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

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:

Company/Department	*Name*	*Tel.*	*Date*	*Signature*
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Siemens
A&D SE BT E

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

ChangeNr.				
Date				
Release	05	06	07	08

Changed pages:

Release:	Pages:
02	01 :Type designation changed
	11 : Blemish specification changed
	16 : Heater Cathode voltage
	25 : Drawing : brackets added
03	16 : Heater voltage specification , Brightness variation
	19 : Stray emission
	23 : Drawing

2 Aplication

CRT for displays in medical and alphanumerical 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

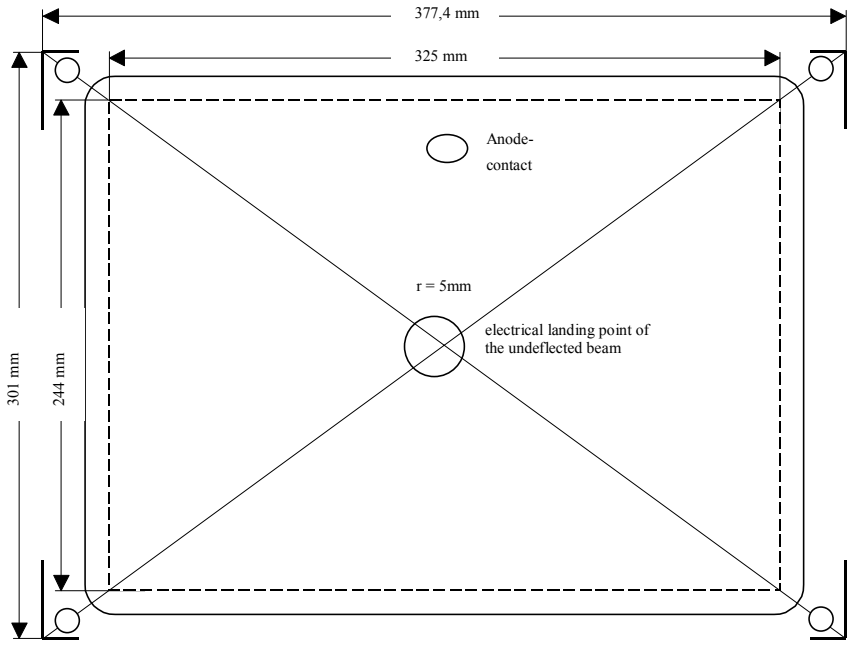
4 Important notes

Implosion hazard	**CRT is evacuated. In case of mechanical damage (e.g. by shock or scratches) implosion can occur.**
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; Attechment 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 nmbr. 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 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 ± 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 symmetrical and equal focus exists.**

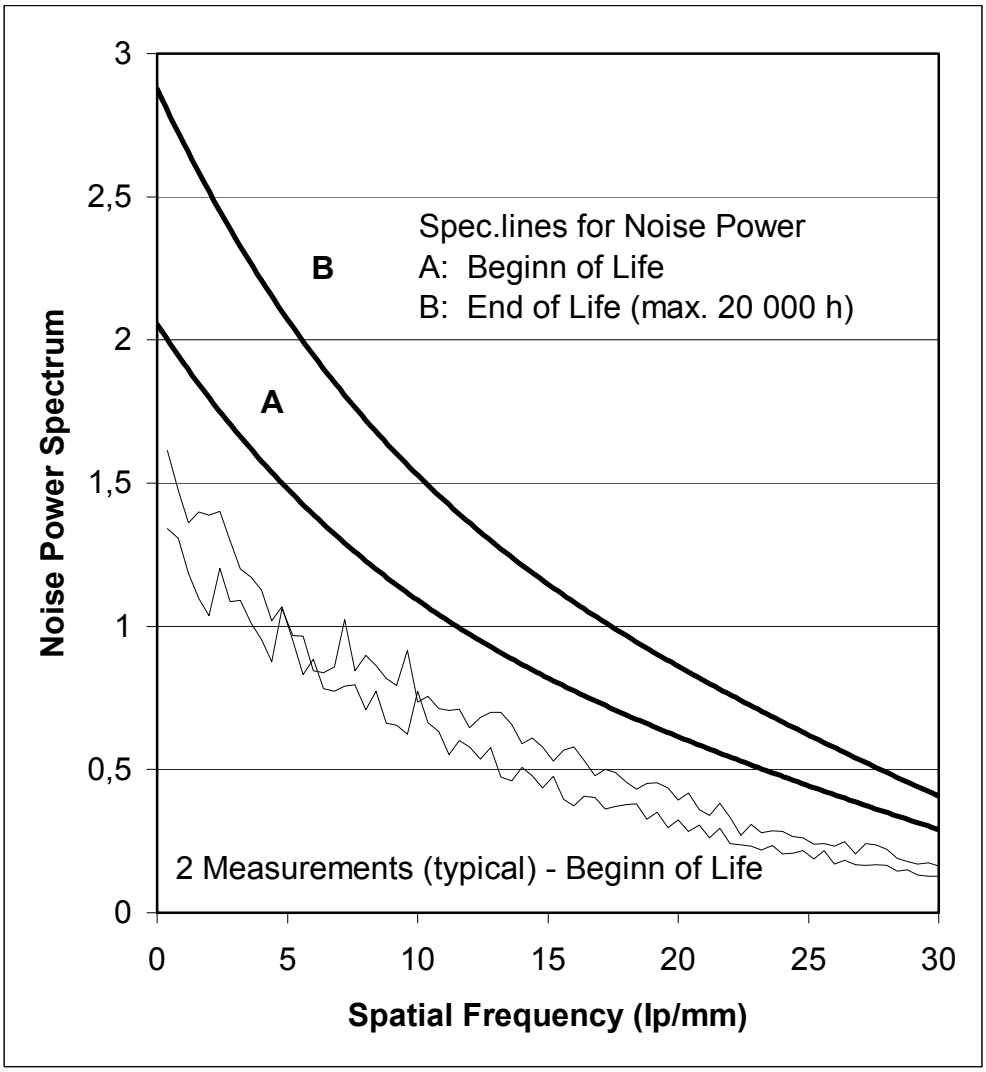
- **The non-deflected spot landing must be within a circle with a radius of 2 mm around a point 3 mm left and 2 mm down from the mechanical centre of the CRT, provided that:**
  - **the CRT axis is in east-west direction and the front panel is facing east,**
  - **the anode connector is located on top 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°.**

7 Optical data

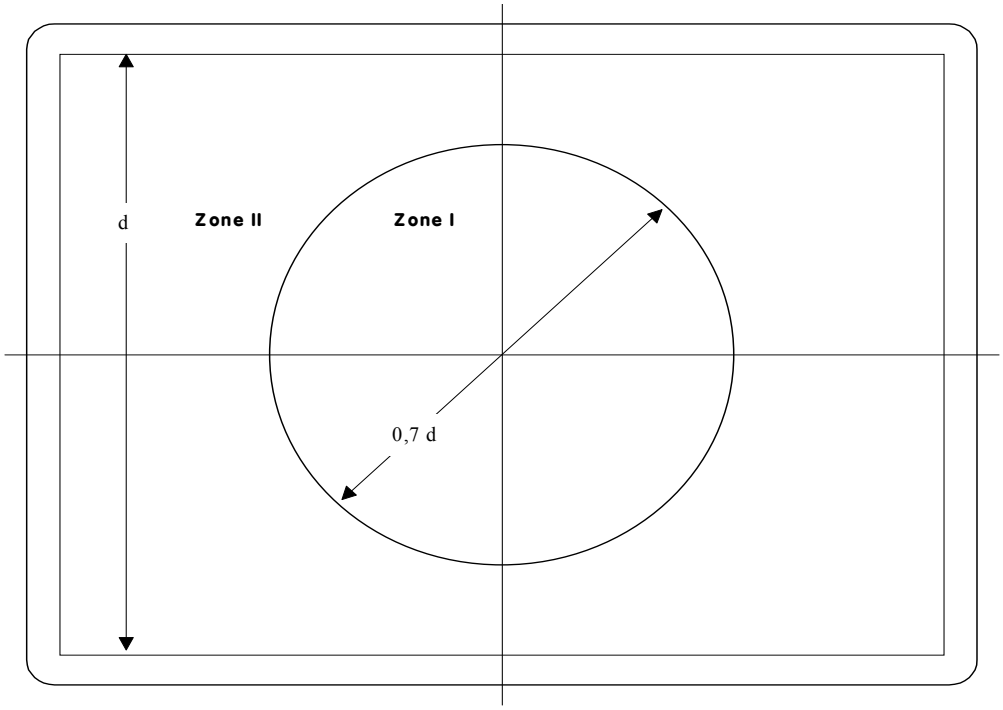
Total transmission of bulb including coating/panel:	**49 % ± 3 % at 546 nm**	
Phosphor	**P45**	
7.1	**Noise Power (see fig.)**	
Color coordinates: (during operation)	**P45-Phosphor**	
at a luminance of 250 Cd/m^2 (Nit) with CL60-Filter, (measured with LMT Color meter or Minolta CA100)	**X = (0,250 ± 0,01)**	**Y = (0,305 ± 0,01)**
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/m^2 (Nit) at any point of the screen.**	
Glass bulb	**Drawingnmbr. 252 907.GZ or equivalent bulb after agreement with customer.**	

7.1 Noise power



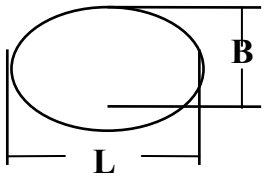
Noise Power measured with SIEMENS Measurement system.

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 ≤ 3 G = ½ (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

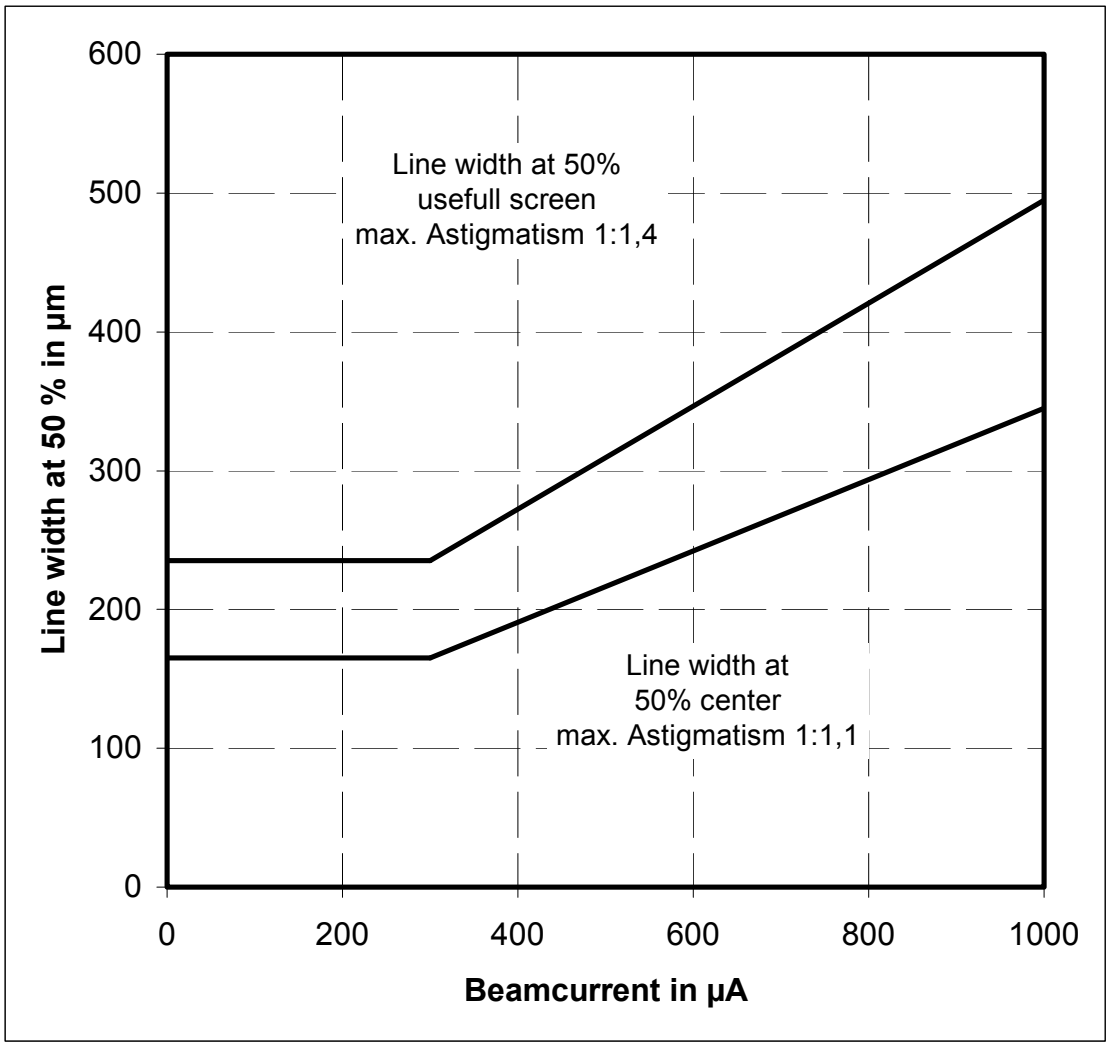
Sum ≤ 2
distance > 50 mm
max. length < 10 mm
max. width < 50 µm

Scratches <15 µm are permitted

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

9 Resolution

50 % of peak value
Optimal focus: 300µA
Duty cycle 100 %

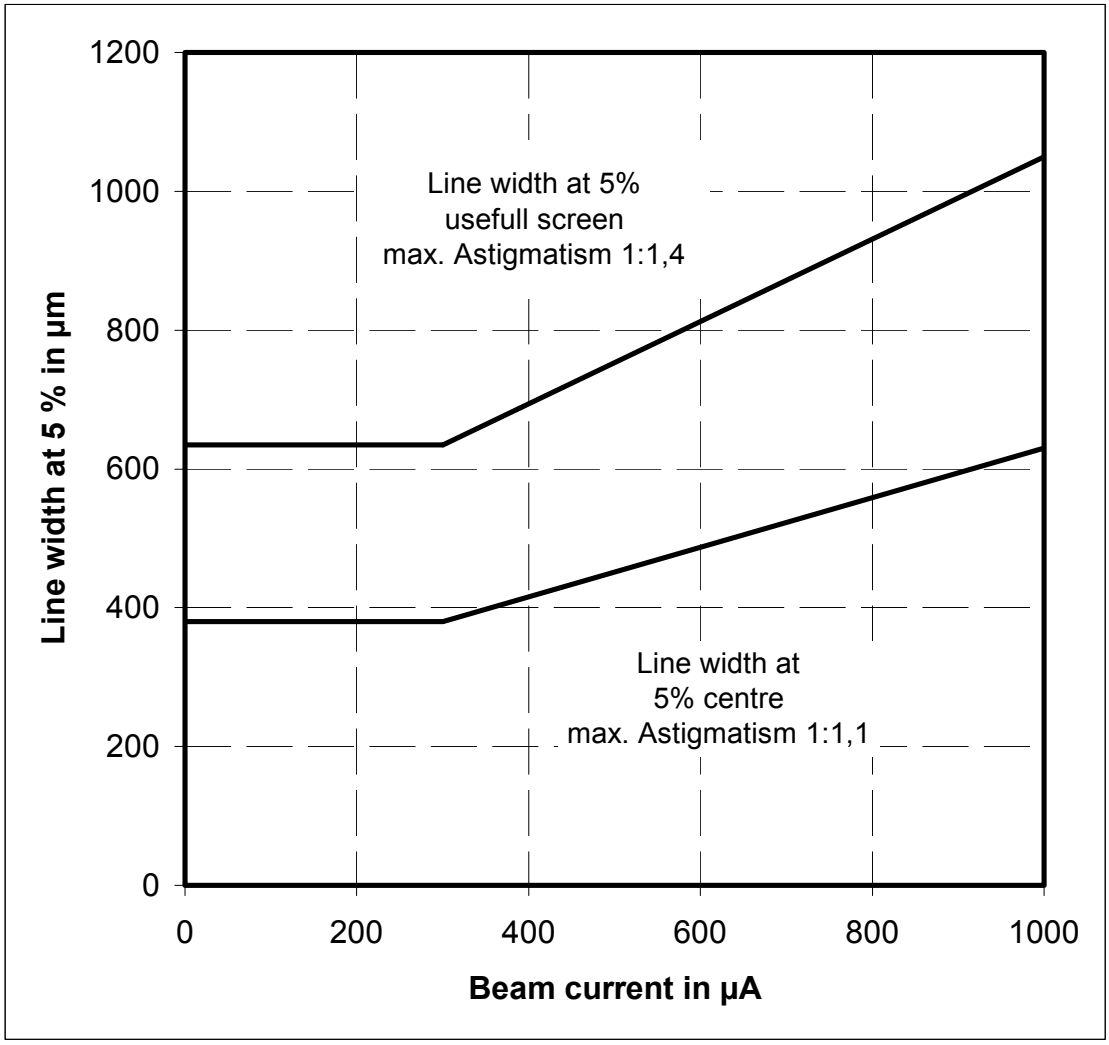


Measured with Microvision Superspot SS200 or PDS spot profile measuring system

- 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}	± 1µA	
	I_{G2a}	± 1µA	max. 5 changes allowed
	I_{Gsb}	± 1µA	
	I_{G3}	± 2µA	
Capacity *) (Grid 1 to all other electrodes)	$C_{G1\text{-}all}$	5,3 pF ± 1 pF	
Capacity *) (Cathode to all other electrodes)	C_K	3.5 pF ± 1 pF	
Capacity *) (Grid1 to cathode)	$C_{G1\text{-}K}$	2,3 pF ± 0,7 pF	
Capacity (Anode to outher coating)	$C_{A\text{-}M1}$	1600 ... 3000 pF	

Electrical Data from THOMSON-Coil		**Drawing nmbr. 250 898.ZZ THOMSON-YOKE Nr. 9294.xx**
Horizontal deflection	**Lx**	**49,5 µH ± 5 %**
	Rx	**150 mΩ ± 10 %**
Vertical deflection	**Ly**	**1.83 mH ± 5 %**
	Ry	**3.28 Ω ± 10 %**
Rotationcoil	**Rr**	**133 Ω ± 10 %**
	Ir	**47 mA / 1 °**
Astigmatism Axial	**La**	**23 µH ± 5 %**
	Ra	**< 6 Ω**
Astigmatism Diagonal	**Ld**	**23 µH ± 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	$U_{G2\ I\&II}$	max. 1300 V min. - 400 V	
Second accelerating voltage	U_A	max. 29,9 kV	
Focus voltage	U_{G4}	max. 9 kV	
Grid 1 voltage	$-U_{G1}$	max. 150 V (200 V for 5 sec. after switch off) min. 2 V	
Heating against cathode	U_{HC}	negative negative peak positive positive peak	255 V 300 V 3 V 50 V
	I_{HC}	max. 15 µA	
Grid 1 leakage resistance	R_{G1}	1,5 MΩ	
Damping of deflection field:	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 µs and a horizontal width of 400 mm at U_A = 27,5 kV).		

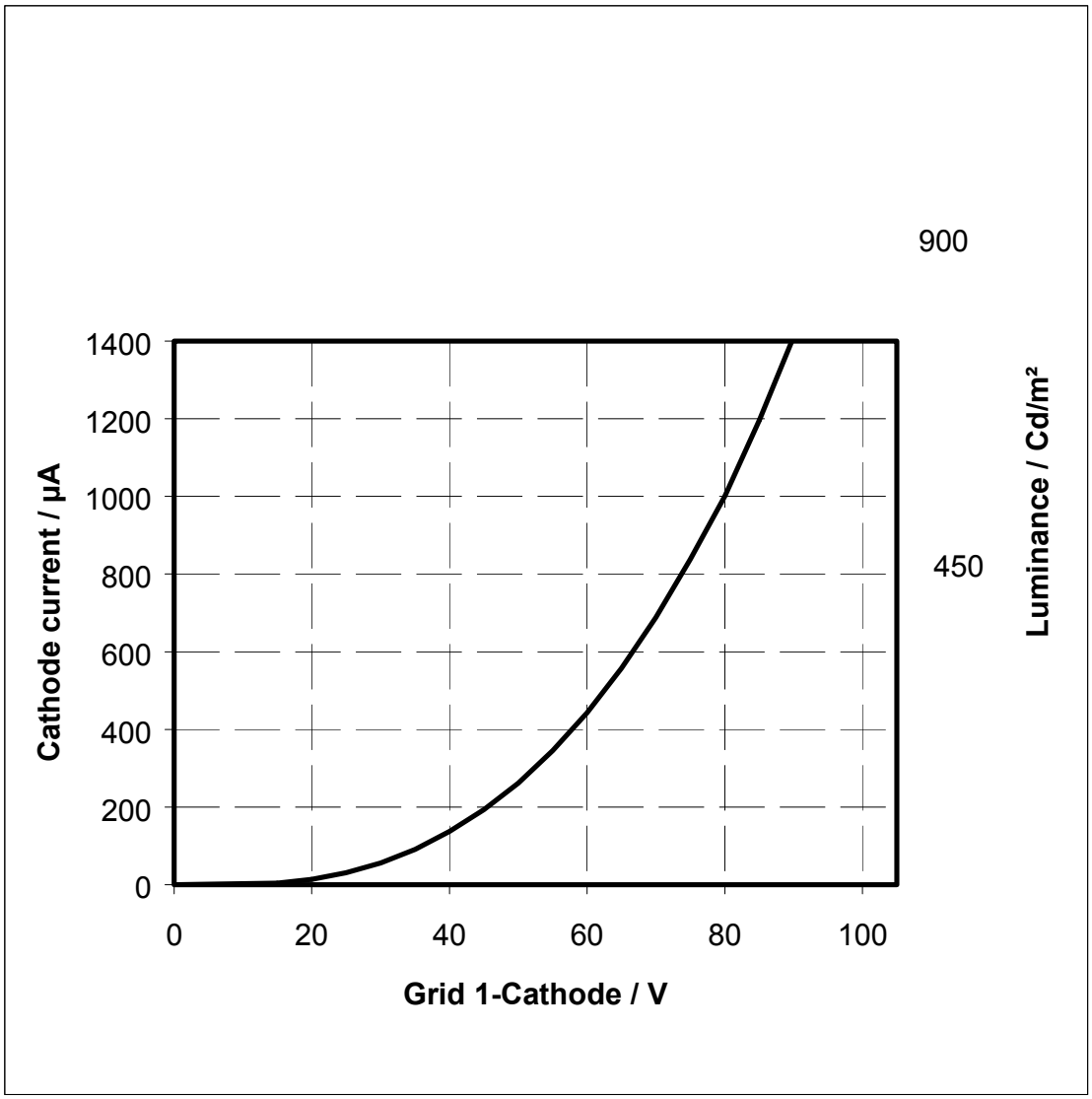
12 Operating values

Cathode heating	- indirect		
	- Heating voltage	U_h	5.65 – 5.85 V
	- Heating current,	I_h	approx. 100 mA;
		I_{hmax}	0,5 A (cold state)

Cathode is reference point vor all valtage values following

First accelerating voltage	$U_{G2\ I}$	600 - 930 V
Halo suppression voltage	$U_{G2\ II}$	0 - 200 V
Grid 1 voltage (for spot suppression)	$-U_{G1}$	105 V
second accelerating voltage	U_A	29,0 kV
Drive voltage (grid drive) (from I_C = 0 µA to I_C = 1200 µA[1)]	ΔU_{WE}	max. 85 V
Luminance drift over time		max. 18 minutes after switch on (an overshoot of max 10% of cutoff voltage is allowed during this time)
Focus voltage (at centre of screen at I_C = 300 µA	U_{G3}	min. 6,80 kV nom. 7,15 kV max. 7,50 kV
Dynamic focus voltage (with reference to Thomson-yoke Nr. 9294.xx)	$U_{G3\ dyn.}$	max. = 850 V
Brightness variation when changing from 100% white pattern to 10% square white pattern (same drive voltage)		No brightness variation allowed

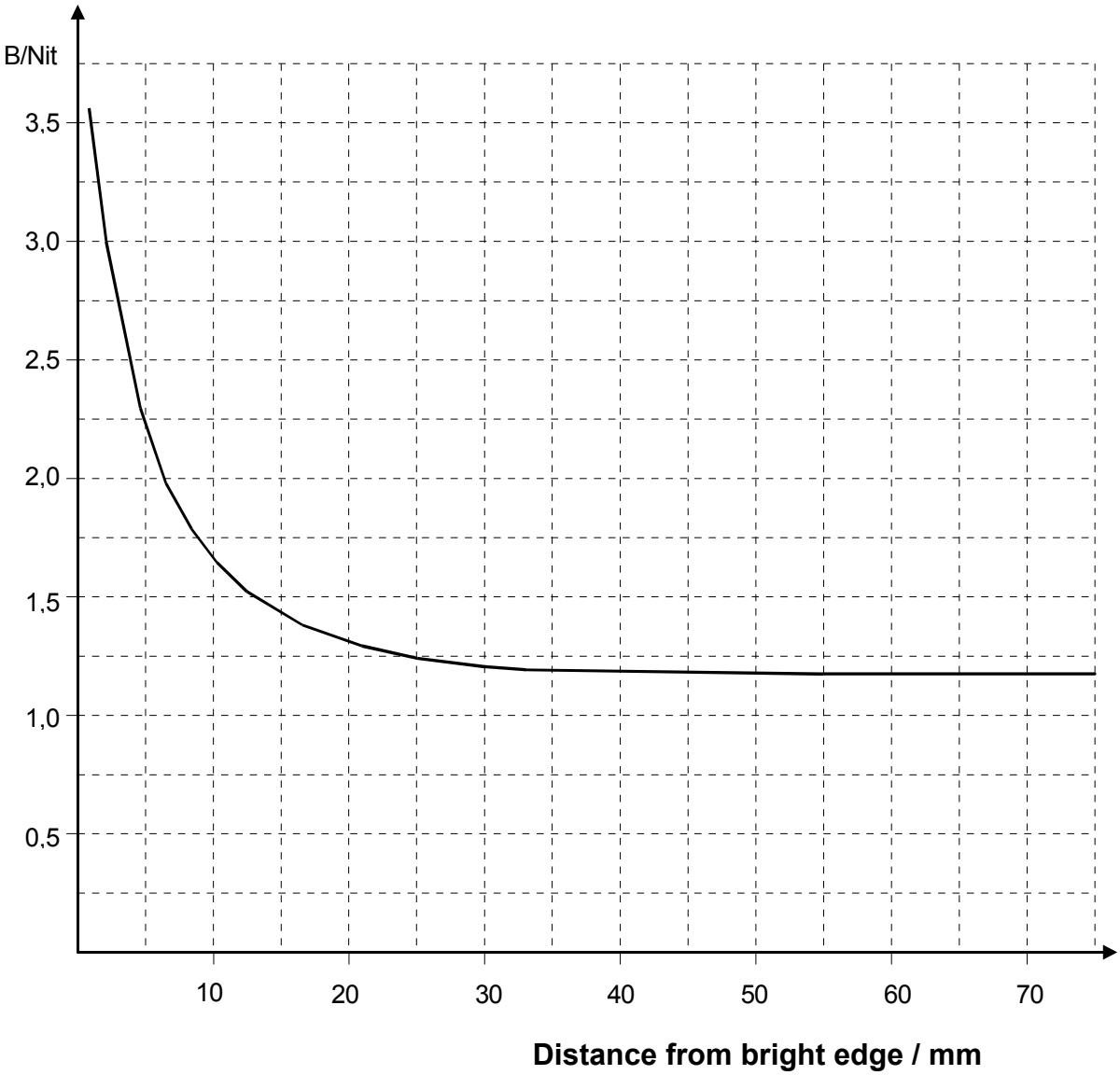
Grid drive characteristics



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.

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

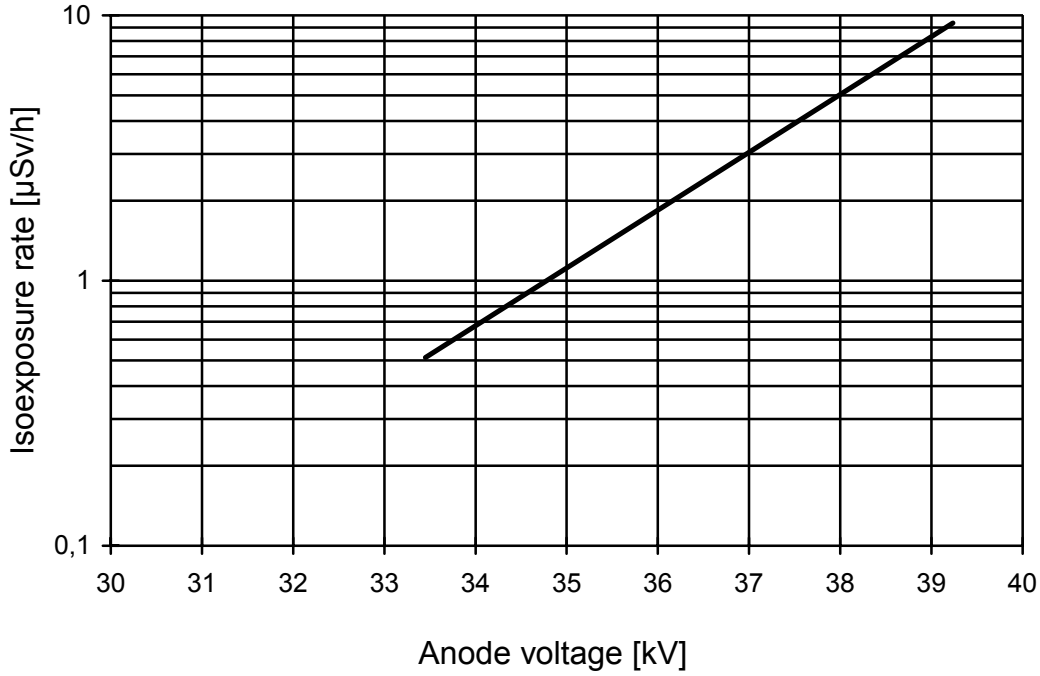
Stray emission : Maximum anode current in cut-off condition Uc- Ug1 > Uco after 10.000 hrs. : < 1 µA

17 X-radiation

X-Radiation Limit Curve

Conditions:

Cathode current I_C = 250 µA

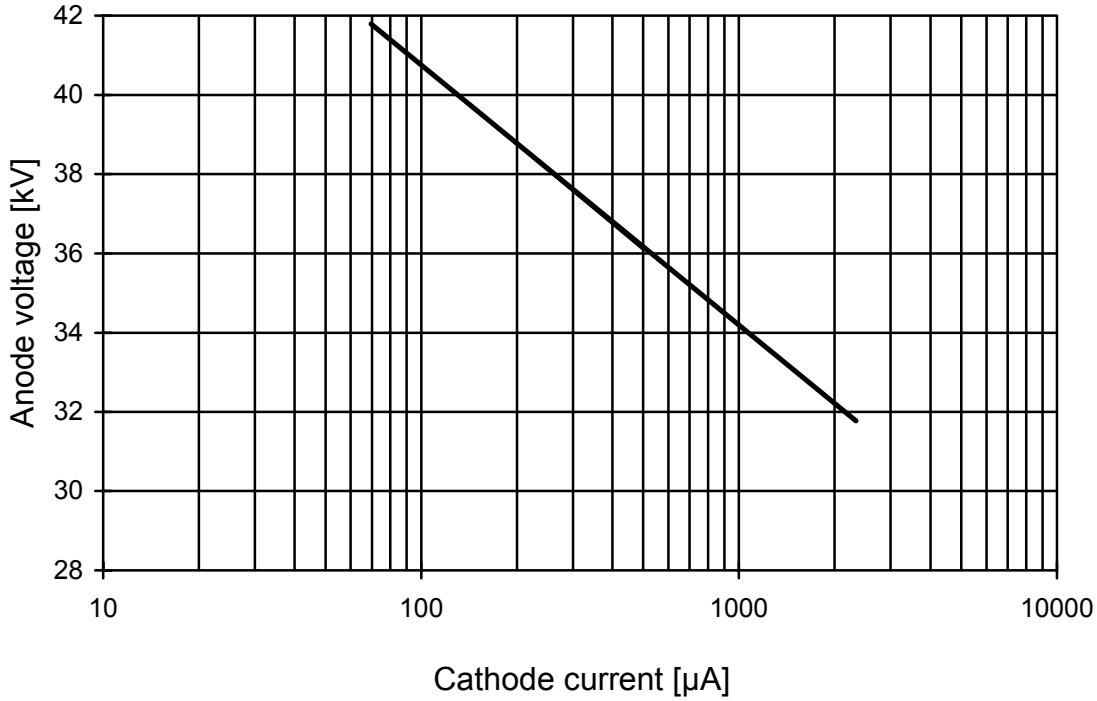


X-Radiation exposure rate vs. anode voltage at a constant value of cathode current measured at 5 cm from the CRT.

The measurement is according:
"Röntgenverordnung der Bundesrepublik Deutschland vom 8. Januar 1987"

Isoexposure - Rate Limit Curve

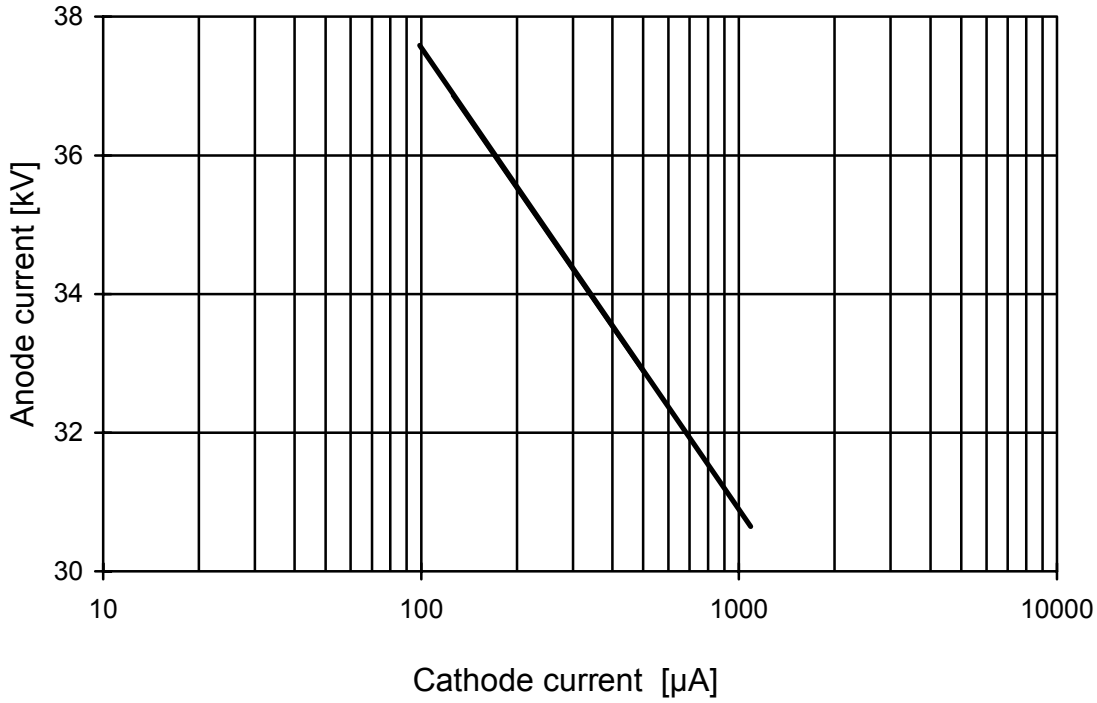
Calculated for 5 µSv/h



This limit curve is plotted at an isoexposure rate of 5 µSv/h (0,5 mR/h) measured at 5 cm from the CRT.

Isoexposure - Rate Limit Curve

Calculated for 1 µSv/h



This limit curve is plotted at an isoexposure rate of 1 µSv/h (0,1 mR/h) measured at 5 cm from the CRT.

Attachment 1