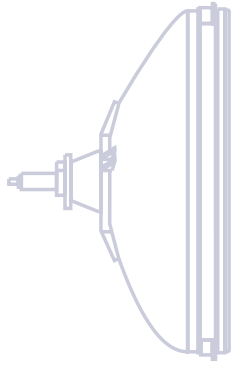
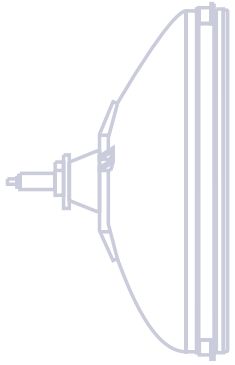
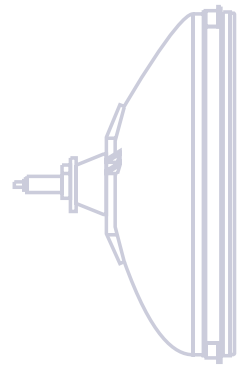
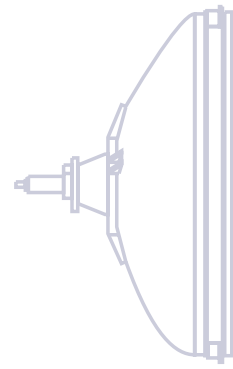
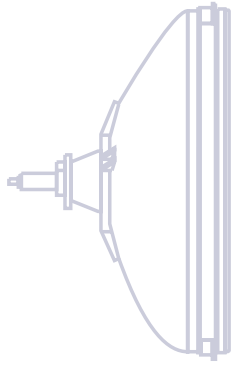
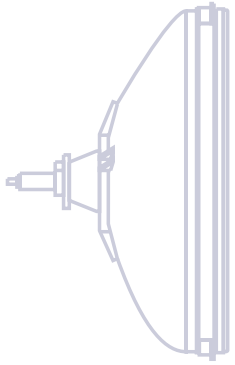


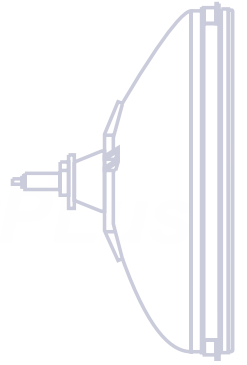
# Panasonic



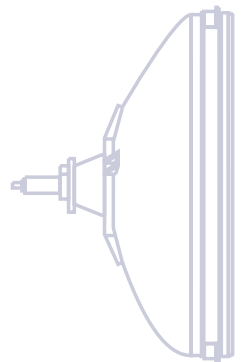
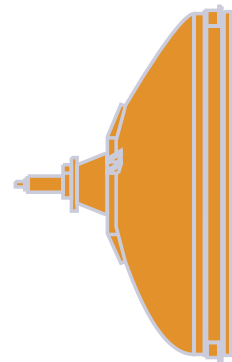
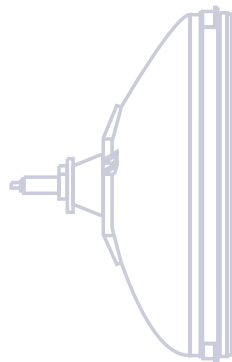
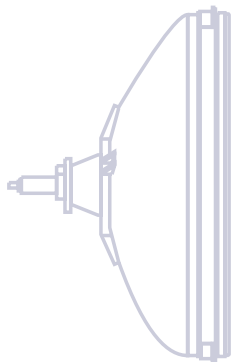
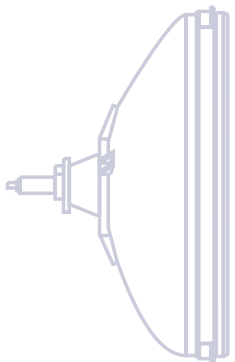
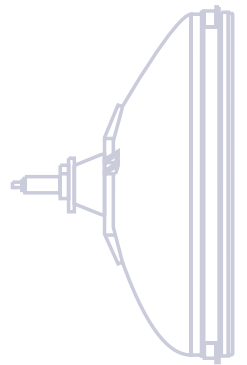
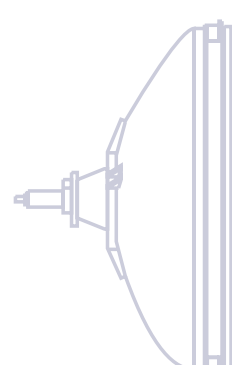
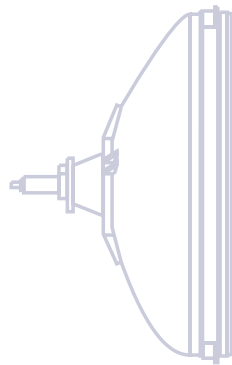
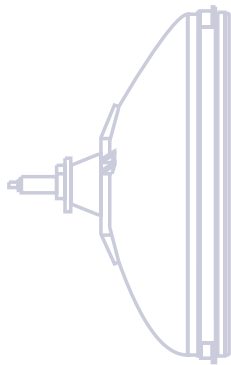
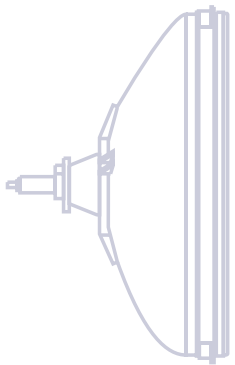
***SuperPigment<sup>Plus</sup>***



Colour Picture Tube  
**A 68 ELO 10 X**



Product Specification



**MATSUSHITA ELECTRONICS  
(EUROPE) GmbH**

Fritz-Müller-Strasse 112  
D-73730 Esslingen · Germany  
P.O. Box 100954  
D-73709 Esslingen · Germany

Phone ++49(0)711 / 3104-536  
Fax ++49(0)711 / 3104-377  
E-mail: [Marketing.Sales@Panasonic-CRT.de](mailto:Marketing.Sales@Panasonic-CRT.de)

The details of this data book refer to the specifications of products, but do not represent a guarantee of characteristics.

Availability and right to change reserved.

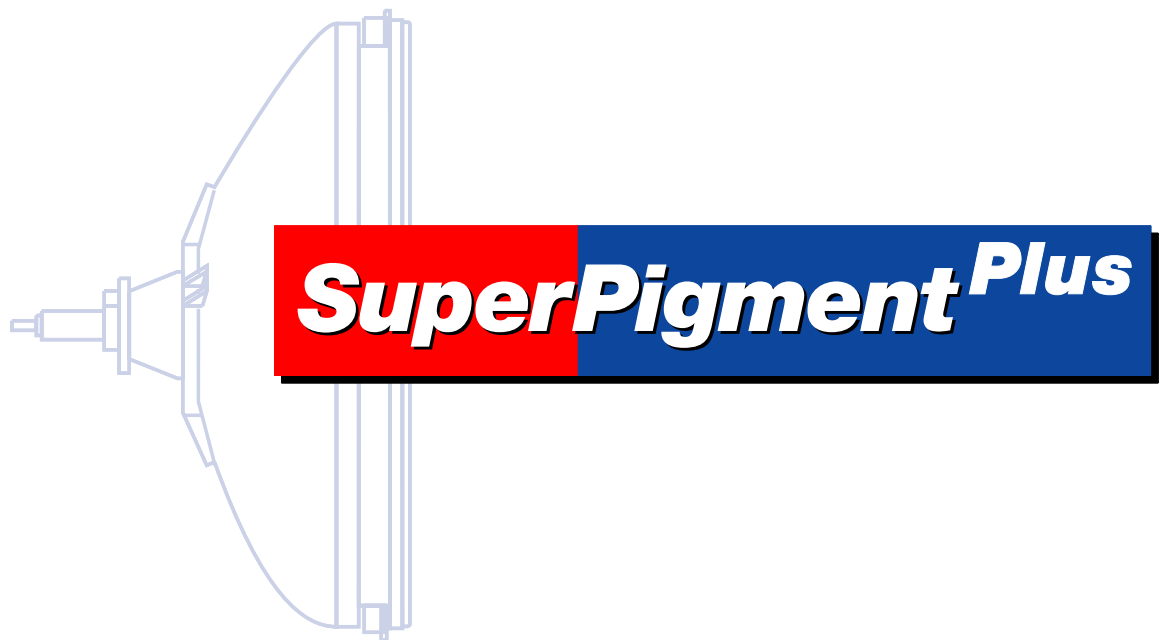
**For design purposes use only 1:1 drawings**

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# Product specification

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## Colour Picture Tube



A 68 ELO 10X

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### 3 Short Description

Useful screen diagonal	67,6 cm	Heater voltage (stab.) $U_F = 6,3 \text{ V}$
Glass diagonal	72,4 cm	Heater current $I_F = 310 \text{ mA}$
Deflection angle	104°	Anode voltage with full load
Neck diameter	29,1 mm	$U_A = 25 - 33 \text{ kV}$
Overall length (max)	457 mm	Focusing voltage 25,5 - 29,5% $U_A$
Mass	36 kg	
Glass transmission effective		44%

Aspect ratio	4:3
--------------	-----

Screen	vertical line with black matrix Pure flat and square
--------	---

Phosphors	cadmium free green, gold activated superpigmented high Europium red superpigmented blue
-----------	---

Shadow mask assembly	Slotted type of SST temperature compensated
----------------------	--

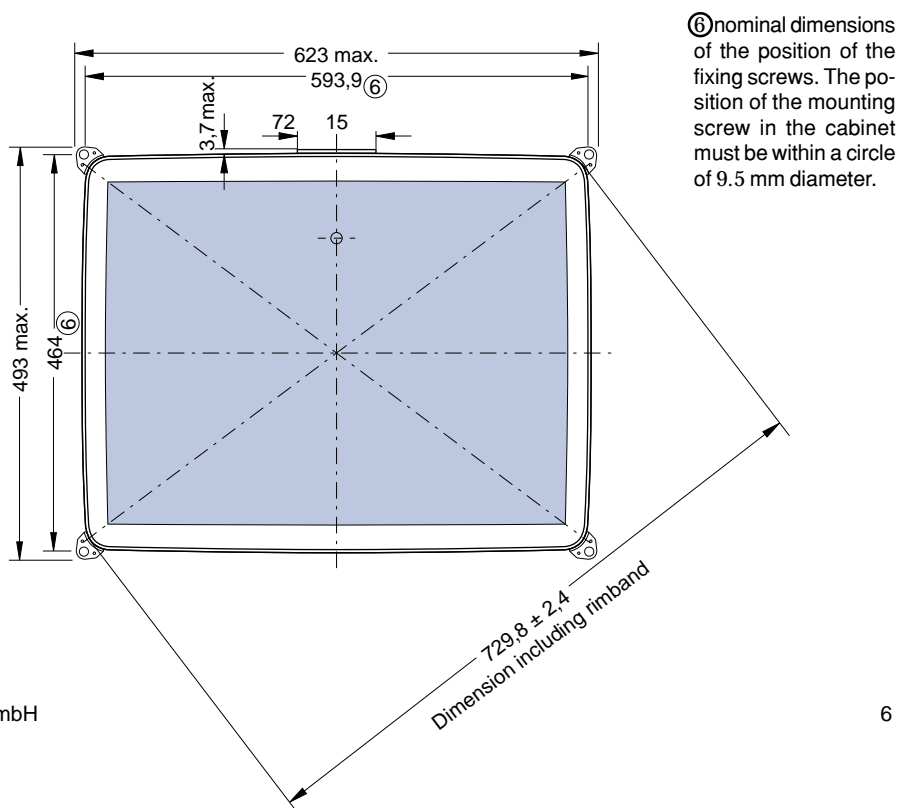
Electron gun	in-line, Hi-Bi potential MPF/OLF/ART external multipole unit
--------------	--

Magnetic shield	inner magnetic shield
-----------------	-----------------------

Implosion protection	shrink frame technology
----------------------	-------------------------

Base cap	B12-285
----------	---------

Figure 1:  
Tube Dimensions, Front View



Exposure	northern hemisphere
Scanning-line system	525 and/or 625 scanning-lines
Deflection yoke	<ul style="list-style-type: none"> <li>* north/south pincushion free,</li> <li>* self converging</li> <li>* 50 or 100 Hz</li> <li>* fully coma corrected</li> </ul>
Other features	<ul style="list-style-type: none"> <li>* soft flash technology</li> <li>* SVM coil integrated</li> <li>* Cathode ray tube intrinsically safe up to 29,9 kV according to appendix III Röntgenverordnung (newly issued 8.1.1987).</li> </ul>

Figure 2:  
Tube Dimensions, Side View

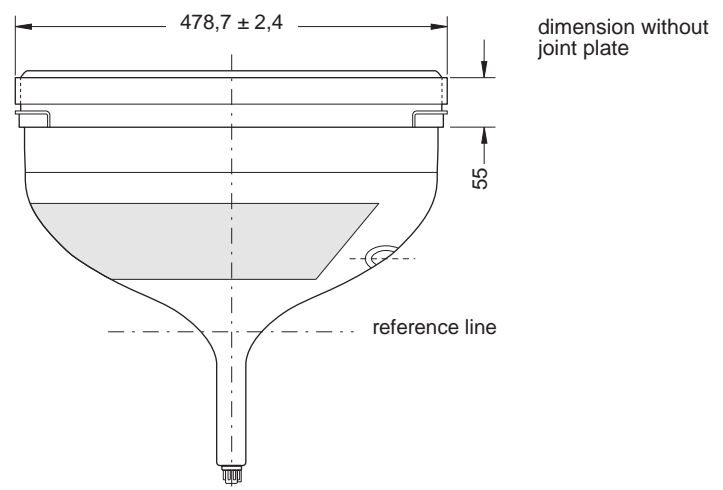
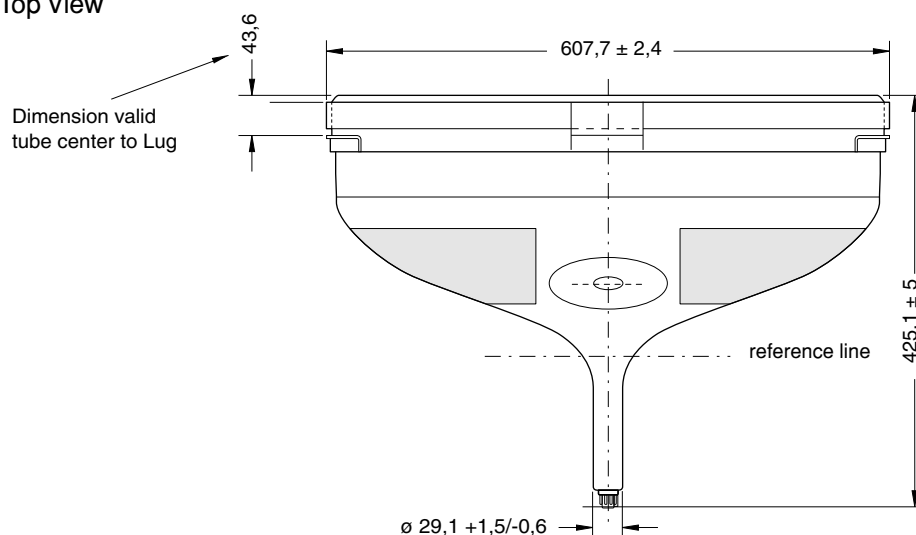


Figure 3:  
Tube Dimensions, Top View



#### 4

##### Typical Operating Conditions

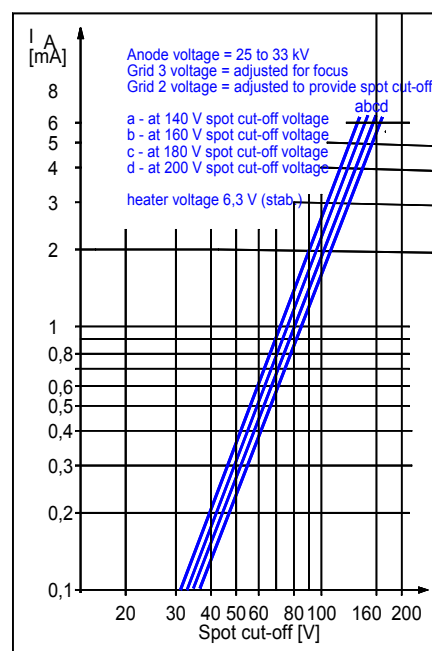
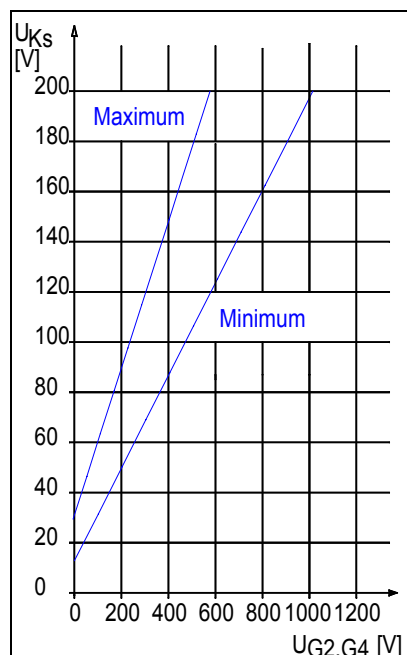
Voltages are specified with respect to grid 1

Anode voltage  
Focusing voltage  
Cut-off voltage grid 2,4 ( $V_{kc} = 170V$ )  
Heater voltage (stab.)  
Heater current

$U_A = 29,5 \text{ kV}$   
 $U_{G3,G5} = 7,52 - 8,7 \text{ kV}$   
 $U_{G2,G4} = 482 - 842 \text{ V}$   
 $U_F = 6.3 \text{ V}$   
 $I_F = 310 \text{ mA}$

Figure 4 (left):  
Cut-off Voltage Range

Figure 5 (right):  
Video Drive Characteristics



#### 5

##### Circuit Design Values

Voltages are specified with respect to grid 1

Anode voltage  
Grid 3,5 focus voltage  
Grid 1 reference point

$U_A = 25 - 33 \text{ kV}$   
 $U_{G3,G5} = 25,5 - 29,5\% \text{ of } U_A$   
 $U_{G1} = 0 \text{ V}$

Cut-off voltage range

Figure 4

Grid 2,4 cut-off voltage  
Recommended cathode voltage for  
black level adjustment.

$U_{G2,G4} = 482 - 842 \text{ V}$   
 $U_K = 170 \text{ V}$

Video drive characteristics

Figure 5

Grid 1 to all other electrodes  
Cathode to all other electrodes  
Grid 3,5 to all other electrodes  
Anode to external conductive coating  
Anode to metal rimband

$C_{G1} = 17 \text{ pF}$   
 $C_K = 14 \text{ pF}$   
 $C_{G3,G5} = 8 \text{ pF}$   
 $C_{A/M} = 1900 \text{ pF} - 2600 \text{ pF}$   
 $C_{A/Z} = 300 \text{ pF} - 400 \text{ pF}$



Leakage current cathode-heater  $I_{KF \max} = 5 \quad \mu A$

Test conditions  $U_A = 0 \quad V$   
grid 1, 2 and 3 has to be connected  $U_{KF} = 275 \quad V$   
to the cathode of the gun in test.

Leakage currents, flashovers, stray emission

Test conditions  $U_K = 250 \quad V$   
for these three items.  $U_A = 33 \quad kV$   
 $U_{G2,G4} = 620 \quad V$

Leakage currents

grid 3  $I_{G3,G5 \max.} = \pm 5 \quad \mu A$   
grid 2  $I_{G2,G4 \max.} = \pm 5 \quad \mu A$   
grid 1  $I_{G1 \max.} = \pm 5 \quad \mu A$

Flashovers  $U_{G3,G5} = 8,1 \quad kV$   
within 1 minute max. 2  
within 15 minutes max. 5

Stray emission

Vertical deflection switched off.  $U_{G3,G5} = 8,1 \quad kV$   
No brightening on screen visible.

Warm-up-time

max. = 8 s  
Test conditions  $U_F = 6,3 \quad V$   
 $R_1 \sim 0,1 \quad \Omega$

Regulated power supply

$I > 6 \quad A$

The measuring time is from switch on of the heaters until a raster is visible.  
Brightness and contrast controls should be set for normal operation.

Colour coordinates

x y  
red 0,653 0,323  
green 0,286 0,607  
blue 0,141 0,061

Cathode currents for white

D = 9000 K +5 M.P.C.D.  
CIE-coordinates x = 0,287  
y = 0,295  
red 38%  
green 30%  
blue 32%

Cathode current ratio

red-blue 0,9.....1,5  
red-green 1,0.....1,6  
blue-green 0,6.....1,2

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Colour Picture Tube  
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## 6

### Glass- and Screen Data

(see Figure 6)

Glass transmission at screen centre	44%
Brightness at the screen centre	$\approx 80 \text{ cd/m}^2 \pm 10\%$
Test conditions	$U_A = 29,5 \text{ kV}, I_A = 1 \text{ mA}$
Overscanning	105%
Exact adjustment for horizontal and vertical linearity	
Colour temperature white	D 6500 K

Phosphors	
green -	cadmium free, gold activated
blue -	superpigmented blue
red -	superpigmented high Europium red

Persistence of phosphors	
Time to decay to 10% of initial peak value - medium short	
red	ca. 100 $\mu\text{s}$
green	20 - 40 $\mu\text{s}$
blue	11 - 17 $\mu\text{s}$

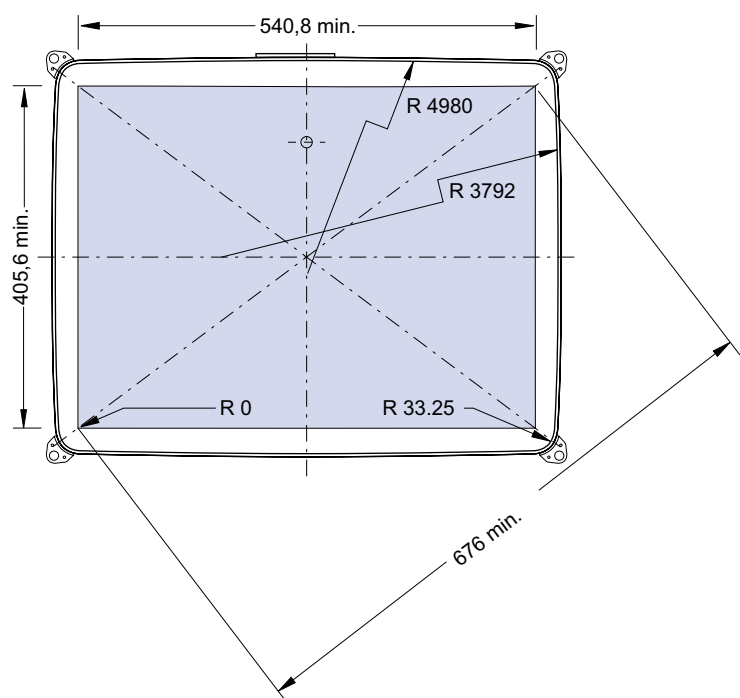
Pitch at the centre of tube	0,80 mm
(horizontal screen pitch - center to center distance of identical color phosphor stripes)	

Surface	polished
---------	----------

Visible screen area	2193 $\text{cm}^2$
---------------------	--------------------

Deflection angle	
diagonal	104°
horizontal	91°
vertical	74°

Figure 6:  
Phosphor and Screen Dimensions



## 7 Notes for Test and Adjustment

### Adjustment of focus voltage

Conditions:

$$\begin{aligned} U_{G3,G5} &= 29,5 \text{ kV}, U_K = 170 \text{ V}, \\ I_{AP} &= 5 \text{ mA} \text{ ①} \end{aligned}$$

Test chart crosshatch pattern

18 squares = 19 grid lines horizontal

14 squares = 15 grid lines vertical

105% picture width and height.

Optimal adjustment of focus between horizontal- and vertical lines at the centre of the screen.

### Test cut-off voltage area

Conditions:

$$\begin{aligned} U_{G2,G4} &= 29,5 \text{ kV} \\ U_A &= 29,5 \text{ kV} \end{aligned}$$

Beam undeflected and brightness- and contrast controls to minimum.

$U_K$  at the cathode to be tested

$$U_K = 170 \text{ V}$$

$U_K$  to other cathodes

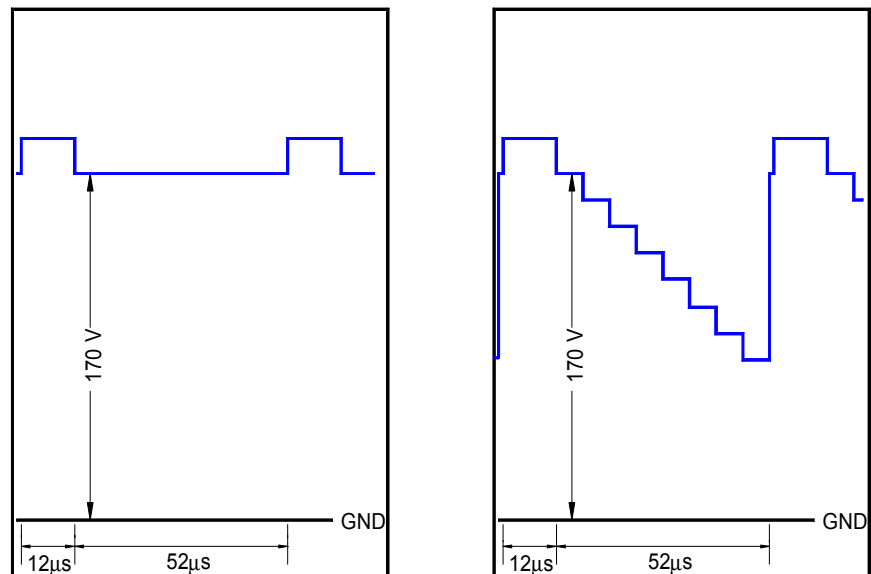
$$U_K = 250 \text{ V}$$

Turn  $U_{G2,G4}$ -control from 200 V to cut-off.

The cut-off has to be within the range of 482 - 842 V.

① The peak beam current of 5 mA corresponds roughly to 400µA average.

Figure 7:  
Recommended Cathode Voltage



### Adjustment of grid 2 voltage $U_{G2,G4}$

#### a) Individual cut-off adjustment

Set brightness- and contrast controls to minimum. All three cathodes at 170V. Increase  $U_{G2,G4}$  until the cut-off spot of the first gun appears. Reduce  $U_K$  of the two other guns until their cut-off spot is reached.

#### b) Automatic cut-off with black-level clamping

Set brightness- and contrast controls to minimum. Connect one of the three cathodes to an oscilloscope. Set DC-input to display 200 V. Turn  $U_{G2,G4}$ -control to the recommended cathode voltage of 170 V.

c) Automatic cut-off without black-level clamping

Test pattern grey scale.

Adjust contrast- and brightness-controls to linear grey scale.

Absolute values of voltage jumps from step to step are constant.

The last grey value is different to the black level. Set contrast control at  $I_A \sim 500 \mu A$ . Turn  $U_{G2,G4}$ -control to the recommended cathode voltage of 170 V, (see figure 7).

## 8 Mechanical Data and Dimensional Drawings

Overall length	452,1 ± 5	mm
Neck diameter	29,1 +1,5/-0,6	mm
Outside dimensions		
Diagonal (including rimband)	729,8 ± 2,4	mm
Horizontal (including lugs)	623	mm max.
Vertical (including lugs)	493	mm max.
Screen Dimensions		
Diagonal	676	mm min
Horizontal	540,8	mm min
Vertical	405,6	mm min
Area	2.193	cm <sup>2</sup>
Base	JEDEC B 12-285	
Anode contact	7,92 IEC 67-III-2, JEDEC J1-21	
Weight	appr. 36 kg	

### Notes to outline drawings

- ① Anode contact 7,92 according to IEC 67-III-2, JEDEC J1-21
- ② This area is free of external conductive coating and must be kept clean.
- ③ Implosion protection frame and external conductive coating are galvanically separated from each other. They can be connected taking into consideration the existing safety regulations.
- ④ The external conductive coating must be connected to the negative high voltage terminal. Conduction cross-section  $A=1 \text{ mm}^2$ .
- ⑤ The tube base is in a circle of a diameter max. = 55 mm with respect to the tube axis. The socket has to be connected by flexible wires only.
- ⑥ Nominal dimensions of the position of the fixing screws. The nominal dimensions are designed for the use of fixing screws with a diameter up to 9,5 mm.
- ⑦ One out of the four mounting lugs may deviate by max. 1 mm to the plane of the other three.
- ⑧ The Z-points are reference points for the distance to X and Y. (Figure 9)
- ⑨ Minimum space to be reserved for mounting lug.
- ⑩ Dimension without joint plate.

Figure 8:  
Anode Contact ①

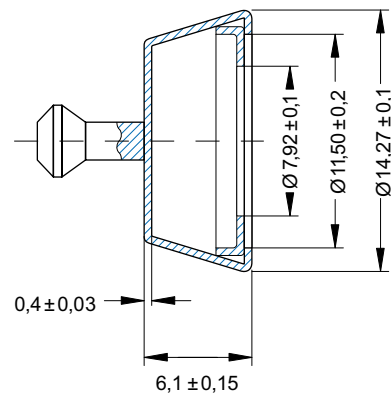


Figure 9:  
Panel Reference Points ⑧

Outside face contour

$$z = R - \sqrt{R^2 - (x^2 + y^2)}$$

$$R = 100000$$

center point to z point = 0,6  
z-point to y-point = 0,2  
z-point to x-point = 0,4

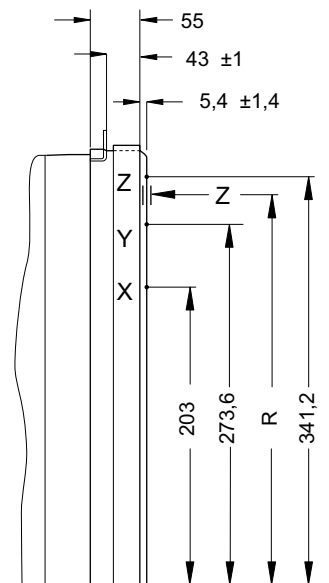
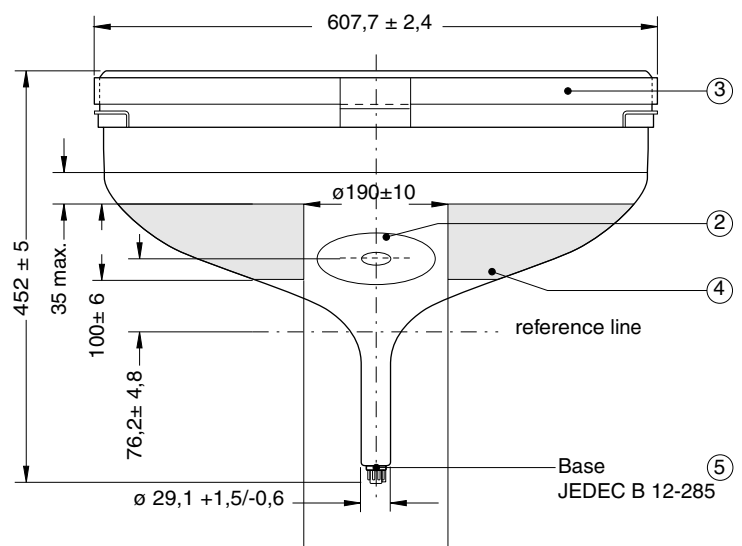


Figure 10:  
Overall Dimensions of Tube, Top  
View



For design purposes use only  
drawings

Figure 11:  
Overall Dimensions of Tube, Side  
View

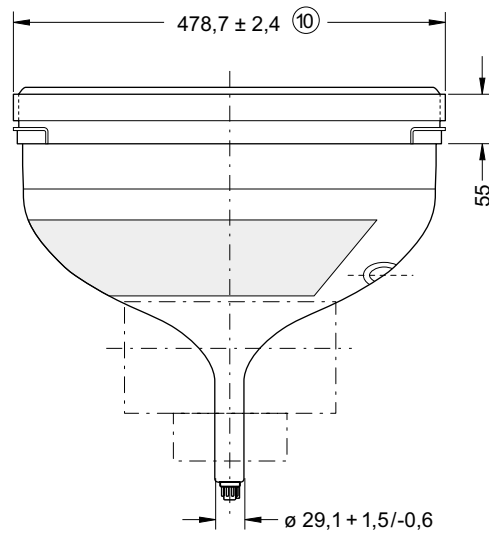
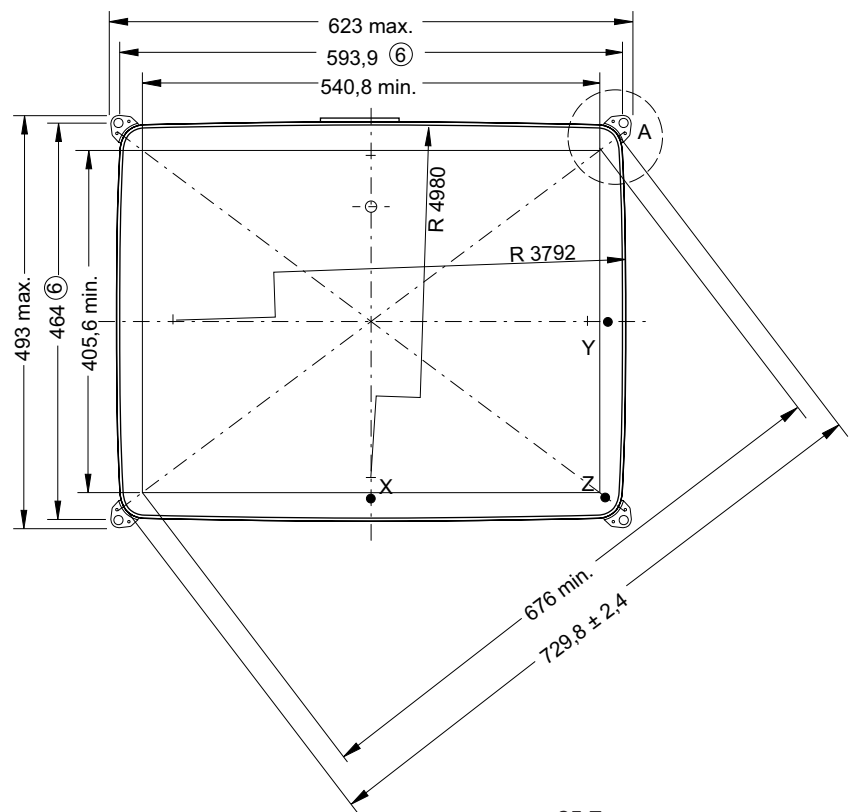


Figure 12:  
Overall Dimensions of Tube, Front  
View



For design purposes use only  
1:1 drawings.

Figure 13:  
Section A, Dimensions of Lug

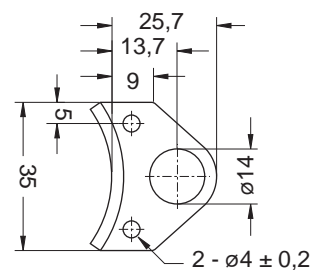


Figure 14:  
Dimensions of Lug, Side View

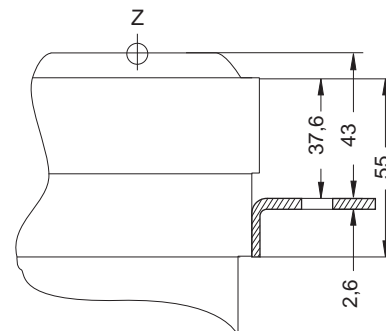
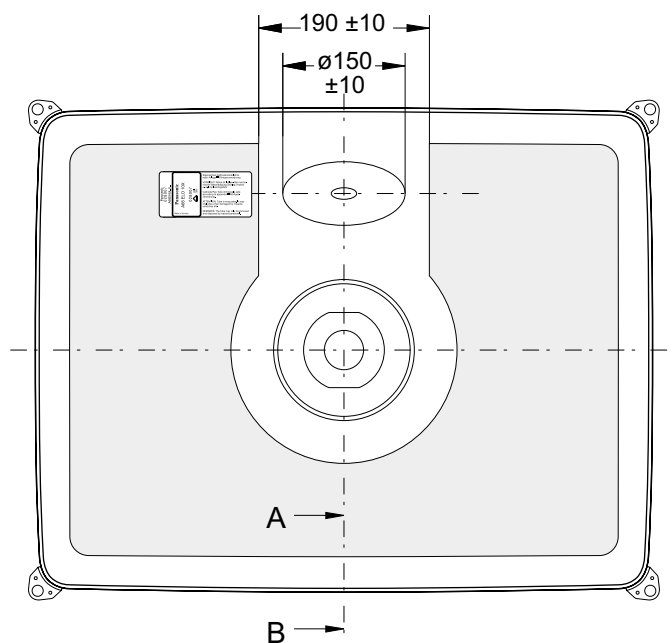


Figure 15:  
External Coating



**For design purposes use only drawings.**

Figure 16:  
Implosion Frame  
(External Coating, Section A - B)

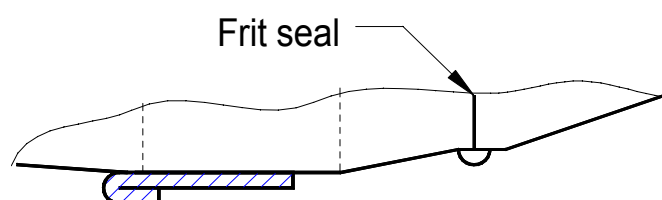
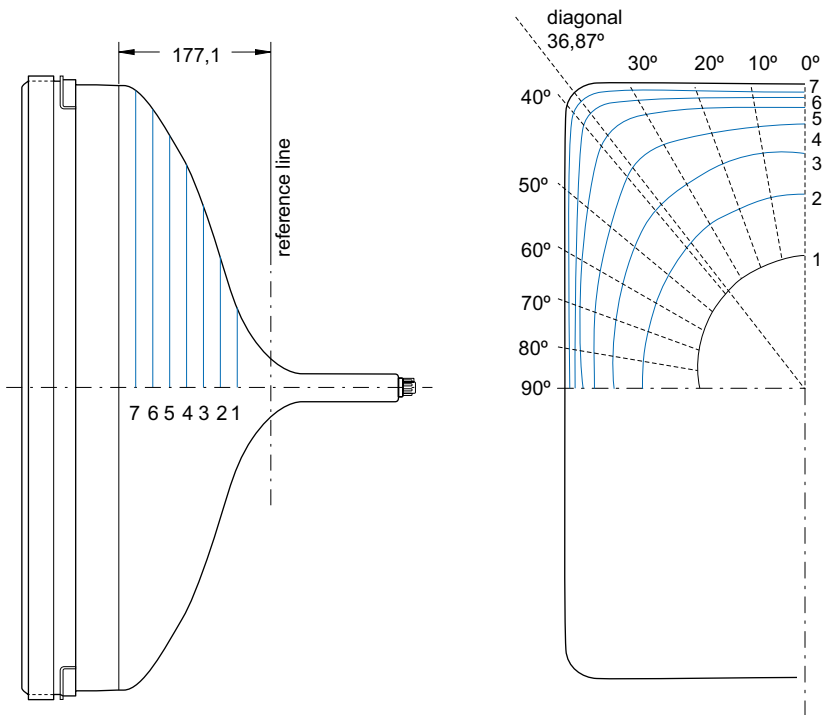


Figure 17 :  
Funnel Radial Coordionates



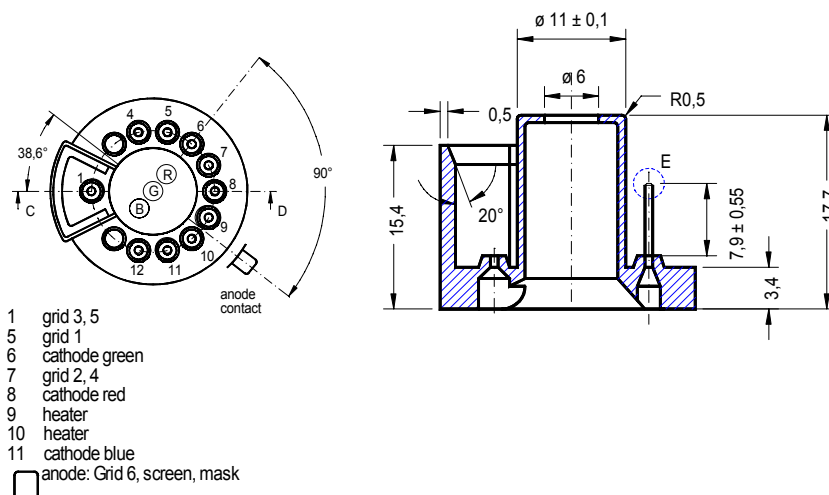
For design purposes use only drawings.

Nominal Outside Contour Radial Coordinates													
No.	Height from Reference Line	Major Axis	10°	20°	30°	Dia 36.87°	40°	50°	60°	70°	80°	Minor Axis	No.
1	36.35	81.92	82.13	82.76	83.74	84.05	84.03	83.35	82.59	82.04	81.70	81.59	1
2	56.35	155.72	155.73	155.78	155.85	155.92	155.13	146.74	139.95	135.22	132.44	131.52	2
3	76.35	207.68	208.14	209.53	211.81	213.71	211.93	195.71	183.44	175.14	170.35	168.78	3
4	96.35	242.88	244.37	248.85	256.43	262.37	259.37	233.54	215.07	202.99	196.15	193.94	4
5	116.35	267.28	269.73	277.23	290.20	300.27	296.03	261.38	237.75	222.67	214.26	211.56	5
6	136.35	284.05	287.48	298.12	317.06	331.92	325.60	281.22	252.64	234.88	225.12	222.01	6
7	156.35	293.82	297.93	310.79	334.20	352.74	345.58	294.61	262.72	243.21	232.60	229.22	7



Figure 18 (left):  
Tube Base

Figure 19 (right):  
Tube Base, Section C - D

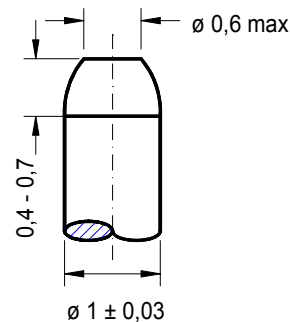


unused pins 4 and 12 must not be connected

tube base JEDEC-No. B 12-285

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Detail E



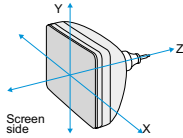
## 9 Limiting Values

Heater voltage	$U_F$	= 6,0 - 6,6V ..... ①
Anode voltage	$U_{A \max}$	= 33 kV
Anode voltage	$U_{A \min}$	= 25 kV
Anode current	$I_{A \max}$	= 1,8 mA ... ④
Focusing voltage grid 3,5	$U_{G3, G5 \max}$	= 10 kV
Voltage between grid 3,5 and grid 6	$U_{G3, G5/ G6 \max}$	= 24 kV
Screen grid voltage peak	$U_{G2, G4p \max}$	= 1,4 kV

Cathode voltages		
positive	$U_{K \max}$	= 200 V
negative	$-U_{K \max}$	= 0 V
positive peak voltage	$U_{KP \max}$	= 400 V
negative peak voltage	$-U_{KP \max}$	= -2 V

Voltages between heater and cathode		
Heater negative to cathode	$U_{-FK \max}$	= 275 V ..... ②
Heater positive to cathode	$U_{+FK}$	= 0 V
Heater to cathode peak voltage	$U_{-FKP \max}$	= 385 V
Heater to cathode peak voltage	$U_{+FKP \max}$	= 200 V

Shock acceleration during transport and handling ③

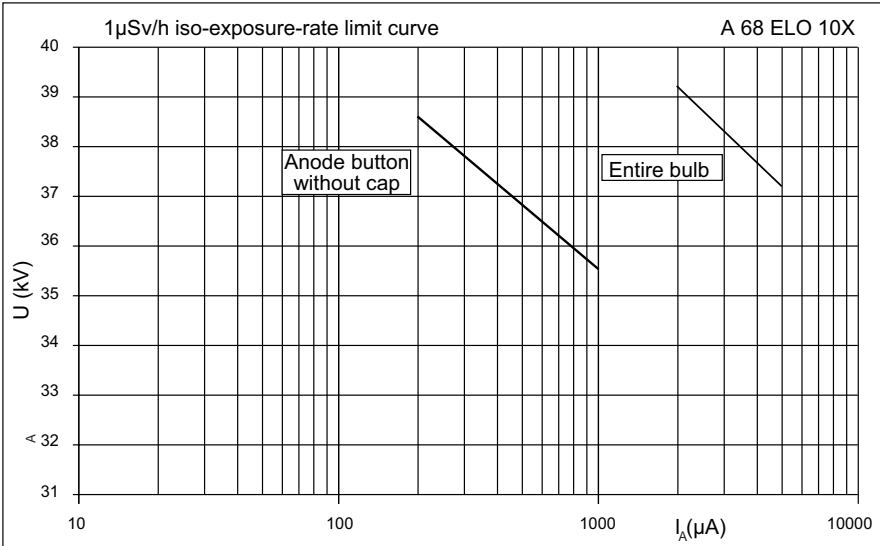


Y-axis and screen side of Z-axis	343m/s <sup>2</sup>
Neck side of Z-axis	245 m/s <sup>2</sup>
X-axis	196 m/s <sup>2</sup>

- ① To secure good emission characteristics through the life, it is recommended to regulate the heater voltage at 6,3 V.
- ② During warm up period of max. 15 sec the maximum voltage between heater and cathode must not exceed 385 V. This voltage must be reduced to 275 V at least time proportionally within 45 sec.
- ③ The tube has an integrated implosion protection according to VDE and BSI requirements. Rough tube mechanical treatment might lead to implosions.
- ④ short term average (with ABL circuit)  $I_{A\ max.} = 1,8\ mA$   
long term average (with ABL circuit)  $I_{A\ max.} = 1,4\ mA$

Cut-off voltage ratio	$U_K$ -Quotient = 1,16
X-radiation	max. 1 $\mu Sv/h$
Test conditions Dose rate measuring in the distance of 100 mm to the glass surface.	
ISO-dose rate	Figure 20
Maximum	1 $\mu Sv/h$
Parameters: Anode voltage - anode current	

Figure 20:  
ISO Dose Rate



# 10 Screen- and Glass-Blemishes Limits

Contrast blemishes  
Bubbles in glass, missing phosphor,  
black spots.

Figure 21 + 22

The size of the blemish is defined by length plus width divided by two. Judgement of defects should not be done before 10 minutes after switch on.

$$(L + W) / 2$$

Viewing distance to classify the contrast degree is

60 cm

For definition of defect size and contrast degree template can be used.

## Defects with high contrast

The defect remains visible if template is moved from 0,7 to 1,3 filter.

## Defects with medium contrast

Defect disappears if template is moved from 0,7 to 1,3 filter.

Screen zones see Figure 23  
Zone A, centre area 325 x 254 mm  
Zone B, outside area  
Zone C is defined as the unscreened area of the faceplate.

Figure 21:  
Blemishes, High Contrast

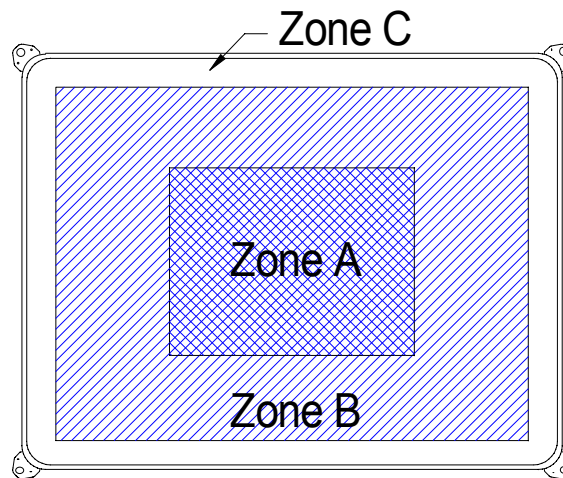
Blemish size (mm)	Limited blemishes		Distance (mm)
	A	A+B	
>1,0	0	0	-
0,8...<1,0	0	1	-
0,5...<0,8	1	3	80
0,25...<0,5	2	4	50 ①
< 0,25 ②	unlimited	unlimited	-

- ① Accepted are three defects, minimum distance of 2 failures is 50 mm.  
② Blemish size unlimited. Limited only by cloud in a viewing distance of 1 m.

Figure 22:  
Blemishes, Medium Contrast

Blemish size (mm)	Limited blemishes		Distance (mm)
	A	A+B	
>1,0	0	0	-
0,8...<1,0	1	2	80
0,5...<0,8	4	8	50 ①
< 0,5 ②	unlimited	unlimited	-

Figure 23:  
Screen Zones



Scratches on the faceplate (see Figure 24)

The sum of all scratches with a width of 0.05-0.15 mm should not exceed 180 mm.

Viewing distance ~1,0 m

Ambient light (activated screen) ~1 Lux

Ambient light (non-activated screen) ~1.000 Lux

Figure 24 :  
Scratches on the Faceplate

Width (mm)	Length (mm)	Distance (mm)
$\leq 0,05$	unlimited	-
$0,05 \dots < 0,10$	50	19
$0,10 \dots \leq 0,15$	13	45
$> 0,15$	-	-

Figure 25:  
Stains

Stain size (mm)	Limited stains		Distance (mm)
	A	A+B	
$> 1,3 \dots \leq 1,8$	1	2	80
$> 0,8 \dots \leq 1,3$	2	3	80

## 11 Geometry and Convergence Specification

For the judgement of geometry and convergence the following conditions are valid:

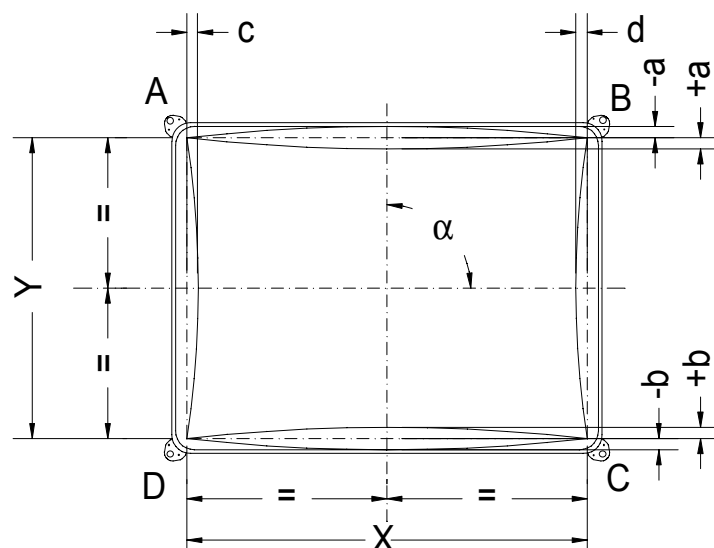
1. Warm up time	15 min
2. Anode voltage	$U_A = 29,5 \text{ kV}$
3. Heater voltage	$U_F = 6,3 \text{ V}$
4. $U_{G2}$ adjustment related to recommended cathode voltage	$U_{G2,G4} = 482-842 \text{ V}$ $U_K = 170 \text{ V}$
5. Focusing voltage adjustment for optimum of focus for vertical and horizontal lines at the centre	$U_{G3,G5} \quad I_{AP} = 5\text{mA}$
6. Screen has to face east	
7. Test pattern	Cross hatch pattern White pattern
8. Colour temperature adjustment to white	$D = 9000 \text{ K}$

<b>Raster distortion</b>	Figure 26
Test pattern	Cross hatch pattern, only green.
The peak beam current of $200 \mu\text{A}$ corresponds roughly to $25 \mu\text{A}$ average.	$I_p = 200 \mu\text{A}$
Linearity, picture width and height should be correctly adjusted.	

Overscanning	5%
--------------	----

		max. (%)
north-south distortion	$[2(a+b)/(AD+BC)] \bullet 100\%$	- 1,2
north-south symmetry	$[2(a-b)/(AD+BC)] \bullet 100\%$	1
east-west distortion	$[2(c+d)/(AB+CD)] \bullet 100\%$	14
east-west symmetry	$[2(c-d)/(AB+CD)] \bullet 100\%$	1
horizontal trapezium	$[(AD-BC)/(AD+BC)] \bullet 100\%$	1
vertical trapezium	$[(AB-DC)/(AB+DC)] \bullet 100\%$	1
orthogonality	$\alpha = 90^\circ \pm 0,42^\circ$	

Figure 26:  
Raster Distortion, Separate

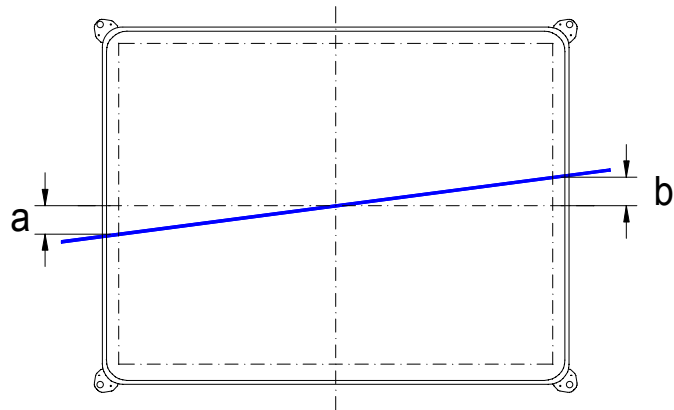


### Rasterrotation

Figure 27

Cross hatch pattern only green.  
Difference between the mechanical and  
the electrical centre line.

Figure 27: Raster Rotation



$a + b$  max. (mm)

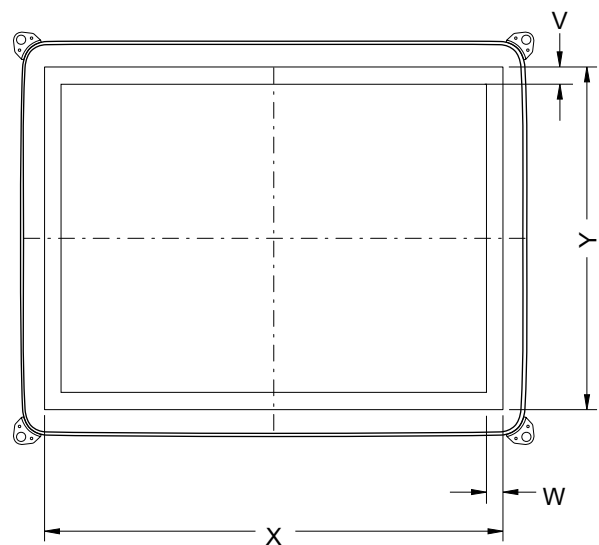
3,0

### Sum of raster distortion

Figure 28

All raster failures have to be inside the shown frame

Figure 28:  
Raster Distortion, Sum



$X = 490$  mm

$Y = 370$  mm

$W = 6$  mm

$V = 5$  mm

### Rastershift

Horizontal

max. 5 mm

Vertical

max. 5 mm

Scanning switched off. Beam current adjusted to a visible spot. The value is  
the distance of the spot to the mechanical centre.

### Convergence

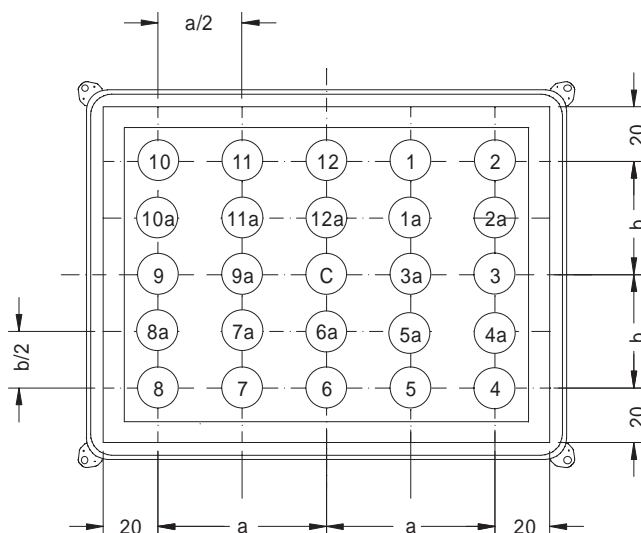
Test pattern cross hatch white.

The peak beam current of 5mA corresponds roughly to 400  $\mu$ A average.

Figure 29

$I_{AP} = 5 \text{ mA}$

Figure 29:  
Convergence



C	0,4 mm
2, 4, 8, 10	1,6 mm
3, 6, 9, 12	1,4 mm
1, 5, 7, 11	1,4 mm
3a, 6a, 9a, 12a	1,3 mm
2a, 4a, 8a, 10a	1,6 mm
11a, 1a, 5a, 7a	1,3mm

Maximum values shown are related to the distance between the centre of blue-,red- and green lines, in vertical and horizontal direction.

### White uniformity

Test pattern white

Horizontal Magnetic field

$0 \pm 25 \mu\text{T}$

Beam current

$I_A = 1000 \mu\text{A}$

Viewing distance

2 m

Ambient light

$\sim 1 \text{ Lux}$

Tube has to be degaussed. Check after 30 minutes warm-up.

Tube is acceptable if there are no distinct colour differences visible.

### Purity

Test pattern white

Horizontal Magnetic field

$0 \pm 25 \mu\text{T}$

Beam current

$I_A = 1000 \mu\text{A}$

Viewing distance

2 m

Tube has to be degaussed. Wait for 30 minutes for the tube to warm up, then check each colour red, green and blue. The tube is acceptable if there is no discolouration visible.

## **12** **General Notes**

Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electronic device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

### **12.1** **Limit Values by** **IEC Publication**

The equipment manufacturer must design so that, initially and throughout life, no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions:

- \* supply voltage variation
- \* equipment and control adjustment
- \* components spread and variation
- \* load variations
- \* signal variations
- \* environmental conditions and also picture tube spread and variations.

### **12.2** **Voltage between Heater to** **Cathode**

The voltage between heater to cathode should be as small as possible.

### **12.3** **Voltages between Cathode** **and Grids 1, 2, 3**

Do not operate the tube unless all electrodes are connected to a DC potential. Do not exceed the limit value of any electrode. No electrode should be connected to a high voltage potential.

Test- or check circuits should be agreed with Matsushita Electronics (Europe) GmbH.

### **12.4** **Screen**

To avoid screen damages please pay attention to the following:

- \* Do not operate the tube with a stationary cross hatch pattern or a similar test pattern.
- \* Do not operate picture tube with a stationary luminary spot except with an extremely low beam current.
- \* Afterglow should not exceed 1,5 sec.
- \* The anode voltage  $U_A$  has to be reduced to less than 15 kV within 1 sec after switch off or switching into standby.
- \* If no bleeder resistor is used it has to be ensured by circuit design, that the tube will be discharged in a time <1 sec.

### **12.5** **Spark Gaps**

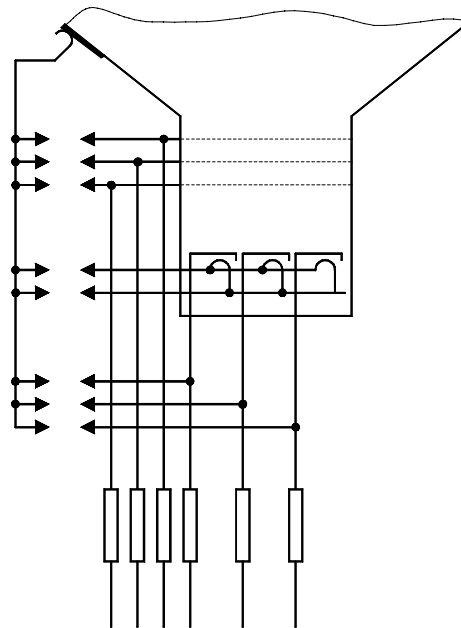
To avoid possible damages to tube or circuitry by internal flash over, spark gaps should be used (Figure 30).

For the connection of the spark gaps to the external conductive coating, the shortest possible wires should be used.

The connection to the external conductive coating should cover a large area. Isolation resistors should be used in series with each grid and cathode wire. The spark gaps should be designed for a breakdown voltage at the focusing electrode of 14 kV, at the other electrodes of 2kV.



Figure 30:  
Spark Gaps -  
Recommended Values



$$R_{KG} = 1,5 \text{ k} \Omega$$

$$R_{KR} = 1,5 \text{ k} \Omega$$

$$R_{KB} = 1,5 \text{ k} \Omega$$

$$R_{G1} = 100 \text{ k} \Omega$$

$$R_{G2} = 100 \text{ k} \Omega$$

$$R_{G3} = 1 \text{ M} \Omega$$

## 12.6 Degaussing

The tube has an internal shielding against external magnetic fields. The shield and the mask should be degaussed automatically whenever the TV-set is switched on.

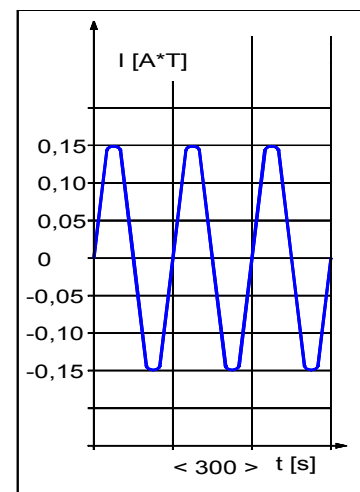
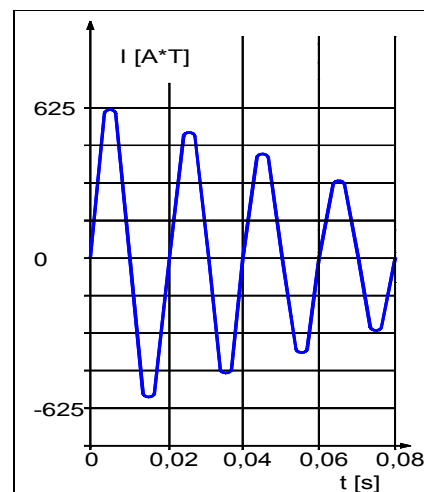
To get sufficient degaussing a magnetomotive force with an initial value of minimum 625 ampere turns peak per each coil is needed (see figure 31). The total number of turns is the sum of turns of each coil.

The time of current decay has to be continuously. The value of the degaussing current after 4 cycles should be 50% of the initial value (4 cycles 50Hz = 80 ms, 60Hz = 67 ms, see figure 31). Figures 33 and 34 show a possible layout of degaussing coil, and degaussing circuit.

The reduction of current per half wave must be less than 10 percent. The residual value of magnetic flux must be less than 0.15 ampere turns peak to peak (see figure 32), before vertical scan starts.

Figure 31 (left):  
Degaussing - Reduction of Current  
per Halfwave

Figure 32 (right):  
Degaussing - Residual Value of  
Magnetomotive Force



To avoid coupling of line frequency current a sufficient capacitor should be connected in parallel to the degaussing coil.  
When using external degaussing coils vertical deflection of tube must be switched off. In this case the initial value of magnetic field strength at front panel should be min. 160 A/m .

Figure 33:  
Placement of Degaussing Coil,  
Version 1

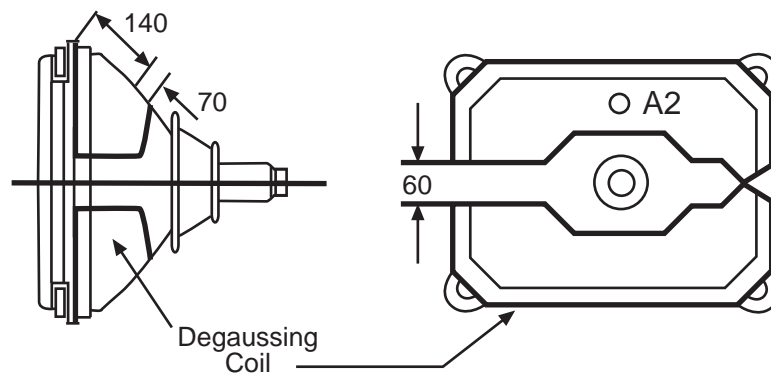
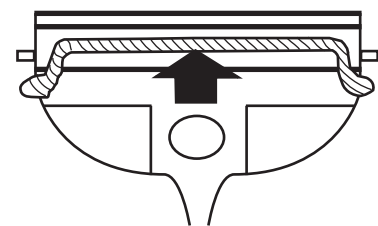
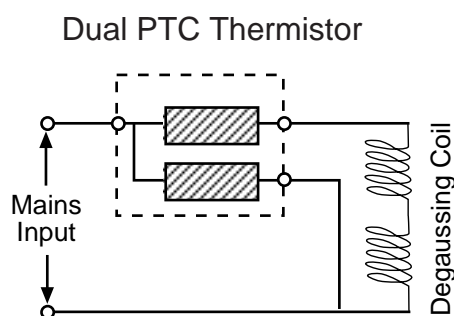


Figure 34:  
Degaussing circuit.



Location of degaussing coil should be as close to the screen as possible to have a maximum degaussing effect.

## 12.7 Implosion Protection

All picture tubes from Matsushita Electronics (Europe) GmbH are implosion protected according to VDE DIN 57860, IEC 65, BSI and CCIB.

Care should be taken not to scratch or knock any part of the tube.

Please handle tube careful to avoid any risk of implosion.

In all handling procedures prior to insertion into the cabinet, there is a risk of personal injury as a result of severe accidental damage to the tube. It is therefore recommended that protective clothing should be worn, particularly eye shielding.

Remember when replacing or servicing the tube assembly, that a residual electrical charge may be carried by the anode contact and also 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.

**The final customer has to be informed about statements of implosion protection**

## 12.8 Handling

Avoid any mechanical stress to the neck components during transport and handling, it could cause loss of performance.

## 12.9 *Cabinet Design*

Design of the cabinet has to be done according to the 1:1 drawing and not to a tube sample or this specification.

## 12.10 *Microphony*

Intense vibration of the loudspeakers inside the TV set can result in a visible modulation of brightness. This can be minimized by a suitable design of the TV cabinet. - Caution SST-mask is more sensitive against loudspeaker vibration than a conventional mask.

## 12.11 *Transport*

To avoid tube damage during transport, the following has to be taken into consideration:

- a. Single tubes  
Single tubes must be delivered in Matsushita Electronics (Europe) GmbH designed packaging only and transported in the printed position.
- b. TV set  
This must be transported in the packing designed by the set manufacturer in the position printed on the carton. If the tube is transported with it's faceplate in a horizontal position it could cause irreparable damage to the shadow mask

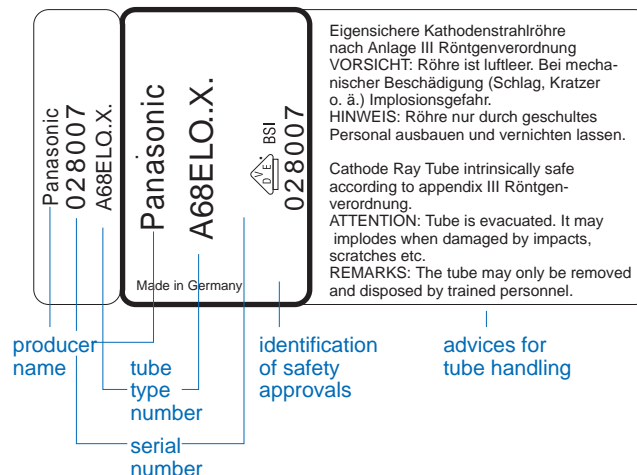
## 12.12 *Storage*

- a. Tubes must only be stored in dry and clean storage facilities. Tubes and polystyrene have to be protected against rain and humidity.
- b. Temperature of tube should be room temperature.

## 12.13 *Type Designation by Pro Electron and Tube Label*

Type .....	A 68 ELO10X
TV picture tube .....	A
Screen diagonal (cm) .....	68
Family code (tube) .....	ELO
Member of family code .....	10
Tri-colour screen .....	X
Code of deflection yoke .....	see separate yoke specification
.....	(50Hz and 100Hz available)

Figure 35:  
Tube Label (Example)



13

Used Formula Signs

**Voltages**

Anode voltage	$U_A$
Cathode voltage	$U_K$
Voltage cathode to heater	$U_{KF}$
Peak cathode voltage	$U_{KP}$
DC voltage grid 1, 2, 3, 4, 5	$U_{G1}, U_{G2, G4} U_{G3, G5}$
DC voltage between grid 2,4 and cathode	$U_{G2, G4/K}$
Voltage between grid 3,5 and grid 6	$U_{G3, G5/G6}$
Screen grid voltage peak	$U_{G2, G4p}$
Heater negative to cathode	$U_{-FK}$
Heater positive to cathode	$U_{+FK}$
Heater to cathode peak voltage	$U_{-FKP}$
Voltage between heater and cathode	$U_{+FK}$
Heater positive to cathode	
Heater voltage	$U_F$
Voltage peak to peak	$U_{PP}$

**Currents**

Anode current	$I_A$
Cathode Current	$I_K$
Leakage current cathode-heater	$I_{KF}$
Current Grid 1, 2, 3	$I_{G1}, I_{G2}, I_{G3}$
Heater current	$I_F$
Beam current	$I_A$
Deflection current horizontal peak to peak	$I_{HP P}$
Deflection current vertical peak to peak	$I_{VPP}$

**Capacities**

Outside capacity	$C$
Grid 1 to all other electrodes	$C_{G1}$
Cathode to all other electrodes	$C_K$
Grid 3 to all other electrodes	$C_{G3}$
Anode to external conductive coating	$C_{A/M}$
Anode to metal rimband	$C_{A/Z}$
Grid 1 to cathode	$C_{G1/k}$

**Resistance**

Active resistance of horizontal deflection coils	$R_H$
Active resistance of vertical deflection coils	$R_V$
Resistance of wires to cathodes green, red, blue	$R_{KG}, R_{KR}, R_{KB}$
Resistance of wires to grids 1, 2, 3	$R_{G1}, R_{G2}, R_{G3}$

### Indices

Anode	A
Heater	F
Grid	G
Cathode	K
Outside conductive coating	M
Peak to peak	p-p
Edge to edge	e-e
Limit value	max.
Peak value	P
Point on Panel Diagonal	Z

### Other Dimensions and Abbreviations

Ambient temperature	T amb
Absolut beam limiter	ABL
Brightness or inductance	L
British Standard Institution	BSI
DC	direct current
eff.	effective
Inductance horizontal deflection coils	L <sub>H</sub>
Inductance vertical deflection coils	L <sub>V</sub>
International Electrotechnical Commission	IEC
International Standards Organisation	ISO
Joint Electron Device Engineering Council	JEDEC
Minimum Perception Colour Difference	M.P.C.D.
Multi Functional Triode	MFT
Multi Pre Focus	MPF
N, S, E, W	north, south, east, west
Overlapped Field Lens	OLF
Pulse duration	t <sub>p</sub>
Sensitivity	LI <sup>2</sup> e-e
Sensitivity	RI <sup>2</sup> e-e
Verband Deutscher Elektrotechniker e.V.	VDE
Semi - Stretch Tension	SST
Aberration Reducing Triode	ART

**MATSUSHITA ELECTRONICS  
(EUROPE) GmbH**

Fritz-Müller-Strasse 112  
D-73730 Esslingen · Germany  
P.O. Box 100954  
D-73709 Esslingen · Germany

Phone ++49(0)711 / 3104-536  
Fax ++49(0)711 / 3104-377  
E-mail: [Marketing.Sales@Panasonic-CRT.de](mailto:Marketing.Sales@Panasonic-CRT.de)

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