

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

This document is a preview generated by EVS

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 61947-2:2003 sisaldab Euroopa standardi EN 61947-2:2002 ingliskeelset teksti.

Standard on kinnitatud Eesti Standardikeskuse 15.01.2003 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.

Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 28.02.2002.

Standard on kättesaadav Eesti standardiorganisatsioonist.

This Estonian standard EVS-EN 61947-2:2003 consists of the English text of the European standard EN 61947-2:2002.

This standard is ratified with the order of Estonian Centre for Standardisation dated 15.01.2003 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.

Date of Availability of the European standard text 28.02.2002.

The standard is available from Estonian standardisation organisation.

ICS 33.160.60, 35.140, 37.020

### Standardite reprodutseerimis- ja levitamiseõigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonilisse süsteemi või edastamine ükskõik millises vormis või millisel teel on keelatud ilma Eesti Standardikeskuse poolt antud kirjaliku loata.

Kui Teil on küsimusi standardite autorikaitse kohta, palun võtke ühendust Eesti Standardikeskusega:  
Aru 10 Tallinn 10317 Eesti; [www.evs.ee](http://www.evs.ee); Telefon: 605 5050; E-post: [info@evs.ee](mailto:info@evs.ee)

### Right to reproduce and distribute Estonian Standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without permission in writing from Estonian Centre for Standardisation.

If you have any questions about standards copyright, please contact Estonian Centre for Standardisation:  
Aru str 10 Tallinn 10317 Estonia; [www.evs.ee](http://www.evs.ee); Phone: +372 605 5050; E-mail: [info@evs.ee](mailto:info@evs.ee)

EUROPEAN STANDARD

**EN 61947-2**

NORME EUROPÉENNE

EUROPÄISCHE NORM

February 2002

ICS 33.160.60;35.140;37.020

English version

**Electronic projection –  
Measurement and documentation of key  
performance criteria  
Part 2: Variable resolution projectors  
(IEC 61947-2:2001)**

Projection électronique –  
Mesure et documentation des  
critères principaux de performance  
Partie 2: Projecteurs à résolution  
variable  
(CEI 61947-2:2001)

Elektronische Projektion –  
Messung und Dokumentation  
wichtiger Leistungsmerkmale  
Teil 2: Projektoren variabler Auflösung  
(IEC 61947-2:2001)

This European Standard was approved by CENELEC on 2001-11-01. 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, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, 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**

## Foreword

The text of document 100/268/FDIS, future edition 1 of IEC 61947-2, prepared by SC 100C, Audio, video and multimedia subsystems and 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 61947-2 on 2001-11-01.

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) 2002-08-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2004-11-01

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, G and ZA are normative and annexes C, E, F, H, I and J are informative.

Annex ZA has been added by CENELEC.

---

## Endorsement notice

The text of the International Standard IEC 61947:2001 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

|             |      |                                                  |
|-------------|------|--------------------------------------------------|
| ISO 9241-8  | NOTE | Harmonized as EN ISO 9241-8:1997 (not modified). |
| IEC 60107-1 | NOTE | Harmonized as EN 60107-1:1997 (not 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.

| <u>Publication</u> | <u>Year</u> | <u>Title</u>                                                                                                                      | <u>EN/HD</u> | <u>Year</u> |
|--------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------|--------------|-------------|
| IEC 60050-845      | 1987        | International Electrotechnical Vocabulary (IEV)<br>Chapter 845: Lighting                                                          | -            | -           |
| IEC 61947-1        | - 1)        | Electronic projection<br>Part 1: Fixed resolution projectors                                                                      | -            | -           |
| ISO 3741           | 1999        | Acoustics - Determination of sound power levels of noise sources using sound pressure - Precision methods for reverberation rooms | EN ISO 3741  | 1999        |
| ISO 7779           | 1999        | Acoustics<br>Measurement of airborne noise emitted by information technology and telecommunications equipment                     | EN ISO 7779  | 2001        |

---

1) To be published.

# INTERNATIONAL STANDARD

**IEC**  
**61947-2**

First edition  
2001-09

---

---

**Electronic projection –  
Measurement and documentation  
of key performance criteria –**

**Part 2:  
Variable resolution projectors**



Reference number  
IEC 61947-2:2001(E)

## Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

## Consolidated editions

The IEC is now publishing consolidated versions of its publications. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

## Further information on IEC publications

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology. Information relating to this publication, including its validity, is available in the IEC Catalogue of publications (see below) in addition to new editions, amendments and corrigenda. Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is also available from the following:

- **IEC Web Site** ([www.iec.ch](http://www.iec.ch))

- **Catalogue of IEC publications**

The on-line catalogue on the IEC web site ([www.iec.ch/catlg-e.htm](http://www.iec.ch/catlg-e.htm)) enables you to search by a variety of criteria including text searches, technical committees and date of publication. On-line information is also available on recently issued publications, withdrawn and replaced publications, as well as corrigenda.

- **IEC Just Published**

This summary of recently issued publications ([www.iec.ch/JP.htm](http://www.iec.ch/JP.htm)) is also available by email. Please contact the Customer Service Centre (see below) for further information.

- **Customer Service Centre**

If you have any questions regarding this publication or need further assistance, please contact the Customer Service Centre:

Email: [custserv@iec.ch](mailto:custserv@iec.ch)  
Tel: +41 22 919 02 11  
Fax: +41 22 919 03 00

# INTERNATIONAL STANDARD

**IEC**  
**61947-2**

First edition  
2001-09

---

---

**Electronic projection –  
Measurement and documentation  
of key performance criteria –**

**Part 2:  
Variable resolution projectors**

© IEC 2001 — Copyright - all rights reserved

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Electrotechnical Commission

Telefax: +41 22 919 0300

3, rue de Varembé, Geneva, Switzerland

e-mail: [inmail@iec.ch](mailto:inmail@iec.ch)

IEC web site: <http://www.iec.ch>



Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

PRICE CODE

**X**

*For price, see current catalogue*



## CONTENTS

|                                                                                       |    |
|---------------------------------------------------------------------------------------|----|
| FOREWORD .....                                                                        | 4  |
| INTRODUCTION .....                                                                    | 6  |
| 1 Scope .....                                                                         | 7  |
| 2 Normative references .....                                                          | 7  |
| 3 Definitions .....                                                                   | 8  |
| 4 General requirements .....                                                          | 12 |
| 5 Light output measurement and specification .....                                    | 13 |
| 5.1 Light output specifications .....                                                 | 14 |
| 5.1.1 Light output specification for projectors with a separate screen .....          | 14 |
| 5.1.2 Full-black light level specification .....                                      | 15 |
| 5.1.3 Luminance specification for devices with an integral screen .....               | 15 |
| 5.2 Light output uniformity .....                                                     | 15 |
| 5.2.1 Example of a uniformity specification .....                                     | 15 |
| 5.3 Contrast ratio .....                                                              | 15 |
| 5.4 Blanking measurement and specification .....                                      | 15 |
| 5.5 Effective blanking time .....                                                     | 16 |
| 5.6 Blanking specification .....                                                      | 16 |
| 6 Variable resolution projector characteristics .....                                 | 17 |
| 6.1 Visual resolution measurement and specification .....                             | 17 |
| 6.1.1 Description and general requirements .....                                      | 17 |
| 6.1.2 Horizontal resolution .....                                                     | 17 |
| 6.1.3 Vertical resolution .....                                                       | 18 |
| 6.1.4 Procedure .....                                                                 | 18 |
| 6.2 Video frequency response specifications .....                                     | 20 |
| 6.2.1 Frequency response specifications .....                                         | 20 |
| 6.3 Viewing angle (half/gain) specification for devices with an integral screen ..... | 20 |
| 6.4 Input signal format compatibility .....                                           | 20 |
| 6.5 Response time .....                                                               | 20 |
| 6.6 Colour measurements .....                                                         | 21 |
| 6.6.1 Colour chromaticity .....                                                       | 21 |
| 6.6.2 Colour uniformity .....                                                         | 21 |
| 6.7 Keystone correction .....                                                         | 22 |
| 7 Range of focus and image size .....                                                 | 22 |
| 8 Audio characteristics .....                                                         | 22 |
| 9 Light source specification .....                                                    | 22 |
| 10 Noise: maximum sound level .....                                                   | 23 |
| 11 Power consumption .....                                                            | 23 |
| 12 Weight .....                                                                       | 23 |
| 13 Dimensions .....                                                                   | 23 |
| 14 Recommended practices .....                                                        | 23 |
| 14.1 Recommended practice 1 – Sync hierarchy .....                                    | 23 |
| 14.2 Recommended practice 2 – DC restoration .....                                    | 23 |
| 14.3 Recommended practice 3 – Sync .....                                              | 24 |
| 14.4 Recommended practice 4 – Scan range labelling .....                              | 24 |

|                                                                                                               |    |
|---------------------------------------------------------------------------------------------------------------|----|
| Annex A (normative) Figures .....                                                                             | 25 |
| Annex B (normative) Pattern generator specifications .....                                                    | 29 |
| Annex C (informative) Considerations in formulating this standard .....                                       | 30 |
| C.1 General.....                                                                                              | 30 |
| C.2 Light output measurement.....                                                                             | 30 |
| C.3 Visual resolution measurement.....                                                                        | 31 |
| C.4 Possible causes for measurement errors .....                                                              | 31 |
| C.5 Input signal levels .....                                                                                 | 31 |
| Annex D (normative) Complete sample specification .....                                                       | 33 |
| Annex E (informative) Other issues, outside the scope of this standard, that may affect picture clarity ..... | 35 |
| Annex F (informative) Possible causes of photometric measurement errors.....                                  | 36 |
| F.1 Size of measured spot.....                                                                                | 36 |
| F.2 Colour measurement.....                                                                                   | 36 |
| Annex G (normative) Alternative method for measuring resolution using the NIDL grille contrast method.....    | 37 |
| Annex H (informative) Photometer precision and veiling glare .....                                            | 39 |
| H.1 Photometer precision .....                                                                                | 39 |
| H.2 Integration time .....                                                                                    | 39 |
| H.3 Veiling glare .....                                                                                       | 39 |
| Annex I (informative) Light measuring devices .....                                                           | 41 |
| Annex J (informative) Figure of merit for projection display colour gamut.....                                | 42 |
| Bibliography .....                                                                                            | 44 |
| Figure A.1 – Test patterns/measurements set-up .....                                                          | 25 |
| Figure A.2 – Thirteen-point measuring grid .....                                                              | 26 |
| Figure A.3 – Contrast measurement.....                                                                        | 26 |
| Figure A.4 – Vertical alternating lines.....                                                                  | 26 |
| Figure A.5 – Horizontal alternating lines.....                                                                | 27 |
| Figure A.6 – Resolution equipment set-up/depth of modulation measurement.....                                 | 27 |
| Figure A.7 – Sync and blanking timing .....                                                                   | 28 |
| Figure C.1 – Simulation of lowered resolution .....                                                           | 32 |

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

# **ELECTRONIC PROJECTION – MEASUREMENT AND DOCUMENTATION OF KEY PERFORMANCE CRITERIA –**

## **Part 2: Variable 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 61947-2 has been prepared by subcommittee 100C: Audio, video and multimedia subsystems and 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 |
|--------------|------------------|
| 100/268/FDIS | 100/418/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.

Annexes A, B, D, and G form an integral part of this standard.

Annexes C, E, F, H, I and J are for information only.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

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

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

This document is a preview generated by EVS

## INTRODUCTION

This standard was developed to ensure a common, meaningful description of key performance parameters for variable resolution projectors (for example, CRT or laser 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 variable 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 variable 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 2: Variable resolution projectors**

### **1 Scope**

This part of IEC 61947 specifies requirements for measuring and documenting key performance parameters for CRT and laser-based projectors and other variable resolution projectors that are capable of multiple variable resolutions and in which the image is raster-scanned.

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 variable resolution projectors (including projection displays that are capable of multiple variable resolutions) that are designed for use with primarily 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 to NTSC/RS170A, PAL, SECAM, or future HDTV, or ATV standards, which are fully described in their respective documentation and are not within the scope of this part of IEC 61947. In this part of IEC 61947, all of these signals are referred to as television video (TV video) (see IEC 60107-1 [27]).

Displays with fixed resolutions (i.e. individual pixel light sources or matrix displays such as liquid crystal, DMD, plasma, or electroluminescent panels), are not fully addressed by this standard, and reference should be made to IEC 61947-1.

Factors outside the scope of this standard that may have a bearing on projector performance are listed in annex E. A discussion of considerations informing the development of standard appears in annex C.

### **2 Normative references**

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61947. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61947 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050(845):1987, *International Electrotechnical Vocabulary (IEV) – Chapter 845: Lighting*

IEC 61947-1, *Electronic projection – Measurement and documentation of key performance criteria – Part 1: Fixed resolution projectors*<sup>1)</sup>

<sup>1)</sup> To be published.