

BUREAU OF INDIAN STANDARDS

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मसौदा भारतीय मानक
रंगीन टेलीविजन रिसीवर्स के लिए इलेक्ट्रोस्टैटिक
फोकसिंग और इलेक्ट्रोमैग्नेटिक डिफ्लेक्शन वाले रंगीन
पिक्चर ट्यूब के लिए सामान्य विनिर्देश
(पहला परिशोधन)

Draft Indian Standard
**Generic Specification for Colour Picture
Tube with Electrostatic Focussing and
Electromagnetic Deflection for Colour
Television Receivers**
(*First Revision*)

ICS No: 31.100

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LITD 04: Electronic Display Devices and
systems Sectional Committee

Last Date for Comments: 15 Dec 2024

NATIONAL FOREWORD

(Formal clauses will be added later)

This Indian Standard was adopted by the Bureau of Indian Standards on the recommendation of Electronic Display Devices and systems Sectional Committee (LITD 04) and approval of Electronics and Telecommunication Division Council.

This standard is derived from the provisional specification PQC 97 'Generic specification for colour picture tube with electrostatic focussing and electromagnetic deflection for colour television receivers' which was prepared by India under International Quality Assessment System for Electronics Components (IECQ).

This standard was originally published in 1993 and assistance has been derived from the IEC QC 97 Generic specification for colour picture tube with electrostatic focussing and electromagnetic deflection for colour television receivers. The first revision aligns this Indian Standard with IEC PQC 97, there is a need to align the formatting and appearance of the standard as per the current practice.

The following changes have been required in the standards under this revision:

- a) Adding Front cover page.
- b) Addition of Hindi Title.
- c) National foreword to be written as current practice.
- d) UDC Number to be changed to ICS code.

The text of IEC Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain terminologies and conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

- a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'
- b) Comma (,) has been used as a decimal marker, while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2: 2022 'Rules for rounding off numerical values (second revision)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

Generic Specification for Colour Picture Tube with Electrostatic Focussing and Electromagnetic Deflection for Colour Television Receivers (First Revision)

1 SCOPE

1.1 This standard contains:

- Measurement procedure for electric and photometric parameters,
- Environmental testing procedure, and
- Operating endurance test procedure;

for colour picture tubes (CPT) with electrostatic focussing and electromagnetic deflection for colour television receivers.

2 REFERENCES

2.1 The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 GENERAL

3.1 Marking

3.1.1 The picture tube shall be attached with a label containing the following data:

- Identification of the picture tube, allotted to it by the manufacturer;
- Serial number;
- The date of manufacture of the picture tube (the year and the month), in code or otherwise;
- Trade mark;
- Country of manufacture; and
- Safety warning.

3.1.2 The following data shall be indicated on the package:

- Identification of the picture tube allotted to it by the manufacturer;
- Trade mark; and
- The number of inspection lot.

4 QUALITY ASSESSMENT PROCEDURES

4.1 Primary Stage of Manufacture

The primary stages of manufacture are the process of deposition of the material of the viewing screen, assembly of electron gun structure and the activation of the cathode.

These processes shall be under the control of the manufacturer but need not be carried out at the same location.

4.2 Structurally Similar Components

When simultaneous or successive production is proceeding on several types of tubes having common features, those common features may be sampled from each lot of each type.

4.3 Qualification Approval Procedures

The manufacturer shall

- meet the requirements for the primary stage of manufacture contained in 4.1 of this document.
- produce evidence -of conformance to the specification requirements on three consecutive lots for lot-by-lot inspection and on one lot for periodic inspection and qualification approval.

Samples shall be taken from the lots in accordance with IS 10673: 1983. Normal inspection shall be used, but where the sample size is that which would give acceptance on zero defectives, additional specimens shall be taken to meet the sample size to give acceptance on one defective.

4.4 Quality Conformance Inspection

The blank details specification (see IS 13899 :1993) shall prescribe the minimum test schedule. This schedule shall also specify the division into subgroups for the purpose of lot-by-lot and periodic inspection.

4.5 Alternative Test Methods

The test and measurement methods given in the relevant specification are not necessarily the only methods which can be used. However, the manufacturer shall satisfy the Inspection Authority that any alternative method which he may use will give results equivalent to those obtained by the methods specified. In case of dispute, for referee and reference purposes the specified methods only shall be used.

5 TEST AND MEASUREMENT PROCEDURES

5.1 Standard Conditions for Test

Unless otherwise specified, all tests shall be carried out under standard atmospheric conditions for testing as specified below:

Temperature 15 – 35 °C

Relative humidity 45 – 75 %

Atmospheric pressure 86 – 106 kPa

5.2 Visual Inspection

Visual inspection shall be carried out under standard atmospheric conditions of test and show that:

- Marking is legible;
- There are no freely moving particles available;
- There is no corrosion occurring on metal surface; and
- External conductive coating quality is satisfactory.

5.3 Marking

The markings shall not become illegible on storage and during service through normal handling.

5.4 Check of Dimensions

The dimensioned outline drawing shall be as stated in IS 5840 (Parts 1, 2, and 3): 1970.

5.5 Test and Measurement Procedures

Measurement conditions shall be as stated in IS 10503: 1983.

5.5.1 Total Cathode Current

Purpose - To measure total cathode current

Procedure - Apply the specified voltages to the tube electrodes and if specified, apply scan deflection. Adjust g2 voltage to given visual cut-off of spot or raster. The cathode current shall be equal to or greater than the value calculated as follows:

Cathode current $I = K (\text{Cut off voltage})^{3/2}$ where K is cathode factor specified.

Conditions to be mentioned

- Electrode voltages, as applicable;
- Deflection/raster screen requirements; and
- Cathode factor K.

5.5.2 Heater Voltage and/or Current

Purpose - To measure the heater voltage (current).

Procedure - Apply the specified voltage (current) to the heater and measure the current (voltage) When specified, the test shall be made at a Point in time after application of the supply. In the absence of any specified preheat time, the heater voltage (current) shall have stabilized. used. In case of dispute, d.c. supply shall be

Conditions to be mentioned

- Heater voltage or current; and
- Pre-heat time, if required.

5.5.3 Heater-Cathode Leakage

Purpose - To measure, the leakage current flowing between the heater and the cathode.

Procedure - Apply the specified heater voltage or current. Apply the heater to cathode voltage with the heater at a (1) positive and (2) negative potential with respect to the cathode. Measure the stable current between the heater and the cathode for each condition.

Conditions to be mentioned

- Heater voltage or current, and
- Heater to cathode voltage.

5.5.4 Anode Voltage Breakdown/Voltage Breakdown (Flashover)

Purpose - To verify that when the tube is operated with the maximum rated voltages there is no evidence of flashover.

Method A

Procedure - Apply the specified voltages to the tube electrodes. Display the specified raster over the useful screen area and adjust g2 voltage to give the specified screen luminance or to cut-off value as required. There shall be no sign of flashover within a specified period.

If required, adjust the g2 voltage to cut-off value and remove the deflecting fields. Tap the tube neck using a forked, rubber covered, wooden hammer for a specified, duration unless otherwise specified, the periodicity shall be four taps per second. A suitable design for a hammer is given in Fig. 1.

The tube shall be deemed not to comply with the requirements if flashover causes visible excitation of the screen after the first 5s of tapping, and for 15s after tapping has ceased or continuous arcing is observed.

Method B

Procedure - Apply the specified voltages to the tube electrodes. The circuit shall include a specified impedance in the cathode lead and a counting device suitable for counting the voltage pulses which develop over the cathode impedance as a result of flashover. Display the specified raster over the useful screen area and adjust g2 voltage to give the specified screen luminance or to cut-off value as required. The tube shall be deemed not to comply with the requirements if more than a stated number of Bashes are counted during a specified period or continuous arcing is observed.

Conditions to be mentioned

- Electrode voltages, as applicable;
- Raster scan requirements;
- Screen luminance, if required;
- Duration and periodicity of tapping, if required;
- Input impedance of the counting device, if applicable;
- Sensitivity of the counting device, if applicable;
- Time discrimination between successive pulses of the counting device, if applicable; and
- Period of observation for signs of flashover

5.5.5 Stray Emission

Purpose - To verify that, when the tube is operating with the maximum rated voltages, there is no evidence of stray emission.

Procedure - Apply the specified voltages to the tube electrodes and adjust g2 voltage to the cut-off value. The ambient illumination measured at the screen shall not exceed 5 lux.

If required, tap the tube neck using a forked, rubber covered, wooden hammer for a specified duration. Unless otherwise specified, the periodicity shall be four taps per second. A suitable design for a hammer is given in Fig. 1.

The tube shall be deemed not to comply with the requirements if stray emission causes visible excitation of the screen within a specified period after the first five seconds of operation.

Conditions to be mentioned

- Electrode voltages, as applicable;
- Duration and periodicity of tapping, if required; and
- Period of observation for visible excitation, if required.

5.5.6 Current Ratio for R/G and R/B

Purpose - To determine anode current ratios between R/G and R/B.

Procedure - Apply the specified voltages to the tube electrodes. Display the specified raster over the useful screen area and adjust g2 voltage to give the specified screen luminance or to cut-off voltage as required. Measure red, green and blue component of anode current.

Conditions to be mentioned

- Electrode voltage, as applicable;
- Raster screen requirements; and
- Screen luminance, if required.

5.5.7 Focussing Voltage

Purpose - To measure the focus electrode voltage.

Procedure - Apply the specified voltages to the tube electrodes and produce the specified display. Adjust the g2 voltage to the specified value or to give the specified screen luminous intensity/luminance or the specified beam current. Optimize the focus in two axes at right angles by adjustment of the focus. Unless specified otherwise this optimization of focus shall be performed at the centre of the tube face. A convenient magnifier may be used. Measure focus electrode voltage as specified.

Conditions to be mentioned

- Electrode voltage, as applicable;
- Type of display; and
- g2 voltage screen luminous intensity/luminance or beam current.

5.5.8 Cathode Spot Cut-off Voltage

Purpose - To determine cathode spot cut-off voltage.

Procedure - Apply the specified voltages to the tube electrodes. Measure cathode voltages for specified beam current (typically 0.1 microamps, if not specified).

Conditions to be mentioned

- Electrode voltages, as applicable; and
- Beam current for cut-off.

5.5.9 Maximum Ratio of Cathode Cut-off Voltages, Highest Gun to Lowest Gun

Purpose - To determine the maximum ratio of cathode cut-off voltages.

Procedure - Apply the specified voltages to the tube electrodes. Switch off the horizontal and vertical deflection to get a spot over the screen. Measure minimum and maximum cathode spot cut-off voltage to determine the ratio.

Conditions to be mentioned

- Electrode voltages, as applicable.

5.5.10 Photometric Parameters

If required inspection conditions of luminance, glow chromaticity co-ordinates, nonconformity of luminance, non-uniformity of screen glow chromaticity, the white colour dynamic balance quality shall be specified or taken as specified in IS 9883: 1981.

5.5.11 Raster Centering Shift

Purpose - To verify raster centering shift, horizontal and vertical.

Procedure - Apply the specified voltages to the tube electrodes. Switch off the horizontal and vertical deflection to get a spot over the screen. Measure the shift of the spot from the mechanical centre of the screen vertically and horizontally separately.

Conditions to be mentioned

- Electrode voltage, as applicable.

5.5.12 Centre Resolution

Purpose - To verify centre resolution

Procedure - Apply the specified voltages to the tube electrodes. Display the specified raster over the useful screen area and adjust g2 voltage to give specified screen luminance or to cut off value as required. Measure resolution at the centre of the tube.

Conditions to be mentioned

- Electrode voltages, as applicable;
- Raster scan requirements; and
- Screen luminance, if required.

5.5.13 Capacitance Between External Coating to Anode

Purpose - To measure capacitance between external coating to anode.

Procedure - Measure the capacitance between the anode button and external conducting coating shorted with implosion protection band.

5.5.14 Centre Beam/Outer Beam Convergence

Purpose - To measure centre beam/outer beam convergence.

Procedure - Apply the specified voltages to the tube electrodes. Display the specified raster over the useful screen area and adjust g2 voltage to give the specified screen luminance or to cut-off voltage as required. Measure centre beam convergence (or outer beam convergence).

Conditions to be mentioned

- Electrode voltage, as applicable;
- Raster screen requirements; and
- Screen luminance, if required.

5.5.15 Interelectrode Capacitances

Purpose - To measure interelectrode capacitance.

Procedure - Measure capacitance between specific electrode and all other electrodes shorted together.

5.5.16 Resistance Between Metal Hardware and Conductive Coating

Purpose - To measure the resistance between external conducting coating and metal hardware.

Procedure - Measure the resistance between metal hardware, that is, implosion protection band and external conductive coating.

Conditions to be mentioned

- DC supply voltage 1.5 V to 3.0 V

5.5.17 Ionizing Radiations

Purpose - To measure X-ray radiation.

Procedure - Apply the specified voltages to the tube electrodes. Display the specified raster over the useful screen area and adjust g2 voltage to give the specified screen luminance or to cut-off value as required. All controls accessible from the outside by hand or by a screw driver or any other tool, and those internal adjustments or presets which are not locked in a reliable manner (solder joints and paint locking are examples of adequate locking) are adjusted so as to give maximum radiation while maintaining an intelligible picture for 1 hour at the end of which measurement is made. Measure the amount of radiation at any readily accessible point using a radiation monitor with an effective area of 10 cm² at a distance of 5 cm from the outer surface of the tube. The procedure shall be prescribed as in IS 616: 2017.

Conditions to be mentioned

Electrode voltages, as applicable;
Raster scan requirements; and
Screen luminance, if required.

5.5.18 Quality of Fluorescent Screen and Faceplate

Purpose - To verify that the quality of the fluorescent screen and faceplate is within the specified limits.

Procedure - Apply the specified voltages to the tube electrodes. Display the specified raster (unfocussed) over the useful screen area and adjust g2 voltage to give the specified screen luminance. Examine the screen for blemishes in accordance with the appropriate blemish specification (*see* description of screen blemishes). A calibrated microscope shall be used where accurate measurement is required. Where the screen is divided into zones, these may be determined either by direct measurement or by the use of an engraved graticule or frame.

Examine the screen for uniformity of brightness either by visual inspection or by using a photometer with a specified aperture to compare field ratio of non-uniformity.

Description of screen blemishes - The diameter of diagonals of the quality zones in the screen area shall be specified. Zones are identified by letter, zone A being the central quality zone, surrounded by zone B, etc. For each zone the maximum number of classified blemished permitted within stated ranges of size and the minimum permissible separation between them shall be specified.

The size of the blemish is defined as the sum of its length and width divided by two. The permissible separation between any two blemishes lying in adjacent quality zones is the sum of the permissible separation allowed for each blemish in its own zone divided by two.

Classification of Screen Blemishes

Dead spots - Areas of no effective luminance, including particles of opaque foreign matter in the glass faceplate or phosphor, pinholes in the phosphor; etc. Diffuse or translucent spots are permitted up to twice the size of a sharply defined spot.

Bubbles - Blisters of gas within the thickness of the glass.

Colour spots - Areas of phosphor having a colour response markedly different from the rest of the screen. Diffuse colour spots are permitted up to three times the size of a sharply defined spot.

Cords - Narrow bands of non-homogeneous glass having a visibly different index of refraction from the surrounding glass. They are permitted provided that:

- 1) When viewed they do not distort the trace on the screen.
- 2) They are not visible when the screen is viewed with the eye normal to the screen and the screen is illuminated with a tungsten filament lamp mounted in a line in front of, and at approximately 45 degree to the screen face.

Internal etching - An area of the internal screen face etched during the chemical cleaning process during manufacture.

T-checks - Fissures in the glass extending partially through the thickness.

Cracks - Fissures in the glass extending through the thickness.

Bruises - Fissures caused by impact.

Scratches - Elongated abrasion in the surface of the glass.

Chips - Small fragments of glass broken out of an otherwise regular surface.

Shear marks - Scar appearing on the surface of the glass. These shall not be permitted within the quality zones.

5.5.19 Dry Heat Test

The tube shall be subjected to a temperature value listed in IS/IEC 60068-2-2: 2007.

5.5.20 Damp Heat Test

The tube shall be subjected to test prescribed in IS 9000 (Part 4): 2020.

5.5.21 Cold Test

The tube shall be subjected to a temperature value listed in IS/IEC 60068-2-1: 2007.

5.5.22 Vibration Test

The tube shall be subjected to test prescribed in IS/IEC 60068-2-6: 2007.

5.5.23 Implosion Protection Test

The tube shall be subjected to test prescribed in **18.2** of IS 616: 2017.

5.5.24 Operating Endurance

The tube shall be operated as specified for 1 000 hours.

Conditions to be mentioned

- Operating conditions, and
- Parameters for post measurements.

ANNEX A
(Clause 2)

LIST OF REFERRED INDIAN STANDARDS

| IS No. | Title |
|------------------------|--|
| IS 616: 2017 | Audio, video and similar electronic apparatus - Safety requirements (Fifth Revision) |
| IS 5840 (Part 1): 1970 | Dimensions of cathode - Ray tubes: Part 1: Tube Outlines |
| IS 5840 (Part 2): 1970 | Dimensions of cathode - Ray tubes: Part 2: Bases |
| IS 5840 (Part 3): 1970 | Dimensions of cathode - Ray tubes: Part 3 EHT Terminals |
| IS/IEC 60068-2-1: 2007 | Environmental Testing Part 2 Tests Section 1 Test A: Cold |
| IS/IEC 60068-2-2: 2007 | Environmental Testing Part 2: Tests - Test B Section 2: Dry Heat |
| IS 9000 (Part 4): 2020 | Environmental Testing Part 4 Tests - Test Cab: Damp Heat, Steady State (Second Revision) |
| IS/IEC 60068-2-6: 2007 | Environmental Testing Part 2 Tests Section 6 Test Fc: Vibration sinusoidal |
| IS 9883: 1981 | Photometric and colorimetric methods of measurement of the light emitted by a cathode-ray tube screen |
| IS 10503: 1983 | Methods of measurement of colour television picture tubes |
| IS 10673: 1983 | Sampling plans and procedures for inspection by attributes for electronic items |
| IS 13899: 1993 | Colour picture tube with electrostatic focussing and electromagnetic deflection for colour television receivers - Blank detail - Specification |