

# 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.**



## CONTENTS

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1	VIEW OF CHANGES
2	APPLICATION
3	CHARACTERISTICS
4	IMPORTANT NOTES
5	MECHANICAL DATA
6	MAXIMUM OF NOT DEFLECTED SPOT LANDING
7	OPTICAL DATA
8	PERMISSIBLE GLASS AND SCREEN DEFECTS
9	RESOLUTION
10	ELECTRICAL DATA
11	ABSOLUTE LIMITING VALUES
12	OPERATING VALUES
13	GRID DRIVE CHARACTERISTICS
14	LARGE AREA CONTRAST
15	ENVIRONMENTAL CONDITIONS
16	ESTIMATED LIFE TIME
17	X-RADIATION

**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

<b>ChangeNr.</b>				
<b>Date</b>	<b>11-1-2006</b>	<b>2-2-2006</b>		
<b>Release</b>	<b>01</b>	<b>02</b>	<b>03</b>	<b>04</b>

<b>ChangeNr.</b>				
<b>Date</b>				
<b>Release</b>	<b>05</b>	<b>06</b>	<b>07</b>	<b>08</b>

**Changed pages:**

<b>Release:</b>	<b>Pages:</b>
02	01 :Type designation changed
	11 : Blemish specification changed
	16 : Heater Cathode voltage
	25 : Drawing : brackets added

## 2 Application

CRT for displays in medical and alphanumeric applications

## 3 Characteristics

high resolution  
90° -deflection  
flat & square color bulb (low browning glass)  
multicoated  
conductive coated against charching  
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.

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CRT is labeled according:

UL 1418  
MPR II

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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.

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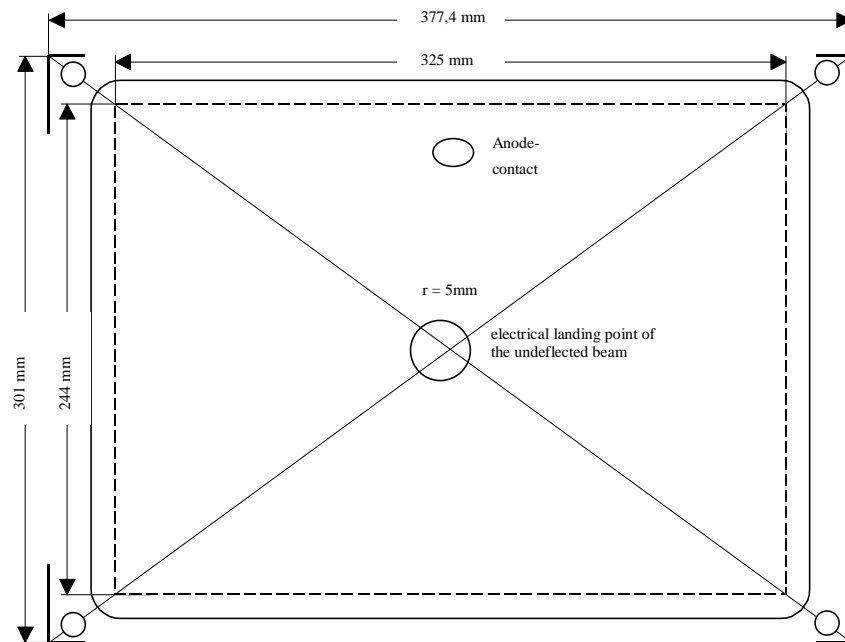
X-ray emission

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

The tube is an intrinsic CRT type according the R $\ddot{o}$ V (German R $\ddot{o}$ ntgenverordnung) dated Jan, 8<sup>th</sup> 1987, Part I; Atteachment III, paragraph 6.



## 6 Maximum of not deflected spot landing



- The CRT is mounted by angle brackets to an apparatus (see schematic in enclosure 1) 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  $\pm 1$  mm.
- Phosphor material must be everywhere within a window of  $300 \times 400$  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 symmetrical and equal 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  $0.2^\circ$ .

**7**      **Optical data**

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

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**Phosphor      P45**

**7.1      Noise Power (see fig.)**

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

**at a luminance of 250 Cd/m<sup>2</sup>      X = (0,250 ± 0,01)      Y = (0,305 ± 0,01)**  
**(Nit) with CL60-Filter,**  
**(measured with LMT Color meter or Minolta CA100)**

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**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.**

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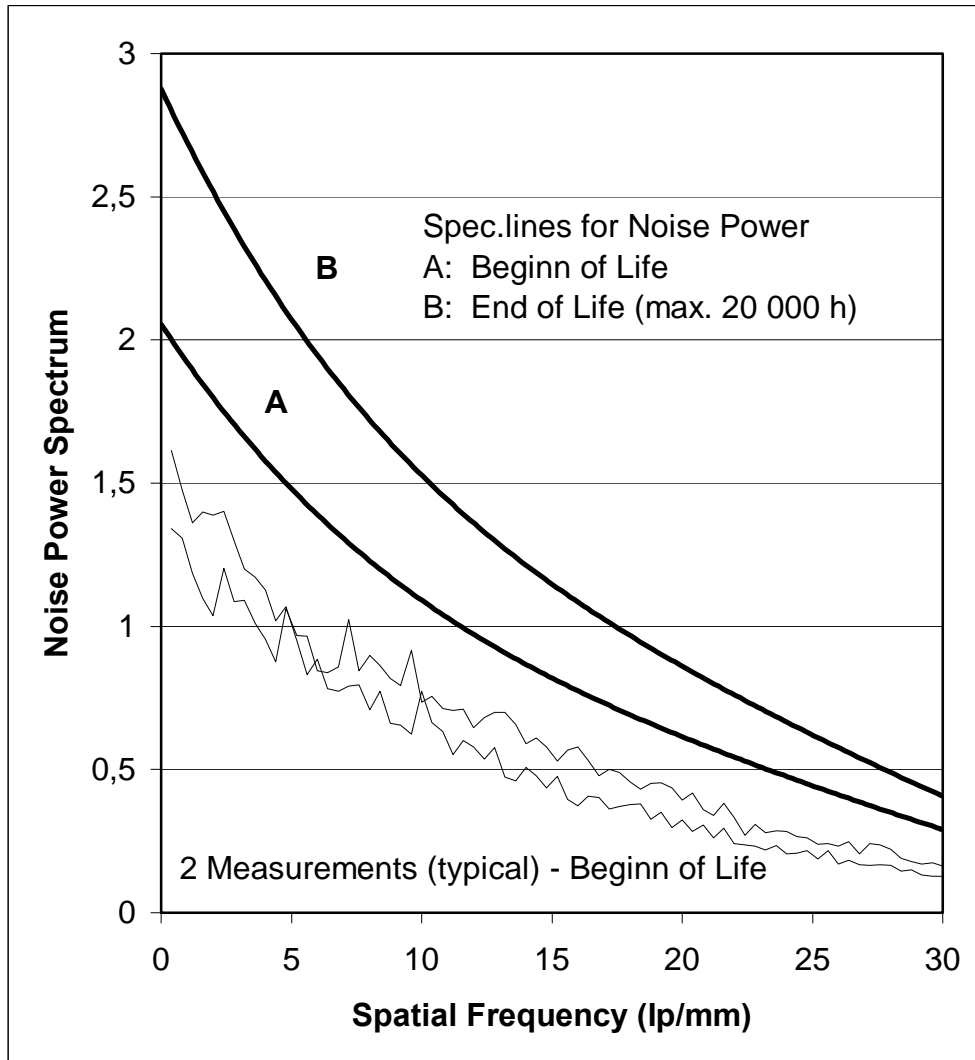
**Uniformity of luminance from centre to any corner      At a luminance of 50 Nit the overall deviation of luminance from centre to any corner may not exceed 12 Cd/m<sup>2</sup> (Nit) at any point of the screen.**

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

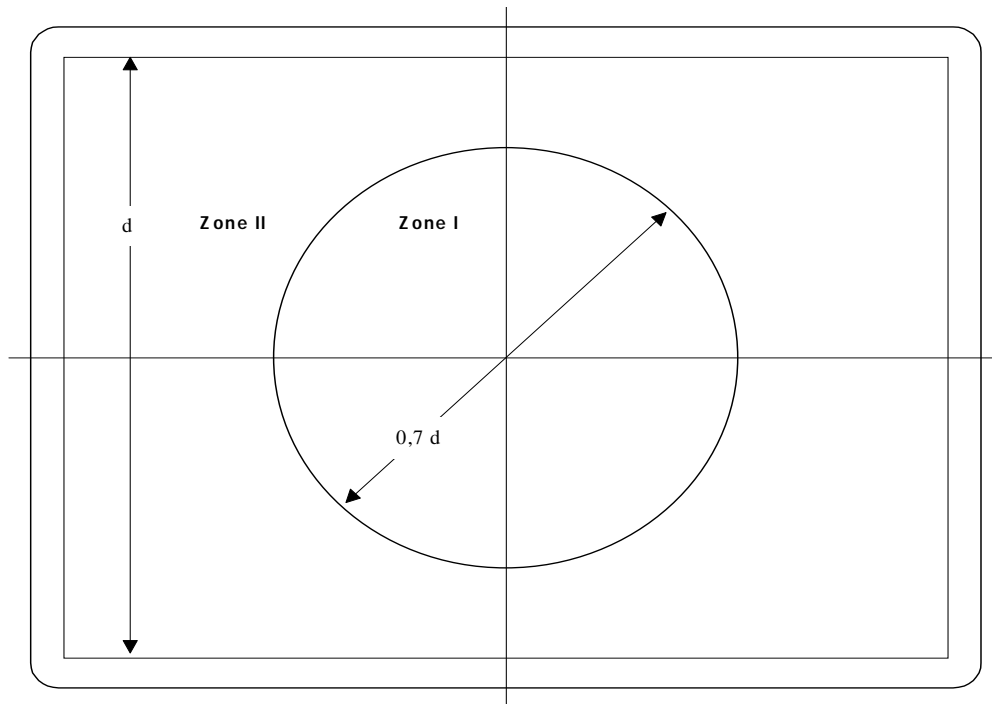


**7.1 Noise power**



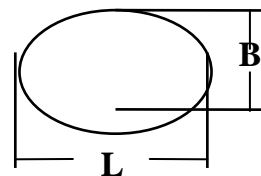
Noise Power measured with SIEMENS Measurement system.

**8**      **Permissible Glass and screen defects**



**L:** max. length of defects

**B:** max. width of defects



**d = 300 mm**

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**Defect size G for the screen and glass specification**


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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 <sup>1)</sup>
< 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	

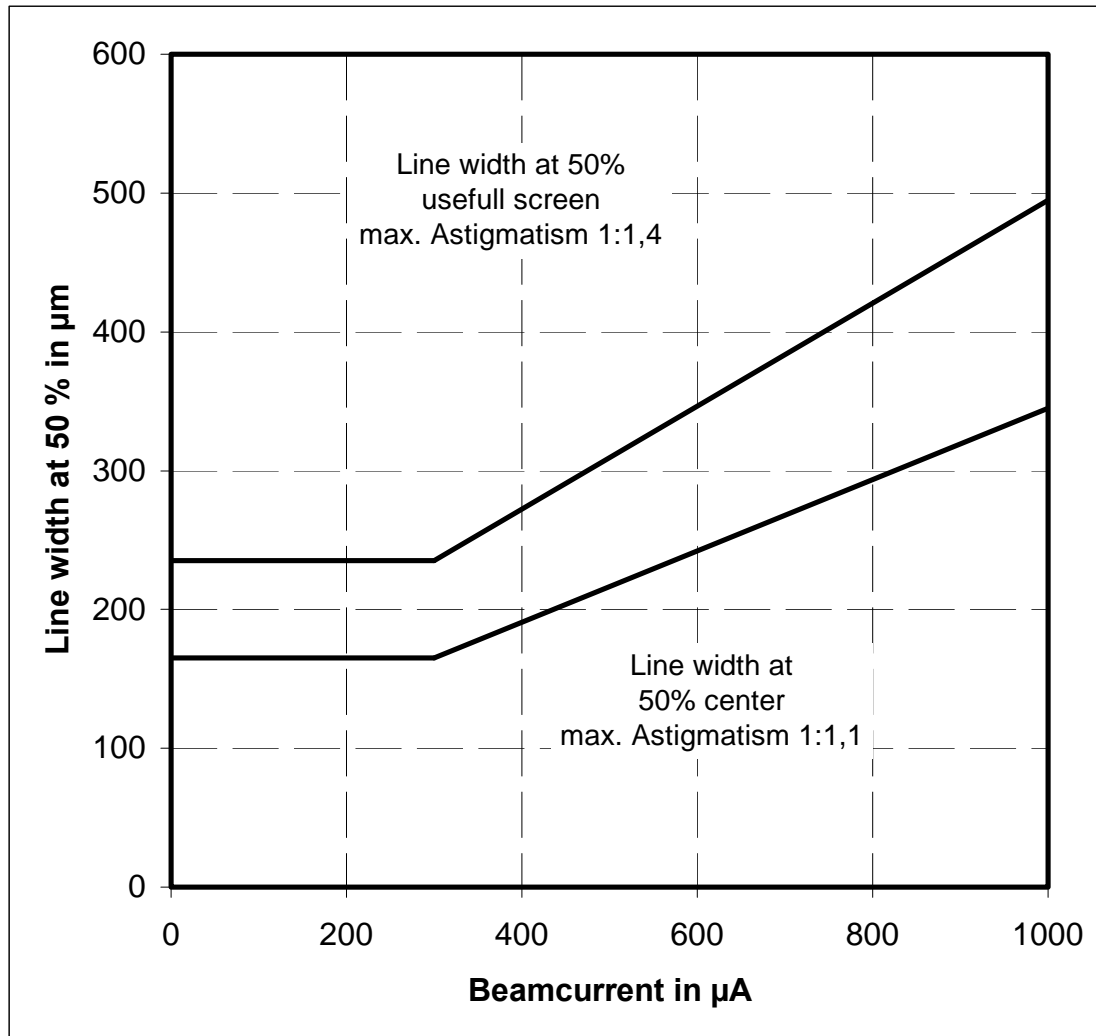
1) Maximum number of defects in zone I and II : 4

**Scratches**

Sum  $\leq 2$   
 distance > 50 mm  
 max. length < 10 mm  
 max. width < 50  $\mu$ m

Scratches <15  $\mu$ m are permitted

Not allowed defects:  
 Open holes, stones, folts, cracks, accumulated defects, 'cloud'.

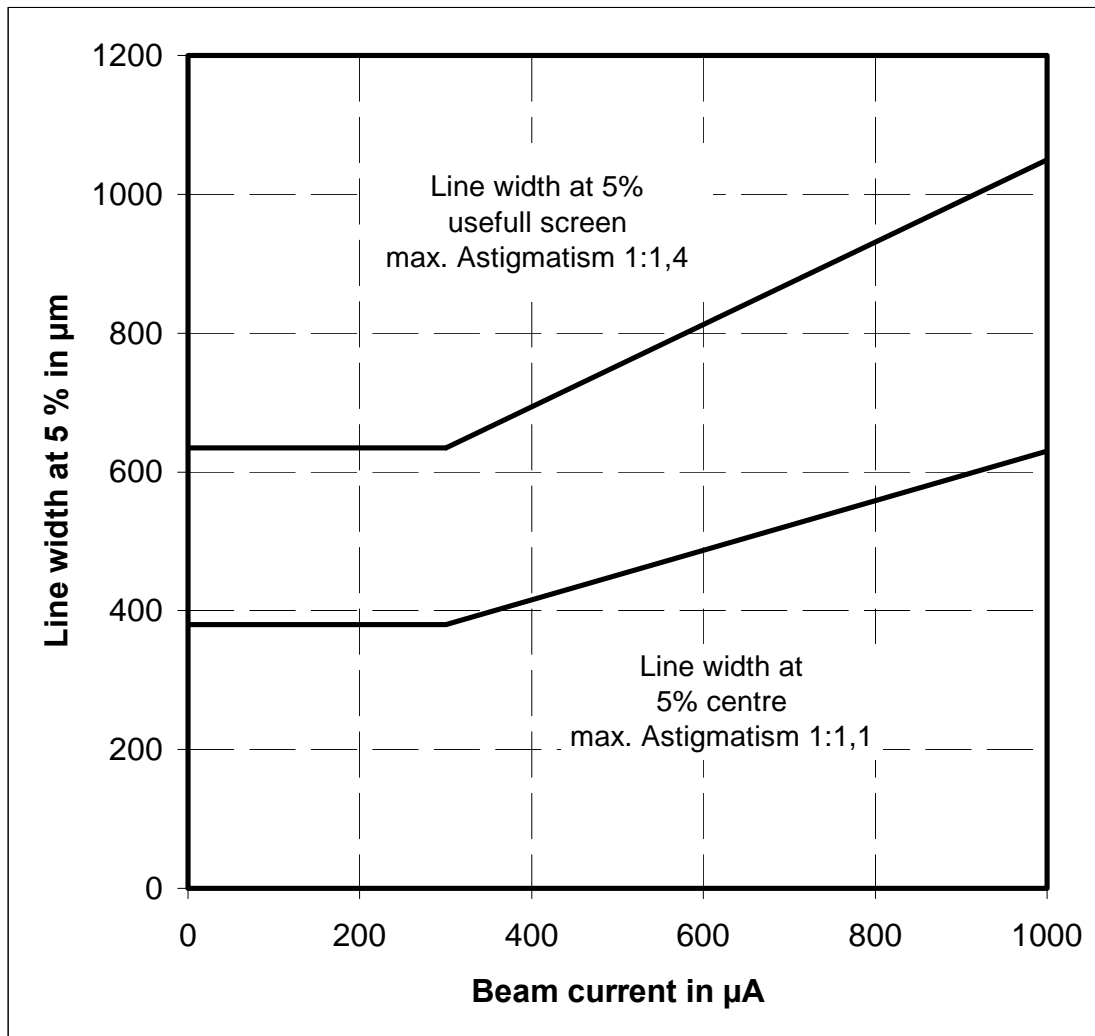
**9**      **Resolution****50 % of peak value****Optimal focus: 300 $\mu$ A****Duty cycle 100 %**

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
$I_{G2a}$	$\pm 1\mu A$	
$I_{Gsb}$	$\pm 1\mu A$	
$I_{G3}$	$\pm 2\mu A$	

### Capacity \*) (Grid 1 to all other electrodes)

 $C_{G1-all}$       5,3 pF  $\pm$  1 pF

### Capacity \*) (Cathode to all other electrodes)

 $C_K$       3.5 pF  $\pm$  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. 9294.xx

### Horizontal deflection

Lx	49,5 $\mu H \pm 5 \%$
Rx	150 $m\Omega \pm 10 \%$

### Vertical deflection

Ly	1.83 $mH \pm 5 \%$
Ry	3.28 $\Omega \pm 10 \%$

### Rotationcoil

Rr	133 $\Omega \pm 10 \%$
lr	47 $mA / 1^\circ$

### Astigmatism Axial

La	23 $\mu H \pm 5 \%$
Ra	< 6 $\Omega$

### Astigmatism Diagonal

Ld	23 $\mu H \pm 5 \%$
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**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. 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 $\mu$ A	
Grid 1 leakage resistance	RG1	1,5 M $\Omega$	
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 <math>\leq 2,5 \mu</math>s and a horizontal width of 400 mm at <math>U_A = 27,5</math> kV).</p>		



## 12 Operating values

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<b>Cathode heating</b>	- indirect		
	- Heating voltage	$U_h$	6,1 V $\pm$ 2%
	- Heating current,	$I_h$	approx. 100 mA;
		$I_{hmax}$	0,5 A ( cold state)

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### Cathode is reference point vor all valtage values following

<b>First accelerating voltage</b>	$UG2 I$	600 - 930 V
<b>Halo suppression voltage</b>	$UG2 II$	0 - 200 V

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<b>Grid 1 voltage (for spot suppression)</b>	- $UG1$	105 V
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<b>second accelerating voltage</b>	$U_A$	29,0 kV
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<b>Drive voltage (grid drive) (from <math>I_c = 0 \mu A</math> to <math>I_c = 1200 \mu A^1</math>)</b>	$\Delta U_{WE}$	max. 85 V
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<b>Luminance drift over time</b>	max. 18 minutes after switch on (an overshoot of max 10% of cutoff voltage is allowed during this time)	
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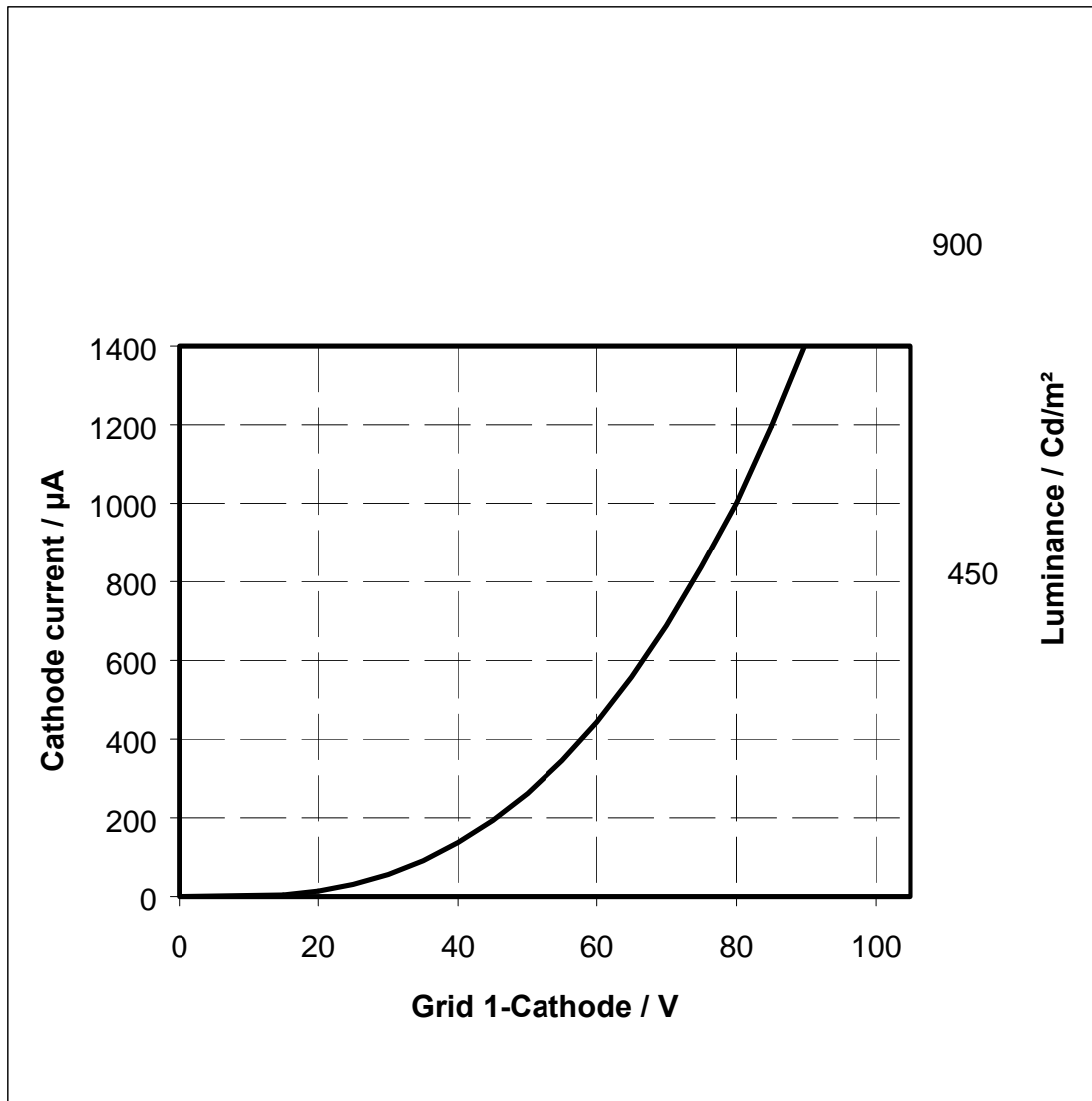
<b>Focus voltage (at centre of screen at <math>I_c = 300 \mu A</math>)</b>	$UG3$	min. 6,80 kV nom. 7,15kV max. 7,50 kV
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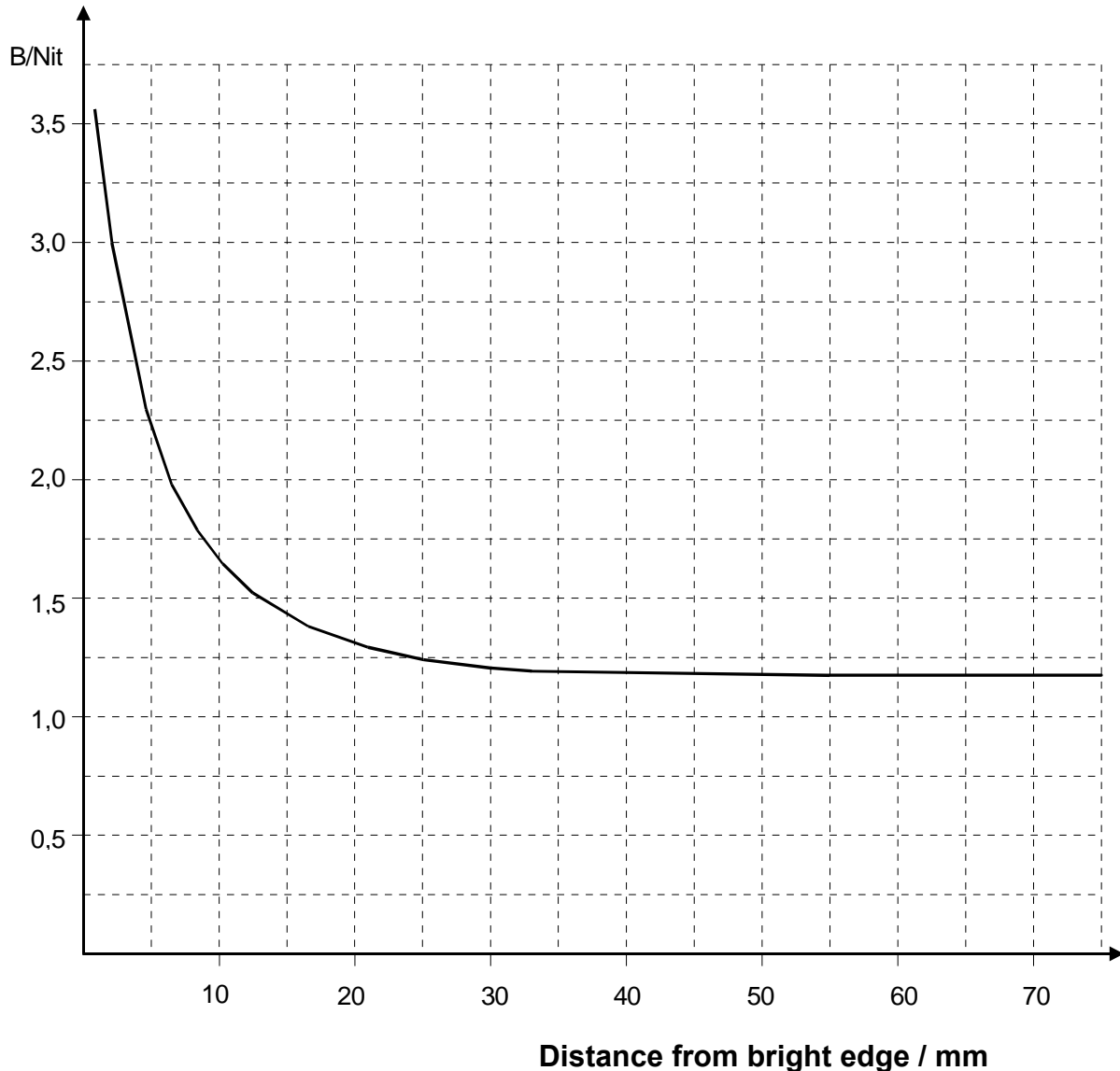
<b>Dynamic focus voltage (with reference to Thomson-yoke Nr. 9294.xx)</b>	$UG3 dyn.$	max. = 850 V
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**13 Grid drive characteristics**



**Luminance at 100% Transmission**  
**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.

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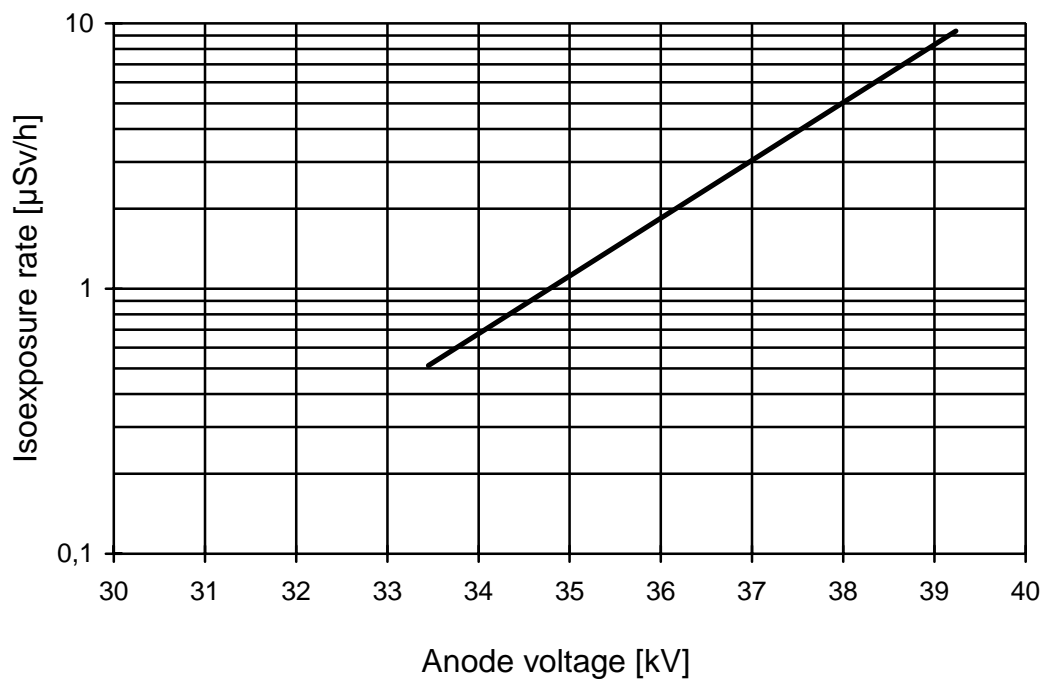
At a maximum luminance level of 350 Nit, after 20.000 hours of operation ,the maximum decrease in phosphor luminance is 15 %.

17 **X-radiation**

**X-Radiation Limit Curve**

**Conditions:**

**Cathode current  $I_c = 250 \mu A$**



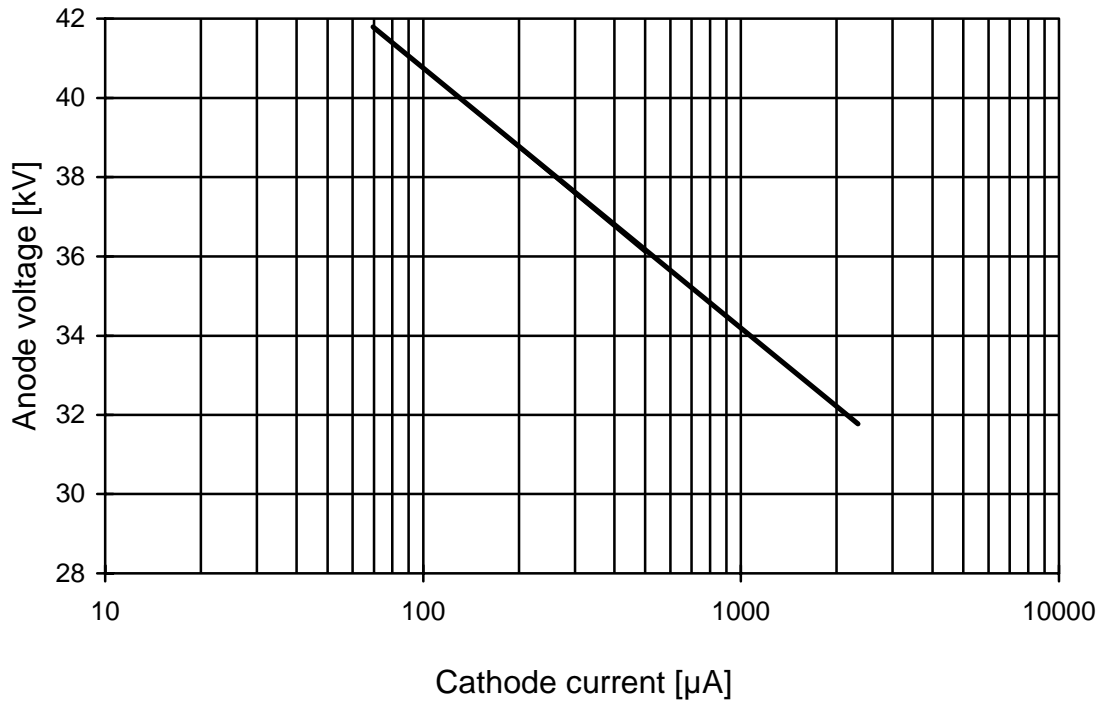
**X-Radiation exposure rate vs. anode voltage at a constant value of cathode current measured at 5 cm from the CRT.**

**The measurement is according:**

**“Röntgenverordnung der Bundesrepublik Deutschland vom 8. Januar 1987”**

**Isoexposure - Rate Limit Curve**

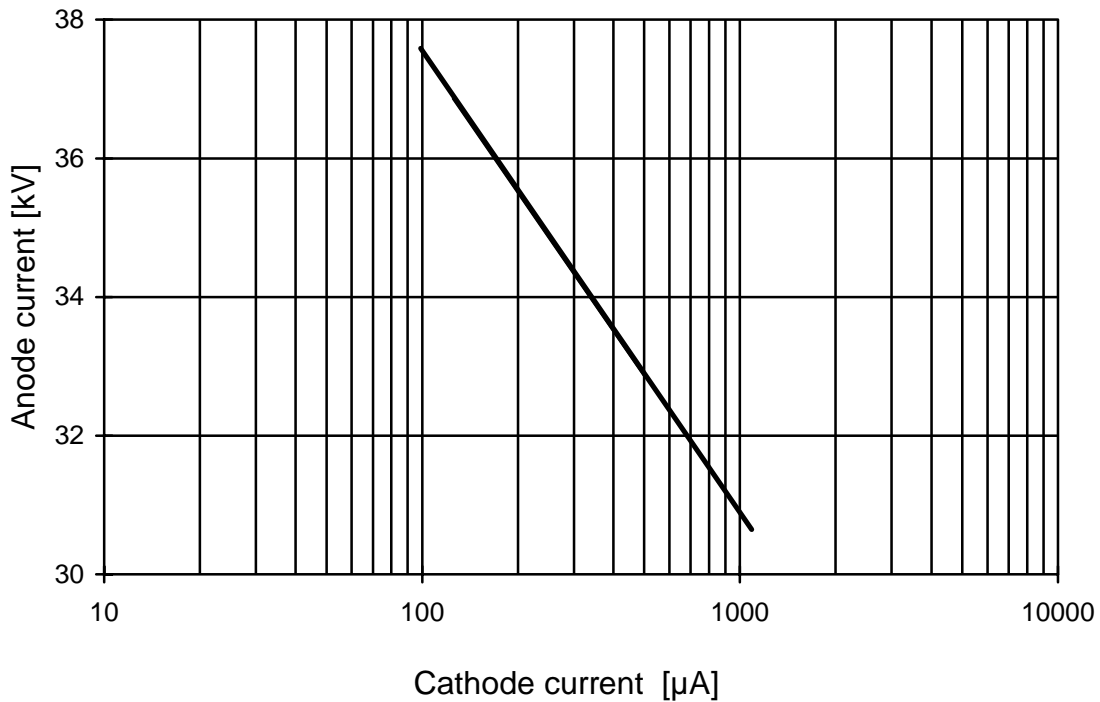
Calculated for 5  $\mu\text{Sv/h}$



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**

