PQC 39/RU 0019
First edition, 2000

INTERNATIONAL ELECTROTECHNICAL COMMISSION

Quality Assessment System
for Electronic Components
IECQ

ELECTRONIC TUBES
Detail Specification: Colour Picture Tubes A33EKC01X…, A33EKC02X…

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Foreword

This Detail Specification is worked out by the company “Ekranas” and supersedes the Detail Specification PQC 39/RU 0013, first edition, 1994.

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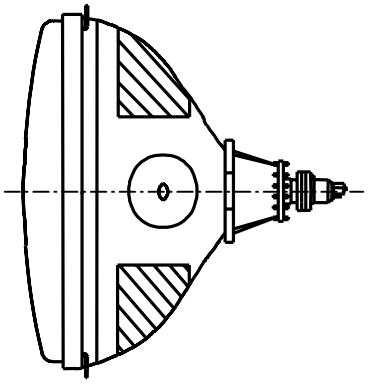
Introduction

Committee of the Russian Federation on Standardization and Metrology	**PQC 39/RU 0019** First edition, 2000
Electronic components of assessed quality in accordance with the IEC Publication QC 001002-3	**Detail specification:** Colour Picture Tubes A33EKC01X…, A33EKC02X…
Outline drawing (See Fig. 1, 2)  Reference dimensions: - total picture tube length (345.8 ± 4.0) mm - attaching dimensions (311.4 x 243.2) mm - neck diameter, nominal 29.1 mm. Mass 6.5 kg maximum	Colour picture tubes A33EKC01X… and A33EKC02X… delivered together with deflecting yoke and magnetostatic convergence and colour purity adjustment device (MCD), having rectangular screen, "Dark Tint" glass screen, 37 cm diagonal, with vertical bands of pigmentized luminophores of three colours (R, G, B), with electron beam deflection angle of 90°, with internal magnetic screen and multiturn tension band, for use in colour receiving TV sets
Dimensions and pin arrangement correspond to Figure 3.	Heater current (at Uh=6.3 V), A: 0.7 Accelerating grid voltage, V: 400-830 Anode voltage, kV: 25.0 Focusing grid voltage (22-26) % from Ua, kV: 5.5-6.5 Cut-off voltage, V: 70-145 Resolution in the centre of white colour and in main colours, lines: 375 minimum Light transmission in the centre of the screen, %: 47.9 Anode current, corresponding to white colour 9300K and luminance 100 cd/m^2, μA: typical value: 305 maximum value: 340
Limiting values of electric operating modes are given in Table 5. Limiting operating temperature is plus (1 – 60) °C	Environmental factors: - high operating temperature: +70 °C - limiting low temperature (at transportation): minus 40 °C - high relative humidity at 40 °C without moisture condensation: (93+2/-3) % - vibration 2 g in frequency range: (10-55) Hz - bumps (pulse duration 6 ms) acceleration: 25 g (250 m/s^2)
The picture tubes shall be kept under the following conditions: - temperature: +(5 – 40) °C - humidity at temperature 25 °C without moisture condensation: 80 % max	
Information about manufacturer who has components qualified to this detail specification is available in the current QC 001005	

CONTENT

SECTION ONE – GENERAL

1.1 Tube Designation

1.1.1 The tube designation includes the following symbols: A 33 EKC 01 X …,
1 2 3 4 5 6

where
1) **A** is the tube with the screen 4:3 designed for receiving television devices;
2) **33** is a minimum size of the useful screen area along a diagonal, cm;
3) **EKC** is a code of the tube family allotted by the International organization “Pro Electron”;
4) **01** or **02** is the tube with particular values of parameters which are given in Tables 2 and 4;
5) **X** is the colour picture tube;
6) designates a type of the deflecting yoke and regulation conditions of the tube (see Table 7).

1.2 Documentation System

Documentation system includes specifications of two levels:
- specification for receiving colour picture tubes A33EKC01X…, A33EKC02X… and
- other IEC documents to which reference is made are given in Appendix F.

1.3 Construction

1.3.1 Graphical symbols used in this Detail Specification are given in the IEC Publication 60617-5.

1.3.2 The overall, setting and attaching dimensions of the tube, dimensions of a screen surface, schematic diagram of grids with terminations and schematic diagram of electronic connections of deflecting yoke shall be in accordance with Figures 1 and 2. Dimensions to be inspected shall be given in Tables 1 and 2.

Table 1. Limiting Dimensions of Conic Part of the Tube

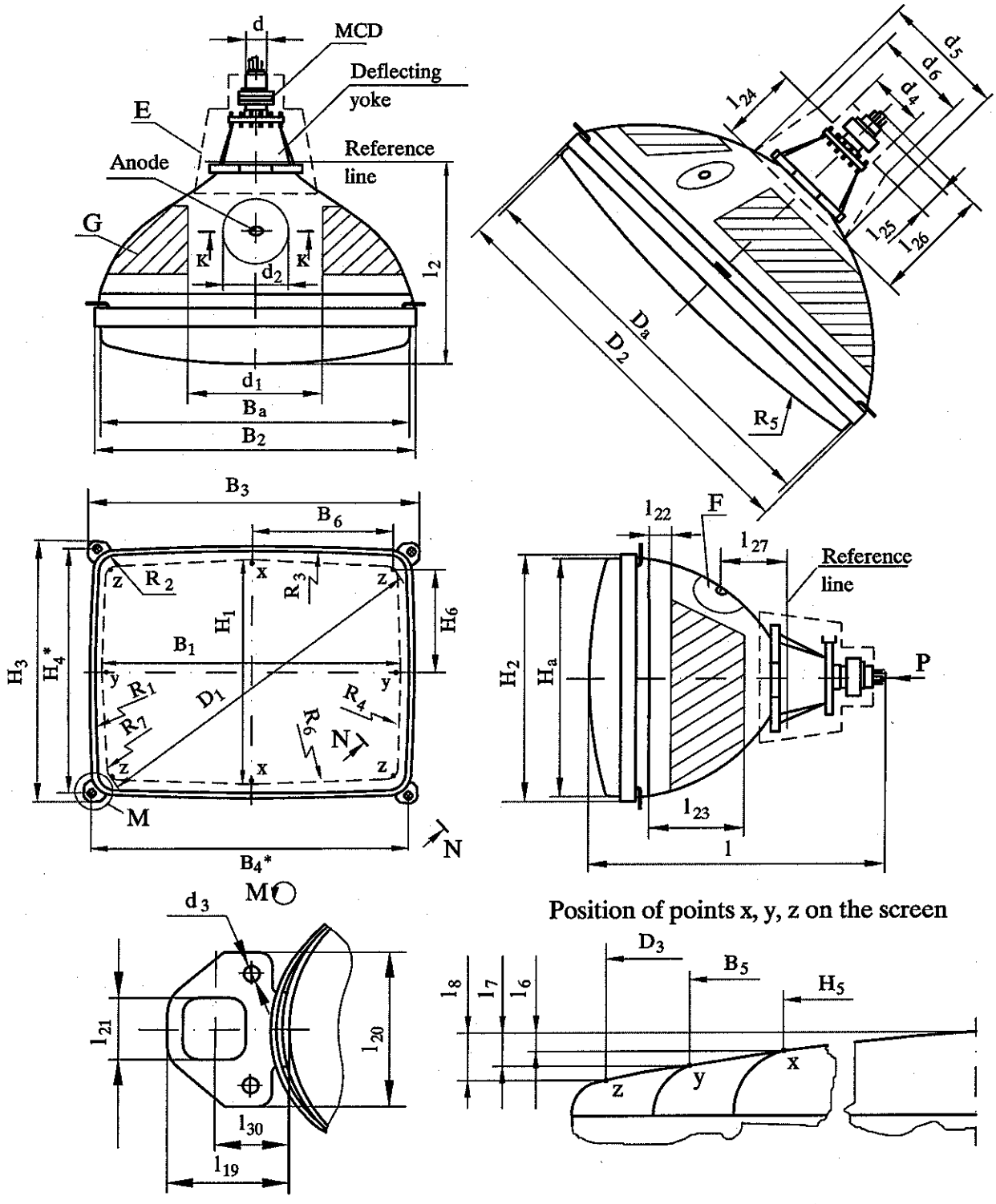
Cross-section	Distance form a reference line		M max, mm	V max, mm	P max mm
	Symbol	Distance, mm			
1	l_{9}	45	158	158	158
2	l_{10}	60	192	202	205
3	l_{11}	80	215	253	268
4	l_{12}	100	234	292	325
5	l_{13}	120	248	316	368

Table 2. Tube Dimensions (mm)

Symbol	Min	Nom	Max	Symbol	Min	Nom	Max
B_a	314,0	316,0	318,0	R_1	-	1095,88	-
B_1	282,0	-	-	R_2		25,3	
B_2	-	-	320,2	R_3	-	1323,44	-
B_2 *	-	-	319,7	R_4	-	1355,06	-
B_3	-	-	336,0	R_5	-	560,83	-
B_4	-	311,4	-	R_6	-	1804,4	-
B_5	-	282,0	-	R_7	-	9,12	-
B_6	-	139,19	-	R_9	-	5,2	-
H_a	245,4	247,4	249,4	l	341,4	345,4	349,4
H_1	211,5	-	-	l_2	201,5	203,5	205,5
H_2	-	-	251,6	l_4	33,7	35,5	37,3
H_2 *	-	-	251,1	l_5	-	2,0	-
H_3	-	-	268,0	l_6	8,6	10,1	11,6
H_4	-	243,2	-	l_7	16,5	18,0	19,5
H_5	-	211,5	-	l_8	24,1	25,6	27,1
H_6	-	94,34	-	l_{19}	-	23,2	-
D_a	365,0	367,0	369,0	l_{20}	-	30,0	-
D_1	334,8	-	-	l_{21}	-	12,0	-
D_2	-	-	375,4	l_{22}	-	-	25,0
D_2 *	-	-	374,9	l_{23}	75,0	-	-
D_3	-	334,8	-	l_{24}	-	125,0	-
d	-	∅29,1	-	l_{25}	-	50,0	-
d_1	-	-	170,0	l_{26}	-	200,0	-
d_2	∅100,0	-	-	l_{27}	68,8	72,0	75,2
d_3	-	∅3,0	-	l_{28}	7,80	7,92	8,05
d_4	-	∅80,0	-	l_{29}	3,46	-	-
d_5	-	∅ 160,0	-	l_{30}	-	14,2	-
d_6	-	∅120,0	-	l_{31}	12	-	-

Note 1 * - Dimensions for tubes A33EKC02X…;
Note 2 - Dimensions B_4, H_4, l, l_4 inspected at lot-by-lot acceptance;
Note 3 - Dimensions B_2, B_3, H_2, H_3, D_2 inspected at periodic tests.

1.3.3 The appearance of the tube corresponds to the approved samples. Metal parts (metal band and lugs) must have no deformation and corrosion; the quality of the external conductive coating of the cone must be satisfactory.

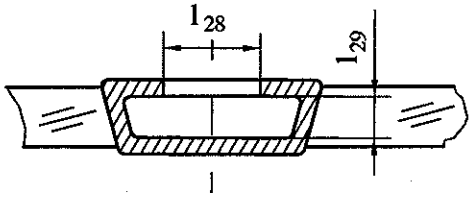


* - Dimensions are verified by a pattern whose pins having diameter 8 mm are placed so that their centres form the rectangle B_4xH_4.

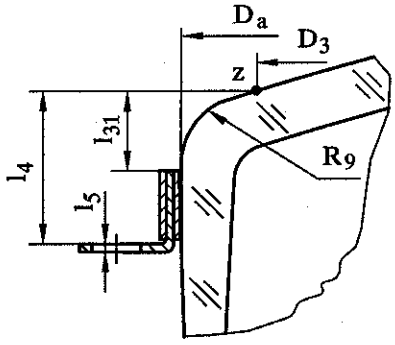
1. Deviation of any lug plane from a plane traversing through the rest three lugs should be no more than 1.6 mm.
2. Mounting bolts in TV-set shall be placed inside circles having 8 mm diameter so that their centres form the rectangle B_4xH_4.
3. It is not permitted to dispose TV-set elements except conducting wires within the zone E.
4. The surface F is insulating.
5. The surface G coating is external, conductive.
6. Dimensions are given in Tables 1 and 2.

Figure 1. Outline Drawing

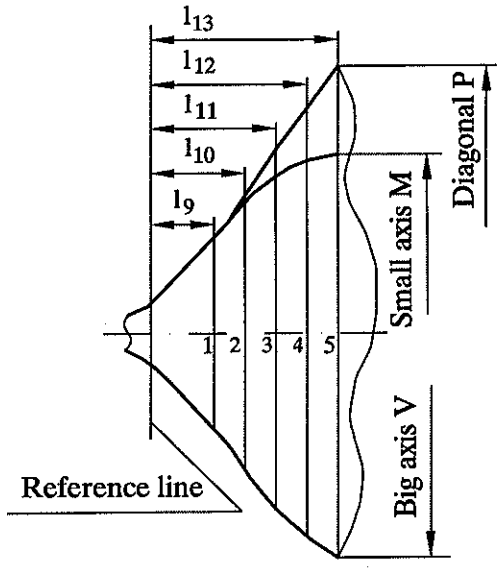
K - K



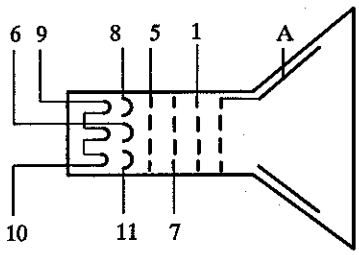
N - N



Dimensions of conic part of the tube

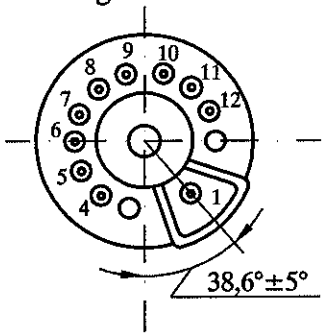


Connection of electrodes with pins



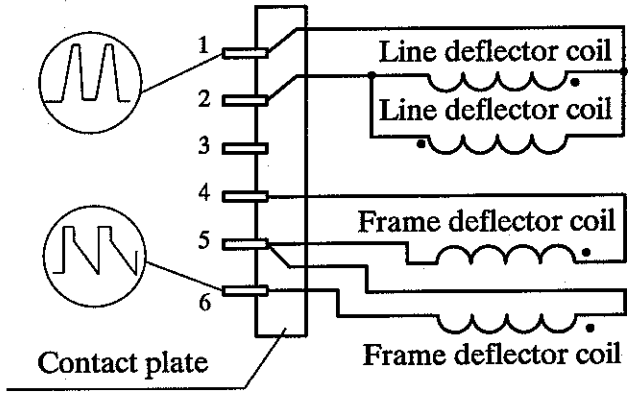
P

According to EIA-552 B10-277



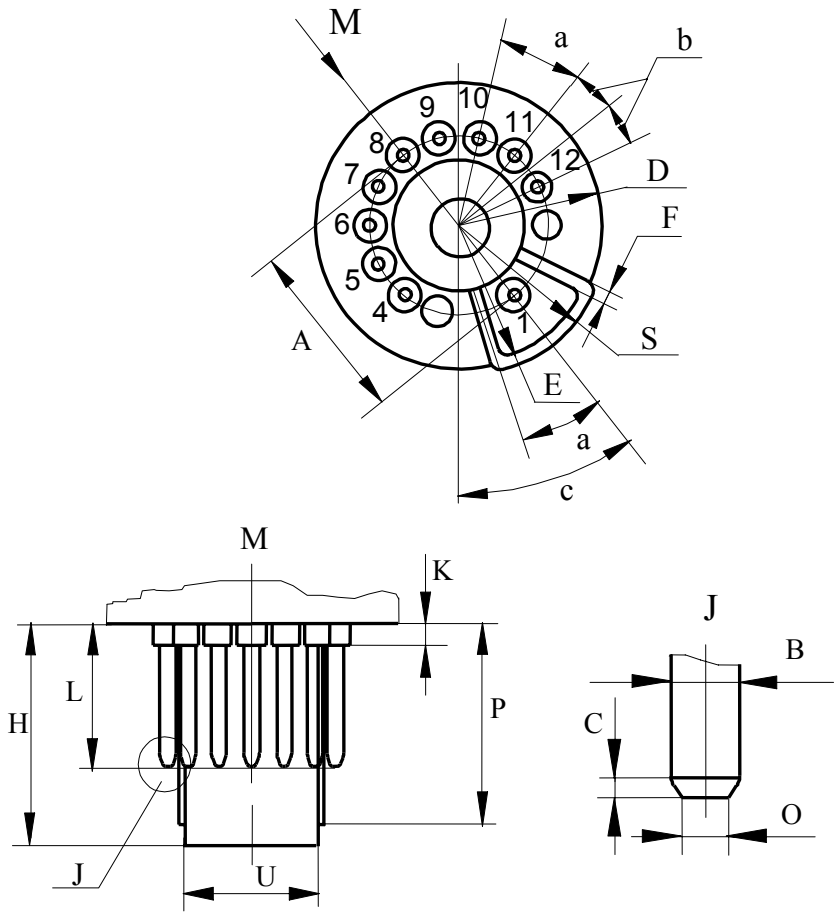
Pin number	Electrode name
1	Focusing grid
5	Grid
6	Green gun cathode
7	Accelerating grid
8	Red gun cathode
9,10	Heater
11	Blue gun cathode
12	Not connected (the pin can be not used)
4	Not connected
A	Anode

Connection of deflecting yoke



1. Dimensions are given in Tables 1 and 2.
2. Line voltage shall be applied to the contacts 1 and 2 and frame voltage shall be applied to the contacts 4 and 6 of the contact plate of the deflecting yoke.
3. Anode contact IEC 60067 - III - 2.

Figure 2. Outline Drawing



Symbol	Dimensions, mm			Degree
	Min	Nom	Max	
A	-	∅15.24	-	-
B	∅0.98	∅1.01	∅1.05	-
C	-	0.6	-	-
D	-	R12	-	-
E	-	R11.2	-	-
F	1.38	1.52	-	-
H	-	-	15.2	-
K	-	-	1.5	-
L	-	-	9.4	-
O	-	-	0.6	-
P	-	-	13.2	-
S	-	R12.5	-	-
U	∅11.02	∅11.2	-	-
a	-	-	-	25° 42′
b	-	-	-	12° 51′
c	-	-	-	36.8° ± 5°

Figure 3. Dimensions and Arrangement of Pins of the Base B10-277 According to EIA-552

1.3.4 Quality of the Useful Screen Area

The operating part of the screen is divided into zones A and B the place and dimensions of which are given in Figure B.1 (Appendix B).

1.3.4.1 Acceptable quantity and dimensions of non-luminous spots, bubbles, foreign particles and other defects of the useful screen area shall not exceed values given in Table 3.
Additional requirements to the quality of the useful screen area of the tube may be specified in a contract.

Table 3. Acceptable Defectives of the Screen of the Picture Tube

Defect size, mm	High contrast			Medium contrast		
	Permitted number of defects		Minimum distance between defects, mm	Permitted number of defects		Minimum distance between defects, mm
	Zone A	Zone A + B		Zone A	Zone A + B	
> 1.3	0	0	-	0	0	-
1.01 – 1.3	0	0	-	0	1	50
0.81 – 1.0	1	2	50	2	3	3 max in any circle diameter 50 mm
0.51 – 0.8	1	2	3 max in any circle diameter 50 mm	2	4	
0.3 – 0.5	2	3		Not limited unless not observed as a collection		
< 0.3	Not limited unless not observed as a collection					
Maximum permitted number of defects	4	7	-	4	8	-

Note 1 When there are no defects of greater size the number of defects of smaller size increases correspondingly.
Note 2 Elliptic defects are identified as circular ones according to the following rule: a half-sum of defect width and length.
Note 3 At low contrast the total area of small defects shall be:
in Zone A not more than circle area Ø 13 mm;
in Zone A + B not more than circle area Ø 30 mm.

1.3.4.2 The following scratches are permitted:
- with width less than 0.05 mm – any length;
- with width from 0.05 mm to 0.10 mm – 40 mm maximum;
- with width from 0.11 mm to 0.15 mm (inclusively) – 10 mm maximum;
- with width more than 0.15 mm – not permitted.

A minimum distance between scratches:
- for scratches with width (0.05 – 0.10) mm – 20 mm;
- for scratches with width (0.11 – 0.15) mm – 45 mm.

A total length of scratches from 0.05 mm to 0.15 mm inclusively shall not exceed 160 mm.

1.3.4.3 Moire on the tube screen is not permitted.

1.3.4.4 Group knots are not permitted in Zone A. Permitted amount and dimensions of knots in Zone B may be determined by specimens.

1.3.5 Base cap fastening must be strong.

1.3.6 Safe operation of TV sets using the picture tubes is assured according to the IEC Publication 60065 sub-clauses 6.1, 14.4.1, 18.1.

1.4 Terms and Definitions

Terms and definitions related to the picture tube are given in the IEC Publication 60050, Chapter 531 “Electronic Tubes”.

1.5 Letter Symbols and Abbreviation

Letter symbols and abbreviations used on this Detail Specification are given in the IEC Publication 60027-1.

1.6 Marking

1.6.1 A label (or a tag) containing the following information shall be tightly attached to the picture tube:
- identification of a tube;
- the date of tube manufacturing (year and month);
- trade mark of a manufacturer;
- individual number of a tube;
- safety requirements (may be given on a separate label).

1.6.2 The following information shall be indicated on the package:
- identification of a tube;
- the date of tube manufacturing (year and month);
- identification of Detail Specification and date of issue;
- trade mark of a manufacturer;
- number of Certificate of Approval of the manufacturer;
- inspection lot identification code;
- special handling precaution, for example “warning marks”.

1.7 Ordering Information

Ordering information:
- identification of a tube;
- identification of Detail Specification and date of issue;
- amount required.

1.8 Main Parameters and Characteristics

1.8.1 Electric and photometric parameters shall correspond to the values given in Table 4.

Table 4. Electric and Photometric Parameters

Parameter, unit of measurement	Symbol	Norm			Test
		Min	Rated	Max	
1 Electrical					
1.1 Heater current, A	I_h	0.63	0.70	0.77	Table 10 C-1, clause 3
1.2 Cathode-heater leakage current for each gun (at Uk-h = -300V) with respect to cathode, μA	I_{k-h}	-	-	15	Table 9, clause 3
1.3 Leakage current of the grid circuit, μA	I_{g1}	minus 2	-	2	Table 9, clause 4
1.4 Leakage current of the accelerating grid circuit, μA	I_{g2}	minus 2	-	2	Table 9, clause 5
1.5 Leakage current of the focusing grid circuit, μA	I_{g3}	minus 2	-	2	Table 9, clause 6
1.6 Cut-off voltage for each gun, V	U_{cut}	70	-	145	Table 9, clause 8
1.7 Focusing voltage, kV	ΔU_{g3}	5.5	-	6.5	Table 9, clause 12
1.8 Resolution, lines: - in the centre on white and in main colours - in corner wedges in main colours	 $r_{cw(R,G,B)}$ $r_{(R,G,B)}$	 375 325	 - -	 - -	Table 10 C-1, clause 4
1.9 Maximum cathode current of each gun, μA	I_k	1000	-	-	Table 9, clause 10
1.10 Ratio of cathode cut-off voltages	$\frac{Ucut\ max}{Ucut\ min}$	-	-	1.25	Table 9, clause 9
1.11 Raster centering shift, mm		minus 4	-	4	Table 9, clause 14
1.12 Flashover, number of flashes: - during the first minute - during the second minute		 - -	 - -	 2 0	Table 10 C-1, clause 9
1.13 Convergence, mm - zone C - zones 6, 12 - zones 3, 9 - zones 1, 5, 7, 11 - zones 2, 4, 8, 10	Δ	 - - - - -	 - - - - -	 0.3 0.8 0.9 1.0 1.2	Table 9, clause 13
1.14 Stray emission		Not permitted			Table 9, clause 7

(Cont'd on page 9)

Table 4 (Concluded)

Parameter, unit of measurement	Symbol	Norm			Test
		Min	Rated	Max	
1.15 Starting time, s		-	-	15	Table 10 C-1, clause 1
1.16 Gas ratio	G	-	-	$1.84x10^{-4}$	Table 10 C-1, clause 2
1.17 Geometric raster distortion of medium beam, %		-	-	1,5	Table 10 C-2, clause 1
1.18 External conductive coating – anode capacitance, pF	C_{ma}	600	-	1500	Table 10 C-2, clause 4
1.19 External conductive coating resistance, Ω	R	-	-	2000	Table 10 C-2, clause 5
1.20 X-ray radiation, mR/h	P	-	-	0.1	Table 10 C-2, clause 3
2 Photometric parameters					
2.1 Anode current corresponding to white colour 9300K, luminance 100 c/d^2, μA	I_a	-	-	340	Table 10 C-1, clause 5
2.2 Non-uniformity of screen luminance in white colour 9300K, %	ΔL	-	-	30	Table 10 C-1, clause 8
2.3 Red gun to green gun current ratio	I_R/I_G	0.7	-	1.3	Table 10 C-1, clause 6
2.4 Red gun to blue gun current ratio	I_R/I_B	0.9	-	1.5	Table 10 C-1, clause 7
2.5 Dynamic balance of the white colour, gradations		8	-	-	Table 10 C-2, clause 2
2.6 Non-uniformity of screen glow chromaticity in main colours and in white colour	Δx, Δy	-	-	0.02	Table 9 clause 11

1.9 Limiting Values

Limiting values (minimum and maximum) are given in Table 5.

Table 5. Limiting Values

Parameter, unit of measurement	Symbol	Limit	
		Min	Max
1 Heater voltage, V	U_h	5.7	6.9
2 Total anode current, long-term average, μA	I_a	-	750
3 Anode voltage, kV	U_a	20	27.5
4 Focusing grid voltage, kV	U_{g3}	3.5	12.0
5 Accelerating grid voltage, kV	U_{g2}	-	1.5
6 Cathode voltage, V	U_k	5	400
7 Cathode-heater voltage, V 7.1 Cathode is positive with respect to the heater: - during first 15 s after the heater switch-on - during the rest period: d. c. component d. c. and a. c. component 7.2 Cathode is negative with respect to the heater d. c. component a. c. component	U_{k-h}	 - - - -	 450 200 300 0 200
8 Voltage of line deflector coils (amplitude),V - during tuning of the TV - during operation	U_H	 - -	 910 870
Note. All voltages except heater voltage, cathode-heater voltage and deflector coil voltage are given with respect to the grid.			

1.10 Parameters for Information

1.10.1 Characteristics of cut-off voltage as a function of accelerating grid voltage shall be within the limits given in Appendix C (Figure C.1).

1.10.2 Typical modulation characteristics of the picture tube in log-log scale shall be rectilinear at beam current change within the limits given in Appendix C (Figure C.2).

1.10.3 X-ray radiation as a function of anode voltage at anode current 0.3 mA is shown in Figure G.1 (Appendix G); anode voltage as a function of anode current at limiting X-ray radiation 0.1 mR/h is shown in Figure G.2 (Appendix G).

1.10.4 Not-inspected parameters of the tube, which depend on construction and do not essentially change, are given in Table 6.

Table 6. Parameters for Information

Parameter, unit of measurement	Symbol	Norm
1 Cathode – all other elements capacitance, pF	C_k	≤ 7.0
2 Grid – all other elements capacitance, pF	C_{g1}	≤ 16.0
3 Focusing grid – all other elements capacitance, pF	C_{g3}	≥ 5.0
4 Breakdown current, A	I_s	≤ 150
5 Chromaticity coordinates of main colours in the CIE System:		
- red colour	X_R Y_R	0.61 – 0.70 0.32 – 0.35
- green colour	X_G Y_G	0.27 – 0.36 0.55 – 0.65
- blue colour	X_B Y_B	0.13 – 0.17 0.04 – 0.08
6 Mass, kg		≤ 6.5

1.10.5 Deflecting Yoke (DY) Electrical Parameters

DY Electrical parameters are given in Table 7.

Table 7. Deflecting Yoke Electrical Parameters

Parameter, unit of measurement	Symbol	Norm
1 Frame coils inductance, mH	L_V	25.3 with error ± 7%
2 Frame deflector coils resistance to direct current, Ω	R_V	15.4 with error ± 5%
3 Frame deflector coil sensitivity, A	Iv	≤ 0.85
4 Frame deflector coils and line deflector coils coupling factor, dB	K	≤ minus 35
5 Regulation		For north semisphere
A33EKC01X01, A33EKC02X01		
6 Line coils inductance, mH	L_H	2.38 with error ± 4%
7 Line deflector coils resistance to direct current, Ω	R_H	3.57 with error ± 7%
8 Line deflector coil sensitivity, A	I_H	≤ 2.28
A33EKC01X11, A33EKC02X11		
9 Line coils inductance, mH	L_H	2.55 with error ± 2%
10 Line deflector coils resistance to direct current, Ω	R_H	3.90 with error ± 7%
11 Line deflector coil sensitivity, A	I_H	≤ 2.22
Note. Electrical parameters of another DY types are specified in a specification on a customer request.		

1.11 Operation Instructions

1.11.1 Preparation to Operation

After transportation or storage at the temperature below +5 ^{o}C the tubes shall be stored for 2 h in the manufacturer's package at standard climatic conditions.

After the package is open the tube shall be taken out only by the lugs or metal band. To take the tube by DY, MCD or neck as well as to put the tube with the screen down on the hard surface is forbidden.

1.11.2 Nominal operation mode of the tube is as follows:

- heater voltage U_h = 6.3 V
- cathode voltage U_k = variable
- grid voltage U_{g1} = 0
- acceleration voltage U_{g2} = (400 – 830) V
- focusing voltage U_{g3} = best focusing
- anode voltage U_a = 25 kV

Permitted limiting operation mode is given in Table 5.

For more than two permitted limiting values of electric modes operation of the tube is not allowed.

1.11.3 Degaussing

To degauss tubes in a TV-receiver (internal degaussing) it is recommended to use the degauss coils the parameters of which are given in Table 8 below; the circuit of their connection is given in Figure D.2 (Appendix D).

Table 8. Parameters of Degauss Coil

Name	Norm
1 Coil length, mm	900
2 Number of turns	120
3 Wire diameter (copper), mm	0.3
4 Resistance, Ω	27

A number of ampere-turns required is 1700 minimum (amplitude value). Additionally, it is necessary to decrease degauss current gradually until maximum 50 % of this current will be achieved for 5 cycles and 1.7 ampere-turns maximum in a steady mode.

Recommended mounting of coils is shown in Figure E.1 (Appendix E). Other degauss coils are permitted to be used when they provide effective degaussing of the tube.

After the tube is inserted into the body of the TV-receiver it is recommended to degauss it with magnetic field (external degaussing) with intensity 50 Gs minimum.

During degaussing the TV-receiver shall be switched-off. When the TV-receiver is switched-on a frame scanning and internal degaussing shall be switched-off.

1.11.4 Breakdown protection

To protect the tubes against possible internal breakdown in all grid circuits the dischargers shall be mounted nearby the outputs of these electrodes as shown in Figure D.1 (Appendix D).

Electrodes of dischargers not connected with tube electrodes are connected between themselves. This point common for dischargers on the tube plate is connected with conductive coating and metal band, and is separately connected with chassis of the TV-set.

Breakdown voltages of dischargers shall be:
- in accelerating grid circuit (1.5 – 3.0) kV;
- in grid, cathode and heater circuits (0.5 – 1.5) kV;
- in focusing grid circuit (10 – 13) kV.

To protect circuit elements at an internal breakdown of the tube it is necessary to connect series resistors in the grid circuits as shown in Figure D.1 (Appendix D). The power of these resistors in the grid, cathode and accelerating grid circuits shall be 0.5 W and in focusing grid circuit 1 W.

1.11.5 Mounting Requirements

The tube in the TV-receiver is mounted by lugs.

A tube board is connected to a chassis so that connecting wires ensure free movement of the board and there is no stress on pins and base cap key.

To prevent overloading of the tube mask and associated frequency distortion of colour the TV-set shall be provided by a device limiting anode current (short-term average anode current) at 1000 μA level.

To provide high reliability during tube operation a heater voltage fluctuation shall not exceed 5 % times rated heater voltage (6.3 V).

When voltages are applied to other grids it is forbidden to switch-off the heater voltage.

The tube shall be protected against magnetic fields created by loud-speakers and transformer.

During mounting into a TV-set as well as at operation an additional regulation of the tube is allowed.

1.11.6 Safety Requirements

Inside a tube there is a high vacuum. The tube shall be saved against bumps and scratches. Damage of a screen coating or metal band may cause implosion of the tube.

To touch a tube during its operation is dangerous for human life because it is under high voltage.

SECTION TWO – APPROVAL PROCEDURE FOR TUBE

2.1 Primary Stage of Manufacture

The primary stage of manufacture is mounting of electron gun structure assembly and screen-mask assembly, screen coating deposition, cathode activation and vacuum attainment.

2.2 Constructively Similar Tubes

All tubes are manufactured by the same manufacturer using the same construction, materials, technology and on the same equipment.

Qualification approval tests and quality inspection tests are performed on samples which include any selected model of a tube.

Test results cover all models of the tube.

2.3 Qualification Approval

Qualification approval tests are performed to the full extent of this Detail Specification requirements. Qualification approval tests include lot-by-lot tests (see sub-clause 2.4.1) of three consecutive inspection lots and periodic tests (see sub-clause 2.4.2) of a sample selected from one or three consecutive inspection lots which have passed lot-by-lot tests.

2.4 Quality Conformance Inspection

For inspection of the picture tube quality compliance with the requirements of this Detail Specification the following tests are performed:
- lot-by-lot tests;
- periodic tests.

2.4.1 Lot-by-lot tests

2.4.1.1 Lot-by-lot tests are performed at each inspection lot. A test schedule and inspection plans are given in Table 9. A sampling plan is in accordance with the IEC Publication 60410.

2.4.1.2 Formation procedures for inspection lots shall correspond to the IEC Publication QC 001002-3, sub-clause 3.3.1.

2.4.1.3 An inspection lot is considered as passed the lot-by-lot tests when it has passed all lot-by-lot test sub-groups.

2.4.1.4 Release or rejection of lots is carried out in accordance with the IEC Publication QC 001002-3, sub-clause 3.2.6.

Released lots shall be clearly identified with a Mark of Conformity or Declaration of Conformity in accordance with the IEC Publication QC 001002-2, sub-clause 2.4.

Stamping of a Mark of Conformity or issue of a Declaration of Conformity is under a supervision of a Designated Management Representative.

2.4.2 Periodic Tests

2.4.2.1 Periodic tests are performed on samples selected from inspection lot which has successfully passed lot-by-lot tests. The test schedule including grouping of tests, their sequence within every group and sub-group, periodicity of tests and sampling plans are given in Table 10.

2.4.2.2 In case when the sample subjected to the periodic tests has failed the IEC Publication QC 001002-3, sub-clause 3.1.8 and a procedure adopted within the manufacturer's company shall be guided.

2.4.2.3 The tubes subjected to Sub-groups C-3, C-4, C-5 and D-1 tests shall not be delivered.

2.5 Delayed delivery

Tubes held for a period exceeding twelve months following the release of the lot shall, before delivery, be re-examined as specified in Group A. A date of re-inspection shall be stated in a Declaration of Conformity.

Table 9 – Lot-by-lot tests

Notes – In Table 9 the following symbols are used:

D – destructive tests
ND – non-destructive tests
IL – inspection level
AQL – acceptable quality level

} according to the IEC Publication 60410

Test	D or ND	Test method	Test conditions						Scanning type and dimension	Sampling plan		Require-ments
			U_h, V	U_k, V	U_{g2}, V	U_{g3}, kV	U_a, kV	I_a, µA		IL	AQL	
GROUP A Sub-group A-1	ND									II	1.5%	
1 Visual examination		Cl. 3.2.1	-	-	-	-	-	-	-			Cl. 1.3.3
2 Cathode-heater leakage current for each gun with respect to cathode (at U_{k-h} = minus 300V), µA		IEC 60151-28 Cl. 4.2	6.3	-	-	-	-	-	-			Table 4, Cl. 1.2
3 Leakage current of the grid circuit, µA		IEC 60151-28 Cl. 4.3	6.3	150	400	7.0	25	-	raster			Table 4, Cl. 1.3
4 Leakage current of the accelerating grid circuit, µA		IEC 60151-28 Cl. 4.3	6.3	150	400	7.0	25	-	raster			Table 4, Cl. 1.4
5 Leakage current of the focusing grid circuit, µA		IEC 60151-28 Cl. 4.3	6.3	150	400	7.0	25	-	raster			Table 4, Cl. 1.5
6 Stray emission		IEC 60151-28 Cl. 4.5	6.3	150	400	7.0	25	-	raster			Table 4, Cl. 1.14
7 Cut-off voltage for each gun, V		IEC 60151-28 Cl. 4.7	6.3	meas.	400	foc.	25	insig-nifi-cant	line			Table 4, Cl. 1.6

(Cont'd on page 17)

Table 9 (Concluded)

Test	D or ND	Test method	Test conditions						Scanning type and dimension	Sampling plan		Require-ments
			U_h, V	U_k, V	U_{g2}, V	U_{g3}, kV	U_a, kV	I_a, μA		IL	AQL	
8 Ratio of cathode cut-off voltages		Cl. 3.4.4	-	-	-	-	-	-	-			Table 4, Cl. 1.10
9 Emission of cathode for each gun, μA		IEC 60151-28 Cl. 4.8	6.3	0	Corres-ponds to U_{cut}= =50V	foc.	25	meas	raster			Table 4, Cl. 1.9
10 Non-uniformity of screen glow chromaticity in white colour and main colours		Cl. 3.4.6	6.3	Cl. 3.4.3		foc.	25	200-500	raster			Table 4, Cl. 2.6
11 Focusing voltage, V		Cl. 3.4.11	6.3	Cl. 3.4.3		meas	25	200	cross-hatch pattern			Table 4, Cl. 1.7
12 Convergence, mm		Cl. 3.4.13	6.3	Cl. 3.4.3		foc.	25	200	cross-hatch pattern			Table 4, Cl. 1.13
13 Raster centering shift, mm		Cl. 3.4.15	6.3	Cl. 3.4.3		foc.	25	insig-nifi-cant	spot			Table 4, Cl. 1.11
14 Screen quality in white and main colours		Cl. 3.2.2	6.3	Cl. 3.4.3		foc.	25	450-500	raster			Cl. 1.3.4.1
<u>Sub-group A-2</u> 1 Mechanical dimensions	ND	Cl. 3.3	-	-	-	-	-	-	-	S-2	2.5%	Cl. 1.3.2

Table 10 – Periodic tests

Notes – In Table 10 the following symbols are used:
D – destructive tests
ND – non-destructive tests
p – periodicity (in months)
n – sample size
c – acceptance criterion (permitted number of defectives)

Test	D or ND	Test method	Test conditions						Scanning type and dimension	Periodicity and sampling plans			Require-ments
			U_h, V	U_k, V	U_{g2}, V	U_{g3}, KV	U_a, kV	I_a, µA		p	n	c	
GROUP C Sub-group **C-1**	ND									1	13	1	
1 Starting time, s		Cl. 3.4.10	6.3	Corres-ponds to I_a	400	Foc.	25	500	raster				Table 4, Cl. 1.15
2 Gas ratio		IEC 60151-28, Cl. 4.24 IEC 60151-16, Cl.6	6.3	I_k = 250 µA is specified by the displacement of U_{g1}; $U_{g2} = U_{g3}$ = 293 V, U_a = minus 28 V									Table 4, Cl. 1.16
3 Heater current, A		IEC 60151-28, Cl. 4.1	6.3	-	-	-	-	-	-				Table 4, Cl. 1.1
4 Resolutions, lines		IEC 60151-28, Cl. 4.22	6.3	Corres-ponds to I_a	400	Foc.	25	300	test table				Table 4, Cl. 1.8
5 Anode current, corresponding to white colour 9300K and luminance 100 cd/m^2, µA		IEC 60151-28, Cl. 4.17	6.3	Corr. to lumina-nce 100 cd/m^2	400	Foc.	25	meas	raster				Table 4, Cl. 2.1
6 Red gun to green gun current ratio		IEC 60151-28, Cl. 4.18, Cl. 3.5.8	6.3	Corr. to lumina-nce 100 cd/m^2	400	foc.	25	meas	raster				Table 4 Cl. 2.3

(Cont'd on page 19)

Table 10 (Cont'd)

Test	D or ND	Test method	Test conditions						Scanning type and dimension	Periodicity and sampling plans			Require-ments
			U_h, V	U_k, V	U_{g2}, V	U_{g3}, KV	U_a, kV	I_a, μA		p	n	c	
7 Red gun to blue gun current ratio		IEC 60151-28, Cl. 4.18, Cl. 3.5.9	6.3	Corr. to lumina-nce 100 cd/m^2	400	foc.	25	meas	raster				Table 4 Cl. 2.4
8 Non-uniformity of screen luminance in white colour, %		Cl. 3.4.5	6.3	Corres-ponds to I_a	400	foc.	25	300	raster				Table 4, Cl. 2.2
9 Flashover, number of flashes		IEC 60151-28, Cl. 4.4	6.3	150	400	5.0	27.5	-	raster				Table 4, Cl. 1.12
Sub-group **C-2** 1 Geometric raster distortion of medium beam, %	ND	Cl. 3.4.17	6.3	Corres-ponds to I_a	400	foc.	25	30 – 50	cross-hatch pattern	3	13	1	Table 4, Cl. 1.17
2 Dynamic balance of the white colour, gradations		Cl. 3.4.7	6.3	Cl. 3.4.3		foc.	25	100-500	grey scale				Table 4, Cl. 2.5
3 X-ray radiation, mR/h		IEC 60562	6.3	Corres-ponds to I_a	400	foc.	27.5	1000	raster				Table 4, Cl. 1.20
4 External conductive coating – anode capacitance, pF		IEC 60100	-	-	-	-	-	-	-				Table 4, Cl. 1.18
5 External conductive coating resistance, Ω		Cl. 3.4.9	-	-	-	-	-	-	-				Table 4, Cl. 1.19
6 Mechanical dimensions		Cl. 3.3	-	-	-	-	-	-	-				Cl. 1.3.2
7 Base cap fastening		Cl. 3.4.16											Cl. 1.3.5

(Cont'd on page 20)

Table 10 (Cont'd)

Test	D or ND	Test method	Test conditions	Periodicity and sampling plans			Requirements
				p	n	c	
Sub-clause **C-3**	D			6	6	1	
1 Vibration		IEC 60068-2-6, Test Fc	1 Initial measurements. 2 Testing without electric load by sweeping frequency method. Tubes shall be mounted with the help of mounting tool in operation position. A force applied under test shall be vertical, i. e. perpendicular to the plane through the central axis of the tube and major axis of the screen. Conditions of test are as follows: - displacement amplitude 0.75 mm; acceleration amplitude 2 g; frequency range (10 – 55) Hz; number of sweeping cycles – 2; duration of endurance 10 min. 3 Final measurements: - visual examination				Cl. 1.3.3
			- cathode-heater leakage current, μA				Table 4, Cl. 1.2
			- leakage current in the grid circuit, μA				Table 4, Cl. 1.3
			- stray emission				Table 4, Cl. 1.14
			- non-uniformity of screen luminance in white colour and main colours				Table 4, Cl. 2.6
			- maximum cathode current of each gun, μA				Table 4, Cl.1.9
			- convergence, mm				Table 4, Cl. 1.13
			- cut-off voltage for each gun, V				Table 4, Cl. 1.6
			- ratio of cathode cut-off voltages				Table 4, Cl.1.10
			- gas ratio				Table 4, Cl. 1.16
			- heater current, A				Table 4, Cl. 1.1
			- flashover, number of flashes				Table 4, Cl. 1.12
			- starting time, s				Table 4, Cl. 1.15
			- external conductive coating resistance, Ω				Table 4, Cl. 1.19

(Cont'd on page 21

Table 10 (Cont'd)

Test	D or ND	Test method	Test conditions	Periodicity and sampling plans			Requirements
				p	n	c	
2 Cold		IEC 60068-2-1, Test Ab	1 Preconditioning for 2 h 2 Initial measurements 3 Testing without electric load: - temperature minus (40±3) °C - duration 2 h. 4 Recovery 2 h 5 Final measurements: - visual examination				Cl. 1.3.3
			- cathode-heater leakage current, μA				Table 4, Cl. 1.2
			- leakage current in the grid circuit, μA				Table 4, Cl. 1.3
			- stray emission				Table 4, Cl. 1.14
			- non-uniformity of screen luminance in white colour and main colours				Table 4, Cl. 2.6
			- maximum cathode current of each gun, μA				Table 4, Cl. 1.9
			- convergence, mm				Table 4, Cl. 1.13
			- cut-off voltage for each gun, V				Table 4, Cl. 1.6
			- ratio of cathode cut-off voltages				Table 4, Cl. 1.10
			- gas ratio				Table 4, Cl. 1.16
			- heater current, A				Table 4, Cl. 1.1
			- flashover, number of flashes				Table 4, Cl. 1.12
			- starting time, s				Table 4, Cl. 1.15
			- external conductive coating resistance, Ω				Table 4, Cl. 1.19

(Cont'd on page 22)

Table 10 (Cont'd)

Test	D or ND	Test method	Test conditions	Periodicity and sampling plans			Requirements
				p	n	c	
3 Dry heat		IEC 60068-2-2, Test Bb	1 Preconditioning for 2 h 2 Initial measurements 3 Testing without electric load: - temperature (70±2) ^{o}C - duration 2 h. 4 Recovery 2 h 5 Final measurements: - visual examination				Cl. 1.3.3
			- cathode-heater leakage current, μA				Table 4, Cl. 1.2
			- leakage current in the grid circuit, μA				Table 4, Cl. 1.3
			- stray emission				Table 4, Cl. 1.14
			- non-uniformity of screen luminance in white colour and main colours				Table 4, Cl. 2.6
			- maximum cathode current of each gun, μA				Table 4, Cl. 1.9
			- convergence, mm				Table 4, Cl. 1.13
			- cut-off voltage for each gun, V				Table 4, Cl. 1.6
			- ratio of cathode cut-off voltages				Table 4, Cl. 1.10
			- gas ratio				Table 4, Cl. 1.16
			- heater current, A				Table 4, Cl. 1.1
			- flashover, number of flashes				Table 4, Cl. 1.12
			- starting time, s				Table 4, Cl. 1.15
			- external conductive coating resistance, Ω				Table 4, Cl. 1.19

(Cont'd on page 23)

Table 10 (Cont'd)

Test	D or ND	Test method	Test conditions	Periodicity and sampling plans			Requirements
				p	n	c	
4 Damp heat		EC 60068-2-3 Test Ca	1 Preconditioning for 2 h 2 Initial measurements 3 Testing without electric load: - humidity (93+2/-3) % - temperature (40±2) °C - duration 96 h. 4 Recovery 2 h 5 Final measurements: - visual examination				Cl. 1.3.3
			- cathode-heater leakage current, μA				Table 4, Cl. 1.2
			- leakage current in the grid circuit, μA				Table 4, Cl. 1.3
			- stray emission				Table 4, Cl. 1.14
			- non-uniformity of screen luminance in white colour and main colours				Table 4, Cl. 2.6
			- maximum cathode current of each gun, μA				Table 4, Cl. 1.9
			- convergence, mm				Table 4, Cl. 1.13
			- cut-off voltage for each gun, V				Table 4, Cl. 1.6
			- ratio of cathode cut-off voltages				Table 4, Cl. 1.10
			- gas ratio				Table 4, Cl. 1.16
			- heater current, A				Table 4, Cl. 1.1
			- flashover, number of flashes				Table 4, Cl. 1.12
			- starting time, s				Table 4, Cl. 1.15
			- external conductive coating resistance, Ω				Table 4, Cl. 1.19

(Cont'd on page 24)

Table 10 (Cont'd)

Test	D or ND	Test method	Test conditions	Periodicity and sampling plans p	n	c	Requirements
5 Bumps		IEC 60068-2-29 Test Eb	1 Initial measurements 2 Testing without electric load: - acceleration 25 g (250 m/s^2) - pulse duration 6 ms - number of bumps: 1000 ± 10 3 Final measurements: - visual examination				Cl. 1.3.3
			- cathode-heater leakage current, μA				Table 4, Cl. 1.2
			- leakage current in the grid circuit, μA				Table 4, Cl. 1.3
			- stray emission				Table 4, Cl. 1.14
			- non-uniformity of screen luminance in white colour and main colours				Table 4, Cl. 2.6
			- maximum cathode current of each gun, μA				Table 4, Cl. 1.9
			- convergence, mm				Table 4, Cl. 1.13
			- cut-off voltage for each gun, V				Table 4, Cl. 1.6
			- ratio of cathode cut-off voltages				Table 4, Cl. 1.10
			- gas ratio				Table 4, Cl. 1.16
			- heater current, μA				Table 4, Cl. 1.1
			- flashover, number of flashes				Table 4, Cl. 1.12
			- starting time, s				Table 4, Cl. 1.15
			- external conductive coating resistance, Ω				Table 4, Cl. 1.19
Sub-group **C-4** **1 Explosion tests**	D	IEC 60065, Cl.18.2	Testing of tubes with defects not influencing explosion safety of the tubes is permitted.	3	12	0	IEC 60065, Cl.18.1

(Cont'd on page 25)

Table 10 (Concluded)

Test	D or ND	Test method	Test conditions	Periodicity and sampling plans			Requirements
				p	n	c	
Sub-group **C-5** **1 Flame test**	D	IEC 60065, Cl.14.4.1	A base cap and insulation coating around anode pin are tested	12	3	0	IEC 60065, Cl.14.4.1
GROUP D Sub-group **D-1** 1 Endurance test	D	Cl. 3.4.12	1. Initial measurements 2. Conditions of test: Uh = 6.3 V; U_{g3} = foc.; Ua = 25 kV U_{g2} = (400 – 830) V, adjusted according to Cl. 3.4.3. Ia = 500 μA (I_R = 170 μA; I_G = 170 μA; I_B = 160 μA) Raster (282 x 211) mm; Duration 3000 h 3 Final measurements: - visual examination - cathode-heater leakage current, μA - leakage current in the grid circuit, μA - maximum cathode current of each gun, μA - convergence, mm: Zone C Zones 6, 12 Zones 3, 9 Zones 1, 5, 7, 11 Zones 2, 4, 8, 10 - anode current corresponding to white colour 9300K and luminance 100 cd/m^2, μA - ratio of cathode cut-off voltages - heater current, A - starting time, s	12	12	1	 Cl. 1.3.3 ≤ 30 ≤ |5| ≥ 900 ≤ 0.3 ≤ 1.0 ≤ 1.1 ≤ 1.2 ≤ 1.4 ≤ 415 ≤ 1.35 0.63–0.77 ≤ 30

SECTION THREE – TEST AND MEASUREMENT PROCEDURES

3.1 Conditions of Measurement

3.1.1 Conditions of measurement are given in the IEC Publication 60151-28 clause 3.

3.1.2 All tests and measurements are carried out under standard atmospheric conditions stated in the IEC Publication 60068-1, sub-clause 5.3.

- temperature (15 – 35) ^{o}C
- relative humidity (45 – 75) %
- atmospheric pressure (86 – 106) kPa

3.1.3 Photometric parameters are measured in a white colour 9300K (x=0.281; y= 0.311).

3.2 Examination

3.2.1 Visual examination (sub-clause 1.3.3), defects on non-luminance screen of the tube, scratches and marking shall be examined in accordance with the IEC Publication PQC 100, sub-clause 4.3.1, at the external luminance (700 – 1000) lx.

3.2.2 A screen quality (sub-clause 1.3.4.1) is visually inspected from a distance 0.6 m using a step optical wedge (pattern – filter) at the picture tube operation conditions in a white colour and main colours consequently at declined reverse scanning at synchronized and focused raster.

The optical wedge (pattern – filter) shall consist of neutral raster photofilters of different transparency:

- filter with optical density 1.3 has transparency (6 + 2) %;
- filter with optical density 0.7 has transparency (20 + 3)%;
- filter with optical density 0.4 has transparency (40 + 3) %;
- transparent glass has transparency (90 + 3) %.

There are the following kinds of defects:

1) defects of high contrast, i. e. defects visible through all the filters;
2) defects of medium contrast, i. e. defects visible through the filter with density 0.7 and invisible through the filter with density 1.3;
3) defects of low contrast, i. e. defects visible through the filter with density 0.4 and invisible through the filter with density 0.7.

In disputable cases a re-inspection is carried out at the external luminance 5 lx maximum.
The optical wedge is held over an observed defect at stretched hand distance (0.6 m) in such a manner that it comes in succession under photofilters as it moves. Evaluation starts from the filter with the smaller density and proceeds to the filter with the greater density.

Knots are visually verified at the luminous screen of the picture tube.

3.3 Examination of Dimensions

The overall, setting and attaching dimensions of the picture tube and limiting dimensions of the conic tube part (sub-clause 1.3.2) are examined with universal and special measuring tools and instruments assuring tolerances specified by drawings.

The dimensions of the useful screen area are examined in accordance with the IEC Publication 60151-16, Section 5.

3.4 Measurement of Electric and Photometric Parameters

3.4.1 Precautions relating to methods of parameters measurement shall correspond to those in the IEC Publication 60151-0.

3.4.2 Before measurement the picture tube shall be degaussed.

3.4.3 Unless otherwise specified a white colour in the tube is adjusted as follows. A voltage 150 V is applied to the cathodes of each three guns (there must be no videosignal) and under switched-off vertical deviation an accelerating grid voltage U_{g2} is varied until a luminous horizontal line of any colour appears. Then cathode voltages of the rest guns are varied by turns until the luminous horizontal lines appear. A luminance of each three horizontal lines must be as low and uniform as possible. Then a vertical deviation is switched-on and a videosignal is fed and a total anode current Ia is varied only by the adjustment of the videosignal amplitude (accelerating grid voltage does not change).

3.4.4 Cut-off voltage of each gun is determined by observation of focused non-defected spot disappearance. Ratio of cathode cut-off voltages, maximum to minimum, is calculated according to measurement results.

3.4.5 Non-uniformity of the screen luminance in white colour is measured by a photometer, CRT color analyzer or other similar device, the relative spectral sensitivity curve of which corresponds to the function V(λ) for the CIE standard photometric observer of the day vision at declined reverse scanning with the area diameter 25 mm maximum at the centre of the screen and in corners or in the plot having maximum divergence from the luminance in the centre of the screen.

Non-uniformity of the screen luminance "ΔL", in percents, shall be calculated by the following formula:

$$\Delta L = \frac{L_{maks} - L_{\min}}{L_{maks} + L_{\min}} \times 100$$

where L_{max} is a maximum screen luminance, cd/m^2
L_{min} is a minimum screen luminance, cd/m^2

3.4.6 Chromaticity of main colours and non-uniformity of the screen glow chromaticity in main colours and in white colour are determined visually from a distance 1.0 m at luminance 5 lx maximum.

In any disputable case and under periodic tests the chromaticity coordinates are measured by colorimeter in accordance with the IEC Publication 60441.

Measurements shall be carried out as minimum 5 minutes after the tube is switched-on. The chromaticity coordinates are measured at declined reverse scanning with the area diameter 50 mm maximum at the centre of the screen and in corners or in the plot having maximum visual divergence from the luminance of the screen.

Non-uniformity of the screen glow chromaticity Δx and Δy is calculated by the following formulae:

$$\Delta x = x_{max} - x_{min}$$
$$\Delta y = y_{max} - y_{min}$$

where x_{max} and y_{max} are maximum measured coordinate values for the colour;
x_{min} and y_{min} are minimum measured coordinate values for the colour.

3.4.7 A quality of a dynamic balance of the white colour is inspected at the signal "grey scale" reproduced on the screen with minimum number of gradations 8. Before measurement a voltage corresponding to trigger voltage of the gun having minimum cut-off voltage is applied to the accelerating grid at U_{cut} = 150 V.

A raster glow disappearance on the black band of a picture is achieved by adjusting the voltage applied to cathodes. On the lightest band the white colour is being set visually by the videosignal amplitude adjustment.

3.4.8 Red gun to blue gun and red gun to green gun current ratios are determined at the luminance 100 cd/m^2 in white colour 9300K. Each of three beam currents is measured and the above mentioned ratios are calculated.

3.4.9 An external conductive coating resistance is measured by an ohmmeter with maximum permissible resultant error 2.5 % maximum. Edges of the probe contacts shall be rounded to provide a contact with area (0.5 – 5.0) mm^2. The resistance is measured between external points not less than 10 mm from the coating edge with no voltage applied to the electrodes.

3.4.10 The tube starting time is considered to be a time necessary for the tube to achieve anode current 250 μA in a white colour.

The starting time is measured in accordance with the IEC Publication 60151-8, sub-clause 2.2.3, with the following details:

- measurements are performed with the help of mechanical chronometer. Rated heater voltage is achieved by means of a heater voltage source during 1 s maximum. Operation voltages are applied to the tube electrodes according to clause 1, Table 10, sub-group C-1.

5 minutes after switching-on, the white colour is achieved on the screen at the total current of three guns equal to 500 μA and red, green and blue gun currents equal to 170 μA, 170 μA and 160 μA respectively.

During 15 minutes all supply voltages of the tube electrodes are switched-off without measuring device being switched-off and without changing of regulator position.

In 15 minutes the tube heater source and chronometer are switched-on simultaneously.

1 s after starting of the chronometer all operation voltages are applied to the rest tube electrodes.

At the moment when total anode current achieves 250 μA the chronometer is stopped and its readings are taken. The error of the parameter "starting time" measurement shall not exceed +15 % with a confidence level 0.95.

3.4.11 A focusing voltage is measured in accordance with the IEC Publication 60151-28, sub-clause 4.6, at the best pattern focusing in a white colour in the centre of the screen.

3.4.12 The picture tubes which have passed Group A tests are subjected to endurance tests. Visual examination and measurements of parameters together with acceptance criteria are carried out after 0, 24, 100, 300, 500, 750, 1000, 1500, 2000, 2500 and 3000 hours of the tube operation according to Table 10.

At the same time the parameters in Group A which are not considered to be acceptance criteria shall comply with norms stated in Table 4.

3.4.13 Residual beam non-convergence over the centered screen area is verified in zones given in Appendix B when a signal "cross-hatch pattern" is applied. Luminous band width shall be as minimum as possible and the same. A residual non-convergence is defined as a distance between the centres of extreme colour lines.

3.4.14 A moire absence (sub-clause 1.3.4.3) is assured by a design of the picture tube. In disputable cases the moire absence inspection is performed at a total anode current 500 μA by means of special test patterns with preliminary selected focusing voltage providing best resolution.

A test pattern along a horizontal axis is equal to the luminous screen area and along a vertical axis it is symmetrical to and 7% over the height of the luminous screen area. It is tuned by means of raster dimension change and centering adjustment.

The moire absence or presence is defined in a white field at total anode current (100 – 500) μA with preliminary selected focusing voltage from observing distance 1.0 m. Conditions of test: U_h= 6.3 V; U_{g2} = 400 V; U_k = corresponds to I_a; U_a = 25 kV.

3.4.15 A raster centering shift is verified to the IEC Publication 60151-28, clause 4.10. This is a distance of converged spot (at switched-off DY) from geometric screen centre along directions "x" and "y".

3.4.16 A base cap fastening to a pin (sub-clause 1.3.5) is inspected by application to the cap of smoothly increasing tearing-off axial force 9.8 N + 10 %.

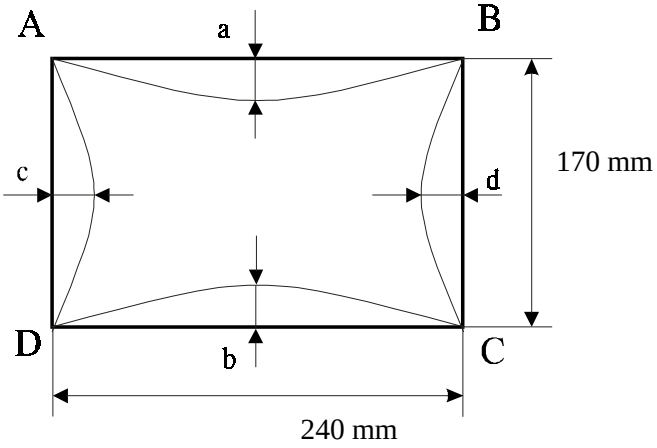
3.4.17 A geometric raster distortion is measured by a medium beam as specified in Appendix A.

Appendix A (normative)

Geometric Raster Distortions

A.1 Concave and Convex Distortions

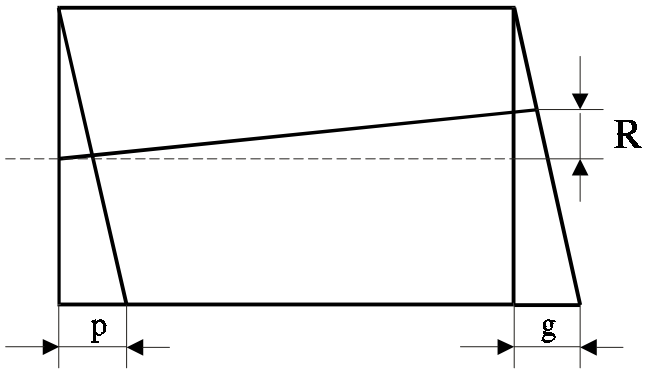
Horizontal lines = 2 (a+b) / (AD+BC) x 100 = 1.5 % max; (a+b) ≤ 2.6 mm
Vertical lines = 2 (c+d) / (AB+DC) x 100 = 1.5 % max; (c+d) ≤ 3.6 mm



A.2 Trapezoidal Distortions

Horizontal lines = (AD-BC) / (AD+BC) x 100 = 1.5 % max; |AD-BC| ≤ 5.1 mm
Vertical lines = (AB-DC) / (AB+DC) x 100 = 1.5 % max; |AB-DC| ≤ 7.2 mm

A.3 Parallelogram Distortions



Parallelogram = p or g ≤ 4.0 mm
Turn of raster = R ≤ 3.0 mm

Appendix B (normative)

Position of Zones A and B on the Screen of the Tube and Convergence Inspection Zones

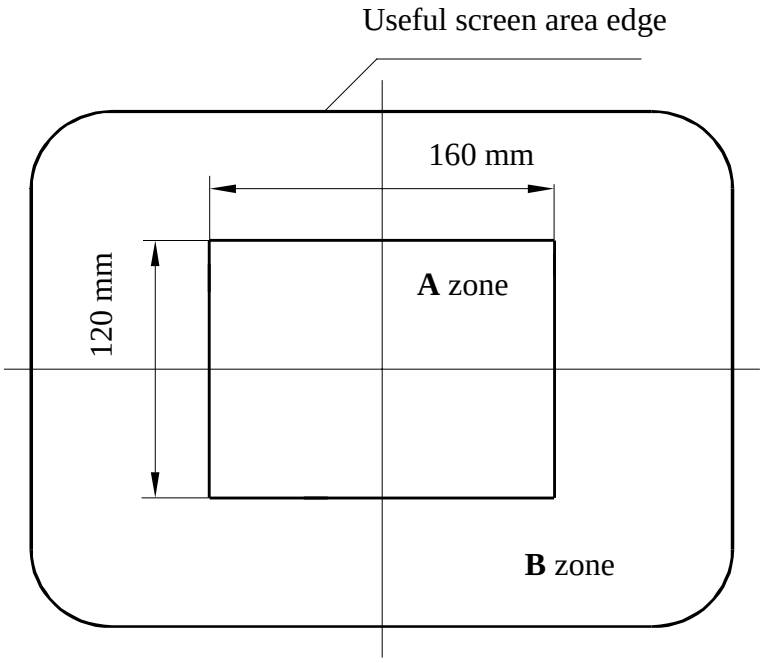


Figure B.1. Position of Zones A and B on the Screen of the Tube

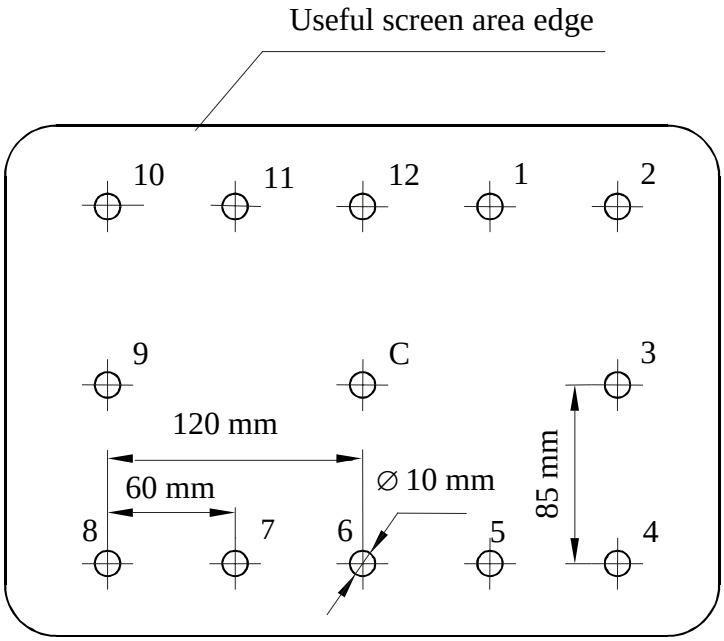
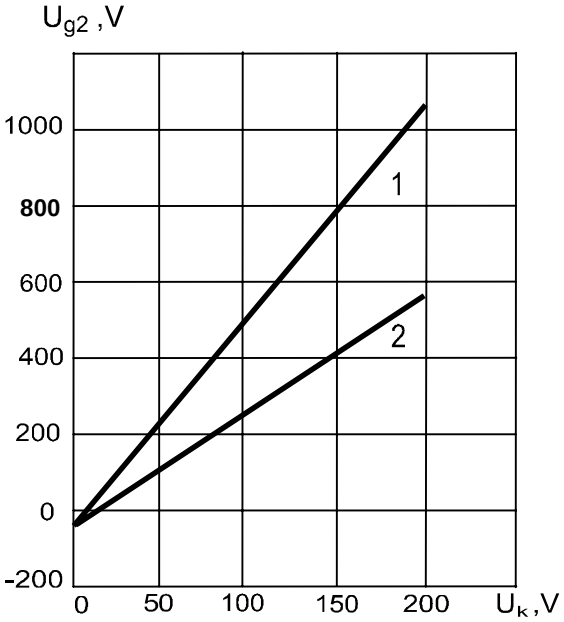


Figure B.2. Convergence Inspection Zones

Appendix C (for information)

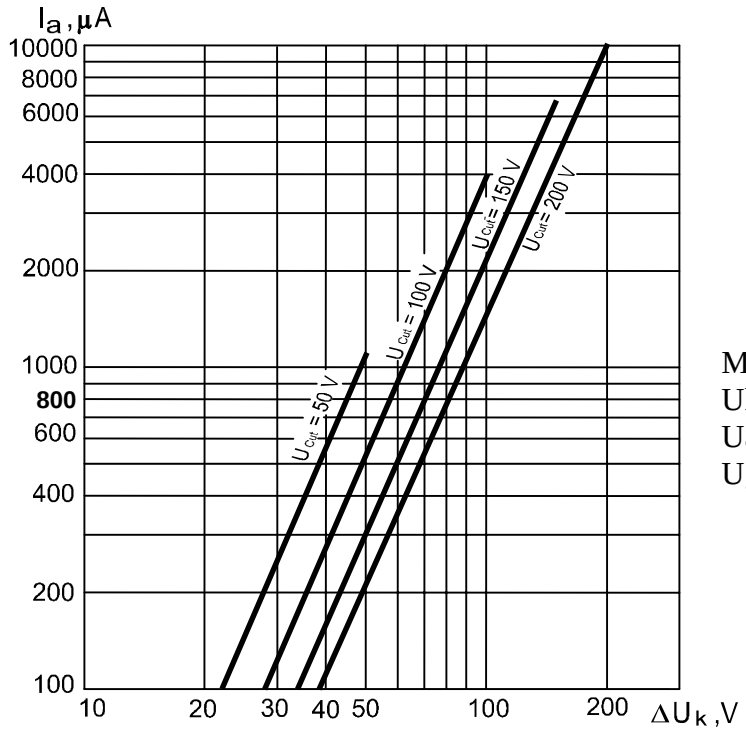
Cut-off Voltage as a Function of Accelerating Grid Voltage and Typical Modulation Characteristics



1 – minimum Ucut of any gun;
2 – maximum Ucut of any gun.

Measurement conditions:
Uh = 6.3 V;
Ua = 25 kV;
Ug3 = corresponds to the best focusing.

Figure C.1. Cut-off Voltage as a Function of Accelerating Grid Voltage



Measurement conditions:
Uh = 6.3 V;
Ua = 25 kV;
Ug3 = corresponds to the best focusing.

Figure C.2. Typical Modulation Characteristics, Cathode Modulation

Appendix D (for information)

Schematic Diagram for Resistors, Dischargers and Degauss Coil Connection

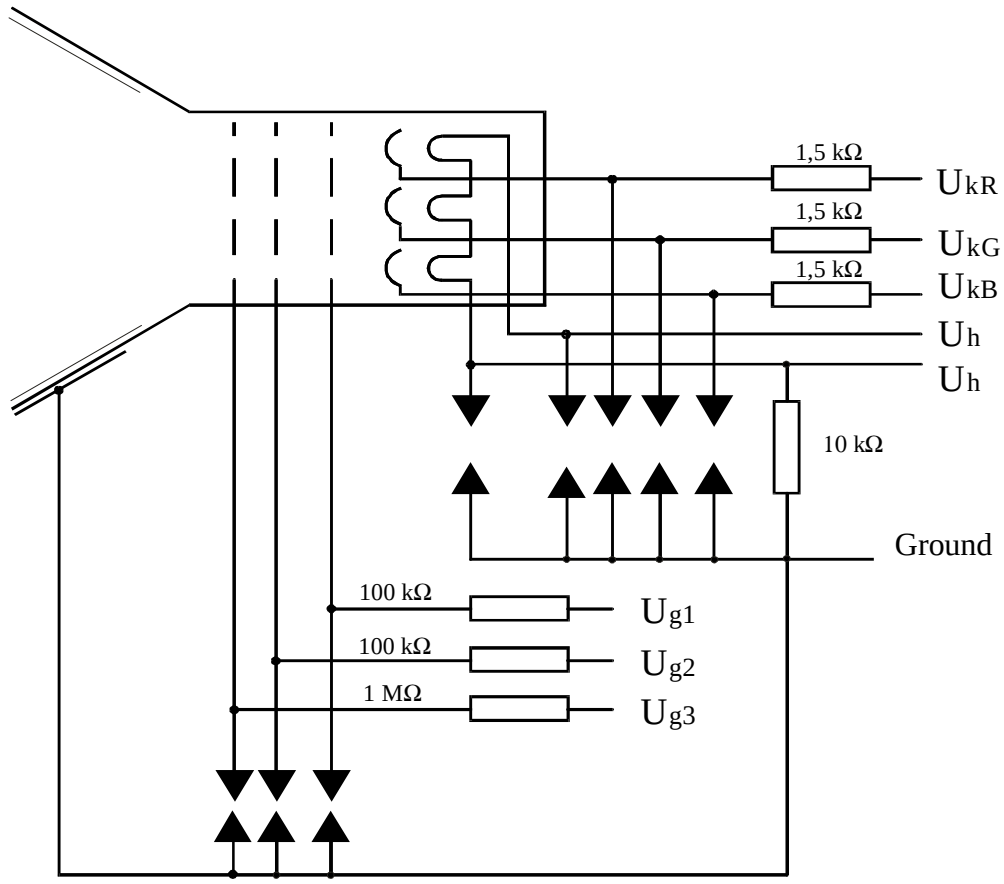


Figure D.1. Schematic Diagram for Resistors and Dischargers Connection

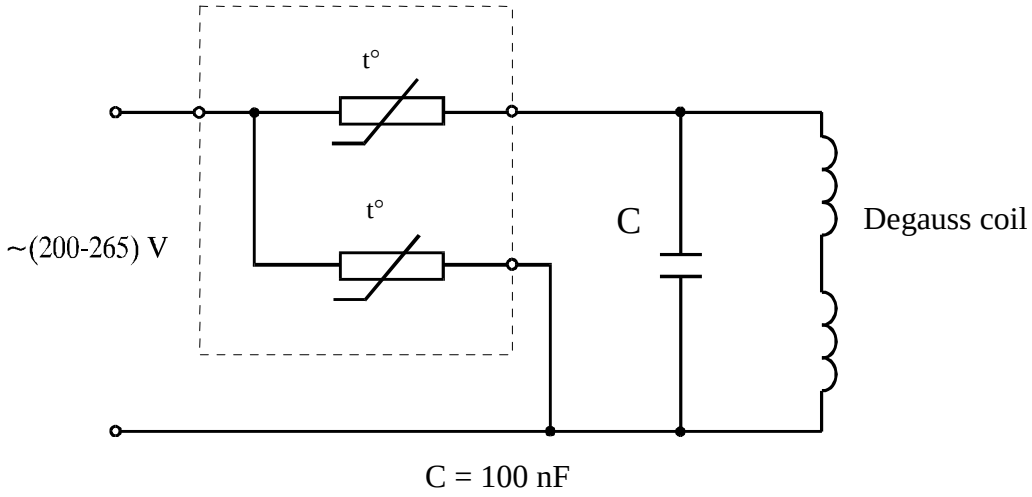


Figure D.2. Schematic Diagram for Degauss Coil Connection

Appendix E (for information)

Mounting of Degauss Coil

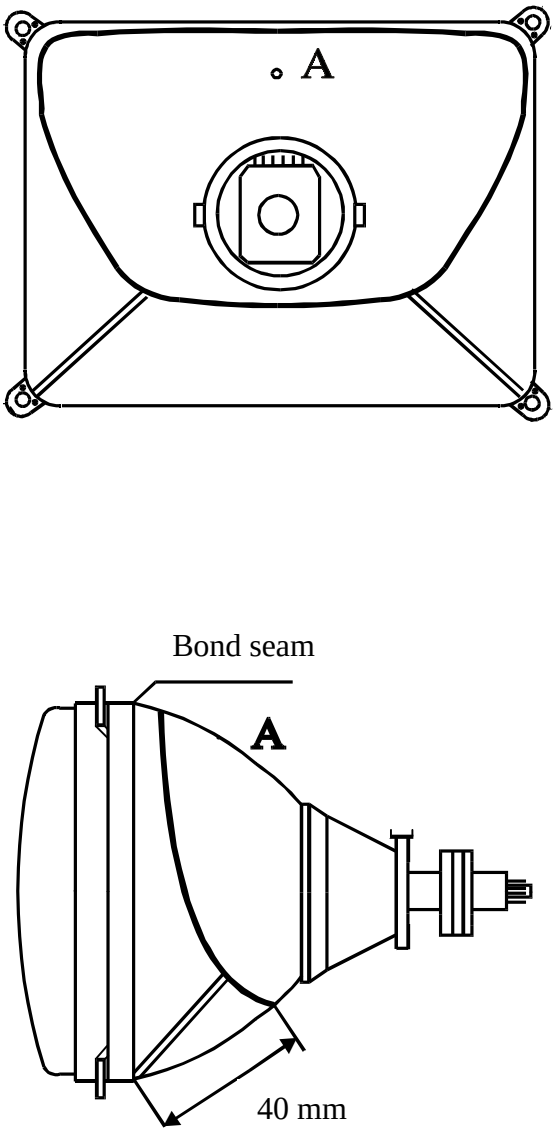


Figure E.1. Mounting of Degauss Coil

Appendix F (for information)

Related Documents

QC 001002-2 (1998)	IEC Quality Assessment System for Electronic Components (IECQ) – Rules of Procedure. Part 2: Documentation
QC 001002-3 (1998)	IEC Quality Assessment System for Electronic Components (IECQ) – Rules of Procedure. Part 3: Approval Procedures
PQC 100 (1989)	Electronic Tubes. Part 1: Generic Specification
IEC Publications:	
60027-1 (1995) Amendment No. 1 (1997)	Letter Symbols to be Used in Electrical Technology
60050 (1978)	International Electrotechnical Vocabulary. Chapter 531. Electronic Tubes.
60065 (1998)	Safety Requirements for Mains Operated Electronic and Related Apparatus for Household and Similar General Use
60067 (1966)	Dimensions of Electronic Tubes and Valves
60068-1 (1988) Amendment No. 1 (1992)	Basic Environmental Testing Procedures. Part 1. General
60068-2-1 (1990) Amendment No. 1 (1993) Amendment No. 2 (1994)	Basic Environmental Testing Procedures. Part 2. Tests. Test A: Cold
60068-2-2 (1974) Amendment No. 1 (1993) Amendment No. 2 (1994)	Basic Environmental Testing Procedures. Part 2. Tests. Test B: Dry heat.
60068-2-3 (1969)	Basic Environmental Testing Procedures. Part 2. Tests. Test Ca: Damp heat, steady state
60068-2-6 (1995)	Basic Environmental Testing Procedures. Part 2. Tests. Test Fc and Guidance: Vibration (sinusoidal)
60068-2-29 (1987)	Basic Environmental Testing Procedures. Part 2. Tests. Test Eb and Guidance: Bump
60100 (1964) Amendment No. 1 (1969)	Methods of Measurement of Direct Interelectrode Capacitances of Electronic Tubes and Valves
60134 (1961)	Rating Systems for Electronic Tubes and Valves and Analogous Semiconductor Devices
60151-0 (1966)	Measurements of Electrical Properties of Electronic Tubes. Part 0. Precautions relating to Methods of Measurement of Electronic Tubes and Valves
60151-8 (1966)	Measurements of Electrical Properties of Electronic Tubes. Part 8. Measurement of Cathode Heating Time and Heater Warm-Up Time
60151-16 (1968)	Measurements of Electrical Properties of Electronic Tubes. Part 16. Methods of Measurement for Television Picture Tubes
60151-28 (1978)	Measurements of Electrical Properties of Electronic Tubes. Part 28. Methods of Measurement of Colour Television Picture Tubes
60410 (1973)	Sampling Plans and Procedures for Inspection by Attributes
60441 (1974)	Photometric and Colourimetric Methods of Measurement of the Light Emitted by a Cathode-Ray Tube Screen
60562 (1976)	Measurements of Incidental Ionizing Radiation from Electronic Tubes
60617-5 (1996)	Graphical Symbols for Diagrams. Part 5: Semiconductors and Electron Tubes

Appendix G (for information)

X-ray Radiation Characteristics

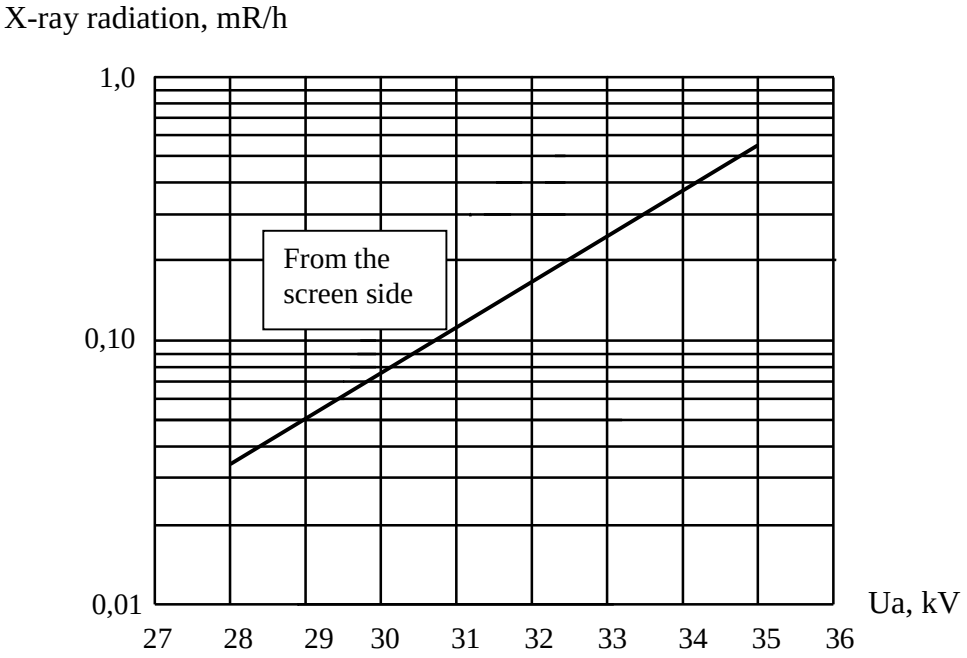


Figure G.1. X-ray Radiation as a Function of Anode Voltage at Anode Current 0.3 mA

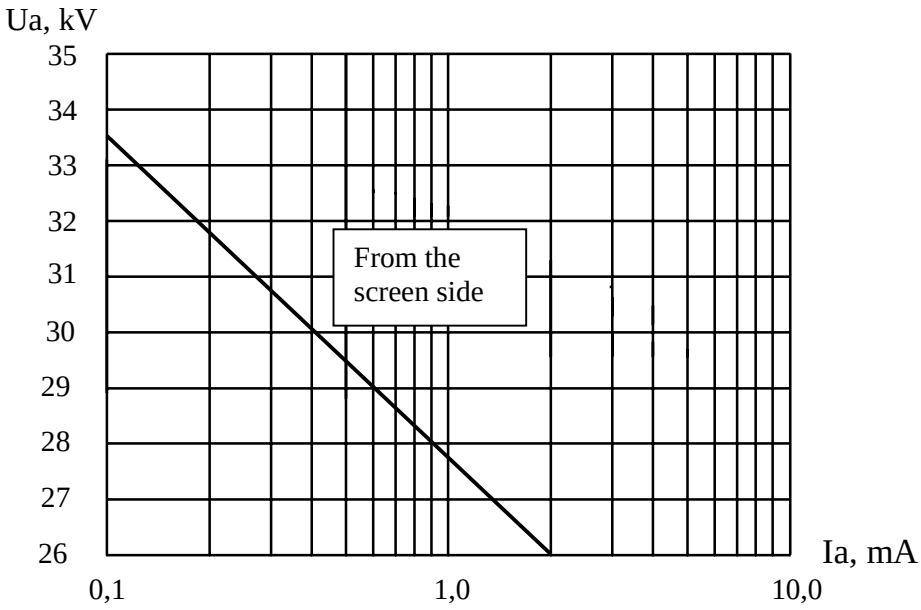


Figure G.2. Anode Voltage as a Function of Anode Current at Limiting X-ray Radiation 0.1 mR/h

Appendix H

Table H.1. Records of Amendments

Amendment		Place of Amendment (page number)
Number	Date of Approval	