



SLOVENSKI STANDARD

SIST EN 61610:1999

01-april-1999

Prints and transparencies produced from electronic sources - Assessment of image quality (IEC 61610:1995)

Prints and transparencies produced from electronic sources - Assessment of image quality

Beurteilung der Bildqualität von durch elektronischen Quellen erzeugten reflektierenden und transparenten Reproduktionen

Images imprimées et transparents obtenus à partir de sources électroniques - Evaluation de la qualité de l'image

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35.240.20 Uporabniške rešitve IT pri IT applications in office work
pisarniškem delu

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ICS 35.240.20

Descriptors: Electronic equipment, reproduction: Documents, printing, colour printing, printed forms, printers, images, colours, measurements method, characteristics, testing conditions

English version

Prints and transparencies produced from electronic sources
Assessment of image quality
(IEC 1610:1995)

Images imprimées et transparents
obtenus à partir de sources
électroniques
Evaluation de la qualité de l'image
(CEI 1610:1995)

Beurteilung der Bildqualität von durch
elektronischen Quellen erzeugten
reflektierenden und transparenten
Reproduktionen
(IEC 1610:1995)

This European Standard was approved by CENELEC on 1995-11-28. 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, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, 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 84/399/FDIS, future edition 1 of IEC 1610, prepared by IEC TC 84, Equipment and systems in the field of audio, video and audiovisual engineering, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61610 on 1995-11-28.

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) 1996-09-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1996-09-01

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

Endorsement notice

The text of the International Standard IEC 1610:1995 was approved by CENELEC as a European Standard without any modification.

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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 50(845)	1987	International electrotechnical vocabulary (IEV) Chapter 845: Lighting	-	-
ISO 5-1	1984	Photography Density measurements Part 1: Terms, symbols and notations	-	-
ISO 5-2	1991	Part 2: Geometric conditions for transmission density	-	-
ISO 5-3	1984	Part 3: Spectral conditions	-	-
ISO 5-4	1983	Part 4: Geometric conditions for reflection density	-	-
ISO/CIE ¹⁾ 10526	1991	CIE standard for colorimetric illuminants	-	-
ISO/CIE 10527	1991	CIE standard colorimetric observers	-	-
CIE 15.1	1972	Special metamerism index: Change in illuminant	-	-
CIE 15.2	1986	Colorimetry	-	-
CIE Technical Report 80	1989	Special metamerism index: Change in observer	-	-
ITU-R Recommendation BT 471-1 ²⁾	1990	Nomenclature and description of colour bar signals	-	-

1) CIE stands for the International Commission on Illumination.

2) Formerly CCIR Recommendation.

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**Images imprimées et transparents obtenus
à partir des sources électroniques –
Evaluation de la qualité de l'image**

iTeh STANDARD PREVIEW
**Prints and transparencies produced
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Bureau Central de la Commission Electrotechnique Internationale 3, rue de Varembe Genève, Suisse



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International Electrotechnical Commission
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CONTENTS

	Page
FOREWORD	5
Clause	
1 Scope	7
2 Normative references	7
3 Terms and definitions	9
4 Conditions	11
4.1 Environmental conditions	11
4.2 Conditions of measurement	11
4.3 Conditions of calculation	13
5 Methods of measurements	15
5.1 Gamut of colours	15
5.2 Reproduced colours	25
5.3 Colour rendering	31
5.4 Grey balance	33
5.5 Grey scale reproduction (tone reproduction)	35
5.6 Grey non-uniformity	37
5.7 Resolution	41
5.8 Image stability under exposure to light (light fastness)	43
5.9 Image stability under exposure to heat (heat fastness)	47
5.10 Reproducible dimensional range	49
5.11 Flat field modulation	51
5.12 Contouring	57
5.13 Spatial linearity	59
5.14 Misregistration	61
Annexes	
A Specification of the input signal for the measurement of reproduced colours ..	67
B Bibliography	69

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**PRINTS AND TRANSPARENCIES
PRODUCED FROM ELECTRONIC SOURCES –
ASSESSMENT OF IMAGE QUALITY**

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. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 1610 has been prepared by IEC technical committee 84: Equipment and systems in the field of audio, video and audiovisual engineering.

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

FDIS	Report on voting
84/399 /FDIS	84 /443/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 forms an integral part of this standard.

Annex B is for information only.

PRINTS AND TRANSPARENCIES PRODUCED FROM ELECTRONIC SOURCES – ASSESSMENT OF IMAGE QUALITY

1 Scope

This International Standard applies to the assessment of image attributes on prints and transparencies produced from electronic sources. Assessment of the equipment itself which produces prints and transparencies is outside the scope.

This standard specifies test signals, measurement conditions and forms of reporting the results so as to make possible the comparison of the results of measurements. The methods of measurement are designed to make possible the assessment of the image quality of prints and transparencies produced from electronic sources. The electronic sources are either analogue or digital signals of defined format, whose corresponding images are reproduced on either a transparent or a non-transparent medium.

The methods of measurement in this standard are designed to be applicable to a wide quality range of colour prints and transparencies. This range runs from a small piece of image for consumer use to a large and precise image for professional use. The prints and transparencies may be produced either by colour video printers with analogue inputs for consumer use, by professional colour image printers with digital inputs or by any other electronic means.

This standard does not specify limiting values for various parameters.

2 Normative references

[SIST EN 61610:1999](https://standards.iteh.ai/catalog/standards/sist/2899ddc6-643e-4f57-b4dc-1b3c00000000/sist-en-61610-1999)

[https://standards.iteh.ai/catalog/standards/sist/2899ddc6-643e-4f57-b4dc-](https://standards.iteh.ai/catalog/standards/sist/2899ddc6-643e-4f57-b4dc-1b3c00000000/sist-en-61610-1999)

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

IEC 50(845): 1987, *International Electrotechnical Vocabulary (IEV) – Chapter 845: Lighting*

ISO 5-1: 1984, *Photography – Density measurements – Part 1: Terms, symbols and notations*

ISO 5-2: 1991, *Photography – Density measurements – Part 2: Geometric conditions for transmission density*

ISO 5-3: 1984, *Photography – Density measurements – Part 3: Spectral conditions*

ISO 5-4: 1983, *Photography – Density measurements – Part 4: Geometric conditions for reflection density*

ISO/CIE¹ 10526: 1991, *CIE standard for colorimetric illuminants*

¹⁾ CIE stands for the International Commission on Illumination.

ISO/CIE 10527: 1991, *CIE standard colorimetric observers*

CIE 15.1: 1972, *Special metamerism index: Change in illuminant*

CIE 15.2: 1986, *Colorimetry*

CIE Technical Report 80: 1989, *Special metamerism index: Change in observer*

ITU-R¹⁾ Recommendation BT 471-1: 1990, *Nomenclature and description of colour bar signals*

3 Terms and definitions

For the purpose of this International Standard, the following definitions apply.

3.1 **image:** Visible, two-dimensional representation of electronic signals intended to form a picture.

3.2 **electronic source:** Apparatus which supplies electronic signals of analogue or digital form carrying colorimetric information to be used as input to equipment that produces coloured images.

3.3 **medium:** Substance within which the equipment produces an image.

3.4 **substrate:** Substance providing support for a medium.

3.5 **test signal:** Output of an electronic source to enable the performance of the image-making equipment to be assessed.

3.6 **print:** Reproduced image formed on an opaque substrate.

3.7 **transparency:** Reproduced image formed on a transparent substrate.

3.8 **image quality:** Objective quality of an image.

3.9 **integrated density:** Logarithm to base ten of the reciprocal of definite integral of the spectral product of the CIE standard luminous efficiency function with the spectral reflectance or spectral transmittance.

NOTE – The notations for integrated densities are modified from those specified in ISO 5-1 for the sake of avoiding confusion.

3.10 **gamut of colours:** Three-dimensional maximum range of reproducible colours expressed in CIE 1976 $L^*a^*b^*$ colour space defined in CIE 15.2.

3.11 **primary colours:** Colours produced by signals from the electronic source, which when formed by the additive process are red, green and blue, or by the subtractive process are yellow, cyan and magenta.

3.12 **secondary colours:** Colours produced by a mixture of two primary colours.

3.13 **saturated colours:** Reproduced primary colours and secondary colours.

NOTE – Saturation means the maximum excitation purity (chromaticity), limited by each specific system.

¹⁾ Formerly CCIR Recommendation.

3.14 colour bars: Test signal which carries colorimetric information on black, white and saturated colours.

3.15 reproduced colours: Colorimetric information measured from the reproduced image expressed in CIE 1976 $L^*a^*b^*$ colour space which is defined in CIE 15.2.

3.16 tone reproduction: Colorimetric relation between a test signal which is intended to produce an achromatic image and the image actually produced.

4 Conditions

4.1 *Environmental conditions*

All measurements shall be carried out within the environmental conditions as specified by the manufacturer of the equipment which produces prints and transparencies, unless otherwise specified by this standard.

The environmental conditions during measurement, at least the room temperature and the relative humidity, shall be reported together with the presentation of the results of measurements.

4.2 *Conditions of measurement*

Any adjustable parameters shall be set to the manufacturer's recommended or defaults values. An adequate warm-up time shall be allowed.

The test images shall be produced by applying the test signals to the equipment following the manufacturer's specification. The medium on which the images are produced shall be the one specified by the manufacturer of the equipment.

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The measurements of image quality of prints and transparencies shall be carried out by measuring the optical characteristics of reflectance or transmittance, respectively. Optical spectral density and integrated density may be used for specific measurements in this standard.

Each test signal of known characteristics shall be generated to produce the image which is specified in this standard. The image shall be measured without any time interval, unless otherwise specified. Spectral radiation or spectral reflectance should be measured over the wavelengths from 360 nm to 780 nm, but shall be measured at least from 400 nm to 700 nm in 10 nm, and 5 nm steps for incandescent lamps and fluorescent lamps, respectively.

If the input signal to equipment which produces prints or transparencies is expressed in a set of digital codes whose colorimetric coordinate values for four colours (white, red, green and blue) in the CIE 1931 xy chromaticity diagram defined in CIE 15.2 are different from those corresponding to the standard colours for conventional television systems [1]*, these values shall be specified by the manufacturer of the equipment for the four colours: white, red, green, and blue. These coordinate values shall be used to translate the actual input information to corresponding tristimulus values by the method given in [2] to obtain the conversion coefficients.

* Numbers in square brackets refer to annex B, Bibliography.

NOTES

1 The spectral reflectance should be measured using a spectrophotometer with either 0/5 or 45/0 geometry as stated in ISO 5-4.

2 Reflectance (optical) density is defined as logarithm to base ten of the reciprocal of the reflectance [IEV 845-04-65]. The IEV also states that the reflectance is composed of regular reflectance and diffuse reflectance, and that the results of measurements of these reflectances depend on the instruments and the measuring techniques used [IEV 845-04-62]. The same applies for transmittance (optical) density [IEV 845-04-66, IEV 845-04-59, IEV 845-04-63].

4.3 Conditions of calculation

4.3.1 Illuminants and colorimetric observers

The CIE standard illuminant C or D_{65} defined in ISO/CIE 10526 and the CIE 1931 standard colorimetric observer defined for a view angle of 2° in ISO/CIE 10527 should be used for calculation of the tristimulus values. If any another illuminant is used, it shall be reported. For some measurements, optical transmittance density and reflective density may be used, but it should be noted that the measured values depend on the instruments used for the measurement.

4.3.2 Tristimulus values

The tristimulus values for object colours and illuminant colours shall be calculated by the summations of the products of the spectral radiation, $S(\lambda)$, of the standard illuminant, the spectral transmittance or reflectance, $\rho(\lambda)$, and the colour matching functions, $x(\lambda)$, $y(\lambda)$, $z(\lambda)$ as defined by the following formulae:

$$X = \frac{1}{K} \int_{\text{vis}} S(\lambda) \rho(\lambda) \bar{x}(\lambda) d\lambda$$

$$Y = \frac{1}{K} \int_{\text{vis}} S(\lambda) \rho(\lambda) \bar{y}(\lambda) d\lambda$$

$$Z = \frac{1}{K} \int_{\text{vis}} S(\lambda) \rho(\lambda) \bar{z}(\lambda) d\lambda$$

where

$$K = \int_{\text{vis}} S(\lambda) \bar{y}(\lambda) d\lambda$$

$\bar{x}(\lambda)$, $\bar{y}(\lambda)$ and $\bar{z}(\lambda)$ are the functions specified as the CIE 1931 standard colorimetric observer for a view angle of 2° (see ISO/CIE 10527).

4.3.3 Relation between input values and tristimulus values

When the input signal is a standard analogue or digital video signal, the appropriate colorimetric specification should be used to transform corresponding tristimulus values. The conversions from R , G , B to the tristimulus values shall be made by the following equations according to the video standard used.