



# SLOVENSKI STANDARD

## SIST ISO 21550:2011

01-julij-2011

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**Fotografija - Elektronski skenerji za fotografske slike - Merjenje dinamičnega obsega**

Photography - Electronic scanners for photographic images - Dynamic range measurements

**iTeh STANDARD PREVIEW**

Photographie - Scanners électroniques pour images photographiques - Mesurages d'intervalles dynamiques

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Ta slovenski standard je istoveten z: **ISO 21550:2004**

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**ICS:**

37.040.10	Fotografska oprema. Projektorji	Photographic equipment. Projectors
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**SIST ISO 21550:2011**

**en**

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**Photography — Electronic scanners for  
photographic images — Dynamic range  
measurements**

*Photographie — Scanners électroniques pour images  
photographiques — Mesurages d'intervalles dynamiques*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 21550 was prepared by Technical Committee ISO/TC 42, *Photography*.

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## Introduction

The use of scanners to provide digital image files is rapidly growing. A standard is needed in order to measure the ability of scanners to capture tones especially in the dark areas of the original. At the present time most manufacturers calculate the dynamic range from the bit depth of the implemented A/D conversion which is usually higher than the actual capabilities of the scanner. This International Standard can be used for photofinishing, professional, graphic arts and consumer scanners.

This International Standard specifies methods for measuring the ability of scanners to capture tones especially in the dark areas of the original. The scanner measurements described in this International Standard are performed in the digital domain, using digital analysis techniques. A test chart of appropriate size and characteristics is scanned and the resulting data is analysed. The test chart described in this International Standard is designed specifically to evaluate continuous tone film and reflection scanners. It is not designed for evaluating electronic still-picture cameras, video cameras, or bi-tonal document scanners.

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# Photography — Electronic scanners for photographic images — Dynamic range measurements

## 1 Scope

This International Standard specifies methods for measuring and reporting the dynamic range of electronic scanners for continuous tone photographic media. It applies to scanners for reflective and to scanners for transmissive media.

## 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.

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

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

ISO 554, *Standard atmospheres for conditioning and/or testing — Specifications*

ISO 12231, *Photography — Electronic still-picture cameras — Terminology*

ISO 12232:1998, *Photography — Electronic still-picture cameras — Determination of ISO speed*

ISO 14524, *Photography — Electronic still-picture cameras — Methods for measuring opto-electronic conversion functions (OECFs)*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12231 and the following apply.

### 3.1

#### **addressable photoelements**

number of active photoelements in an image sensor

NOTE This is equal to the number of active lines of photoelements, multiplied by the number of active photoelements per line.

### 3.2

#### **aliasing**

output image artefacts that occur in a sampled imaging system for input images having significant energy at frequencies higher than the Nyquist frequency of the system

### 3.3

#### **digital output level**

numerical value assigned to a particular output level, also known as the digital code value

**ISO 21550:2004(E)****3.4  
edge spread function  
ESF**

normalized spatial signal distribution in the linearized output of an imaging system resulting from imaging a theoretical infinitely sharp edge

**3.5  
effectively spectrally neutral**

characteristic of an imaging system whereby the output is the same as that produced from a spectrally neutral object

**3.6  
electronic scanners for photographic film**

scanner that incorporates an image sensor whose output is a digital signal that represents a still film image

**3.7  
fast scan direction**

scan direction corresponding to the direction of the alignment of the addressable photoelements in a linear array image sensor

**3.8  
gamma correction**

process that alters the image data in order to modify the tone reproduction

**3.9  
image sensor**

electronic device that converts incident electromagnetic radiation into an electronic signal; e.g. a charge coupled device (CCD) array

**3.10  
incremental gain function**

change in output level (digital code value) divided by the change in input level (luminance or exposure) as a function of input level

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NOTE 1 For the determination of incremental gain values, log input values are not used.

NOTE 2 If the input exposure points are very finely spaced and the output noise is small compared to the quantization interval, the incremental gain function may have a jagged shape. Such behaviour is an artefact of the quantization process and should be removed by using an appropriate smoothing algorithm, or by fitting a smooth curve to the data. In some cases it may be desirable to fit a curve to the input-output data and then determine the incremental gain function by taking the first derivative of the function used for the curve fit.

**3.11  
incremental output signal**

input level multiplied by the system incremental gain at that level

**3.12  
incremental signal to noise ratio**

ratio of the incremental output signal to the root-mean-squared (rms) noise level, at a particular signal level

NOTE This is typically expressed as a graph or table showing the rms noise level versus output signal level for the full range of output signal levels.

**3.13  
ISO scanner dynamic range**

difference of the maximum density where the incremental gain is higher than 0,5, as determined according to ISO 21550 to the minimum density that appears unclipped

**3.14****noise**

unwanted variations in the response of an imaging system

**3.15****resolution**

measure of the ability of a digital image capture system, or a component of a digital image capture system, to capture fine spatial detail

NOTE Resolution measurement metrics include resolving power, limiting visual resolution, SFR, Modulation Transfer Function (MTF) and Contrast Transfer Function (CTF).

**3.16****sampled imaging system**

imaging system or device which generates an image signal by sampling an image at an array of discrete points, or along a set of discrete lines, rather than a continuum of points

NOTE The sampling at each point is done using a finite size sampling aperture or area.

**3.17****sample spacing**

physical distance between sampling points or sampling lines

NOTE 1 The sample spacing may be different in the two orthogonal sampling directions.

NOTE 2 Measured in units of distance (e.g. microns, mm).

**3.18****sampling frequency**

reciprocal of sample spacing

NOTE This is expressed in samples per unit distance [e.g. dots per inch (dpi)].

**3.19****scanner**

electronic device that converts a fixed image, such as a film or film transparency, into an electronic signal

**3.20****scanner opto-electronic conversion function****Scanner OECF**

relationship between the input density and the digital output levels for a scanner

**3.21****slow scan direction**

direction in which the scanner moves the photoelements (perpendicular to the lines of active photoelements in a linear array image sensor)

**3.22****spatial frequency response****SFR**

measured amplitude response of an imaging system as a function of relative input spatial frequency

NOTE The SFR is normally represented by a curve of the output response to an input sinusoidal spatial luminance distribution of unit amplitude, over a range of spatial frequencies. The SFR is normalized to yield a value of 1,0 at a spatial frequency of 0.

**3.23****spectrally neutral**

test chart equality of the relative spectral power distributions of the incident and reflected (or transmitted) light