
**Photography — Electronic still picture
imaging — Vocabulary**

Photographie — Prises de vue électroniques — Vocabulaire

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Published in Switzerland

Foreword

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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 12231 was prepared by Technical Committee ISO/TC 42, *Photography*.

This third edition cancels and replaces the second edition (ISO 12231:2005), which has been technically revised.

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Introduction

Electronic still picture imaging concepts are drawn from traditional photography, electronics, video, and information technology. In some cases the concepts are redefined to apply to electronic still picture imaging. For example, unlike traditional photography, measurements cannot be defined in terms of “film” or “sensitized material”, since images acquired by digital image capture devices are stored electronically and are not immediately exposed on film. The meaning of shutter and exposure time is also different for digital image capture devices, because an electronic imaging sensor typically has image acquisition characteristics that are different from those of film.

This International Standard provides a vocabulary which standardizes the use and meaning of terms associated with electronic still picture imaging. It is organized alphabetically and follows natural (English) word order wherever possible. The source documents for most of the definitions provided in this International Standard are International Standards on electronic still picture imaging developed by ISO/TC 42 and ISO/TC 130.

Where possible, users are advised to verify if a more recent edition of the source document has been published, which contains an updated version of the term and definition. Future revisions of this International Standard will include updated terms and definitions consistent with the source documents at the time the revision is prepared.

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Photography — Electronic still picture imaging — Vocabulary

1 Scope

This International Standard defines terms used in electronic still picture imaging.

Only terms related to electronic still picture imaging are defined. These terms are relevant to current tasks or are of general interest in electronic still picture imaging.

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/IEC 10918-1, *Information technology — Digital compression and coding of continuous-tone still images: Requirements and guidelines*

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

ISO 12234-2, *Electronic still-picture imaging — Removable memory — Part 2: TIFF/EP image data format*

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

ISO 21550, *Photography — Electronic scanners for photographic images — Dynamic range measurements*

IEC 61966-2-1, *Multimedia systems and equipment — Colour measurement and management — Part 2-1: Colour management — Default RGB colour space — sRGB*

3 Terms and definitions

3.1

absolute colorimetric coordinates

tristimulus values, or other colorimetric coordinates derived from tristimulus values, where the numerical values correspond to the magnitude of the physical stimulus

EXAMPLE When CIE 1931 standard colour-matching functions are used, the Y-coordinate value corresponds to the luminance, not the luminance factor (or some scaled value thereof).

[ISO 22028-1:2004, definition 3.1]

3.2

adapted white

colour stimulus that an observer who is adapted to the viewing environment would judge to be perfectly achromatic and to have a luminance factor of unity; i.e. absolute colorimetric coordinates that an observer would consider to be a perfect white diffuser

NOTE 1 The adapted white can vary within a scene.

NOTE 2 See also **adapted white** (3.5).

NOTE 3 This term is also defined in ISO 22028-1 and ISO/TS 22028-3.

[ISO/TS 22028-2:2006, definition 3.1]

3.3

additive RGB colour space

colorimetric colour space having three colour primaries (generally red, green and blue) such that CIE XYZ tristimulus values can be determined from the RGB colour space values by forming a weighted combination of the CIE XYZ tristimulus values for the individual colour primaries, where the weights are proportional to the radiometrically linear colour space values for the corresponding colour primaries

NOTE 1 A simple linear 3x3 matrix transformation can be used to transform between CIE XYZ tristimulus values and the radiometrically linear colour space values for an additive RGB colour space.

NOTE 2 Additive RGB colour spaces are defined by specifying the CIE chromaticity values for a set of additive RGB primaries and a colour space white point, together with a colour component transfer function.

NOTE 3 This term is also defined in ISO 22028-1 and ISO/TS 22028-3.

[ISO/TS 22028-2:2006, definition 3.2]

3.4

addressable photoelements

number of active photoelements in an image, which is equal to the number of active lines of photoelements multiplied by the number of active photoelements per line

NOTE 1 It is possible that the number of addressable photoelements may be different for the different colour records of an image. When the signal values of the photoelements are digitized, the digitized code values may be referred to as picture elements, or pixels.

NOTE 2 This term is also defined in ISO 16067-1, ISO 16067-2 and ISO 21550.

[ISO 12233:2000, definition 3.1]

3.5

adopted white

spectral radiance distribution as seen by an image capture or measurement device and converted to colour signals that are considered to be perfectly achromatic and to have an observer adaptive luminance factor of unity, i.e. colour signals that are considered to correspond to a perfect white diffuser

NOTE 1 The adopted white can vary within a scene.

NOTE 2 No assumptions can be made concerning the relation between the adapted or adopted white and measurements of near perfectly reflecting diffusers in a scene, because measurements of such diffusers will depend on the illumination and viewing geometry, and other elements in the scene that can affect perception. It is easy to arrange conditions for which a near perfectly reflecting diffuser will appear to be grey or coloured.

NOTE 3 See also **adapted white** (3.2).

NOTE 4 This term is also defined in ISO 17321-1 and ISO 22028-1.

3.6

album

end-user created object used to logically group data objects according to some user-defined criteria

NOTE An album might or might not be a physical folder in a file system. In this International Standard, an album is a type of association.

[ISO 15740:2008, definition 3.1]

3.7

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

NOTE 1 These artefacts usually manifest themselves as moiré patterns in repetitive image features or as jagged “stairstepping” at edge transitions.

NOTE 2 This term is also defined in ISO 12233, ISO 16067-2 and ISO 21550.

[ISO 16067-1:2003, definition 3.2]

3.8

aliasing ratio

value equal to the “maximum minus minimum” modulation divided by the “average” modulation of an electronic still picture camera when imaging a frequency burst of constant spatial frequency

NOTE The aliasing ratio is described in 6.4 of ISO 12233:2000.

[ISO 12233:2000, definition 3.4]

3.9

application

image application software for use on a personal computer

[ISO 12231:2005, definition 3.5]

3.10

Application Programming Interface

API

high-level functional description of a software interface

NOTE 1 An API is typically language-dependent.

NOTE 2 This was taken from ISO 15740:2005, definition 3.2, which has been cancelled and replaced by ISO 15740:2008.

3.11

artefactual attribute

attribute of image quality that, when evident in an image, nearly always leads to a loss of overall image quality

NOTE The commonly used terms *defect* and *impairment* are similar in meaning.

EXAMPLE Examples of artefactual attributes include noise and aliasing.

[ISO 20462-1:2005, definition 3.1, ISO 20462-3:2005, definition 3.1]

3.12 aspect ratio

3.12.1

image aspect ratio

ratio of the image width to the image height

[ISO 12233:2000, definition 3.10, ISO 15740:2008, definition 3.16]

3.12.2

pixel aspect ratio

ratio of the distance between sampling points in the two orthogonal sampling directions

NOTE 1 If the distances are equal, the pixel aspect ratio equals 1:1, and is said to be “square”.

NOTE 2 See also **image aspect ratio** (3.12.1).

[ISO 12231:2005, definition 2.6.2]

3.13

association

logical construct used to expose a relationship between discrete objects

NOTE Associations are used to indicate that separate data objects are related. Associations are represented like folders, and may be nested using a standard branched hierarchical tree structure.

EXAMPLE A time sequence or user-defined groupings by content or capture session.

[ISO 15740:2008, definition 3.2]

**3.14
attribute**

aspect, dimension, or component of overall image quality

NOTE 1 See also **artefactual attribute** (3.11) and **preferential attribute** (3.138).

NOTE 2 This term is also defined in ISO 20462-1 and ISO 20462-3.

EXAMPLE Examples of image quality attributes include image structure properties such as sharpness and noise; colour and tone reproduction properties such as contrast, colour balance, and relative colourfulness; and digital artefacts such as aliasing, contouring, and compression defects.

**3.15
attribute just noticeable difference
attribute JND**

measure of the detectability of appearance variations, corresponding to a stimulus difference that would lead to a 75:25 proportion of responses in a paired comparison task in which univariate stimuli pairs were assessed in terms of a single attribute identified in the instructions

NOTE 1 As an example, a paired comparison identifying the sharper of two stimuli that differed only in their generating system modulation transfer function (MTF) would yield results in terms of sharpness attribute JNDs. If the MTF curves differed monotonically and did not cross, the outcome of the paired comparison would depend primarily upon the observers' ability to detect changes in the appearance of the stimuli as a function of MTF variations, with little or no value judgement required of the observers.

NOTE 2 If observers are instead asked to choose which of a pair of stimuli is higher in overall image quality, and if the stimuli in aggregate are multivariate, such that the observer must make value judgements of the importance of a number of attributes, rather than focusing on one aspect of image appearance, it is observed experimentally that larger objective stimulus differences (for example, MTF changes) are required to obtain a 75:25 proportion of responses, which in this case corresponds to a quality JND.

NOTE 3 A JND is a statistical quantity, derived from a number of observations. An observer assessing a single pair of images differing by one attribute JND is unlikely to be confident that he or she has detected the sample difference. A stimulus difference of approximately three JNDs is usually needed for an observer of average sensitivity to feel reasonably certain of his or her assessment.

NOTE 4 See also **quality JND** (3.143).

NOTE 5 Adapted from ISO 20462-1.

**3.16
categorical sort method**

psychophysical method involving the classification of a stimulus into one of several ordered categories, at least some of which are identified by adjectives or phrases that describe different levels of image quality or attributes thereof

NOTE The application of adjectival descriptors is strongly affected by the range of stimuli presented, so that it is difficult to compare the results of one categorical sort experiment to another. Range effects and the coarse quantization of categorical sort experiments also hinder conversion of the responses to JND units. Given these limitations, it is not possible to unambiguously map adjectival descriptors to JND units, but it is worth noting that in some experiments where a broad range of stimuli have been presented, the categories *excellent*, *very good*, *good*, *fair*, *poor*, and *not worth keeping* have been found to provide very roughly comparable intervals that average about six quality JNDs in width.

[ISO 20462-1:2005, definition 3.4, ISO 20462-2:2005, definition 2.5]

**3.17
colorimetric colour space**

colour space having an exact and simple relationship to CIE colorimetric values

NOTE 1 Colorimetric colour spaces include those defined by CIE (e.g. CIE XYZ, CIELAB, CIELUV, etc.), as well as colour spaces that are simple transformations of those colour spaces (e.g. additive RGB colour spaces).

NOTE 2 This term is also defined in ISO/TS 22028-2.

[ISO 22028-1:2004, definition 3.5, ISO/TS 22028-3:2006, definition 3.3]

3.18**colour component transfer function**

single variable, monotonic mathematical function applied individually to one or more colour channels of a colour space

NOTE 1 Colour component transfer functions are frequently used to account for the nonlinear response of a reference device and/or to improve the visual uniformity of a colour space.

NOTE 2 Generally, colour component transfer functions will be nonlinear functions such as a power-law (i.e. “gamma”) function or a logarithmic function. However, in some cases a linear colour component transfer function may be used.

[ISO 22028-1:2004, definition 3.6, ISO/TS 22028-2:2006, definition 3.4, ISO/TS 22028-3:2006, definition 3.4]

3.19**colour encoding**

generic term for a quantized digital encoding of a colour space, encompassing both colour space encodings and colour image encodings

[ISO 22028-1:2004, definition 3.7, ISO/TS 22028-2:2006, definition 3.5, ISO/TS 22028-3:2006, definition 3.5]

3.20**colour gamut**

solid in a colour space, consisting of all those colours that are either: present in a specific scene, artwork, photograph, photomechanical, or other reproduction; or capable of being created using a particular output device and/or medium

NOTE See also **luminance ratio** (3.100).

[ISO 22028-1:2004, definition 3.8, ISO/TS 22028-2:2006, definition 3.6, ISO/TS 22028-3:2006, definition 3.6]

3.21**colour image encoding**

digital encoding of the colour values for a digital image, including the specification of a colour space encoding, together with any information necessary to properly interpret the colour values such as the image state, the intended image viewing environment and the reference medium

NOTE 1 In some cases the intended image viewing environment will be explicitly defined for the colour image encoding. In other cases, the intended image viewing environment may be specified on an image-by-image basis using metadata associated with the digital image.

NOTE 2 Some colour image encodings will indicate particular reference medium characteristics, such as a reflection print with a specified density range. In other cases the reference medium will not be applicable, such as with a scene-referred colour image encoding, or will be specified using image metadata.

NOTE 3 Colour image encodings are not limited to pictorial digital images that originate from an original scene, but are also applicable to digital images with content such as text, line art, vector graphics and other forms of original artwork.

[ISO 22028-1:2004, definition 3.9, ISO/TS 22028-2:2006, definition 3.7, ISO/TS 22028-3:2006, definition 3.7]

3.22**colour matching functions**

tristimulus values of monochromatic stimuli of equal radiant power

NOTE See also **tristimulus value** (3.186).

[CIE Publication 17.4 (845-03-23), ISO 22028-1:2004, definition 3.10]

3.23

colour rendering

mapping of image data representing the colour-space coordinates of the elements of a scene to output-referred image data representing the colour-space coordinates of the elements of a reproduction

NOTE Colour rendering generally consists of one or more of the following: compensating for differences in the input and output viewing conditions, tone scale and gamut mapping to map the scene colours onto the dynamic range and colour gamut of the reproduction, and applying preference adjustments.

[ISO 22028-1:2004, definition 3.11, ISO/TS 22028-2:2006, definition 3.8, ISO/TS 22028-3:2006, definition 3.8]

3.24

colour re-rendering

mapping of picture-referred image data appropriate for one specified real or virtual imaging medium and viewing conditions to picture-referred image data appropriate for a different real or virtual imaging medium and/or viewing conditions

NOTE Colour re-rendering generally consists of one or more of the following: compensating for differences in the viewing conditions, compensating for differences in the dynamic range and/or colour gamut of the imaging media, and applying preference adjustments.

[ISO 22028-1:2004, definition 3.12]

3.25

colour space

geometric representation of colours in space, usually of three dimensions

[CIE Publication 17.4 (845-03-25), ISO 22028-1:2004, definition 3.13, ISO/TS 22028-2:2006, definition 3.9, ISO/TS 22028-3:2006, definition 3.9]

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3.26

colour space encoding

digital encoding of a colour space, including the specification of a digital encoding method, and a colour space value range

ISO 12231:2012
<http://enr.incluzh.org/standards/it/3/93/dr/464/88/464/dc173b725373/iso-12231-2012>

NOTE 1 Multiple colour space encodings can be defined based on a single colour space where the different colour space encodings have different digital encoding methods and/or colour space value ranges. (For example, 8-bit sRGB and 10 bit e-sRGB are different colour space encodings based on a particular RGB colour space.)

NOTE 2 This term is also defined in ISO 22028-1, ISO/TS 22028-2 and ISO/TS 22028-3.

3.27

colour space white point

colour stimulus to which colour space values are normalized

NOTE 1 It is not necessary that the colour space white point correspond to the assumed adapted white point and/or the reference medium white point for a colour image encoding.

NOTE 2 This term is also defined in ISO 22028-1.

[ISO/TS 22028-2:2006, definition 3.11, ISO/TS 22028-3:2006, definition 3.11]

3.28 compression

3.28.1

image compression

process that alters the way digital image data is encoded in order to reduce the size of an image file

[ISO 12233:2000, definition 3.11]

3.28.2**sound compression**

process of altering the sound data coding in order to reduce the size of a sound file in the electronic still picture camera

NOTE See also sound recording (3.167).

[ISO 12234-1:2007, definition 3.8]

3.29**connection**

transport-provided mechanism for establishing paths for transferring data between devices

[ISO 15740:2008, definition 3.3]

3.30**continuous colour space values**

real-valued, unbounded colour space values that have not been encoded using a digital encoding method

NOTE This term is also defined in ISO 22028-1.

[ISO/TS 22028-2:2006, definition 3.12, ISO/TS 22028-3:2006, definition 3.12]

3.31**cycles per millimetre****cy/mm**

unit used for specifying resolution characteristics in terms of the response of an imaging system to a linear radiance sine wave input, as a function of the frequency of the sine wave

NOTE 1 A range of input sine wave frequencies is obtained in ISO 12233 through the use of a sharp edge target.

NOTE 2 Most pictorial imaging systems exhibit nonlinear behaviour, which can result in the nature of the target affecting the measured resolution characteristics. Distance units other than millimetres are also used.

NOTE 3 This term is also defined in ISO 12233.

3.32**datacode**

16-bit unsigned integer whose Most Significant Nibble (4 bits) is used to indicate the category of code and whether the code value is standard or vendor-extended

[ISO 15740:2008, definition 3.4]

3.33**dataset**

transport-independent collection of one or more individual data items with known interpretations

NOTE Data sets are not necessarily opaque or atomic to transport implementations.

[ISO 15740:2008, definition 3.6]

3.34**data object**

image or other type of data that typically exists in persistent storage of a DSPD or other device

[ISO 15740:2008, definition 3.5]

3.35**design rule for camera filesystem****DCF**

standard convention for camera filesystems which specifies the file format, foldering and naming conventions in order to promote file interoperability between conforming digital photography devices

[ISO 15740:2008, definition 3.7]

3.36

device-dependent colour space

colour space defined by the characteristics of a real or idealized imaging device

NOTE Device-dependent colour spaces having a simple functional relationship to CIE colorimetry can also be categorized as colorimetric colour spaces. For example, additive RGB colour spaces corresponding to real or idealized CRT displays can be treated as colorimetric colour spaces.

[ISO 22028-1:2004, definition 3.17]

3.37

device discovery

act of determining the set of all devices present on a particular transport or platform that are physically or logically accessible

[ISO 15740:2008, definition 3.8]

3.38

digital imaging system

system that records and/or produces images using digital data

[ISO 22028-1:2004, definition 3.18, ISO/TS 22028-3:2006, definition 3.13]

3.39

digital output level

digital code value

numerical value assigned to a particular output level

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NOTE This term is also defined in ISO 16067-2 and ISO 21550.

[ISO 14524:2009, definition 3.2, ISO 15739:2003, definition 3.2, ISO 16067-1:2003, definition 3.3]

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3.40

digital still camera

DSC

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

NOTE 1 A digital still camera is typically a portable, hand-held device. The digital signal is usually recorded on a removable memory, such as a solid-state memory card or magnetic disk.

NOTE 2 This term is also defined in ISO 12232, ISO 15739 and ISO 17321-1.

3.41

digital print order format

DPOF

standardized ASCII file stored on removable media along with the image files that indicates how many copies of which images should be printed

NOTE DPOF also allows index prints, cropping, and text overlays to be specified.

[ISO 15740:2008, definition 3.10]

3.42

digital still photography device

DSPD

device with persistent storage that captures a two-dimensional digital still image

[ISO 15740:2008, definition 3.9]

3.43
edge spread function
ESF

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

NOTE See also **line spread function** (3.94), **point spread function** (3.136).

[ISO 12233:2000, definition 3.5, ISO 16067-1:2003, definition 3.4, ISO 16067-2:2004, definition 3.4, ISO 21550:2004, definition 3.4]

3.44
effectively spectrally neutral

having spectral characteristics which result in a specific imaging system producing the same output as for a spectrally neutral object

NOTE 1 See also **spectrally neutral** (3.169).

NOTE 2 This term is also defined in ISO 21550.

[ISO 12233:2000, definition 3.6, ISO 16067-1:2003, definition 3.5, ISO 16067-2:2004, definition 3.5]

3.45
electronic scanner for photographic films

scanner incorporating an image sensor that outputs a digital signal representing a still film image

NOTE This term is also defined in ISO 21550.

[ISO 16067-2:2004, definition 3.6]

3.46
electronic scanner for photographic prints

scanner incorporating an image sensor that outputs a digital signal representing a still print image

[ISO 16067-1:2003, definition 3.6]

3.47
electromechanical shutter

mechanical shutter which is electronically controlled

[ISO 14524:2009, definition 3.3]

3.48
electronic still-picture camera

camera incorporating an image sensor that outputs an analogue or digital signal representing a still-picture, or records an analog or digital signal representing a still picture on a removable media, such as a memory card or magnetic disk

NOTE This term is also defined in ISO 14524 and ISO 15739.

[ISO 12233:2000, definition 3.7]

3.49
enumeration

act of creating an ordered increasing numerical list that contains one representative element for each member of a set

[ISO 15740:2008, definition 3.11]