

Specification

M 51EDF300WB70L

51 cm / 21 inch rectangular monochrome CRT

Landscape format

Status: Preliminary

Modifications may be agreed upon after evaluation of about 200 products.

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1 View of changes

- The first release will be "01" .
- Changes and supplements to this specification during the development require the agreement of all persons responsible.

Responsible for the contents of this document are:

<i>Company/Department</i>	<i>Name</i>	<i>Tel.</i>	<i>Date</i>	<i>Signature</i>
PDS	P.Aerssens	+31 45 5439331		

Siemens
A&D SE BT E

ChangeNr.				
Date	11-1-2006	2-2-2006	21-6-2006	23-7-2007
Release	01	02	03	04

ChangeNr.				
Date	11-10-2007			
Release	05	06	07	08

Changed pages:

Release:

02

03

04

05

Pages:

01 : Type designation changed

10 : Blemish specification changed

15 : Heater Cathode voltage

22 : Drawing : brackets added

15 : Heater voltage specification , Brightness variation

18 : Stray emission

22 : Drawing

16 : Drawing. 15 : Heater voltage

07 : delete -with CL60 filter-

2 Application

CRT for displays in medical and alphanumeric applications

3 Characteristics

**high resolution
90° -deflection
flat & square colour bulb (low browning glass)
multicoated
conductive coated against charging
intrinsically safe
high contrast
high luminance
long life time**

4 Important notes

Implosion hazard

CRT is evacuated. In case of mechanical damage (e.g. by shock or scratches) implosion can occur.

CRT is labelled according:

**UL 1418
MPR II**

High voltage

For reasons of the CRT's capacities the anode connection can conduct high voltage for a long time after high voltage is switches off.

X-ray emission

Operating the tube within the limits the x-ray dose rate will be under the allowed value of 1 µSv/h (adequate to: 0,1 mR/h)

The tube is an intrinsic CRT type according the RöV (German Röntgenverordnung) dated Jan, 8th 1987, Part I; Attachment III, paragraph 6.

5 Mechanical Data

Screen **rectangular, R = 1370 mm**

Useable screen **• Screen diagonal min. 508,0 mm**
• Screen width min. 304,8 mm
• Screen height min. 406,4 mm

Position of operation **anode connector on top of tube**

Socket **JEDEC B10-277 or equal**

Neck diameter **29,1 mm ± 0,7 mm**

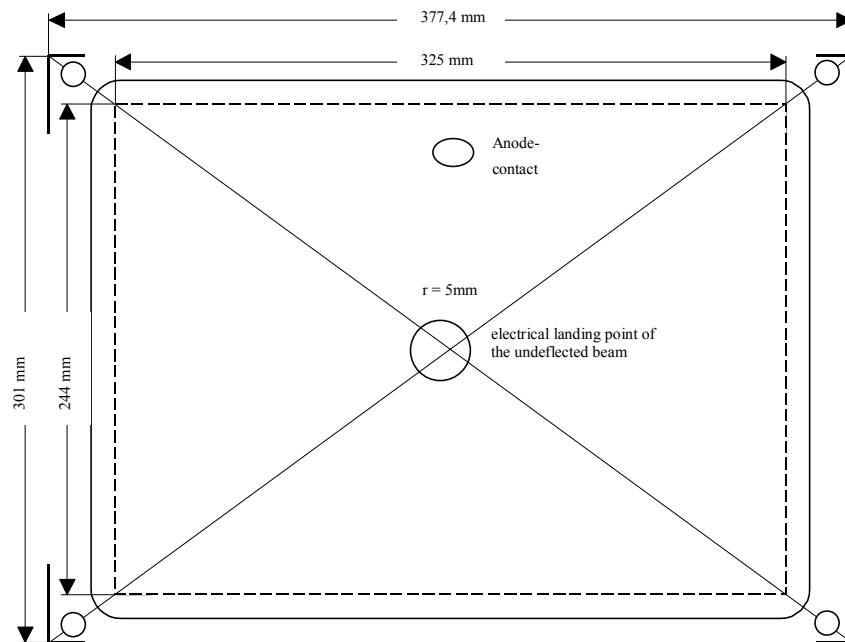
Anode connector **Bulb contact 7,92 DIN 41543**

Deflection yoke **Drawing nr. 250 898.ZZ**
THOMSON-Yoke No.: 9294.xx

Weight **Approx. 17,0 kg incl. Deflection yoke**

Mechanical outlines **see attachment 1**

6 Maximum of not deflected spot landing



- The CRT is mounted by angle brackets in a jig (see schematic) whose pick-up holes meet those of the monitor chassis.
- The CRT has to be moved in its fitting ears in such a way, that finally the centre of the glass bulb matches the mechanical centre of the jig ± 1 mm.
- Phosphor material must be everywhere within a window of 300×400 mm. The centre of that phosphor window matches the mechanical centre of the CRT.
- The spot or the deflection yoke will be adjusted, so that equal and symmetrical focus exists.
- The non-deflected spot landing must be within a circle with a radius of 2 mm around a point 3 mm left and 2 mm down from the mechanical centre of the CRT, provided that:
 - the CRT axis is in east-west direction and the front panel is facing east,
 - the anode connector is located on top of the tube,
 - the deflection unit has been mounted to the tube,
 - there is a metal shield behind the deflection unit around the tube's neck
- The maximum rotation angle of the deflection unit may not exceed 0.2° .

7 **Optical data**

Total transmission of bulb including coating/panel: 49 % ± 3 % at 546 nm

Phosphor P45

7.1 Noise Power (see fig.)

Color coordinates: P45-Phosphor
(during operation)

at a luminance of 250 Cd/m² X = (0,250 ± 0,01) Y = (0,305 ± 0,01)
(Nit).
(measured with LMT Color meter or Minolta CA100)

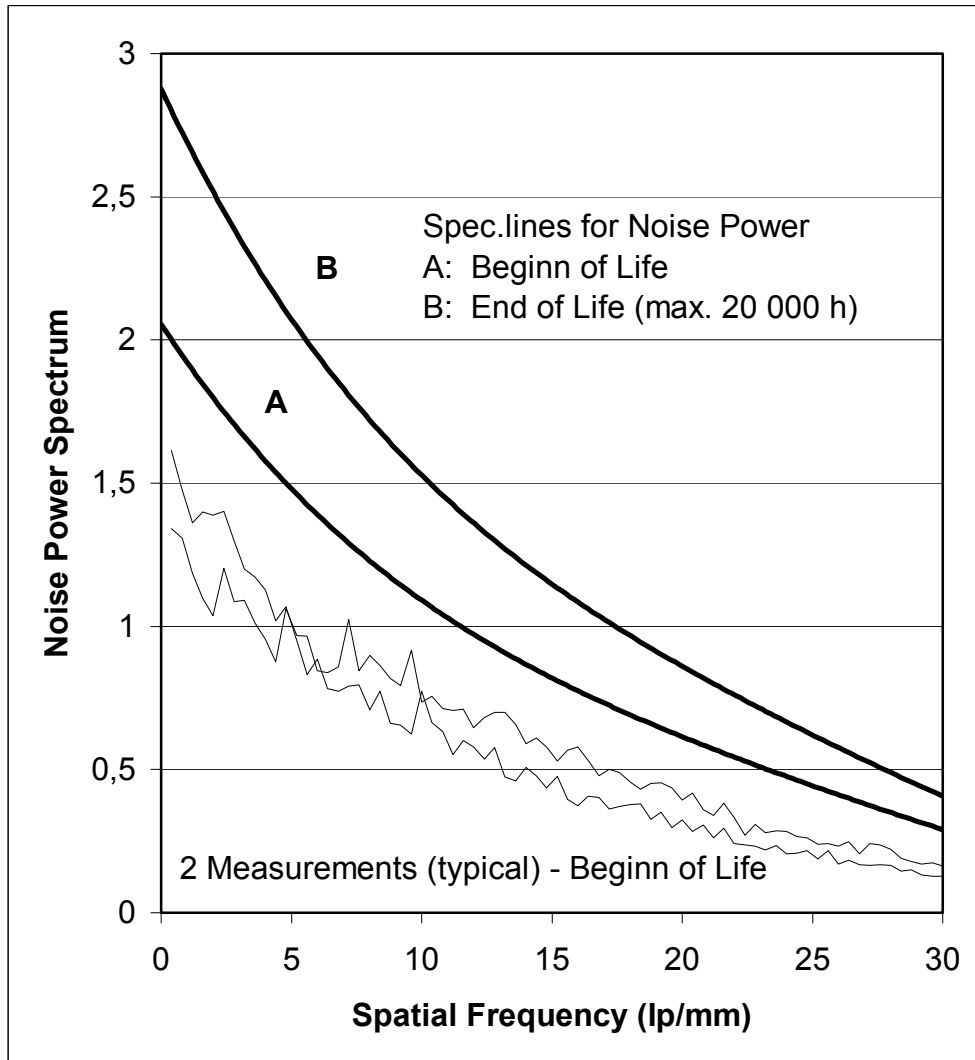
Front panel Transmission at 546 nm ca. 95% Coating : Flabeg OEL-95

Direct coating alternative after agreement with customer. The connection with the mounting device aluminium strips are mounted on front panel.

Uniformity of luminance from centre to any corner At a luminance of 50 Nit the overall deviation of luminance from centre to any corner may not exceed 12 Cd/m² (Nit) at any point of the screen.

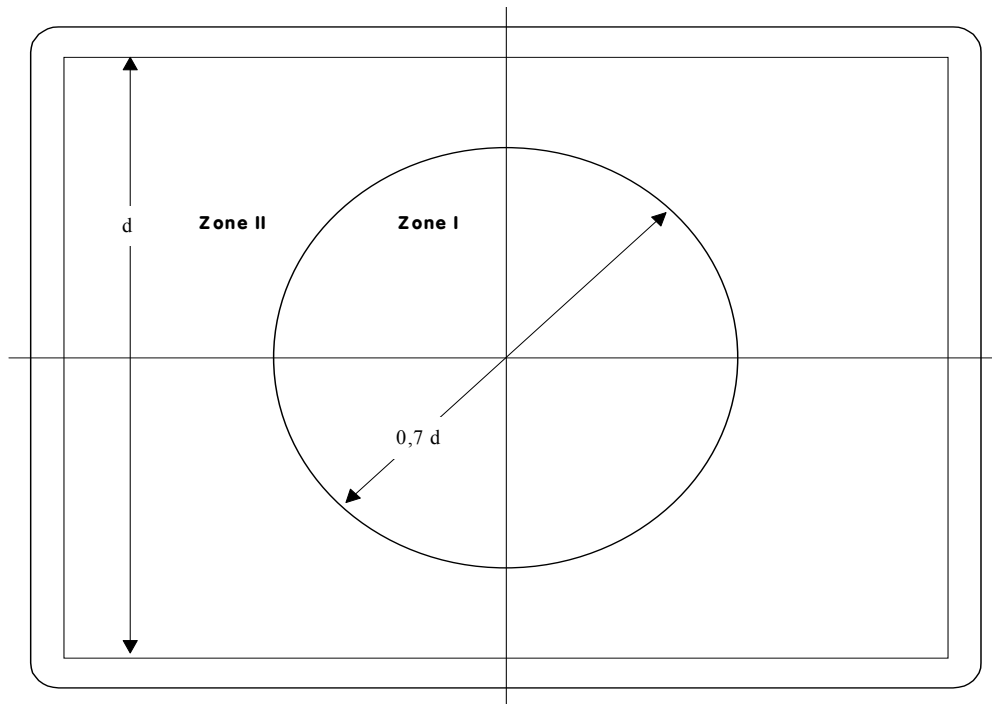
Glass bulb Drawingnbr. 252 907.GZ or equivalent bulb after agreement with customer.

7.1 Noise power



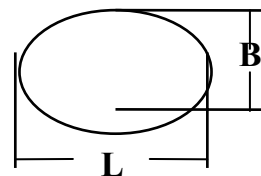
Noise Power measured with SIEMENS Measurement system.

8 **Permissible Glass and screen defects**



L: max. length of defects

B: max. width of defects



d = 300 mm

Defect size G for the screen and glass specification

for a side ratio of $L/B \leq 3$ $G = \frac{1}{2} (L + B)$
 for a side ratio of $L/B > 3$ $G = L/20 + 2 B$

Permissible defect (Panel included)

Defect size G in mm	Number of defects Zone I	Number of defects Zone II	Number of defects Sum ¹⁾
< 0,2	Within any area of 30 *30 mm only 3 phosphor defects with size 0.1 – 0.2 mm are allowed.		
0,2 < G < 0,4	2	3	4
0,4 < G < 0,6	-	3	3
Distance between defects	> 50 mm	> 50 mm	

1) Maximum number of defects in zone I and II : 4

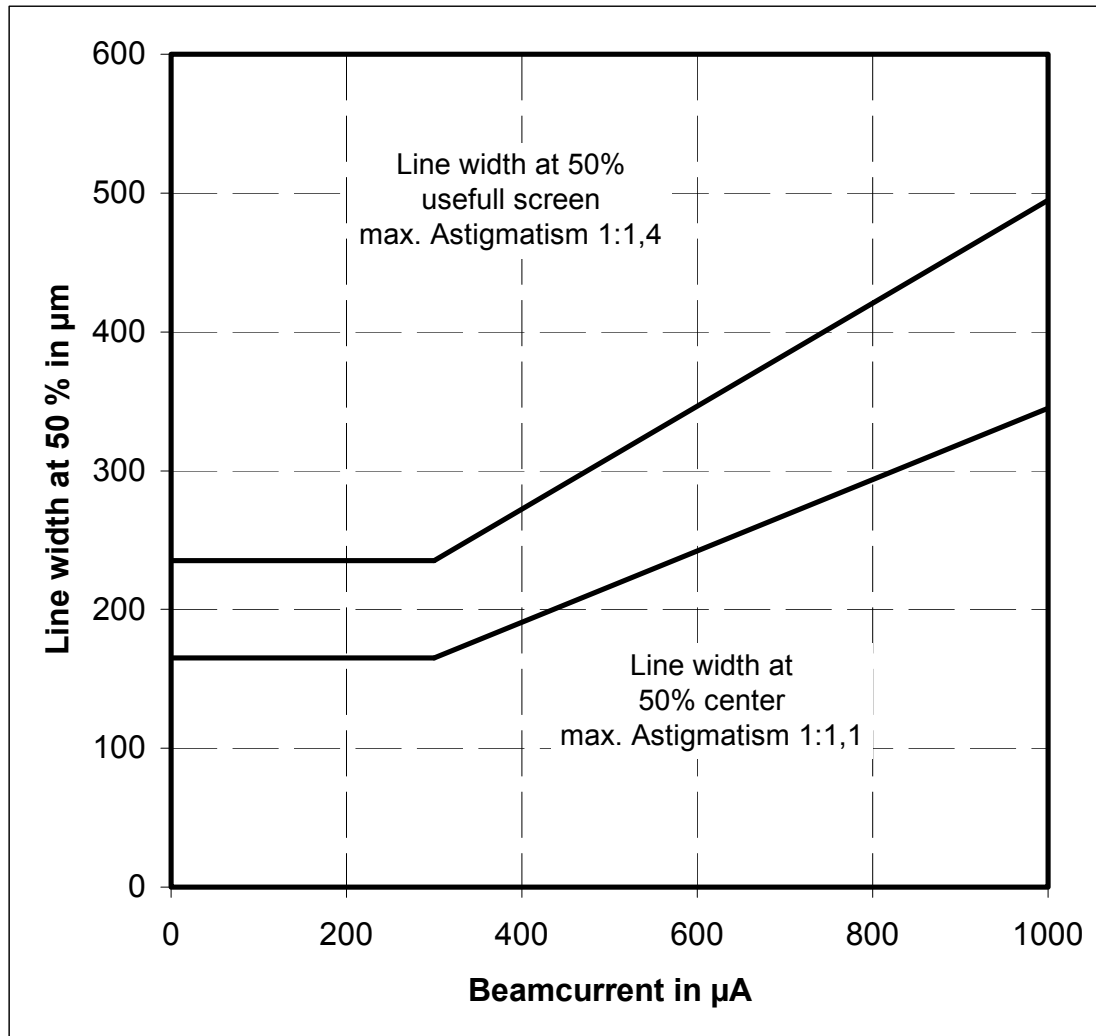
Scratches

Sum ≤ 2
 distance > 50 mm
 max. length < 10 mm
 max. width < 50 μ m

Scratches <15 μ m are permitted

Not allowed defects:

Open holes, stones, folds, cracks, accumulated defects, 'cloud'.

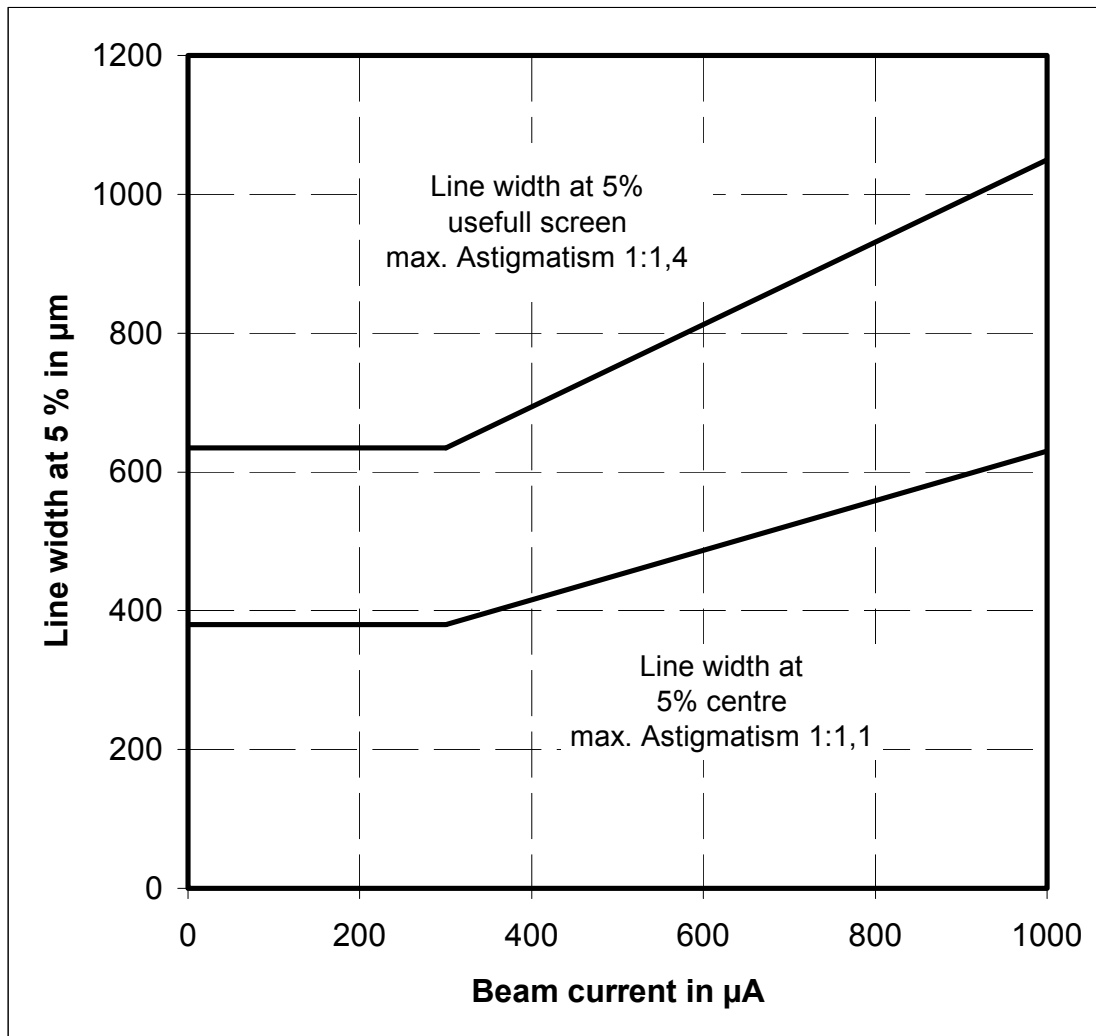
9 **Resolution****50 % of peak value****Optimal focus: 300 μ A****Duty cycle 100 %**

Measured with Microvision Superspot SS200 or PDS spot profile measuring system

- Astigmatism at 5% and 50 %-line width has the same shape.
- Astigmatism is not allowed to turn at increased beam current
- The spot profile approximates the Gaussian distribution.

Resolution

**5 % of peak value
Duty cycle 100 %**



Measured with Microvision Superspot SS200 or PDS spot profile measuring system

10 Electrical Data

Deflection

magnetically, deflection angle

- horizontal ca. 78°
- vertical ca. 60°
- diagonal ca. 90°

Focussing

electrostatic

Maximum currents (leakage)

I_{G1}	$\pm 1\mu A$	max. 5 changes allowed
I_{G2a}	$\pm 1\mu A$	
I_{G2b}	$\pm 1\mu A$	
I_{G3}	$\pm 2\mu A$	

Capacity *) (Grid 1 to all other electrodes)

C_{G1-all} 5,3 pF ± 1 pF

Capacity *) (Cathode to all other electrodes)

C_K 3.5 pF ± 1 pF

Capacity *) (Grid1 to cathode)

C_{G1-K} 2,3 pF $\pm 0,7$ pF

Capacity (Anode to outer coating)

C_{A-M1} 1600 ... 3000 pF

Electrical Data from THOMSON-Coil

Drawing nمبر. 250 898.ZZ
THOMSON-YOKE Nr. 9294.xx

Horizontal deflection

Lx 49,5 $\mu H \pm 5$ %

Rx 150 m $\Omega \pm 10$ %

Vertical deflection

Ly 1.83 mH ± 5 %

Ry 3.28 $\Omega \pm 10$ %

Rotationcoil

Rr 133 $\Omega \pm 10$ %

lr 47 mA / 1 °

Astigmatism Axial

La 23 $\mu H \pm 5$ %

Ra < 6 Ω

Astigmatism Diagonal

Ld 23 $\mu H \pm 5$ %

Rd < 6 Ω

*) measured with PHILIPS RLC Meßbrücke PM6303

11 Absolute limiting values

Cathode is reference point for all voltage values

First accelerating voltage	UG2 I&II	max. 1300 V min. - 400 V	
Second accelerating voltage	UA	max. 29,9 kV	
Focus voltage	UG4	max. 9kV	
Grid 1 voltage	- UG1	max. 150 V (200 V for 5 sec. after switch off) min. 2 V	
Heating against cathode	UHC	negative	255 V
		negative peak	300 V
		positive	3 V
		positive peak	50 V
	IHC	max. 15 μ A	
Grid 1 leakage resistance	RG1	1,5 M Ω	
Damping of deflection field:	<p>The power consumption of the horizontal deflection is allowed to increase by max. 1.4 W when yoke is mounted to the CRT. (at 80 kHz horizontal frequency, a retrace time of $\leq 2,5 \mu$s and a horizontal width of 400 mm at $U_A = 27,5$ kV).</p>		

12 Operating values

Cathode heating	- indirect		
	- Heating voltage	U_h	6.0 – 6.2 V
	- Heating current,	I_h	approx. 100 mA;
		$I_h \text{ max}$	0,5 A (cold state)

An integrated series resistor of 0.39 Ω reduces the effective heater voltage to 5.6-5.8V.

Cathode is reference point for all voltage values following

First accelerating voltage	$UG2 I$	600 - 930 V
Halo suppression voltage	$UG2 II$	0 - 200 V

Grid 1 voltage (for spot suppression)	- $UG1$	105 V
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second accelerating voltage	U_A	29,0 kV
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Drive voltage (grid drive) (from $I_c = 0 \mu A$ to $I_c = 1200 \mu A^1$)	ΔU_{WE}	max. 85 V
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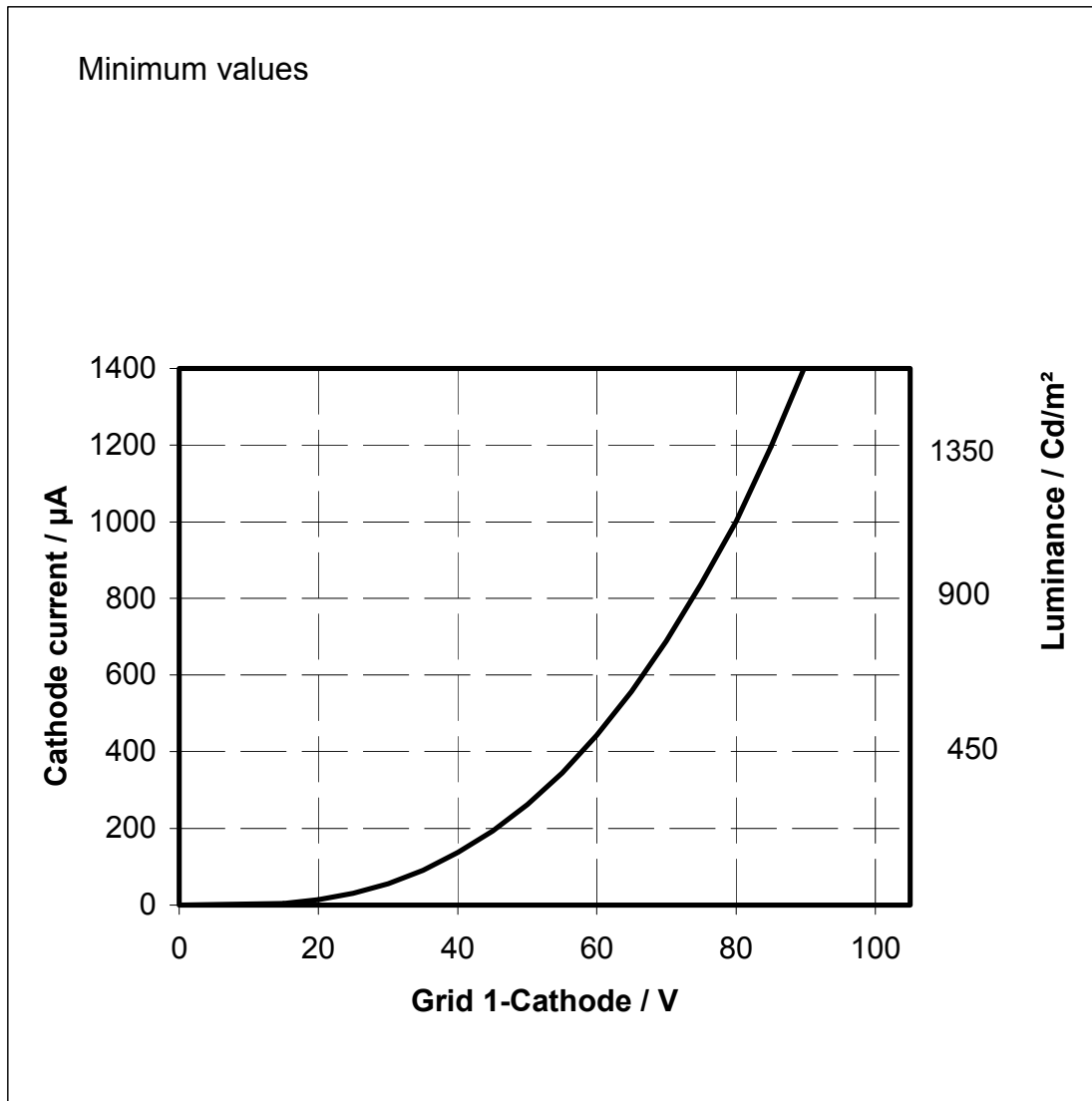
Luminance drift over time	max. 18 minutes after switch on (an overshoot of max 10% of cut-off voltage is allowed during this time)	
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Focus voltage (at centre of screen at $I_c = 300 \mu A$)	$UG3$	min. 6,80 kV nom. 7,15kV max. 7,50 kV
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Dynamic focus voltage (with reference to Thomson-yoke Nr. 9294.xx)	$UG3 \text{ dyn.}$	max. = 850 V
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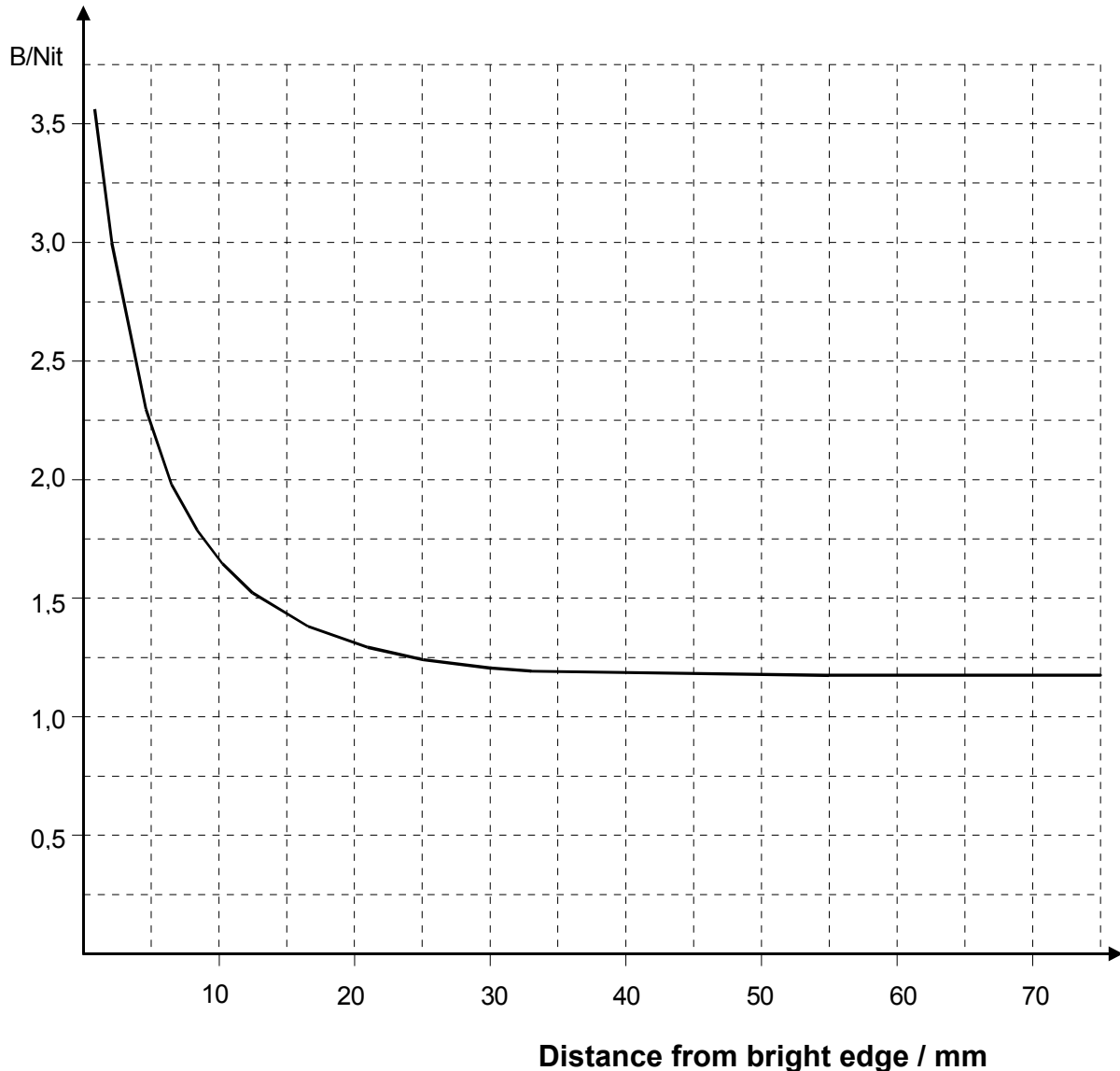
Brightness variation when changing from 100% white pattern to 10% square white pattern (same drive voltage)	No brightness variation allowed	
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Grid drive characteristics



Luminance at 100% duty cycle. Horizontal freq: 64 kHz; Vertical freq: 50 Hz.

Scan area 300*400 mm

14 Large area contrast**Max. value**

To measure the large area contrast a bright rectangle is displayed on one half of the screen. This area must be 50% of the total screen area with an aspect ratio of $x : y = 2:3$, and a luminance of 400 Nit.

The luminance of the black area is adjusted in such way that no lines can be seen in dark room conditions (optical cut-off value).

With the Microvisionsystem Superspot (or similar) the brightness is measured in relation to the distance from the black/white edge.

The bright rectangle must be totally covered with a non reflecting cover during measuring.

15 Environmental conditions

Temperature range:

Operation 0 to + 70 °C
 relative humidity 75 %
 non condensing

Storage - 40 to 70 °C

Temperature gradient 20 °C/h

Air pressure 400 hPa to 1060 hPa

16 Estimated life time

Decrease of the cathode current of 800 µA at 100 % duty cycle and constant Cut-Off-voltage (Grid 2-voltage adjusted)

after 20.000 hrs. < 10 %

Burning conditions:

The cathode current during testing is max. 500 µA at 100 % duty cycle over total scan area.

During life time of the CRT (20 000 hours) G2a voltage may be increased to max. 1250 V, to maintain G1-Cut-Off voltage of -105V.

At a maximum luminance level of 350 Nit, after 20.000 hours of operation ,the maximum decrease in phosphor luminance is 15 %.

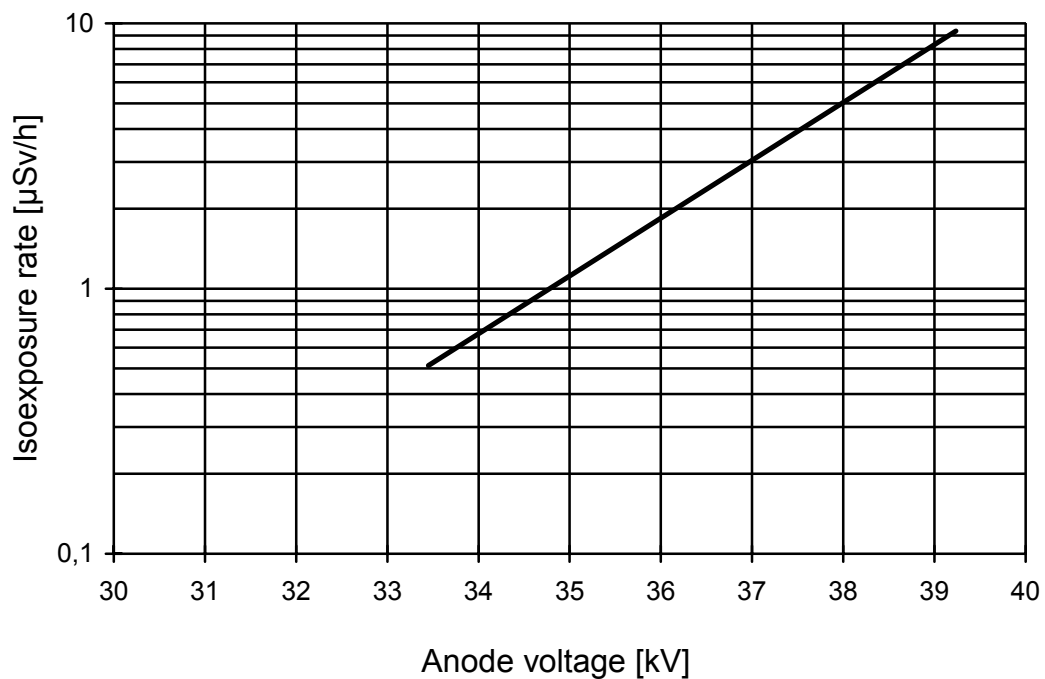
Stray emission : Maximum anode current in cut-off condition $U_c - U_{g1} > U_{co}$ after 10.000 hrs. : < 1 µA

17 **X-radiation**

X-Radiation Limit Curve

Conditions:

Cathode current $I_c = 250 \mu\text{A}$



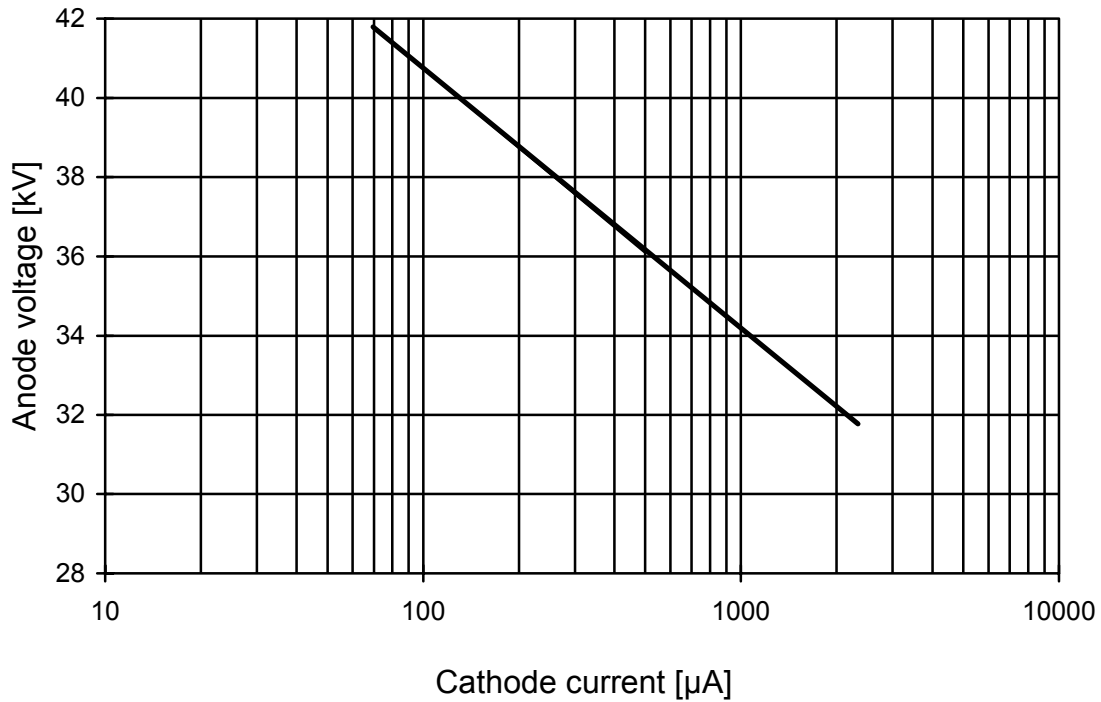
X-Radiation exposure rate vs. anode voltage at a constant value of cathode current measured at 5 cm from the CRT.

The measurement is according:

“Röntgenverordnung der Bundesrepublik Deutschland vom 8. Januar 1987”

Isoexposure - Rate Limit Curve

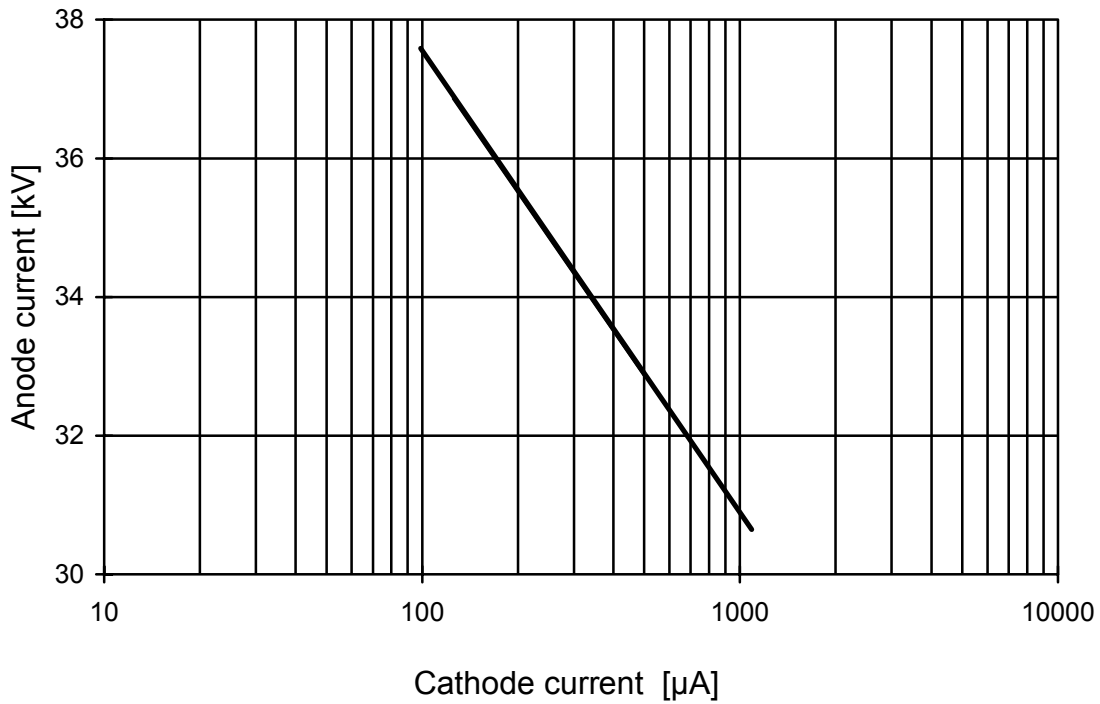
Calculated for 5 $\mu\text{Sv/h}$



This limit curve is plotted at an isoexposure rate of 5 $\mu\text{Sv/h}$ (0,5 mR/h) measured at 5 cm from the CRT.

Isoexposure - Rate Limit Curve

Calculated for 1 $\mu\text{Sv/h}$



This limit curve is plotted at an isoexposure rate of 1 $\mu\text{Sv/h}$ (0,1 mR/h) measured at 5 cm from the CRT.

