit or other neck components. In addition it should not be handled in the anode and A2 insulation area which should be kept clean and free from dust and dirt.

In all handling procedures prior to insertion in the receiver cabinet, there is a risk of personal injury if severe accidental damage to the tube occurs.

It is therefore recommended that in areas containing unpacked and unprotected tubes, protective clothing is worn, **particularly gloves and safety glasses with side-shields** to prevent possible injury from flying glass in the event of such an accident. **Handle the tube with extreme care.** Do not strike, scratch or subject the tube to more than moderate pressure.

When placing a tube assembly face downwards, ensure that the screen rests on a soft pad of suitable material, kept free from abrasive substances.

A picture tube assembly can be lifted from the edge-down position by using the two upper mounting lugs.

If suspending the tube assembly from the mounting lugs, ensure that a **minimum of two** are used. **Under no circumstances suspend the tube assembly from one lug.**

5.4 Packaging

The standard packaging provides protection against tube damage under normal conditions of shipment or handling. This is also valid for tubes with screen coatings, so no foil is being used on the screen. Observe any instructions given on the packaging and handle accordingly.

Under no circumstances should the tube assembly be subjected to accelerations greater than the values given in "Accelerations".

5.4.1 ACCELERATIONS

PARAMETER	PULSE DURATION	MAX.	UNIT
Acceleration in cone direction	≤10 ms	350	m/s ²
	30 ms	350	m/s ²
Acceleration in all other directions	30 ms	350	m/s ²

5.4.2 STORAGE CONDITIONS

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
T _{stg}	storage temperature	-20	+60	°C
RH	relative humidity	5	95	%
P _{stg}	atmospheric pressure	90	1060	hPa

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A41EAM40WB**6 DEFINITIONS**

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

7 LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. PDS customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify PDS for any damages resulting from such improper use or sale.

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NOTES

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NOTES



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Printed in The Netherlands