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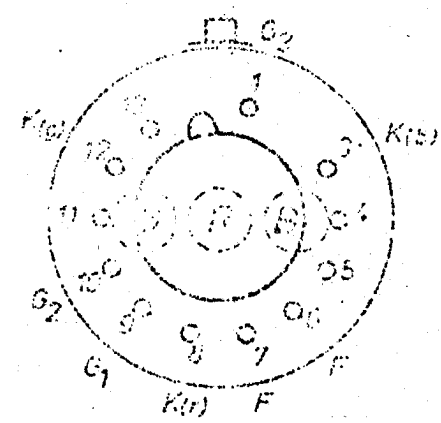
SECRET

TECHNICAL DATA
FOR THE
SEL-PICTURE TUBE
TYPE 51-190 X

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Annex CRT
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Technical Data 15 pages.

Alterations reserved.

DESCRIPTION

The SEL-Picture Tube F 51-190 X is a rectangular colour picture tube with 90° deflection angle and 29 mm neck diameter.

The useful screen area of 1190 cm² (appr.) has nearly straight sides of 40 x 30 cm (appr.) with 3 x 4 aspect ratio. The filter-glass of the faceplate has a light transmission of 65,5 % (appr.)

The phosphor screen is composed of red-, green- and blue-emitting vertical phosphor stripes. The green- and blue-emitting phosphors are silver activated sulfide phosphors, the red emitting phosphor is composed of yttrium compounds activated with rare-earths.

The tube is operating according to the shadow mask principle, whereby however slots have replaced the conventional round holes.

The tube utilizes three electrostatic-focus guns, lying horizontal in-line. So, in combination with the integrated tube components a dynamic convergence is achieved and no additional correction components are necessary.

The neck components (yoke, one pair of permanent magnetic rings for colour purity, two pairs of permanent rings for static convergence) are fixed on the neck by the manufacturer and are adjusted exactly for optimum performance that no further adjustment is needed.

Magnetic Shield:

To reduce the influence of external interference fields an internal magnetic shield are supplied.

This shield takes effect only after degaussing. This may be done automatically by means of a degaussing coil when the equipment is switched on. An initial magnetic flux with a peak value of appr. 700 ampere turns is recommended.

1. MECHANICAL DATA

Bulb	All-glass Type with rectangular Spherical Faceplate of Filterglass (Push-Through Presentation)
Implosion Protection	Steel-Jacket with Lugs
Minimum Useful Screen Dimensions	
Aspect Ratio 3 x 4	Diagonal 480 mm Horizontal 404 mm Vertical 303 mm
Deflection Angles	Diagonal 90° Horizontal 78° Vertical 60°
Weight	12,7 kg (appr.)
Base	JEDEC B 12-262

2. ELECTRICAL DATA

2.1. TYPICAL OPERATING CONDITIONS ¹⁾

Heater Voltage	U_f	6,3 V ²⁾
Heater Current	I_f	0,750 A (appr.)
Anode Voltage	U_{g4g5a}	25 kV
Focusing Voltage	U_{g3}	4,2...5,0 kV

Cutoff Design Chart ³⁾
see diagrams page 8 and 9

2.2. MAXIMUM RATINGS ¹⁾

Anode

Voltage	U_{g4g5a} max	27,5 kV ⁵⁾
	U_{g4g5a} min	20 kV

Current ⁴⁾

	I_{g4g5a} max	1,0 mA
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Focusing Electrode

Voltage	U_{g3} max	6,0 kV
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Grid-No. 2

Peak Voltage (incl. Video Signal)	$U_{g2 p}$ max	1,0 kV
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Cathode

Positive Peak Voltage	$U_k p$ max	400 V
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Positive Operating Cutoff Value	U_k max	200 V
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Negative Bias Value ($-U_k$)		0 V
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Negative Peak Value ($-U_k$) p		2 V
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Heater/Cathode ⁷⁾

Voltage ⁸⁾	$U_{-f/k}$ max	450 ⁹⁾ V
	$U_{-f/k}$ max	200 V
	$U_{-f/k p}$ max	200 V
	$U_{+f/k p}$ max	200 V
	$U_{+f/k}$ max	0 V

Notes see page 4 and 5

2.3. RATINGS FOR CIRCUIT DESIGN

Leakage current ⁶⁾	I_{g3}	$\leq \pm 15$	mA
	I_{g2}	$\leq \pm 5$	mA
	I_{g1} ($U_k = 150$ V)	$\leq \pm 5$	mA

NOTES FOR PAGE 3 AND 4

- 1) For cathode drive service. Voltage values are for each gun and refer to grid-1-potential.
- 2) Maximum heater voltage tolerance of $\pm 10\%$ is admissible. For maximum cathode life, it is recommended to regulate heater supply to 6.3 V.
- 3) Maximum ratio of cathode cutoff voltages, Highest Gun to Lowest Gun in any tube will not exceed the value of 1.5.
- 4) Due to a higher total anode current of longer duration, deformation of the shadow mask may be effected, causing colour impurities. To avoid this effect, a limitation of the total anode current to 1.5 mA is practically sufficient.
- 5) Design-Maximum Rating should not be exceeded under the worst probable operating conditions.
- 6) These values indicate the permissible leakage currents of the electrodes concerned. The circuit must be designed in such a manner that the voltage applied are not substantially altered by these currents.
- 7) The equipment should be designed mechanically and electrically so that in consequence of an internal arc no power sources alone or in combination will cause a discharge current across the heater exceeding 750 mA.
Such current limitation will prevent heater burnout.
- 8) To avoid picture distortions, the interference from the heater must be kept as low as possible. Therefore, the AC voltage between heater and cathode shall not exceed the value
 $U_{f/k \text{ rms}} = 20$ V.
- 9) During warm-up period not exceeding 15 second $U_{-f/k \text{ max}}$ may increase to 450 V; within 15 and 45 seconds this value must decrease at least gradually to 200 V.

2.4. CAPACITANCES

Grid-No.1 to all other electrodes	c_{g1}	(appr.)	15 pF
Cathode to all other electrodes	c_k	(appr.)	15 pF
Grid-No 3 to all other electrodes	c_{g3}	(appr.)	6 pF
Anode to external conductive coating	$c_{g4g5a/m}$ max		2200 pF
	$c_{g4g5a/m}$ min		1400 pF
Anode to steel- reinforcement	$c_{g4g5a/m'}$	(appr.)	250 pF

3. OPTICAL DATA

Faceplate	Filterglass		
	Light Transmission (appr.)		65.5 %
Screen	Always three separated vertical stripes of red-, green- and blue-phosphors, aluminized.		
	Spacing between centres of stripes in the centre of screen (appr.)		0.82 mm
	Colour dot Coordinates	x	y
	Red	0.660	0.334
	Green	0.285	0.606
	Blue	0.151	0.061
	Coordinates for White	0.281	0.311
	Ratio of cathode currents for White		
	Red to Green	1.0	(0.5...1.6)
	Red to Blue	1.4	(0.8...2.0)

4. GENERAL CONSIDERATIONS

X-RADIATION

At the maximum permissible anode voltage of 27.5 kV and a total anode current of 1.0 mA, X-Radiation will not exceed the permissible value of 0.5 mR/h.

MOUNTING INFORMATION

Orientation

The tube must be operated with the large tube axis in a horizontal position.

The deflection yoke should not be used for supporting the picture tube.

Socket

Socket should not be rigidly mounted but connected by flexible leads and should not be used for supporting the tube. The base may be located within a circle of 51 mm diameter, concentric with the perpendicular line through the centre of screen.

Steel-reinforcement

Mounting angles of the steel-jacket may be used for fixing the tube in the receiver. Corresponding data see drawing page 11.

External conductive coating

Contact to the external conductive coating should be made by multiple fingers to prevent localized overheating.

Steel jacket and external conductive coating are separated galvanically against each other. They may be connected mutually if it is allowed by the effective safety rules.

The impedance between steel jacket and external conductive coating must not exceed 1 M Ω at 50 Hz and 5 k Ω at 15 kHz.

Anode contact

The area round the anode contact is coated with a water-repellent insulating layer, to clean it wipe only with soft dry lintless cloth.

5. APPLICATION DATA

Reference potential

Unless otherwise specified, voltage values apply to each gun and refer to grid-1-potential.

Focusing Electrode

Focusing voltage for optimum focus is 17...20 % of anode voltage.

Cutoff Limiting

The voltages are to be seen in the Cutoff Design Chart, page 8, in connection with the Cathode Drive Characteristic page 9.

Raster displacement measured at centre of screen: max \pm 6.35 mm

The yoke and the additional deflection components are fixed and adjusted by the manufacturer according to the drawing on page 11.

Grounding

The external conductive coating is to connect with the negative high voltage terminal.

Arc-over protection

In order to minimize the possibility of tube damage caused by an internal arc, it is recommended to limit the high voltage power for anode and grid-No. 3 and to apply protective gaps.

Maximum ratings

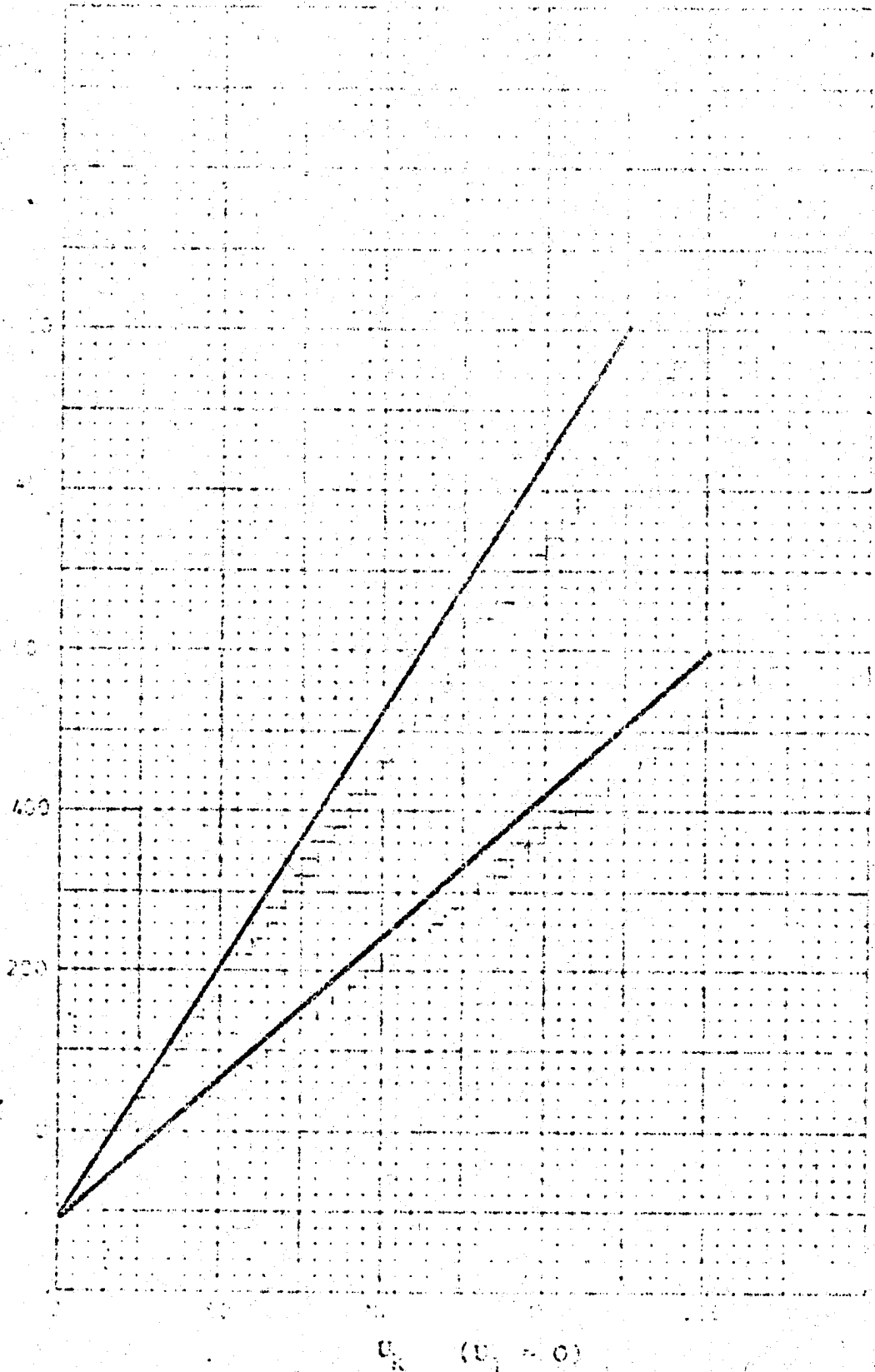
The network is to lay out in such a manner that the data should not be exceeded during life, even under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation or signal and environmental conditions. The high voltage limiting values are of absolute maximum rating type, which are not to exceed initially and throughout life.

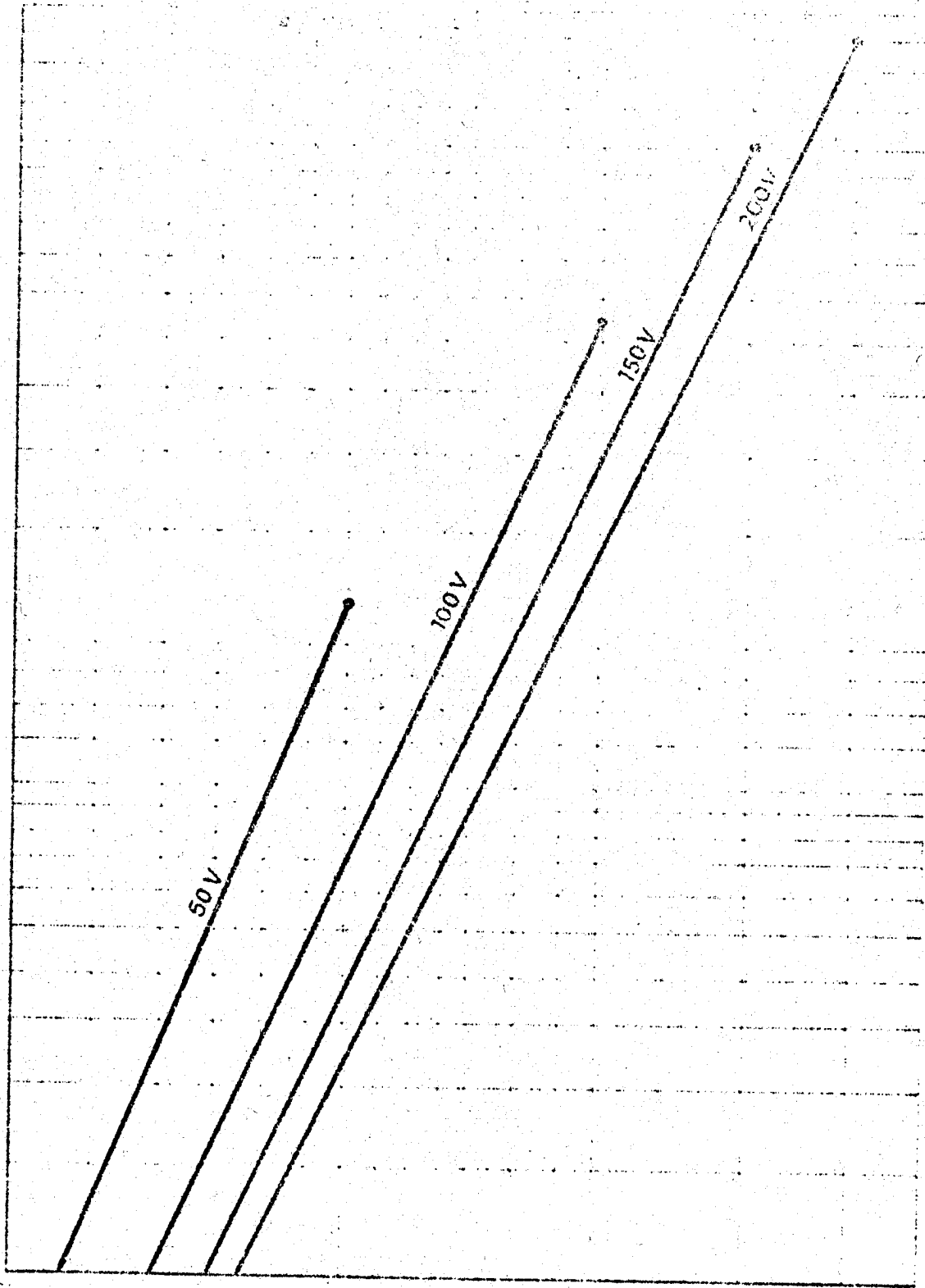
The picture tube must not be connected until the high tension has been adjusted within the limiting values.

OPTICAL DESIGN CHART

$U_{g4g5a} = 20 \dots 27.5 \text{ kV}$

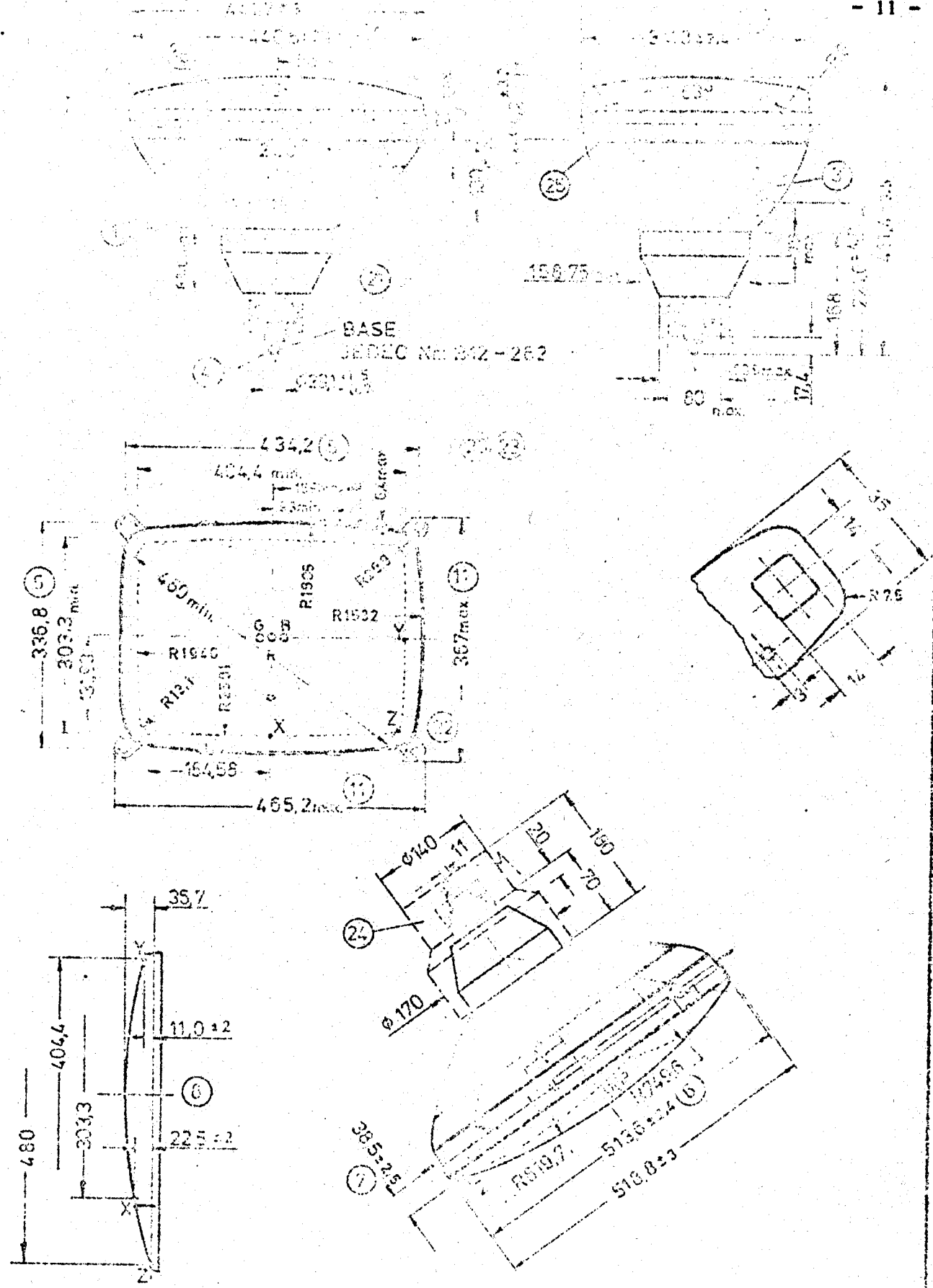
U_{g3} ADJUSTED FOR FOCUS





NOTES (Dimensional Drawings)

- 1) Cavity cap 7,92 according to DIN 41 543 (JEDEC Nr. J 1-21).
- 3) This area is free of external conductive coating and must be kept clean.
- 4) The tube base will fall within a tolerance circle of max. 51 mm diameter, with respect to the tube axis. The socket should not be rigidly mounted but must be connected by flexible leads.
- 5) For mounting bolts a free passage of at least 8.5 mm diameter at nominal position is ensured.
- 6) Dimensions of the bulb, measured at the front edge of the implosion protection.
- 7) The maximum deviation of any mounting lug from the plane formed by the three other lugs is 2 mm.
- 8) The Z points are reference points for the vertical position of the X and Y points. The dimensions for the position of the X, Y and Z points count also for the border line of the minimum useful screen area.
- 11) The outer limitation of the mounting lugs lies within these maximal dimensions.
- 15) Mounting holes for the degaussing coils.
- 20) Metal frame and external coating are galvanically separated against each other. They may be connected mutually if it is allowed by the effective safety rules. The impedance between metal frame and external coating must not exceed 1 M Ω at 50 c/s and 5 k Ω at 15 kc/s.
- 21) The external conductive coating of the tube must be connected with the negative high voltage terminal.
- 22) Minimum useful screen area.
- 23) All over bare metal.
- 24) Do not put any other magnetic materials in this area to prevent deterioration of tube performance (convergence, beam landing).
- 25) Frit seal.



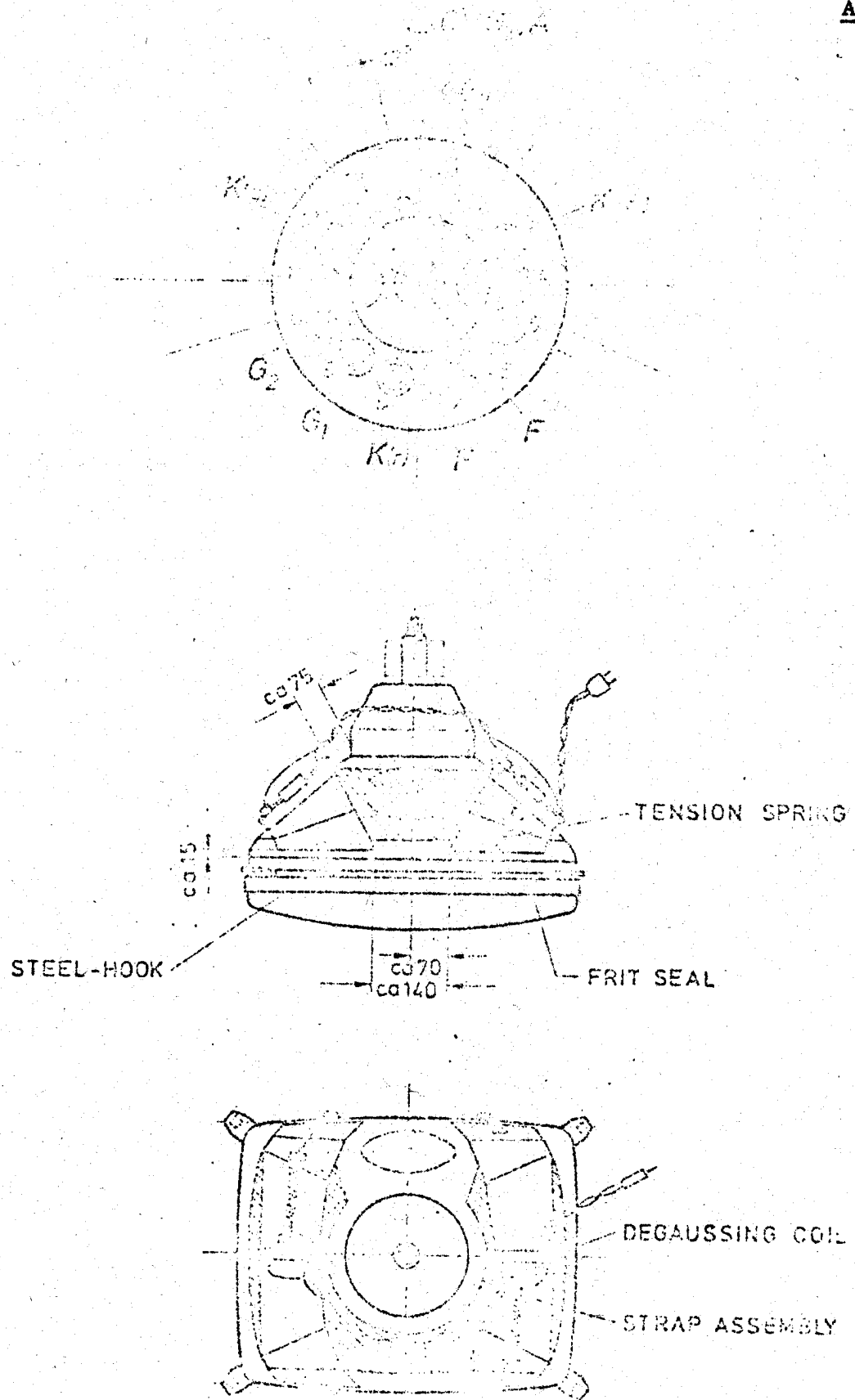


FIG. 4 LOCATION OF THE STRAP ASSEMBLIES ON THE TUBE

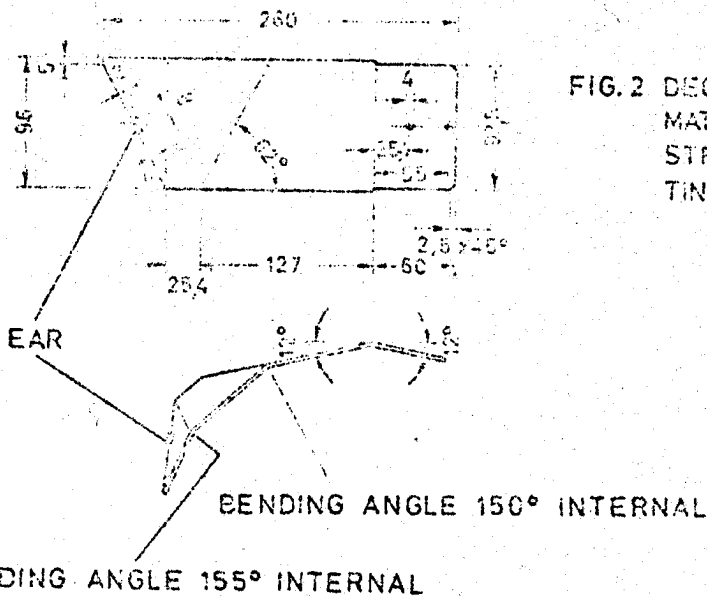
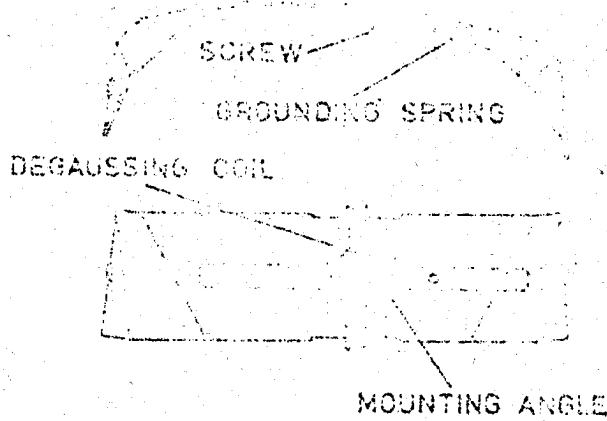


FIG. 2 DEGAUSSING STRAP (LEFT-HAND SIDE)
 MATERIAL:
 STRAP 0,75 DIN 1541 MUST 1203
 TIN PLATED DIN 1616 H 15

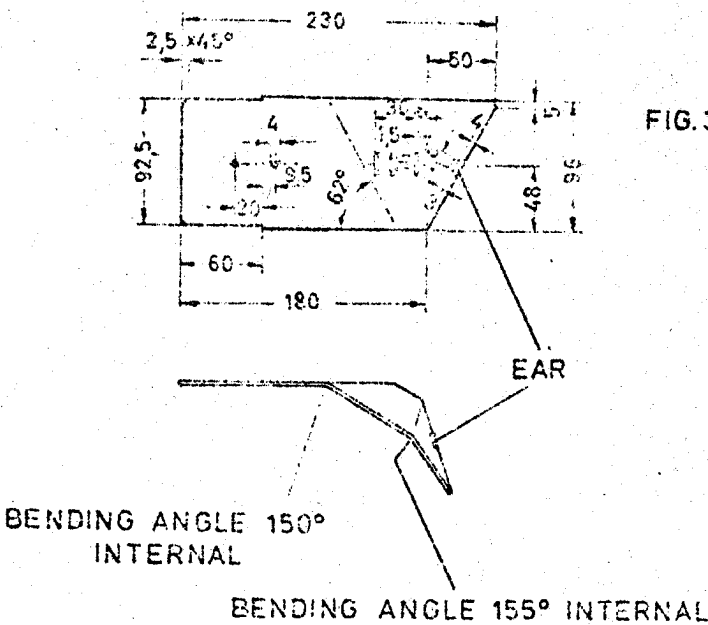


FIG. 3 DEGAUSSING STRAP (RIGHT-HAND SIDE)
 MATERIAL:
 STRAP 0,75 DIN 1541 MUST 1203
 TIN PLATED DIN 1615 H 15

COLOUR DEFLECTION UNIT

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Horizontal Coils: Series connected
(pins 5 and 10; 4 connected with 9)

Inductance at 1 V and 1 kHz	0.664 ± 4 %	mH
Resistance at 25°C	1.452 ± 7 %	Ω
Deflection current peak to peak at 25 kV and 102 % picture width	5.9	A

Parallel connected
(pins 5 and 10; 4 connected with 5
and 9 connected with 10)

Inductance at 1 V and 1 kHz	0.166 ± 4 %	mH
Resistance at 25°C	0.36 ± 7 %	Ω
Deflection current peak to peak at 25 kV and 102 % picture width	11.8	A

Vertical Coils: Series connected
(pins 1 and 6; 2 connected with 7)

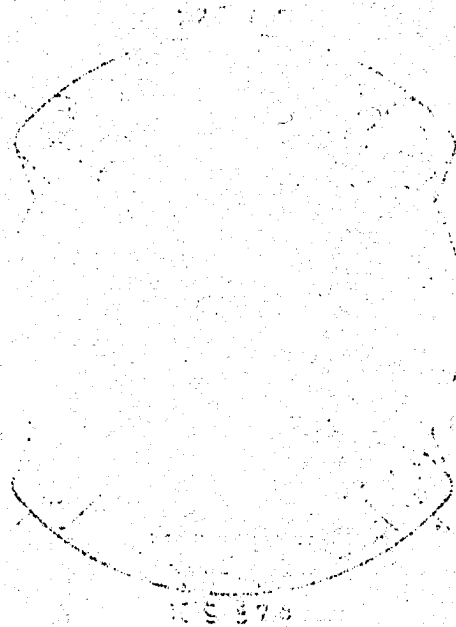
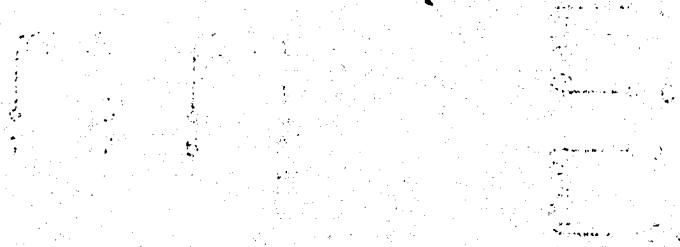
Inductance at 1 V and 1 kHz	1.14 ± 4 %	mH
Resistance at 25°C	1.87 ± 7 %	Ω
Deflection current peak to peak at 25 kV and 102 % picture width	3.6	A

Maximum Ratings: Peak Pulse Voltage
between horizontal and vertical coils max. 700 V

Operating Temperature max. 105°C

VERTICAL COILS

HORIZONTAL COILS



WINDING START