SLOVENSKI STANDARD
SIST EN 60107-7:1999

01-april-1999

Methods of measurement on receivers for television -- Part 7: HDTV displays (IEC 60107-7:1997)

Methods of measurement on receivers for television -- Part 7: HDTV displays

Meßverfahren für Empfänger von Fernseh-Rundfunksendungen -- Teil 7: HDTV-Wiedergabeeinrichtungen

Méthodes de mesures pour les récepteurs de télévision -- Partie 7: Dispositifs de visualisation TVHD

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English version

Methods of measurement on receivers for television
Part 7: HDTV displays
(IEC 60107-7:1997)

Méthodes de mesures pour les récepteurs de télévision
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(CEI 60107-7:1997)

Meßverfahren für Empfänger von Fernseh-Rundfunksendungen
Teil 7: HDTV-Wiedergabeeinrichtungen
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This European Standard was approved by CENELEC on 1997-03-11. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

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Foreword

The text of document 100A/23/FDIS, future edition 1 of IEC 60107-7, prepared by SC 100A, Multimedia end-user equipment, of IEC TC 100, Audio, video and multimedia systems and equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60107-7 on 1997-03-11.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1997-12-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1997-12-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annex ZA is normative and annex A informative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60107-7:1997 was approved by CENELEC as a European Standard without any modification.

In the official version, for annex A, Bibliography, the following note has to be added for the standard indicated:

IEC 65	NOTE: Harmonized, together with its amendments 1:1987, 2:1989 and 3:1992, as EN 60065:1993 (modified).

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE: When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 68-1	1988	Environmental testing Part 1: General and guidance	EN 60068-1[1)]	1994
IEC 60107-1	1997	Methods of measurement on receivers for television broadcast transmissions Part 1: General considerations Measurements at radio and video frequencies	EN 60107-1	1997
IEC 60107-2	1997	Part 2: Audio channels - General methods and methods for monophonic channels	EN 60107-2	1997
ITU-R BT.471-1	1994	Nomenclature and description of colour bar signals	-	-

1) EN 60068-1 includes corrigendum October 1988 + A1:1992 to IEC 68-1.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.

3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.

4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.

5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.

6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60107-7 has been prepared by IEC subcommittee 100A: Receiving equipment, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this standard is based on the following documents:

FDIS	Report on voting
100A/23/FDIS	100A/43/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

Annex A is for information only.

METHODS OF MEASUREMENT ON RECEIVERS FOR TELEVISION BROADCAST TRANSMISSIONS –

Part 7: HDTV displays

1 General

1.1 *Scope and object*

This part of IEC 107 deals with the standard conditions and methods of measurement on high definition television (HDTV) displays. Such displays may be used as an integral part of an HDTV receiver for direct off-air reception, reception via cabled networks, or as a monitor for pre-recorded video, home movies and games, among other applications.

This standard deals with the determination of performance, and permits the comparison of equipment by listing the characteristics which are useful for specifications and by laying down uniform methods of measurement for these characteristics. Performance requirements are not specified.

This standard does not deal with general safety matters, for which reference should be made to IEC 65 [1]* or other appropriate IEC safety standards.

NOTE – Methods of measurement on wide-screen displays for conventional television signals are dealt with in IEC 60107-1.

1.2 *Normative references*

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 107. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 107 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of ISO and IEC maintain registers of currently valid International Standards.

IEC 68: *Environmental testing*

IEC 68-1: 1988, *Environmental testing – Part 1: General and guidance*

IEC 60107-1: 1997, *Methods of measurement on receivers for television broadcast transmissions – Part 1: General considerations – Measurements at radio and video frequencies*

IEC 60107-2: 1997, *Methods of measurement on receivers for television broadcast transmissions – Part 2: Audio channels – General methods and methods for monophonic channels*

ITU-R Recommendation BT.471-1: 1994, *Nomenclature and description of colour bar signals*

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* Figures in square brackets refer to the bibliography given in annex A.

1.3 *Definitions*

For the purpose of this part of IEC 107, the following definitions apply:

1.3.1 **HDTV display**: Integral part of an HDTV receiver or a monitor for displaying picture information carried by the HDTV video signals defined in the Recommendation ITU-R BT.709-1 [2] or similar signals with an aspect ratio of 16:9.

It may include audio amplifiers and loudspeakers.

NOTES

1 The ITU-R Recommendation BT.709-1 [2] defines basic parameters of HDTV signals and their signal formats for 1125/60/2:1 and 1250/50/2:1 systems.

2 Conventional television displays with an aspect ratio of 16:9 are not dealt with by this standard. This type of display is dealt with by the future IEC/FDIS 107-1.

1.3.2 **luminance**: In a given direction, the luminous intensity per unit of projected area of any surface as viewed for that direction.

The luminance value is expressed in candela per square metre.

1.3.3 **chromaticity**: Property of colour stimulus defined by its chromaticity co-ordinates (x,y) of the CIE 1931 standard colorimetric system [3], or chromaticity co-ordinates (u',v') of the CIE 1976 uniform chromaticity system [3].

1.4 *Types of displays*

HDTV displays in this standard include direct-view types using a cathode ray tube (CRT) and liquid crystal display (LCD), and projection types using CRTs and LCDs.

It is assumed that the displays are equipped with input terminals for analogue baseband signals.

2 General notes on measurements

2.1 *General*

Measurement shall be made in accordance with the following conditions to ensure repeatable results.

If audio channels and loudspeakers are provided, characteristics of the audio channels shall be measured by the methods specified in IEC 60107-2.

2.1.1 *Operation conditions*

Unless specified otherwise in the relevant clauses, both the audio and picture parts shall be in operation and the scanning circuits shall be properly synchronized. The contrast and brightness controls should be set at the standard settings specified in 2.5. If different values are used, they shall be noted with the results.

2.1.2 *Presentation of results*

Measurement results shall be listed in a table or presented graphically. However, the relationship between two or more quantities is often more clearly represented in a graph than as a table.

When the results of a point-by-point measurement for an individual sample are presented as a continuous curve in a graph, the measured points shall be clearly indicated. Extrapolated, theoretical or other information presented, but not based on direct measurement, shall be clearly distinguished from measured curves, for example by another style of drawing. Linear or logarithmic scales are recommended for graphical presentation. Linear decibel scales are equivalent to logarithmic scales.

If deviations from the recommended method are adopted, these shall be clearly stated with the results. When known, the accuracy of measuring instruments shall also be given.

2.1.3 *Environmental conditions*

Measurements and mechanical checks may be carried out at any combination of temperature, humidity and pressure within the following limits:

- ambient temperature: 15 °C to 35 °C, preferably 20 °C;
- relative humidity: 25 % to 75 %;
- air pressure: 86 kPa to 106 kPa.

If the manufacturer finds it necessary to specify climatic conditions differing from the above, these should be chosen from IEC 68-1 and the measurements shall be made under these specified conditions.

The conditions mentioned above represent those under which the equipment is required to meet its specifications. Over a wider range, the equipment may operate but not meet all of its specifications and it may be permissible to store the equipment under much more extreme conditions. For more complete discussion of these concepts, reference should be made to IEC 68.

2.1.4 *Precautions during measurement*

When carrying out measurements, all test conditions or operations which may lead to damage of the display shall be avoided. This applies particularly to sensitive, solid-state devices and similar constructions.

If a protective cover is removed and parts that are directly connected to the mains become accessible, the equipment shall be connected to the a.c. mains via a safety transformer, the secondary winding of which is insulated in accordance with the principle of double insulation.

It shall be ascertained that the use of a safety transformer does not influence the receiver properties to be measured. In particular, the internal impedance of the safety transformer shall be sufficiently low for the behaviour of the display to be the same as when directly connected to the mains supply.

2.1.5 *Power supply*

Measurements of the display characteristics shall be carried out at the rated voltage of the power supply. The fluctuation of the power supply voltage during the tests shall not exceed ± 2 %. When a.c. mains are used, the frequency fluctuation and the harmonic components of the power supply shall not exceed ± 2 % and 5 % respectively.

To determine the influence of variations in the supply voltages on the display characteristics, supplementary measurements may be needed at overvoltages and undervoltages, these being chosen appropriately with due regard to the manufacturer's specifications.

2.1.6 *Stabilization period*

In order to ensure that when measurement begins, characteristics do not change significantly with time, the display shall be operated under standard measuring conditions for a sufficient period to permit the characteristics to stabilize.

2.1.7 *Test room*

Measurements shall be carried out in a room that is not subject to disturbing external interference from electromagnetic fields. If interference may effect the results, the measurements shall be carried out in a screened room.

2.2 *Input signals*

2.2.1 *Video signals*

Input video signals to the display shall be YP_BP_R component signals

where

Y is the luminance signal;

P_B is the B-Y signal;

P_R is the R-Y signal.

The synchronizing signal shall be a composite sync signal consisting of tri-level, bipolar line synchronizing pulses and field synchronizing pulses.

The Y signal shall be accompanied by the synchronizing signal.

Some displays may require R, G, and B signals instead of the YP_BP_R component signals. Such displays require that the synchronizing signal or line and field driving pulses be separate.

NOTE – Some displays can be operated by negative synchronizing pulses.

2.3 *Test signals*

2.3.1 *Video test signals (general remarks)*

Waveforms of test signals and test patterns shown in this clause are examples; however, other signals with similar characteristics may also be used.

The amplitude of a picture component is measured from the blanking level and expressed as a percentage to the amplitude of the reference white level. The black level coincides with the blanking level.

The white reference level can be obtained from the Y signals for composite test patterns, colour bars and staircase signals, which are defined in this subclause.

NOTE – In order to avoid excessive overshoots of the signal waveform which may occur in the display under test, high-frequency components of the video signal beyond the nominal frequency bandwidth of the system should be attenuated by suitable low-pass filters.

2.3.1.1 *Composite test pattern signal*

A composite test pattern signal comprises a combination of monochrome and colour signal components that offer as much information as possible on the performance of the displays. Such a pattern should include at least the following items:

– circles and equidistant horizontal and vertical lines for linearity and colour convergence checks;

– a marking to check the visible picture size (see 4.1.3);

– a known brightness scale comprising 5 to 10 brightness steps for gradation checks;

– vertical and horizontal definition wedges in the centre and in the four corners of the picture area;

– vertical bars of different widths or a wedge and horizontal blocks giving black-white and white-black transitions for checking overshoot, reflections and low-frequency response;

– areas at the reference white level and black level to check the maximum and minimum brightness of the picture;

– coloured areas to check decoding operation, colour transitions and luminance/-chrominance time equalization.

An average picture level (APL) of the pattern signal should be approximately 50 %.

2.3.1.2 *Colour bar signal*

A colour bar signal consists of vertical bands of colours in order of descending luminance, left to right, as defined in Recommendation ITU-R BT.471-1. For the measurements of the display, a 100 % colour bar signal consisting of (100/0/100/0) bars shall be used (for the nomenclature of bars, refer to ITU-R BT.471-1).

R, G and B primary bar signals are shown in figure 1.

Y, P_B and P_R bar signals shall comply with the HDTV standard used. Waveforms of the signals are shown in figure 2.

2.3.1.3 *Black and white cross-hatch pattern signals*

The white cross-hatch pattern signal produces a white cross-hatch on a black background and the black cross-hatch pattern signal produces a black cross-hatch on a white background.

The white cross-hatch pattern is used to measure convergence errors or registration errors of displays, and the black cross-hatch pattern is used as a scale for locating a point on the screen and other purposes.

The cross-hatch pattern consists of equidistant horizontal and vertical lines which form rectangular windows. The screen has 13 and 21 lines, respectively, as shown in figure 3.

These patterns require Y signal only.

2.3.1.4 *Full white and full black signals*

The full white and full black signals are flat level Y signals whose amplitudes are set at 100 % and 0 % as shown in figure 4.

These signals are used to measure luminance and other characteristics of a display.