
**Photography — Digital still cameras
— Determination of exposure index,
ISO speed ratings, standard output
sensitivity, and recommended
exposure index**

*Photographie — Appareils de prises de vue numériques —
Détermination de l'indice d'exposition, des régimes de vitesse ISO, de
la sensibilité normale de sortie et de l'indice d'exposition recommandé*



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Published in Switzerland

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

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

This third edition cancels and replaces the second edition (ISO 12232:2006), which has been technically revised.

The main changes compared to the previous edition are as follows:

- definitions of photographic sensitivity and sensitivity setting were added;
- [Clause 4](#) was simplified and clarified;
- it has been defined how to determine the exposure saturation level in [6.2](#);
- the applicability of SOS values for scene-dependent rendering and raw files was clarified;
- original [Table 1](#) was expanded to include higher values, and separated the SOS and REI columns into a new [Table 2](#), which includes alternate values for some of the rows;
- [Annex B](#) was updated to clarify the mathematical basis of [Formula \(2\)](#);
- Annex E was cancelled.

Introduction

The exposure index (EI), ISO speed ratings, standard output sensitivity (SOS) and recommended exposure index (REI) are useful metrics related to the capture of digital images. Standardization assists users and manufacturers in determining the capabilities of Digital Still Cameras (DSCs), in setting DSCs appropriately for the capture conditions, in obtaining well-exposed images, and in communicating exposures and the related DSC characteristics in image files.

The exposures produced by a DSC are determined by the exposure time, the lens aperture, the lens transmittance, the lens illumination falloff, the flare light present at the sensor, and the level and spectral distribution of the scene radiances incident on the camera lens. However, it is not typical for users to deal with this degree of complexity when determining and specifying image exposures. To provide a means for simply communicating exposure information, this document specifies an exposure index (EI) that corresponds to the focal plane exposure of a typical mid-tone. It is intended to be used for setting the camera exposure and as a record of the camera exposure in image files.

When an image from a DSC is obtained using an insufficient exposure, proper tone reproduction can generally be maintained by increasing the electronic or digital gain, but the image will contain an unacceptable amount of noise. As the exposure is increased, the gain can be decreased, and, therefore, the image noise can normally be reduced to an acceptable level. If the exposure is increased excessively, the resulting signal in bright areas of the image may exceed the maximum signal level capacity of the image sensor or camera signal processing. This can cause the image highlights to be clipped to form a uniformly bright area, or to bloom into surrounding areas of the image. Therefore, it is important to know the EI that will on-average produce the best image quality for specific DSC settings, and the range of EIs over which the DSC can be expected to produce acceptable image quality. The ISO speed and speed latitude ratings are intended to provide such information.

This document was designed to harmonize with earlier standards developed for film-based photography. For example, the equations were chosen so that using a particular EI on a DSC should result in approximately the same camera exposure settings, and resulting focal plane exposures, as would be obtained using the same EI on a photographic film camera. For example, the value of 10 as the constant in [Formula \(1\)](#) of this document is consistent with ISO 2721, so as to harmonize with this earlier ISO standard for photographic film cameras. ISO 2721 uses the term nominal exposure and assumes that the nominal exposure is an arithmetic mean exposure value, which usually corresponds to the mid-tone in photographs of average scenes.

However, there are differences between electronic and film-based imaging systems that preclude exact equivalency. DSCs can include variable gain and can provide digital processing after the image data has been captured, enabling desired tone reproduction to be achieved over a range of camera exposures. It is therefore possible for DSCs to have a range of ISO speed ratings. This range is defined as the ISO speed latitude. To prevent confusion, a single value is designated as the ISO speed, with the ISO speed latitude upper and lower limits indicating the speed range.

It can also be useful to compare or record the sensitivity of a DSC, for cases where the DSC has a fixed sensitivity. The standard output sensitivity (SOS) is designed to meet this need. Likewise, it can be useful to know the EI recommended by the DSC manufacturer for a specific condition. This information is provided by the recommended exposure index (REI).

Photography — Digital still cameras — Determination of exposure index, ISO speed ratings, standard output sensitivity, and recommended exposure index

1 Scope

This document specifies the method for assigning and reporting ISO speed ratings, ISO speed latitude ratings, standard output sensitivity values, and recommended exposure index values, for digital still cameras. It is applicable to both monochrome and colour digital still cameras.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 7589:2002, *Photography — Illuminants for sensitometry — Specifications for daylight, incandescent tungsten and printer*

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

ITU-R BT.709, *Parameter values for the HDTV standards for production and international programme exchange*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

digital still camera

DSC

device which incorporates an image sensor and which produces digital image data representing a still picture

Note 1 to entry: A digital still camera is typically a portable, hand-held device. The device can provide additional functions, for example video image capture or wireless telephony. The digital image data is usually recorded on a removable memory, such as a solid-state memory card or using internal memory.

3.2

DSC image signal

image data stored or output by a digital still camera