SLOVENSKI STANDARD
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Fotografija in grafična tehnologija - Razširjeno barvno kodiranje za shranjevanje, izmenjavo in ravnanje z digitalnimi slikami - 3. del: Referenčna vhodna medijska metrika RGB barvnega kodiranja slik (RIMM RGB)

Photography and graphic technology - Extended colour encodings for digital image storage, manipulation and interchange - Part 3: Reference input medium metric RGB colour image encoding (RIMM RGB)

Photographie et technologie graphique - Codages par couleurs étendues pour stockage, manipulation et échange d'image numérique - Partie 3: Codage d'image en couleurs RVB par référence d'entrée par voie métrique

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ICS:

01.070	Barvno kodiranje	Colour coding
37.040.99	Drugi standardi v zvezi s fotografijo	Other standards related to photography
37.100.01	Grafična tehnologija na splošno	Graphic technology in general

SIST-TS ISO/TS 22028-3:2014 **en**

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TECHNICAL SPECIFICATION

ISO/TS 22028-3

Second edition
2012-08-01

Photography and graphic technology — Extended colour encodings for digital image storage, manipulation and interchange —

Part 3:
Reference input medium metric RGB colour image encoding (RIMM RGB)

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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.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of document:

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An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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/TS 22028-3 was prepared by Technical Committee ISO/TC 42, *Photography*.

This second edition cancels and replaces the first edition (ISO/TS 22028-3:2006), which has been technically revised.

ISO/TS 22028 consists of the following parts, under the general title *Photography and graphic technology — Extended colour encodings for digital image storage, manipulation and interchange*:

— *Part 1: Architecture and requirements*

— *Part 2: Reference output medium metric RGB colour image encoding (ROMM RGB)*

— *Part 3: Reference input medium metric RGB colour image encoding (RIMM RGB)* [Technical Specification]

The following parts are under preparation:

— *Part 4: European Colour Initiative RGB colour image encoding [eciRGB (2008)]* [Technical Specification]

ISO/TS 22028-3:2012(E)

Introduction

This part of ISO 22028 has been developed in order to meet the industry need for a complete, fully-documented, publicly-available definition of a wide-primary scene-referred extended colour gamut red-green-blue (RGB) colour image encoding. This encoding provides a way to represent scene-referred images that does not limit the colour gamut to those colours capable of being displayed on a CRT monitor, or require the use of negative RGB colourimetry coordinates.

A scene-referred extended colour gamut colour encoding is particularly desirable for professional photography applications. For example, colours captured by digital cameras, as well as conventional capture devices such as photographic film, can be outside those that can be represented within the colour gamut of a typical monitor or other types of output devices. Similarly, scene-referred images can have a larger luminance dynamic range than output-referred images since they have not been modified by a colour rendering process to fit the images to a specific output medium applying appropriate tone and colour reproduction aims. Retaining the unrendered scene-referred image data has the advantage that it preserves the option to make decisions about how a particular image is to be rendered. For example, a scene-referred image of a backlit scene can retain information about both the dark foreground region and the bright background region of the scene. This information can be used to make a properly exposed print of either the foreground region or the background region, or alternatively can be used to create an improved image by rendering the two regions differently.

By using a standard scene-referred extended colour gamut colour image encoding, images can be stored, interchanged and manipulated without restricting the image to a particular rendering intent or output device. The reference input medium metric RGB (RIMM RGB) colour encoding specified in this part of ISO 22028 meets the needs of these types of applications. An extended dynamic range version of this colour image encoding known as extended reference input medium metric RGB (ERIMM RGB), and a floating point version known as FP-RIMM RGB are also specified for use with high-dynamic range input sources. The scene-referred RIMM RGB colour image encoding is intended to be complementary to the output-referred ROMM RGB colour image encoding specified in ISO/TS 22028-2. Both colour encodings are based on the same "wide RGB" additive colour space to facilitate the development of image processing algorithms and simple colour rendering transformations to convert scene-referred RIMM RGB images to rendered output-referred ROMM RGB images.

The International Organization for Standardization (ISO) draws attention to the fact that it is claimed that compliance with this document may involve the use of patents concerning extended range colour encodings given in 4.4 and 4.5. ISO takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured ISO that he/she is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with ISO. Information may be obtained from

> Director, Intellectual Property Agreements and Standards
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TECHNICAL SPECIFICATION   ISO/TS 22028-3:2012(E)

Photography and graphic technology — Extended colour encodings for digital image storage, manipulation and interchange —

Part 3: Reference input medium metric RGB colour image encoding (RIMM RGB)

1 Scope

This part of ISO 22028 specifies a family of scene-referred extended colour gamut RGB colour image encodings designated as reference input medium metric RGB (RIMM RGB). Digital images encoded using RIMM RGB can be manipulated, stored, transmitted, displayed or printed by digital still picture imaging systems. Three precision levels are defined using 8-, 12- and 16-bits/channel.

An extended luminance dynamic range version of RIMM RGB is also defined, designated as extended reference input medium metric RGB (ERIMM RGB). Two precision levels of ERIMM RGB are defined using 12- and 16-bits/channel.

FP-RIMM RGB, a floating point version of RIMM RGB, defines the expression method of RIMM RGB in a floating point figure. Three precision levels of FP-RIMM RGB are defined using 16-, 32- and 64-bits/channel.

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

ISO 22028-1:2004, *Photography and graphic technology — Extended colour encodings for digital image storage, manipulation and interchange — Part 1:Architecture and requirements*

ISO 11664-1, *Colorimetry — Part 1: CIE standard colorimetric observers*[1]

CIE Publication 15, *Colorimetery*

IEEE 754, *IEEE Standard for Floating-Point Arithmetic*

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1) Replaces ISO/CIE 10527.

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3 Terms and definitions

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

3.1
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 colourimetric coordinates that an observer would consider to be a perfect white diffuser

NOTE   The adapted white can vary within a scene.

3.2
additive RGB colour space

colourimetric 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 3 × 3 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.

3.3
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, if such variation is supported by the imaging system.

NOTE 2   The adopted white is not required to be an estimate or approximation of the adapted white. For example, if a scene lit by tungsten illumination is captured using a DSC with the white balance set to D55 (daylight), the adopted white will be D55 but the adapted white will be closer to a tungsten illuminant (e.g. ISO 7589 Studio Tungsten or CIE Illuminant A).

NOTE 3   See 3.1.

3.4
colourimetric colour space

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

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

3.5
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 can be used.

3.6
colour encoding

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

3.7
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

3.8
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 can 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.

3.9
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;

— applying preference adjustments.

3.10
colour space
geometric representation of colours in space, usually of three dimensions

[CIE Publication 17.4:1987, 845-03-25]

3.11
colour space encoding
digital encoding of a colour space, including the specification of a digital encoding method, and a colour space value range

NOTE   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.)

3.12
colour space white point
colour stimulus to which colour space values are normalized

NOTE   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.