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Digital imaging — Specification guideline for digital cameras

Imagerie numérique — Ligne directrice de spécification pour caméras numériques

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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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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For an explanation of 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 www.iso.org/iso/foreword.html.

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

This second edition cancels and replaces the first edition (ISO 18383:2015), which has been technically revised.

The main changes are as follows:

— Annex B was revised with taking the CIPA DCG-001: 2018, “Individual Guidelines for noting digital camera specifications on Number of pixels, Image file and Focal length of the lens” and ANSI/IS&T IT10.7000: 2015, “Digital Still Cameras – Guidelines for Reporting Pixel-Related Specifications” into account.

— Item 1, 2, 4 were revised in accordance with the revision of Annex B.

— Item 3 was revised.

— Item 8 was revised with taking the newly published CIPA DCG-008-2022 “Guideline for Presentation Method of Shutter Speed on Digital Cameras” into account.

— The provision for item 24 was added as (f) magnification with taking the newly published CIPA DCG-002-2023 “Specification Guideline for Digital Cameras” into account.

— Item 48 was revised in accordance with progress in standardization of referenced ISO standard.

— New Note 1 was added in A.4.2 to explain the relation of AF standards; ISO 15781, ISO/TS 20490.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

The digital still camera (DSC) marketplace continuously produces and promotes new and competitive cameras. Requiring that manufacturers produce DSCs with standard numerical specifications impedes the technical progress, interferes with fair market competition, hinders the sound development of the industry, reduces camera innovation, and limits the customer's choice. On the other hand, standardized definitions of a fundamental set of camera specifications can help consumers to choose, purchase, and use these cameras because they provide the information needed to understand and compare the numerical specifications offered by the manufacturers and, thus, contribute to the fair competition in the market.

The various fundamental features of DSCs have close relationships with other features, such as camera size or cost. Nonetheless, these features, their relationships, and their numerical values vary with time and technological evolution. Manufacturers design and build their cameras to numerical specifications that balance performance with their estimation of the competitiveness of the product in and the feedback from the marketplace.

This document identifies a set of fundamental features that describe DSCs, along with their accepted definitions, measurements, and presentation methods, but it does not define nor specify numerical values for the features, functions for calculating these values, nor limiting values required for these features.

This document is based on Reference [1] prepared by Camera and Imaging Products Association (CIPA).

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Digital imaging — Specification guideline for digital cameras

1 Scope

This document identifies a set of features that describes digital still cameras (DSCs), and it specifies their definitions, measurement methods, and presentation methods. This document applies to DSCs designed and produced for and promoted to general consumers and need not be applied to those DSCs designed and produced to meet individual and special specifications agreed upon by particular business or industrial users and the manufacturer.

The presentation methods specified in this document are intended for use as notations on camera bodies, on product packaging, on promotional materials for advertising and at the point of purchase, in electronic or printed catalogues and other materials, and in the relevant software.

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 516, *Camera shutters — Timing — General definition and mechanical shutter measurements*

ISO 517, *Photography — Apertures and related properties pertaining to photographic lenses — Designations and measurements*

ISO 2720, *Photography — General purpose photographic exposure meters (photoelectric type) — Guide to product specification*

ISO 12232, *Photography — Digital still cameras — Determination of exposure index, ISO speed ratings, standard output sensitivity, and recommended exposure index*

ISO 12233, *Digital cameras — Resolution and spatial frequency responses*

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

ISO 15739, *Photography — Electronic still-picture imaging — Noise measurements*

ISO 15781, *Photography — Digital still cameras — Measuring shooting time lag, shutter release time lag, shooting rate, and start-up time lag*

ISO 17850, *Photography — Digital cameras — Geometric distortion (GD) measurements*

ISO 17957, *Photography — Digital cameras — Shading measurements*

ISO 18844, *Photography — Digital cameras — Image flare measurement*

ISO 19084, *Photography — Digital cameras — Chromatic displacement measurements*

ISO 19567-1, *Photography — Digital cameras — Texture reproduction measurements*

ISO 20087, *Photography — Digital still cameras — Battery life measurement*

ISO 20954-1, *Digital cameras — Measurement method for image stabilization performance — Part 1: Optical systems*

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IEC 61747-6:2003, *Liquid crystal and solid-state display devices — Part 6: Measuring methods for liquid crystal modules — Transmissive type*

3 Terms and definitions

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

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 General terms relating to products

3.1.1
factory shipping conditions
factory shipping settings
factory shipping values
factory shipping mode
camera settings and parameters as configured by the manufacturer for shipping from the factory

3.1.2
primary notation
notation which describes feature name and value presented solely or most noticeably

3.2 Terms in pixel related specifications (See B.2.1)

3.2.1
35 mm film equivalent focal length
measured focal length of a DSC camera lens multiplied by a normalization factor

Note 1 to entry: This is defined in B.2.1.5.11.

Note 2 to entry: The normalization factor is equal to the ratio of the diagonal length of the picture size used for 35 mm film photography and the diagonal length of the sensor picture size of the image sensor used in the DSC.

Note 3 to entry: 35 mm film equivalent focal length is an approximation of the film camera focal length that provides a similar field of view. However, the fields of view can be different even if the values are the same, if the DSC produces images having an image aspect ratio other than 3:2, or if the two lenses have different geometric distortions, or if geometric distortion compensation is used.

3.2.2
image area
region of an image sensor in the focal plane that captures the part of the incident image and that corresponds to the output image data

3.2.3
image compression
process that alters the way digital image data are encoded, to reduce the size of an image file

3.2.4
image data compression ratio
ratio of the size of the compressed image data to the size of the image data that was input to the *image compression* (3.2.3) process

3.2.5
image file size
amount of data that comprises one image frame stored by a DSC

Note 1 to entry: This is defined in B.2.1.5.6.

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3.2.6
number of effective pixels
number of photoelements included the *image area* (3.2.2), optionally also including the ring pixel area.

Note 1 to entry: This is defined in B.2.1.5.2

3.2.7
number of output pixels
number of luminance pixels comprising one picture frame which is output by the DSC via a cable or wireless connection

Note 1 to entry: Horizontal and vertical pixels should be reported separately in this order. (See, B.2.1.5.5).

3.2.8
number of recorded pixels
number of luminance pixels comprising one picture frame stored by the DSC

Note 1 to entry: Horizontal and vertical pixels should be reported separately in this order. (See B.2.1.5.4).

3.2.9
number of total pixels
<on the image sensor> number of pixels in the image sensor array, including the total number of image sensor photoelements plus the number of optical black pixels

Note 1 to entry: This is defined in B.2.1.5.3.

3.2.10
output image
image created by a DSC through capture of an optical image by an image sensor followed by processing and then output through any communication means

3.2.11
pixel
contraction of picture element, smallest geometric unit of information in a digital representation of an image, corresponding to a single spatial sample

Note 1 to entry: For a single-channel (e.g. monochrome) image, a pixel value can be represented as a single digital code value.

Note 2 to entry: The number of pixels in a digital image can be arbitrarily increased or decreased by resampling the image.

Note 3 to entry: It is common to also use the term pixel to mean a photoelement on an image sensor, a display element on an image display, or a printed element on a hardcopy print.

3.2.12
ring pixel
light-sensitive pixels in the image sensor of a DSC, that are outside of, and adjacent to the *image area* (3.2.2) and are used for image processing

Note 1 to entry: Examples of image processing are demosaicing, noise reduction, and spatial filtering.

3.2.13
sensor optical format
classification of the sensor picture size of an image sensor

Note 1 to entry: This is defined in B.2.1.5.12.

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3.2.14
sensor picture size
horizontal and vertical dimensions of the *image area* (3.2.2), where it is assumed that no geometric distortion compensation is used

Note 1 to entry: The sensor picture size gives the nominal physical dimensions of the rectangular image area frame of a camera. It can be used when calculating an equivalent focal length of the lens.

3.2.15
total number of image sensor photoelements
total number of light-sensitive pixels on the image sensor

4 Definition set of the product specifications of DSCs

4.1 Basic requirements

This document does not mandate the inclusion and reporting of any features but provides a reference on what presentation methods and written expressions should be used for particular features. The requirements for the definition, measurement, and presentation of the set of DSC features established in this document are described below. Note well that the requirements do not specify numerical values for any features that DSCs shall achieve. There are features included in this document with the paradoxical statement, "This document does not cover this feature." These features are commonly found on many cameras. They are included for completeness and to explicitly recognize that these features are only specified at the discretion of the manufacturer.

a) When a feature is described on the product, in catalogues, or in other documents, the presentation method of the feature and its measured values shall comply with the following requirements:

   1) Features and their values with factory shipping settings or modes shall be presented as the primary notation of those features. The primary notation need not include the description of the setting and measurement conditions. When additional values with different settings are described, they shall include the details of the settings and measurement conditions.

   2) The descriptions of features and their values that are not available through factory shipping settings shall include the settings or modes that make these features available. Features available in multiple settings or modes shall be made available with the setting or mode that is assumed to be the most likely used and shall be presented if they affect the functionality.

   3) Features with no default parameters or modes in the factory shipping setting shall be assigned parameters or modes that are assumed to be the most likely used. They shall be presented if they affect the functionality.

   4) Exceptions to the priority on the factory shipping setting may be given to certain features defined in 4.2. They may be given when the above requirements are redundant or when the descriptions with the other settings, parameters, or modes give the users more accurate and definitive information.

b) For cameras with interchangeable lenses, the presentation of any features affected by the choice of lens shall include information that identifies the lens (for instance, the model name of lens, type of lens) attached to the camera and that produces, requires, or otherwise affects that feature. The choice of the lens used in the specification of the feature is left to the discretion of the manufacturer.

c) The reported numerical values of features shall be based on measurements using the actual camera and the standard methods of measurement and calculation. The values designed and verified by the manufacturer may be used when the feature does not have an established measurement and/or calculation method.

d) Variations in names and expressions for features in this fundamental set of features, such as customary names and company-used names, may be used unless

   1) the standard explicitly requires a name or an expression;

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