



# SLOVENSKI STANDARD

## SIST EN 61146-1:1999

01-april-1999

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### Video cameras (PAL/SECAM/NTSC) - Methods of measurement -- Part 1: Non-broadcast single-sensor cameras (IEC 61146-1:1994)

Video cameras (PAL/SECAM/NTSC) - Methods of measurement -- Part 1: Non-broadcast single-sensor cameras

Meßverfahren für Videokameras (PAL/SECAM/NTSC) -- Teil 1: Kameras mit einem Aufnahmesensor für den Gebrauch außerhalb des Rundfunks

Caméras vidéo (PAL/SECAM/NTSC) - Méthodes de mesure -- Partie 1: Caméras monocapteurs hors de la radiodiffusion

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**Ta slovenski standard je istoveten z: EN 61146-1:1996**

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#### **ICS:**

33.160.40      Video sistemi                      Video systems

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EUROPEAN STANDARD

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EUROPÄISCHE NORM

September 1996

ICS 33.160.40

Descriptors: Video equipment, motion-picture cameras, measurements, performance evaluation, shot, luminance, test results, comparison, signal to noise ratio, chrominance, amplitude frequency characteristics, distortion, colour, test chart

English version

**Video cameras (PAL/SECAM/NTSC)  
Methods of measurement  
Part 1: Non-broadcast single-sensor cameras  
(IEC 1146-1:1994)**

Caméras vidéo (PAL/SECAM/NTSC)  
Méthodes de mesure  
Partie 1: Caméras monocapteurs hors  
de la radiodiffusion  
(CEI 1146-1:1994)

Meßverfahren für Videokameras  
(PAL/SECAM/NTSC)  
Teil 1: Kameras mit einem  
Aufnahmesensor für den Gebrauch  
außerhalb des Rundfunks  
(IEC 1146-1:1994)

This European Standard was approved by CENELEC on 1996-07-02. 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

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### Foreword

The text of the International Standard IEC 1146-1:1994, prepared by TC 84 (transformed into SC 100C, Equipment and systems in the field of audio, video and audiovisual engineering, of IEC TC 100, Audio, video and multimedia systems and equipment), was submitted to the formal vote and was approved by CENELEC as EN 61146-1 on 1996-07-02 without any modification.

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) 1997-06-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 1997-06-01

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, C, D and ZA are normative and annex E is informative.

Annex ZA has been added by CENELEC.

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### Endorsement notice

The text of the International Standard IEC 1146-1:1994 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 27	series	Letter symbols to be used in electrical technology	HD 245	series
IEC 50(845)	1987	International electrotechnical vocabulary (IEV) Chapter 845: Lighting	-	-
IEC 883	1987	Measuring method for chrominance signal-to-random noise ratio for video tape recorders	HD 527 S1	1989
CCIR Recommendation 567-3	1978 1982 1986 1990	Transmission performance of television circuits designed for use in international connections	-	-
CCIR Report 624-4	1974 1978 1982 1986 1990	Characteristics of television systems	-	-
CIE 01	1986	Colorimetric illuminants	-	-
CIE 02	1986	Colorimetric observers	-	-
CIE 13-2	1988	Method of measuring and specifying colour rendering of light sources	-	-
CIE 15	1971	Colorimetry: Official recommendation of the international commission on illuminants	-	-
Supplement 2	1987	Recommendation on uniform colour space Colour difference equation - psychometric colour terms	-	-

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Caméras vidéo (PAL/SECAM/NTSC) –  
Méthodes de mesure –

Partie 1:  
Caméras monocapteurs hors de la radiodiffusion

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Part 1:  
Non-broadcast single-sensor cameras

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Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

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For price, see current catalogue

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

VIDEO CAMERAS (PAL/SECAM/NTSC) –  
METHODS OF MEASUREMENT –

Part 1: Non-broadcast single-sensor cameras

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 cooperation 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, prepared by technical committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 3) They have the form of recommendations for international use 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.

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 SIST EN 61146-1:1999

International Standard IEC 1146-1 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 on the following documents:

DIS	Report on voting	AMDIS	Report on voting
84(CO)103	84/60B(CO)135/138	84/60B(CO)146	84/60B(CO)156

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

IEC 1146-1 forms part 1 of a series of publications under the general title: Video cameras (PAL/SECAM/NTSC) – Methods of measurement.

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

Annex E is for information only.

# VIDEO CAMERAS (PAL/SECAM/NTSC) – METHODS OF MEASUREMENT –

## Part 1: Non-broadcast single-sensor cameras

### Section 1: General

#### 1 Scope

This part of IEC 1146 is applicable to the assessment of performance of non-broadcast colour video cameras equipped with a single-tube or solid-state imager.

This part of IEC 1146 defines test patterns and measurement conditions, 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 performance of the camera by using the lens input and any electrical output terminals of the device (e.g. Y/C and composite).

This part of IEC 1146 does not specify limiting values for various characteristics.

#### 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 1146. 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 1146 are encouraged to investigate the possibility of applying the most recent editions of the normative documents listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 883: 1987, *Measuring method for chrominance signal-to-random noise ratio for video tape recorders*

CCIR Recommendation 567-3: *Transmission performance of television circuits designed for use in international connections (1978-1982-1986-1990)*

CCIR Report 624-4: 1974-1978-1982-1986-1990, *Characteristics of television systems*

CIE 15: 1971, *Colorimetry: Official Recommendation of the International Commission on Illuminants*

Supplement 2: 1987, *Recommendation on uniform colour space. Colour difference equation – psychometric colour terms*

CIE 13-2: 1988, *Method of measuring and specifying colour rendering of light sources*

CIE 01: 1986, *Colorimetric illuminants*

CIE 02: 1986, *Colorimetric observers*

IEC 27: *Letter symbols to be used in electrical technology*

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

### 3 Conditions

#### 3.1 Environmental conditions

All measurements shall be carried out within the environmental conditions as specified by the manufacturer.

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

An adequate warm-up time shall be allowed.

#### 3.2 Conditions of measurements

Except when otherwise indicated, the measurements shall be carried out by measuring the output signal of the camera when it is shooting different test charts, depending on the characteristic to be measured.

Each test pattern shall be specified, together with the lighting conditions (illumination intensity, correlated colour temperature of the light source, etc.).

The use of transparent test charts instead of the reflection types may be allowed; however, the reflection types should be used in questionable cases.

Unless otherwise stated, all measurements shall be made in automatic mode.

#### 3.3 Conditions of shooting

Unless otherwise stated, the conditions of shooting shall be as follows.

- The subject illumination of a reflective test chart shall be  $2\,000\text{ lx} \pm 5\%$  (see note).
- The luminance of a transparent test chart, at peak white, shall be  $636\text{ cd/m}^2 \pm 5\%$ .
- The non-uniformity of the subject illumination shall be less than 5 %.
- The correlated colour temperature of the light source shall be  $3\,100\text{ K} \pm 100\text{ K}$ .
- The white balance shall be set manually or automatically to  $3\,100\text{ K} \pm 100\text{ K}$ .

- The test chart shall be shot by the camera so that the frame limited by the arrows coincides exactly with the edges of the picture displayed on the video monitor in underscan mode.
- The focus control shall be in auto or manual mode, and shall be in optimum focus.
- The iris control shall be in auto or manual mode.
- In order to obtain the desired exposure level, it may be advantageous to add an illuminated white card or a black area, and also to adjust the lens zoom so that the measurement does not depend on exactly filling the screen to the arrows of the test chart.
- The gain control, if any, shall be set to "0 dB" gain.
- The optical filter, if any, shall be set to "open position".

NOTE - Measured by a luxmeter at the centre of the test chart, the receptor pointing in the direction of the camera.

### 3.4 Reference conditions

Unless otherwise specified, the reference luminance output signal level is assumed to be 700 mV peak-to-peak (p.-p.) for PAL and SECAM systems and 714 mV peak-to-peak for NTSC systems (from the blanking level to the peak white level).

NOTE - In the following clauses, it is also assumed, for the purpose of giving examples of output voltage obtained under certain conditions, that the rated output voltage is also 700 mV p.-p. or 714 mV p.-p.

## Section 2: Luminance video characteristics

### 4 Luminance sensitivity

#### 4.1 Characteristic to be specified

The minimum subject illumination for which the video camera produces a luminance output level of one-half the rated level.

#### 4.2 Method of measurement

- a) The equipment arrangement and the grey-scale test chart shall be as shown in figure 1.
- b) The conditions of shooting shall be those mentioned in 3.3.
- c) Either the screen size or the zoom condition may be changed, or a black or white subject may be added, to give the rated output level, if this level is not obtained due to the automatic light control.
- d) In order to simulate a decrease of the subject illumination without changing the correlated colour temperature of the observed light, a neutral density filter such as the

Kodak Wratten\* density filter No. 96 or equivalent shall be placed in front of the camera lens.

The density of the filter shall be increased until the video output level  $E'_y$  decreases to half the rated output level corresponding to the level of the white area in the centre of the grey scale test pattern (see figure 1).

The density (D) of the filter is read, and the sensitivity is then calculated by means of the following formula:

$$\text{Sensitivity} = \frac{\text{illumination}}{\text{attenuation of filter}} = \frac{2\,000}{10^D} \quad (\text{lx})$$

#### 4.3 *Presentation of results*

The value of the sensitivity shall be reported in lux.

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\* The Kodak Wratten density filter is an example of a suitable product available commercially. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by the IEC of this product.

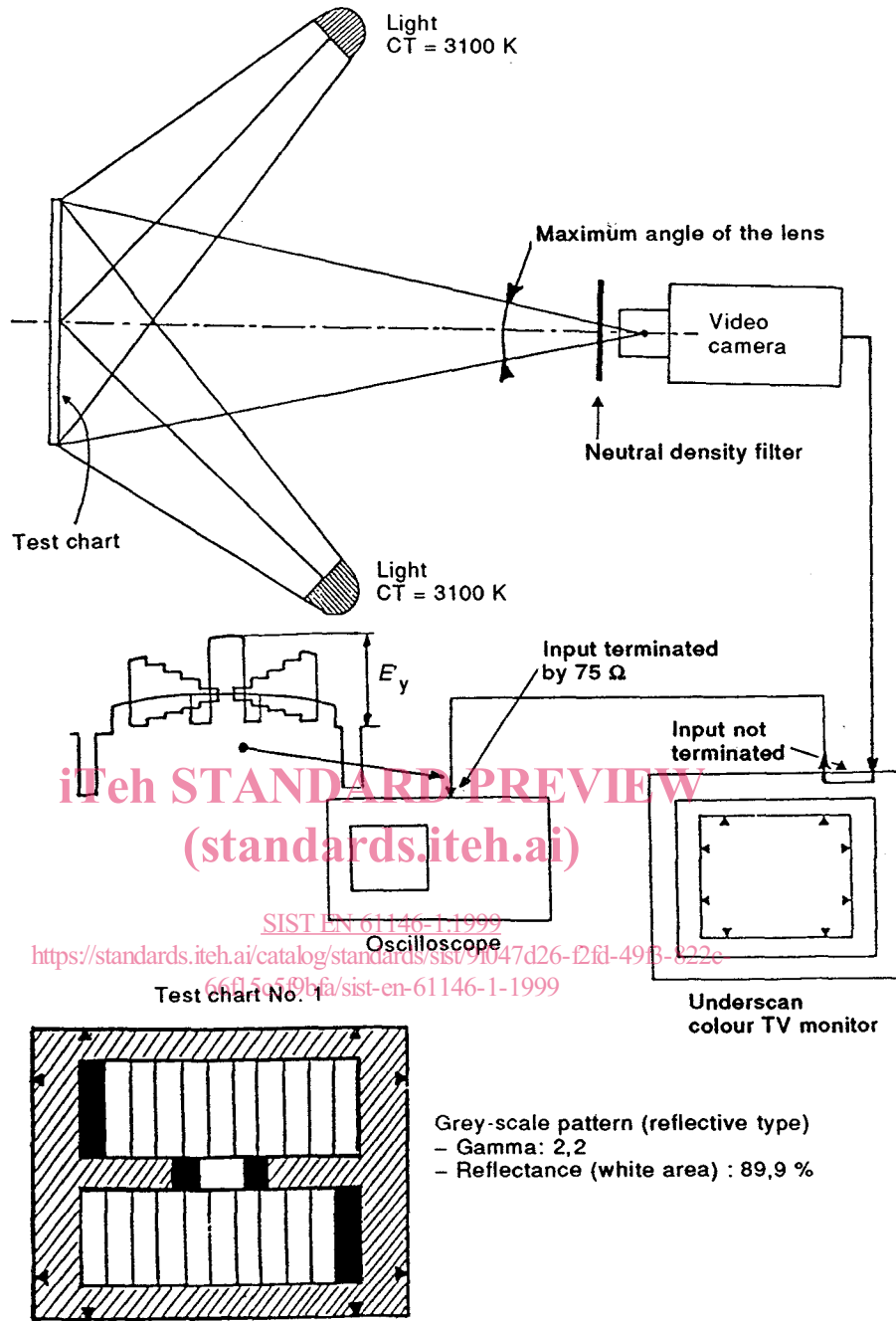


Figure 1 – Luminance sensitivity

## 5 Luminance resolution

### 5.1 Characteristic to be specified

The resolution power of the luminance channel is:

- for the horizontal resolution, the number of vertical black and white bars within a horizontal dimension equal to the picture height (TV lines);
- for the vertical resolution, the number of horizontal black and white bars within the picture height.

### 5.2 Method of measurement

a) The equipment arrangement and the test chart shall be as shown in figure 2.

The test chart is either a radial resolution chart with circles corresponding to the number of TV lines or the conventional EIAJ-A chart or equivalent. This allows the measurement of both the horizontal and the vertical resolution.

b) The conditions of shooting shall be those mentioned in 3.3.

c) The resolution shall be evaluated on a monochrome TV monitor whose frequency response shall exceed the bandwidth of the camera under test.

d) The horizontal resolution is defined by the number of TV lines corresponding to the limit of visibility of the vertical bars. The number of vertical bars may be measured as the depth of modulation measured by an oscilloscope. It is estimated that a depth of modulation of 5 % corresponds to the limit of visibility of the human eye (note).

e) The vertical resolution is defined by the number of TV lines corresponding to the limit of visibility of the horizontal bars.

NOTE - In case it is difficult to read the depth of modulation of 5 % on an oscilloscope, the number of black and white lines at a modulation depth of 10 % may be reported, together with the value of the modulation depth.

### 5.3 Presentation of results

The results shall be reported as follows:

- horizontal resolution: TV lines;
- vertical resolution: TV lines.

Horizontal resolution in lines per picture width, is the number of TV lines per picture height multiplied by the aspect ratio.

In cases of cameras equipped with exchangeable lens, the type shall be reported. If possible, the characteristics of the lens used in the test should be reported.