SLOVENSKI STANDARD

SIST EN 61947-1:2003

oktober 2003

Electronic projection - Measurement and documentation of key performance criteria - Part 1: Fixed resolution projectors (IEC 61947-1:2002)

ICS 33.160.99; 37.040.10

Referenčna številka
SIST EN 61947-1:2003(en)

EUROPEAN STANDARD **EN 61947-1**

NORME EUROPÉENNE

EUROPÄISCHE NORM November 2002

ICS 37.020; 35.180; 33.160.60

English version

Electronic projection - Measurement and documentation of key performance criteria Part 1: Fixed resolution projectors
(IEC 61947-1:2002)

Projection électronique -
Mesure et documentation des critères principaux de performance
Partie 1: Projecteurs à résolution fixe
(CEI 61947-1:2002)

Elektronische Projektion -
Messung und Dokumentation wichtiger Leistungsmerkmale
Teil 1: Projektoren fester Auflösung
(IEC 61947-1:2002)

This European Standard was approved by CENELEC on 2002-10-01. 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.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

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

Ref. No. EN 61947-1:2002 E

Foreword

The text of document 100/501/FDIS, future edition 1 of IEC 61947-1, prepared by 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 61947-1 on 2002-10-01.

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)	2003-07-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2005-10-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annexes A, B, D and ZA are normative and annexes C, E, F, G, H and I are informative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61947-1:2002 was approved by CENELEC as a European Standard without any modification.

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 61947-2	- [1)]	Electronic projection - Measurement and documentation of key performance criteria Part 2: Variable resolution projectors	EN 61947-2	2002 [2)]
IEC 61966-4	- [1)]	Multimedia systems and equipment - Colour measurement and management Part 4: Equipment using liquid crystal display panels	EN 61966-4	2000 [2)]
IEC 61966-5	- [1)]	Part 5: Equipment using plasma display panels	EN 61966-5	2001 [2)]
ISO 3741	- [1)]	Acoustics - Determination of sound power levels of noise sources using sound pressure - Precision methods for reverberation rooms	EN ISO 3741	1999 [2)]
ISO 7779	- [1)]	Acoustics Measurement of airborne noise emitted by information technology and telecommunications equipment	EN ISO 7779	2001 [2)]

1) Undated reference.

2) Valid edition at date of issue.

INTERNATIONAL STANDARD

IEC 61947-1

First edition
2002-08

Electronic projection – Measurement and documentation of key performance criteria –

Part 1: Fixed resolution projectors

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch

Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE V

For price, see current catalogue

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRONIC PROJECTION – MEASUREMENT AND DOCUMENTATION OF KEY PERFORMANCE CRITERIA

Part 1: Fixed resolution projectors

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 specifications, 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 61947-1 was prepared by 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
100/501/FDIS	100/537/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.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until 2004. At that date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

INTRODUCTION

This standard was developed to ensure a common, meaningful description of key performance parameters for fixed resolution projectors. The measurement methods and test signals correlate closely to typical uses involving computer-generated text and graphics displays. These measurements evaluate the actual viewable image that emanates from fixed resolution projectors. The resulting performance specifications are conservative in nature and allow any display device to be used beyond its rated specifications with degraded performance. The point at which this degraded performance is no longer useful is highly subjective and strongly affected by the environment and the application.

This standard is designed to specify a means of measuring and quantifying the performance of fixed resolution projectors and is not intended to provide design goals for manufacturers of such equipment.

ELECTRONIC PROJECTION – MEASUREMENT AND DOCUMENTATION OF KEY PERFORMANCE CRITERIA

Part 1: Fixed resolution projectors

1 Scope

This part of IEC 61947 specifies requirements for measuring and documenting key performance parameters for electronic projection systems with fixed resolution projectors in which the light source and projection/magnification optics are an integral part of the system (i.e. individual pixel light sources or matrix displays such as liquid crystal, DMD, plasma, or electroluminescent panels). It also applies to LCD panels or other fixed resolution imaging devices themselves that are used with overhead projectors.

The provisions of this standard are designed to codify the measurement of the performance of variable resolution projectors and are not intended to provide design goals for manufacturers of such equipment.

This standard is intended for fixed resolution projectors that are primarily designed for use with discrete colour (RGB) raster-scanned video, text, and graphics signals generated by computer equipment.

NOTE These devices may also accept composite or component television video signals encoded in ITU/R publications, which are not within the scope of this standard. In this standard, all of these signals are referred to as television video (TV video).

Projectors and projection systems with multiple variable resolutions, such as cathode-ray tubes and laser projectors, are not fully addressed by this standard, and reference should be made to IEC 61947-2.

A discussion of considerations taken into account in the development of this standard appears in Annex C.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61947-2, *Electronic projection – Measurement and documentation of key performance criteria – Part 2: Variable resolution projectors*

IEC 61966-4, *Multimedia systems and equipment – Colour measurement and management – Part 4: Equipment using liquid crystal display panels*

IEC 61966-5, *Multimedia systems and equipment – Colour measurement and management – Part 5: Equipment using plasma display panels*

ISO 3741, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Precision methods for reverberation rooms*

ISO 7779, *Acoustics – Measurement of airborne noise emitted by information technology and telecommunication equipment*

3 Definitions

For the purposes of this standard, the following definitions apply.

3.1
active matrix display
display that uses switches at each pixel to select those pixels to which a voltage will be applied

3.2
active viewing area
horizontal and vertical dimensions in millimetres (inches) of the boundary of the array of pixels. It may also be expressed in square millimetres or square inches

3.3
aperture ratio (fill factor)
light transmitting/reflecting area of a pixel times the number of pixels divided by the active viewing area (light transmitting area and light blocking area)

3.4
aspect ratio
proportions of a projected picture area, for example, the width compared to the height

NOTE It is usually expressed in standard ratios such as 4:3, 16:9, or others.

3.5
blanking
process of the beam turning off (blanking) which occurs during horizontal and vertical retrace (flyback)

3.6
CIE
Commission Internationale de l'Eclairage, the international commission on illumination

NOTE The CIE is an organization devoted to international cooperation and exchange of information among its member countries on all matters relating to the art and science of lighting.

3.7
CIE chromaticity values
Cartesian coordinates used to define a colour in CIE colour space

NOTE The 1931 chromaticity values are designated x and y. In 1976, the CIE defined a more uniform colour space. The 1976 CIE chromaticity values are u' and v'.

3.8
colour mapping
means for accurately displaying colour signals or altering sets of colour signals in a controlled manner

3.9
contrast ratio
luminance or illuminance ratio of a light area of the image to the dark area of the same image

3.10
correlated colour temperature (CCT) of the white-point
temperature, in kelvins, of the black-body radiator the chromaticity of which is closest to the chromaticity of a particular light, for example, from a display screen, as measured in the 1960 CIE (u, v) uniform chromaticity space

NOTE An algorithm for computing CCT of the white-point, either from 1931 CIE (x, y) coordinates or from 1960 (u,v) coordinates, appears in Wyszecki and Stiles [1]. A graphical nomogram also appears in this work.

Alternatively, a successful numerical approximation has been derived by C. S. McCamy [2]. Given CIE 1931 coordinates (x, y), McCamy's approximation is CCT = 437 n^3 + 3601 n^2 + 6831 n + 5517 where $n = (x - 0{,}3320)/(0{,}1858 - y)$. This approximation, the second of three proposed, is close enough for any practical use between 2000 K and 10 000 K. In units of 1960 u, v chromaticity, it is agreed that the concept of CCT of the white-point has little meaning beyond the distance of 0,01 from the Planckian locus (see Robinson et al [3]), where the distance is specified by:

$$\Delta uv = \sqrt{(u_1 - u_2)^2 + (v_1 - v_2)^2}$$

Most commercial colorimeters will report CCT of the white-point from 0,0175 u, v units above the Planckian locus to 0,014 u,v units below this locus.

3.11
digital micromirror device (DMD)
semiconductor light micromirror array. The DMD can switch incident light on or off in discrete pixels within microseconds to produce projection display systems

3.12
optical distortion
situation in which an image is not a true-to-scale reproduction of an object due to the optics of the system

NOTE There are many types of distortion, such as anamorphic, barrel, curvilinear, geometric, keystone, panoramic, perspective, radial, stereoscopic, tangential, and wide-angle.

3.13
f/number
stop number
the reciprocal value of the relative aperture

NOTE Relative aperture of a photographic lens: twice the numerical aperture where the numerical aperture is the sine of the semi-angle subtended by the exit pupil at the focal plane. For photographic applications, the aperture is equivalent (within a 1/3 stop) to the ratio of the diameter of the entrance pupil to the focal length. (See ISO 517: 1996(E) *Photography – Apertures and related properties pertaining to photographic lenses – Designations and measurements*.)

3.14
fall time
time, in milliseconds, for the image brightness to change from 90 % of its maximum value to 10 % of its maximum value

3.15
focal length
distance between the centre of the focusing lens or mirror and the focal spot.

NOTE Shorter focal length projection lenses produce larger screen images for a given distance from the screen

3.16
focus
adjustment of an optical system to achieve the greatest possible sharpness

3.17
four corners
centres of the four corner points (see Figure A.2), located at 10 % of the distance from the corners to the centre of point 5

3.18
front screen projection
image projected on the audience side of a light-reflecting screen