

Specification

M 51EDF240WB50P

51 cm / 21 inch rectangular monochrome CRT

Portrait 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>
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Siemens
A&D SE BT E

ChangeNr.	1			
Date	March 10 2006	June 21 2006	July 23 2007	
Release	01	02	03	04

ChangeNr.				
Date				
Release	05	06	07	08

Changed pages:

Release: 01 Pages: 11, changed blemish specification < 0,2mm.
 Release: 02 Pages:15, heater voltage specification, brightness variation. 20 : stray emission. 24 : drawing.
 Release :03 Page 15: heater voltage specification. 16: Grid drive characteristics.

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 labeled 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 the right (front view)

Socket JEDEC B10-277 or equal

Neck diameter 29,1 mm ± 0,7 mm

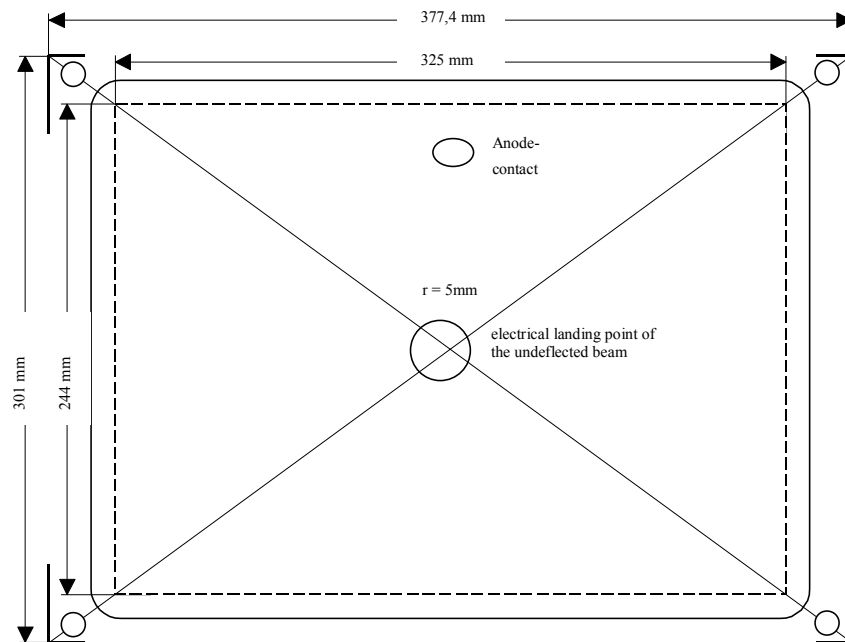
Anode connector Bulb contact 7,92 DIN 41543

Deflection yoke Drawing nr. 250 898.ZZ
THOMSON-Yoke No.: 9290.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 to 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 the right,
 - 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: **32 % ± 3 % at 546 nm**

Phosphor **P45**

7.1 **Noise Power (see fig.)**

Colour coordinates: (during operation) **P45-Phosphor**

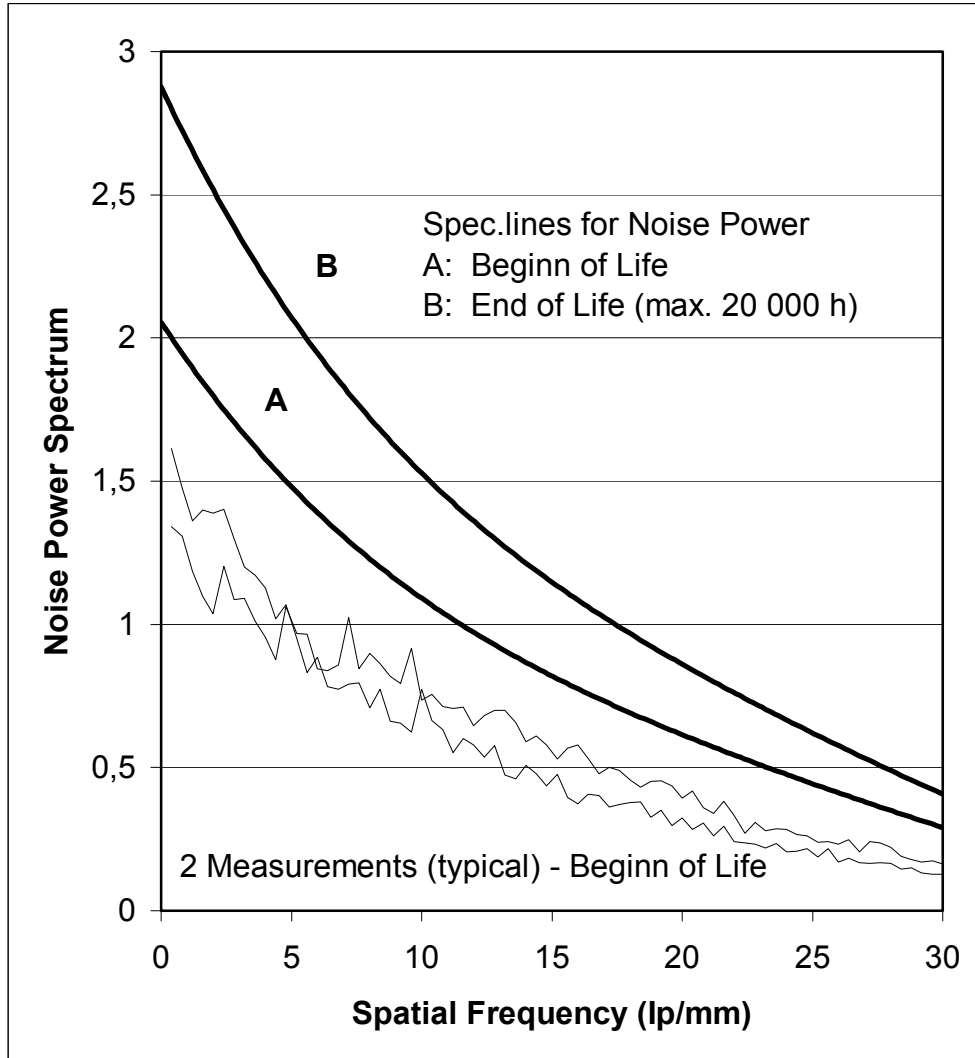
at a luminance of 250 Cd/m² (Nit) with CL60-Filter, (measured with LMT Colour meter or Minolta CA100) **X = (0,250 ± 0,01)** **Y = (0,305 ± 0,01)**

Front panel **Transmission at 546 nm ca.60% Coating Flabeg OEL-65.
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.**

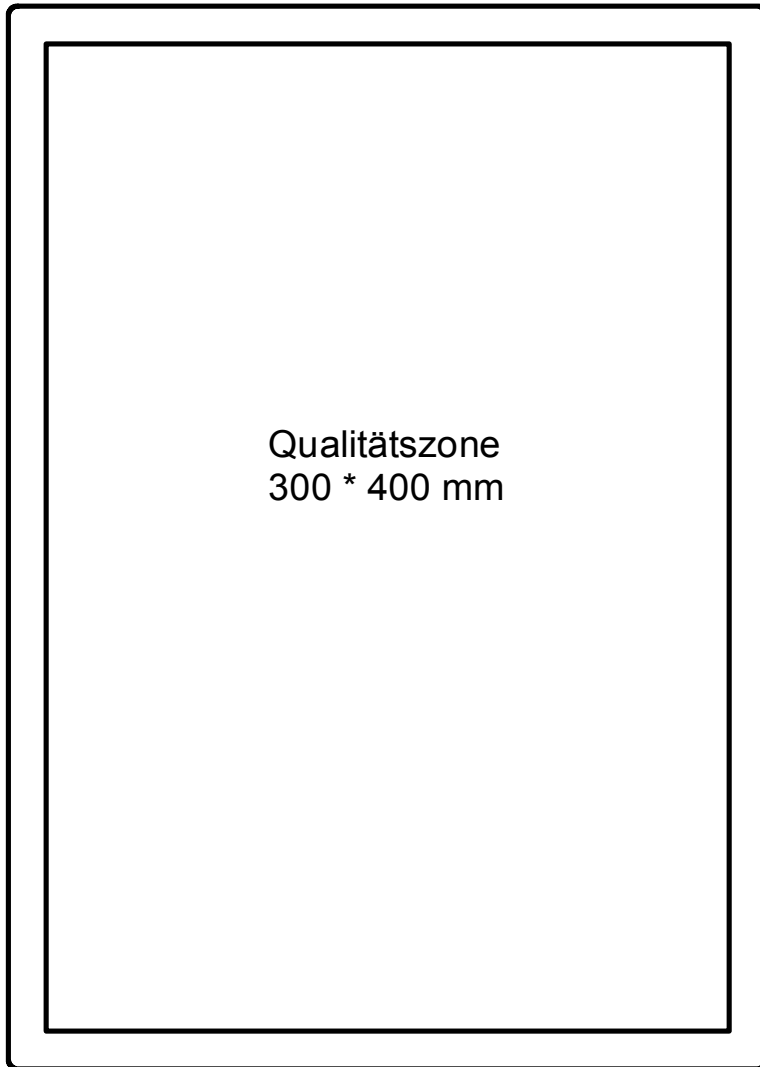
Glass bulb **Drawing nr. 252 907.GZ or equivalent bulb after agreement with customer.**

7.1 Noise power



Noise Power measured with SIEMENS Measurement system.

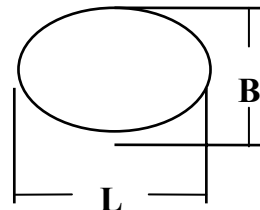
8 **Permissible Glass and screen defects**



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 (inclusive Panel)

Defect size G in mm	Quality zone 400 x 300 mm
$\leq 0,2^*$	Within an area of 30x30mm there are allowed 3 defects with size 0,1- 0,2mm.
$0,2^* < G \leq 0,4^*$	4
Distance between defects	> 50 mm

Scratches

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

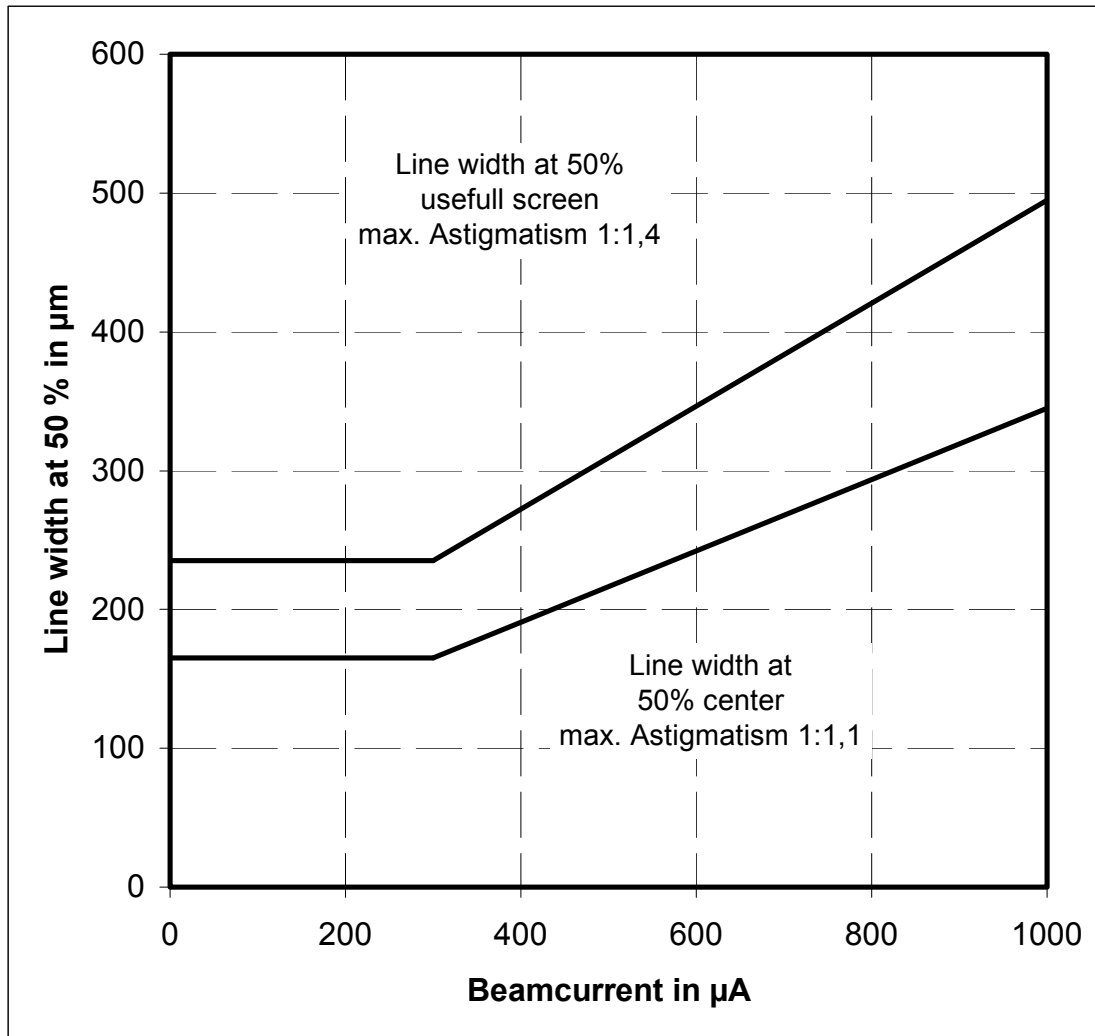
Scratches <15 μ m are permitted

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 %

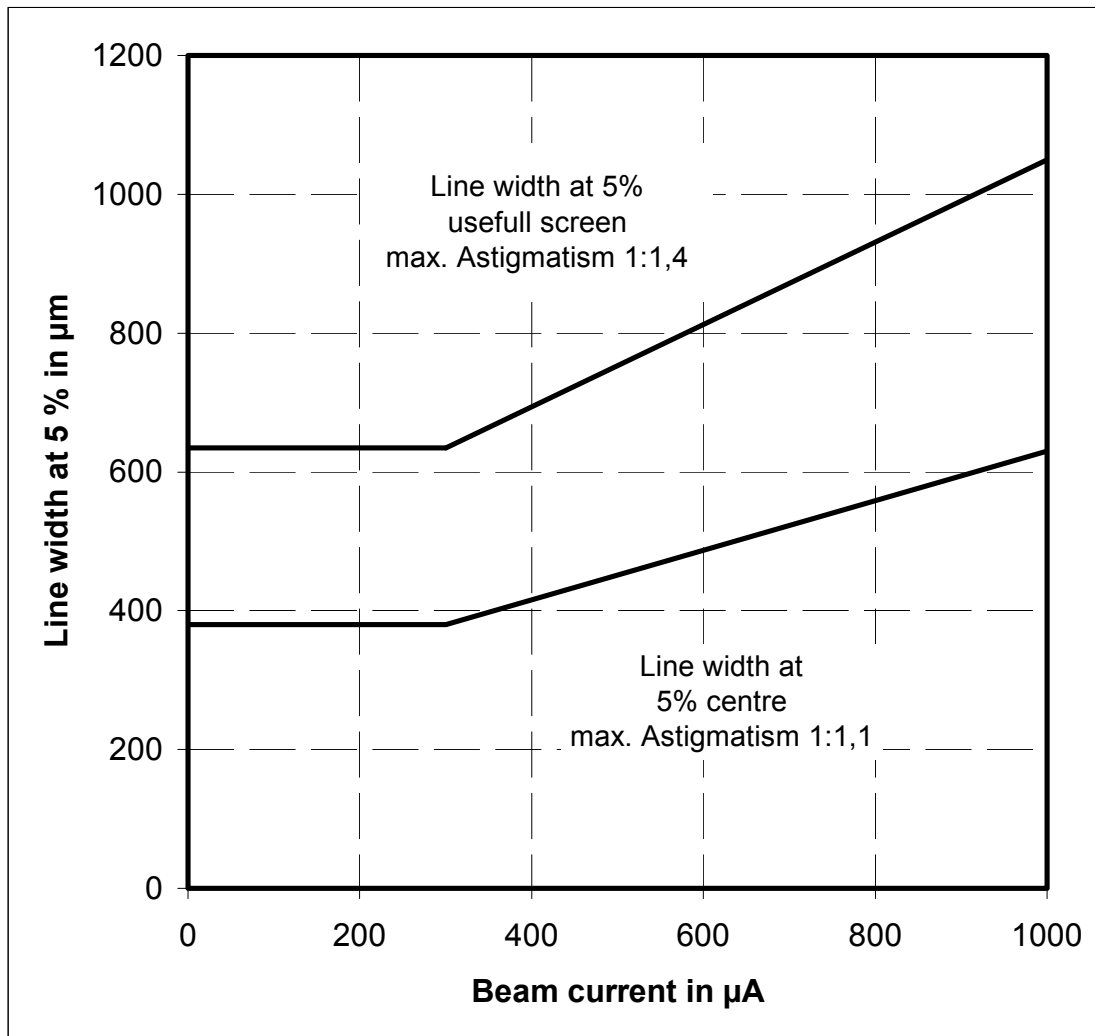


Measured with Microvision Superspot SS200 or PDS spot profile measuring system

- 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. 60°
- vertical ca. 78°
- 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 outhter coating)

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

Electrical Data from THOMSON-Coil

Drawing nمبر. 250 898.ZZ
THOMSON-YOKE Nr. 9290.xx

Horizontal deflection

Lx 27 $\mu H \pm 5$ %

Rx 125 m $\Omega \pm 10$ %

Vertical deflection

Ly 1.80 mH ± 5 %

Ry 3.00 $\Omega \pm 10$ %

Rotation coil

Rr 140 $\Omega \pm 10$ %

Ir 100 mA / 5.2 °

Astigmatism Axial

La 22.5 $\mu H \pm 5$ %

Ra 5.05 $\Omega \pm 10$ %

Astigmatism Diagonal

Ld 23.2 $\mu H \pm 5$ %

Rd 5.05 $\Omega \pm 10$ %

*) 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. 9 kV	
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:

The power consumption of the horizontal deflection is allowed to increase by max. 2,3W when yoke is mounted to the CRT.
(at 200 kHz horizontal frequency, a retrace time of $\leq 1,2 \mu$ s and a horizontal width of 300 mm at $U_A = 29,0$ kV).

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 vor all valtage values following

First accelerating voltage	$UG2 \text{ I}$	600 - 930 V
Halo suppression voltage	$UG2 \text{ II}$	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 $I_c = 0 \mu\text{A}$ to $I_c = 1200 \mu\text{A}^1$)	ΔU_{WE}	max. 85 V
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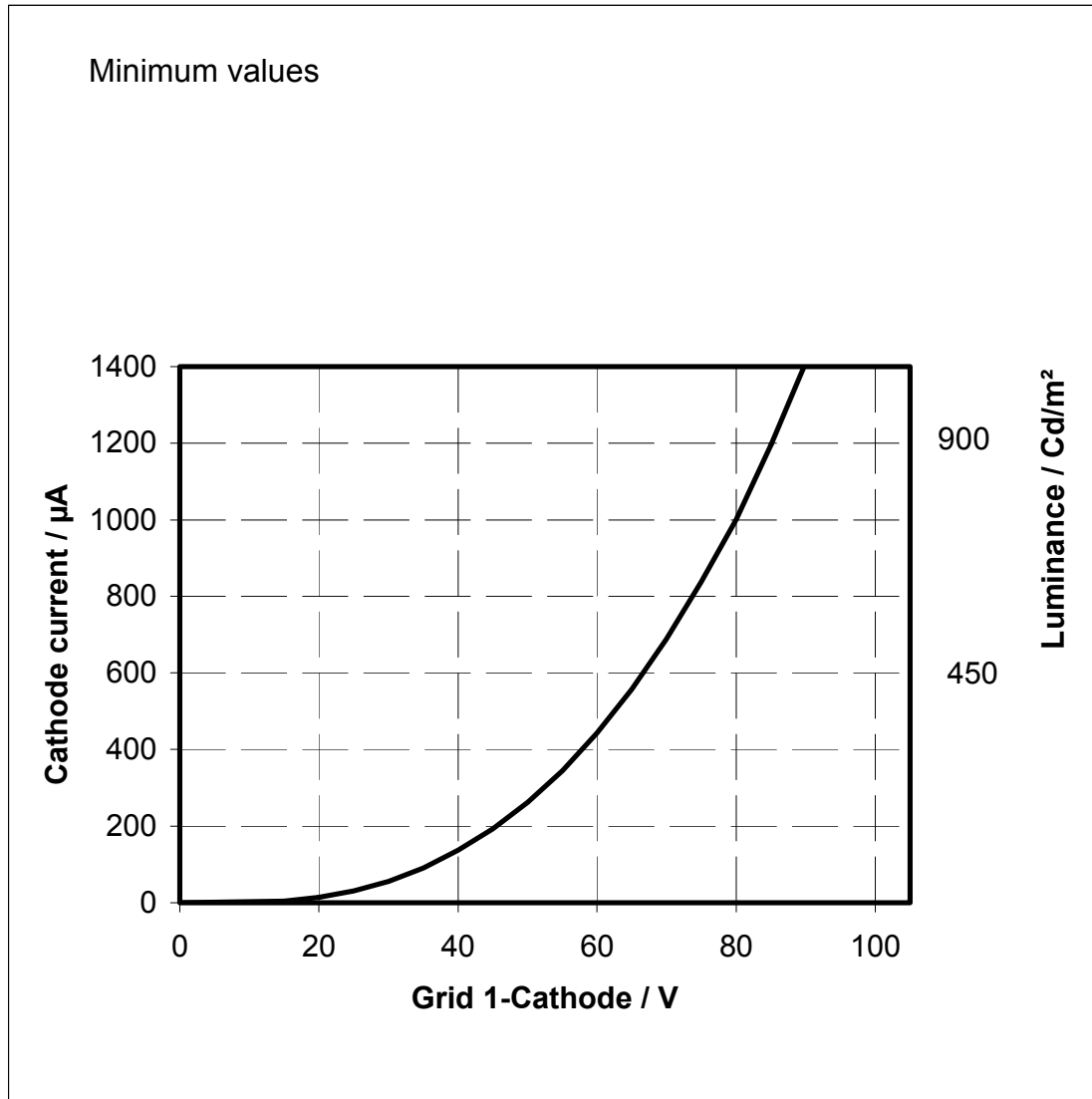
Luminance drift over time	max. 18 minutes after switch on (an overshoot of max 10% of cut-off voltage is allowed during this time)	
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Focus voltage (at centre of screen at $I_c = 300 \mu\text{A}$)	$UG3$	min. 6,80 kV nom. 7,15kV max. 7,50 kV
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Dynamic focus voltage (with reference to Thomson-yoke Nr. 9290.xx)	$UG3 \text{ dyn.}$	max. = 850 V
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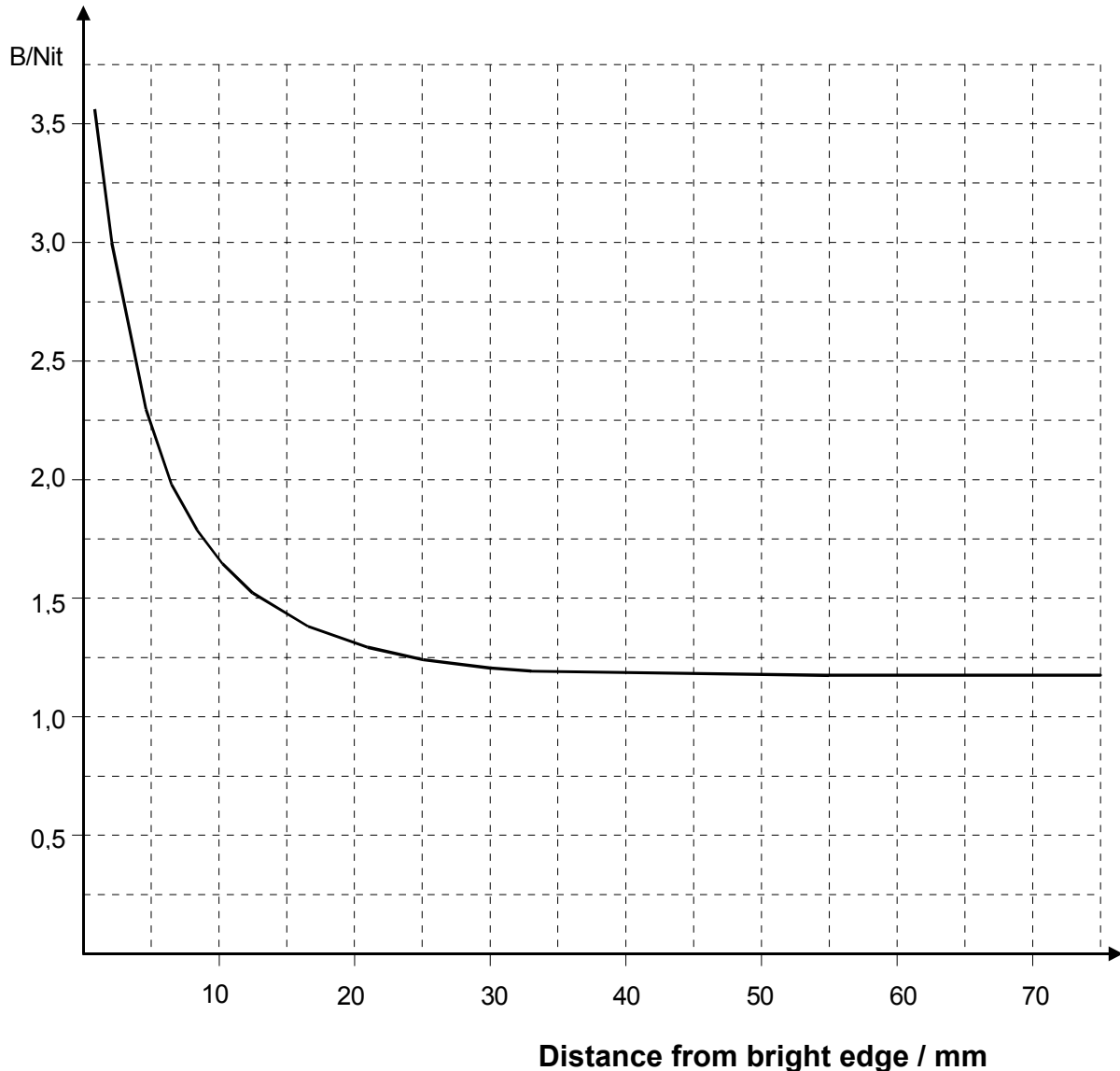
Brightness variation when changing from 100% white pattern to 10% square white pattern (same drive voltage)	No brightness variation allowed	
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Grid drive characteristics



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 %.

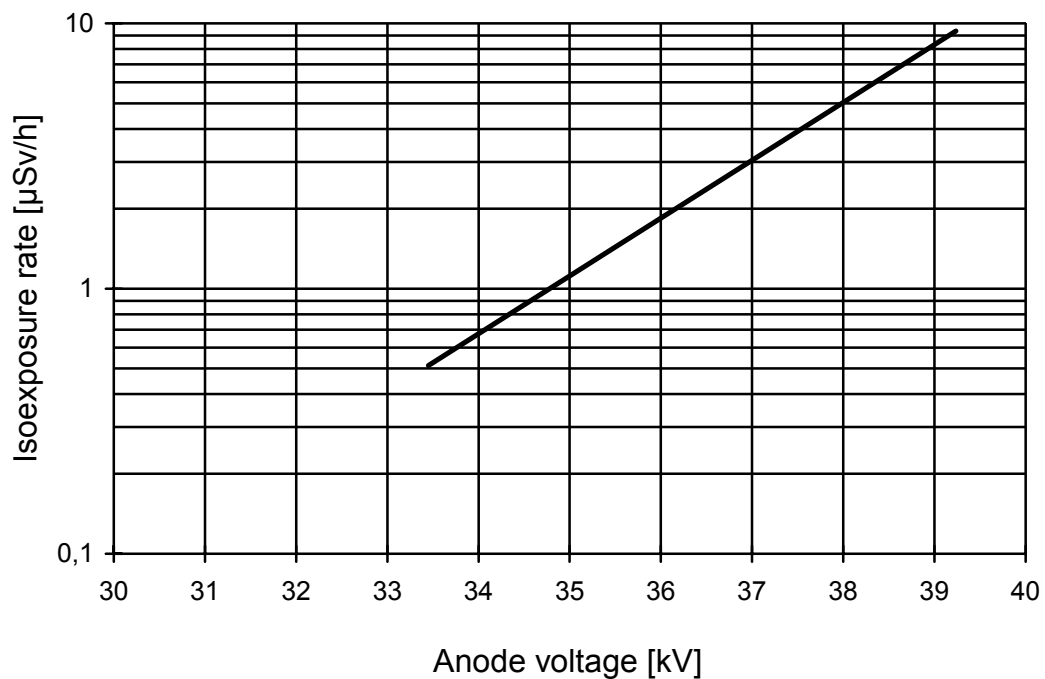
Stray emission : Maximum anode current in cut-off condition $U_c - U_{g1} > U_{co}$ after 10.000 hrs. : < 1 µA

17 **X-radiation**

X-Radiation Limit Curve

Conditions:

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



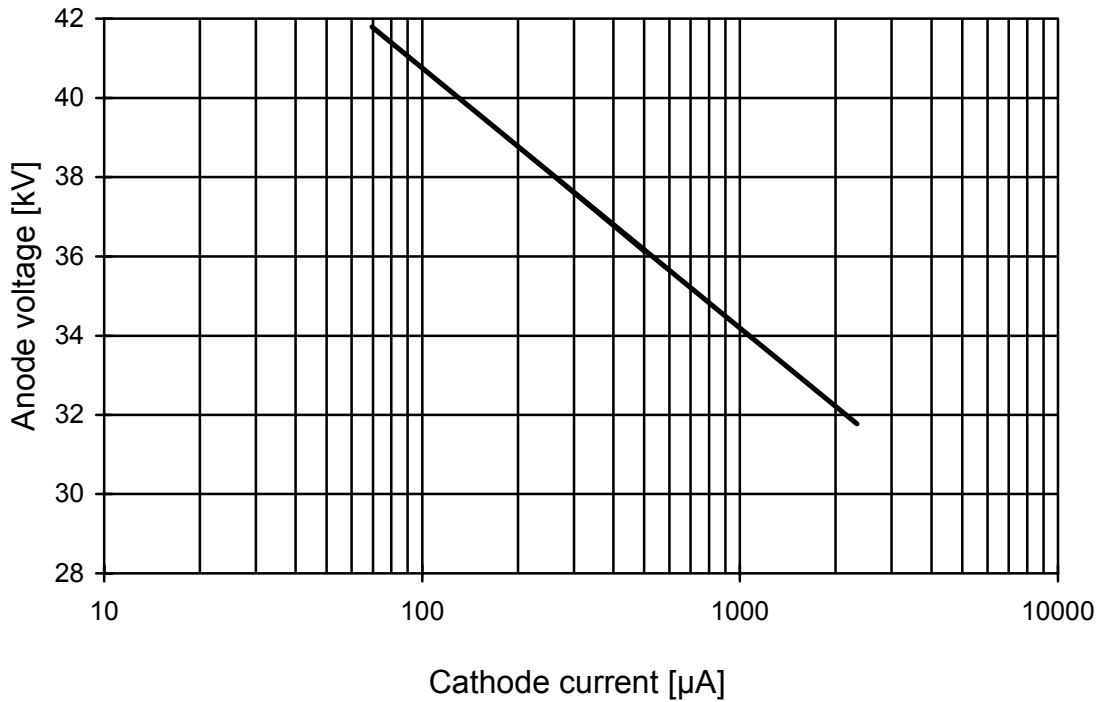
X-Radiation exposure rate vs. anode voltage at a constant value of cathode current measured at 5 cm from the CRT.

The measurement is according:

“Röntgenverordnung der Bundesrepublik Deutschland vom 8. Januar 1987”

Isoexposure - Rate Limit Curve

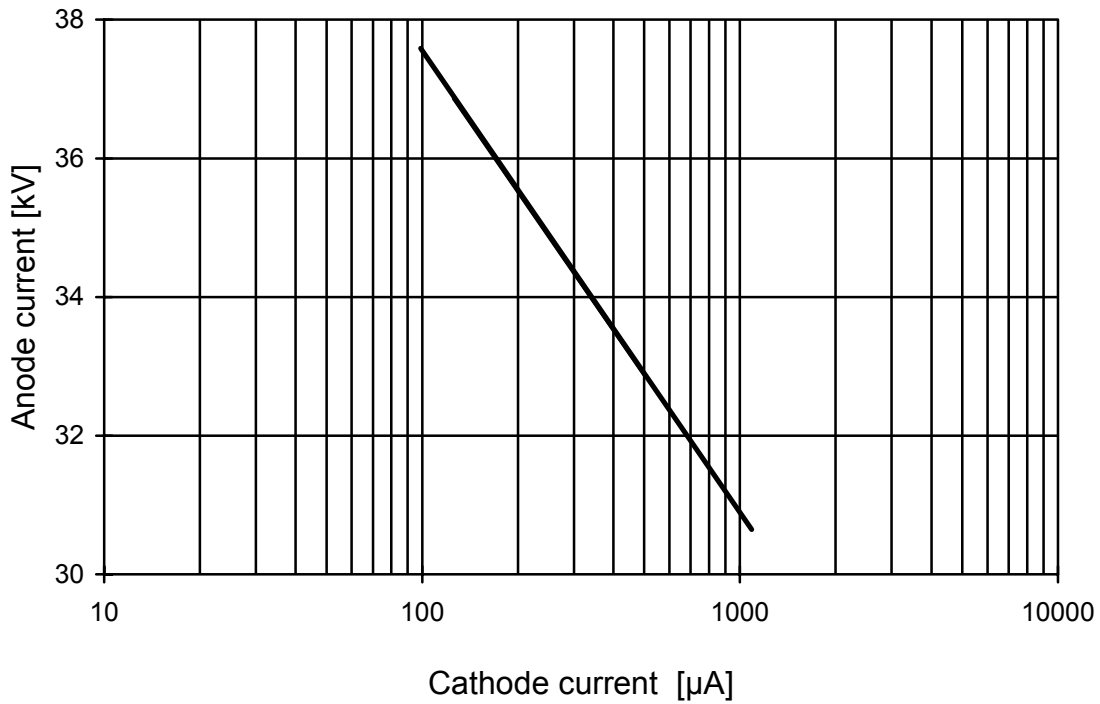
Calculated for 5 $\mu\text{Sv/h}$



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.

Attachment 1

