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BSI Standards Publication

Electronic still picture imaging — Removable memory

Part 3: XMP for digital photography

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National foreword

This British Standard is the UK implementation of ISO 12234-3:2016.

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Part 3: XMP for digital photography

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Partie 3: Utilisation du XMP

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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 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.

The committee responsible for this document is ISO/TC 42, *Photography*.

ISO 12234 consists of the following parts, under the general title *Electronic still-picture imaging — Removable memory*:

— *Part 1: Basic removable-memory model*

— *Part 2: TIFF/EP image data format*

— *Part 3: XMP for digital photography*

Introduction

Metadata enables digital images to be more easily searched and located (e.g. by knowing more about the image), more appropriately processed and printed (e.g. by knowing the picture-taking conditions), and more appropriately stored and shared (e.g. by knowing the GPS location of the image and the copyright owner).

Several different TIFF-based metadata formats are commonly used in digital cameras, while XML-encoded metadata is commonly used in on-line image databases.

The purposes of this part of ISO 12234 are, first, to define unambiguously a mapping for metadata properties that are most relevant to digital photography into XMP and, second, to document the meaning of each metadata item.

This part of ISO 12234 is independent of the format of the image file, could be used inside any image file, and could be used in databases of image-related metadata.

INTERNATIONAL STANDARD **ISO 12234-3:2016(E)**

Electronic still picture imaging — Removable memory —

Part 3:
XMP for digital photography

1 Scope

This part of ISO 12234 defines an XMP namespace for the metadata used in digital photography applications that is formatted for exchange using the syntax of the XML and provides standard definitions of this metadata.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8601, *Data elements and interchange formats — Information interchange — Representation of dates and times*

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

ISO 16684-1:2012, *Graphic technology — Extensible metadata platform (XMP) specification — Part 1: Data model, serialization and core properties*

ISO/IEC 15444-1, *Information Technology — JPEG 2000 image coding system: Core coding system*

ISO/IEC 15444-2, *Information Technology — JPEG 2000 image coding system — Extensions*

3 Terms and definitions

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

3.1
Exif
image file format which specifies the formats to be used for images, sound, and tags in digital still cameras standardized by CIPA (Camera and Imaging Products Association) and JEITA (Japan Electronics and Information Technology Industries Association)

Note 1 to entry: Exif is abbreviation of “Exchangeable image file format for digital still cameras”.

3.2
namespace
set of unique names that are used to unambiguously label the elements in related data sets

3.3
property
named container for a metadata value at the top level of an XMP packet

[SOURCE: ISO 16684-1:2012, 3.5]

3.4
Uniform Resource Identifier
URI
compact sequence of characters that identifies an abstract or physical resource

[SOURCE: ISO 16684-1:2012, 3.8 modified.]

4 Reference model and usage

4.1 General considerations

Figure 1 summarizes the reference model for this part of ISO 12234.

This part of ISO 12234 defines metadata for digital photography and identifies the XMP namespaces used to encode this metadata.

The metadata shall be encoded using the XMP data model and serialization defined in ISO 16684-1.

The metadata includes a number of items that are defined in ISO 16684-1, in Reference [11] or in Reference [6] as indicated in the descriptions of the metadata items included in Clause 6.

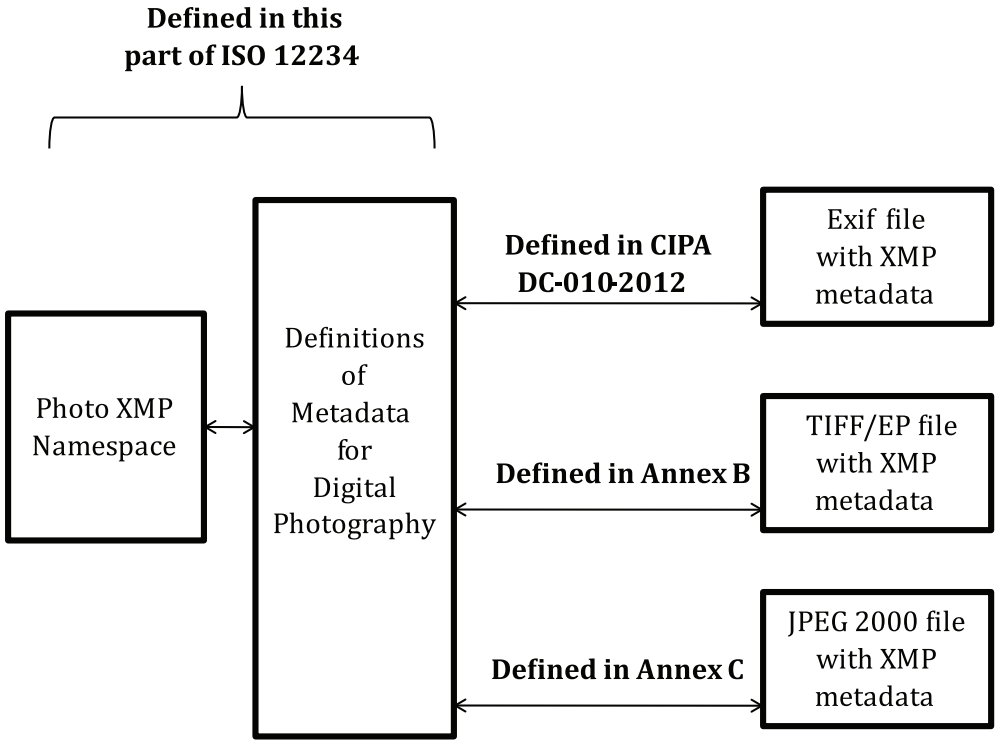


Figure 1 — Reference model

4.2 Native metadata properties and their usage

For Exif, TIFF, and JPEG 2000 file formats supported technical metadata items, only TIFF tags, Exif tags and/or JPEG 2000 boxes should be stored respectively when any one of these file formats is used

with the Photo XMP packet. These are Photo XMP properties in the dc:, tiff:, exif:, exifEX: and xmp: namespaces which are defined in Clause 5.

Refer to sections 4.2.2.1 and 4.2.3.1 of Reference [11] for details.

5 XMP namespace

5.1 General

The XMP namespaces are described in this Clause. Since definitions from current XMP namespaces are used when these definitions are appropriate, metadata properties in this part of ISO 12234 are subset of the properties in these namespaces. Users shall note interpretation from Photo XMP namespaces to these XMP namespaces is not always possible. A new namespace is used only when this is required in order to address newly defined metadata items.

The namespaces in Table 1 shall be used, and the preferred namespace prefixes should be used.

Table 1 — Namespaces used in Photo XMP metadata

Name	URI	Recommended prefix
Dublin Core	http://purl.org/dc/elements/1.1/	dc
Exif 2.21 and Exif 2.3	http://cipa.jp/exif/1.0/	exifEX
Exif 2.2 or earlier	http://ns.adobe.com/exif/1.0/	exif
TIFF Rev. 6.0	http://ns.adobe.com/tiff/1.0/	tiff
XMP	http://ns.adobe.com/xap/1.0/	xmp
PhotoXMP	http://imaging.org/pxmp/1.0/	pxmp

NOTE For convenience in this part of ISO 12234, XMP names are commonly written in a **prefix:local** style; for example, **dc:title**. The relevant URI for the prefix used in this part of ISO 12234 is either explicit or clear from local context. Each URI in Table 1 is the XML namespace, not a URL pointing to a document available on the Internet.

5.2 Extensions

Properties and definitions for new metadata may be added to existing component and XMP namespaces if they do not cause problems for existing processors and applications of the metadata.

The names and definitions of properties in existing namespaces shall remain unchanged.

If it is necessary to change the definition of a property, a new property shall be created, and the old one may be deprecated.

A new version of a namespace and definitions with a new URI may be created so that there is no logical connection between the two versions and the same local name in two different namespaces refers to distinct properties and definitions.

6 Metadata definitions

6.1 Metadata lists

Photo XMP metadata items are defined in this Clause. A list of these items, along with a brief description and the XMP name, is given in Table 2.

Table 2 — Photo XMP metadata list

Metadata name	Description	XMP name	Type
ApertureValue	Aperture value	**exif:ApertureValue**	Rational
Artist	Person who captured the image	**dc:creator**	Ordered array of ProperName
BodySerialNumber	Serial number of the digital camera used to capture the image	**exifEX:BodySerialNumber**	Text
CameraOwnerName	Owner of the camera used to capture the image	**exifEX:CameraOwnerName**	ProperName
CaptureSet	Image position within a set of captured images	**pxmp:CaptureSet**	Structure
CFAPattern	Colour filter array geometric pattern of the image sensor	**exif:CFAPattern**	CFA-Pattern
ColourEncoding	Colour encoding information	**pxmp:ColourEncoding**	Closed choice of Integer
Copyright	Image copyright holder and optional copyright statement	**dc:rights**	LanguageAlternative
DateTimeDigitized	Date and time when the image was stored as digital data	**xmp:CreateDate**	Date
DateTimeOriginal	Date and time when the image was captured	**exif:DateTimeOriginal**	Date
DateTime	Date and time that the image was last modified	**xmp:ModifyDate**	Date
DigitalZoomRatio	Digital zoom ratio used to capture the image	**exif:DigitalZoomRatio**	Rational
Editor	Person(s) who edited the image file	**pxmp:Editor**	Ordered array of ProperName
ExposureBiasValue	Exposure bias in exposure value	**exif:ExposureBiasValue**	Rational
ExposureIndex	Exposure index used by the camera to capture the image	**exif:ExposureIndex**	Rational
ExposureProgram	Class of camera exposure program used to capture the image	**exif:ExposureProgram**	Closed choice of Integer
Faces	Locations of faces in the image, optionally includes the names of the faces	**pxmp:Faces**	Structure
Favorites	Identifier of a “favourite” image	**pxmp:Favorites**	Closed choice of Integer
Flash	State of camera illumination source used to capture the image	**exif:Flash**	Structure
FocalLength	Actual focal length of the lens used to capture the image	**exif:FocalLength**	Rational
FocalLengthIn35mm Film	Indicates the equivalent focal length assuming a 35 mm film camera	**exif: FocalLengthIn35mmFilm**	Integer

Table 2 *(continued)*

Metadata name	Description	XMP name	Type
GPS	Location of the camera used to captutre the image	**exif:GPS**	Structure
ImageAspectRatio	Ratio of image width to image height	**pxmp:ImageAspect**	Rational
ImageDescription	Title of the image	**dc:description**	LangeageAlternative
ImageLength	Number of rows of pixels in the image	**tiff:ImageLength**	Integer
ImageTileSet	Image position of a series of captured images of 1-D or 2-D panoramic series	**pxmp:ImageTileSet**	ImageTile
ImageWidth	Number of columns of pixels in the image	**tiff:ImageWidth**	Integer
LensMake	Lens manufacturer	**exifEX:LensMake**	ProperName
LensModel	Lens's model name and model number	**exifEX:LensModel**	Text
LensSerialNumber	Serial number of the interchangeable lens used to capture the image	**exifEX:LensSerialNumber**	Text
LensSpecification	Minimum focal length, maximum focal length, minimum f/number in the minimum focal length, and minimum f/number in the maximum focal length, which are specification information for the lens	**exifEX:LensSpecification**	Ordered array of Rational
LightSource	Light source which illuminated the scene that is depicted in the image file	**exif:LightSource**	Closed choice of Integer
Make	Manufacturer of the digital camera used to capture the image	**tiff:Make**	ProperName
MaxApertureValue	Smallest f/number of lens in aperture value	**exif:MaxApertureValue**	Rational
MeteringMode	Mode used for exposure metering used to capture the image	**exif:MeteringMode**	Closed choice of Integer
Model	Model name of the digital camera used to capture the image	**tiff:Model**	ProperName
MultiSpectralCaptureSet	The spectral capture conditions of a multispectral image set	**pxmp:MultiSpectralCaptureSet**	MultiSpectral
OECF	Opto-Electronic Conversion Function as specified in ISO 14524	**exif:OECF**	OECF/ SFR
Orientation	Orientation of the captured image	**tiff:Orientation**	Closed choice of Integer
SceneLuminance	Measured average luminance of the scene	**pxmp:SceneLuma**	Rational

Table 2 *(continued)*

Metadata name	Description	XMP name	Type
Self-TimerMode	Self-timer delay	**pxmp:Timer**	Integer
ShutterSpeedValue	Time value	**exif:ShutterSpeedValue**	Rational
Software	Name of the first known tool used to create the resource (the writer software/firmware)	**xmp:CreatorTool**	AgentName
SubjectArea	Coordinates of the area of the main subject in the image	**exif:SubjectArea**	Ordered array of Integer
SubjectDistance	Distance between the camera and the subject in the scene on which the camera is focused	**exif:SubjectDistance**	Rational
UserComments	Comments concerning the image	**exif:UserComment**	LanguageAlternative

Table 3 groups the metadata items listed in Table 2 based on their attribution (such as xmp, tiff, dc, exif) rather than in alphabetical order.

Table 3 — Category list

Category	Metadata name	XMP name
TIFF/image data structure	**ImageWidth**	**tiff:ImageWidth**
TIFF/image data structure	**ImageLength**	**tiff:ImageLength**
TIFF/other	**DateTime**	**xmp:ModifyDate**
TIFF/other	**ImageDescription**	**dc:description**
TIFF/other	**Make**	**tiff:Make**
TIFF/other	**Model**	**tiff:Model**
TIFF/other	**Orientation**	**tiff:Orientation**
TIFF/other	**Software**	**xmp:CreatorTool**
TIFF/other	**Artist**	**dc:creator**
TIFF/other	**Copyright**	**dc:rights**
Exif/user information	**UserComments**	**exif:UserComment**
Exif/date and time	**DateTimeOriginal**	**exif:DateTimeOriginal**
Exif/date and time	**DateTimeDigitized**	**xmp:CreateDate**
Exif/picture-taking conditions	**ExposureProgram**	**exif:ExposureProgram**
Exif/picture-taking conditions	**OECF**	**exif:OECF**
Exif/picture-taking conditions	**ShutterSpeedValue**	**exif:ShutterSpeedValue**
Exif/picture-taking conditions	**ApertureValue**	**exif:ApertureValue**
Exif/picture-taking conditions	**ExposureBiasValue**	**exif:ExposureBiasValue**
Exif/picture-taking conditions	**MaxApertureValue**	**exif:MaxApertureValue**
Exif/picture-taking conditions	**SubjecDistance**	**exif:SubjectDistance**
Exif/picture-taking conditions	**MeteringMode**	**exif:MeteringMode**
Exif/picture-taking conditions	**LightSource**	**exif:LightSource**
Exif/picture-taking conditions	**Flash**	**exif:Flash**
Exif/picture-taking conditions	**FocalLength**	**exif:FocalLength**
Exif/picture-taking conditions	**FocalLengthIn35mmFilm**	**exif:FocalLengthIn35mmFilm**
Exif/picture-taking conditions	**SubjectArea**	**exif:SubjectArea**

Table 3 *(continued)*

Category	Metadata name	XMP name
Exif/picture-taking conditions	**ExposureIndex**	**exif:ExposureIndex**
Exif/picture-taking conditions	**CFAPattern**	**exif:CFAPattern**
Exif/picture-taking conditions	**DigitalZoomRatio**	**exif:DigitalZoomRatio**
Exif/other	**CameraOwnerName**	**exifEX:CameraOwnerName**
Exif/other	**BodySerialNumber**	**exifEX:BodySerialNumber**
Exif/other	**LensModel**	**exifEX:LensModel**
Exif/other	**LensSpecification**	**exifEX:LensSpecification**
Exif/other	**LensMake**	**exifEX:LensMake**
Exif/other	**LensSerialNumber**	**exifEX:LensSerialNumber**
Exif/GPS	**GPS**	**exif:GPS**
This part of ISO 12234	**CaptureSet**	**pxmp:CaptureSet**
This part of ISO 12234	**ColourEncoding**	**pxmp:ColourEncoding**
This part of ISO 12234	**Editor**	**Pxmp:Editor**
This part of ISO 12234	**Faces**	**pxmp:Faces**
This part of ISO 12234	**Favorites**	**pxmp:Favorites**
This part of ISO 12234	**ImageAspectRatio**	**pxmp:ImageAspect**
This part of ISO 12234	**ImageTileSet**	**pxmp:ImageTileSet**
This part of ISO 12234	**MultiSpectralCaptureSet**	**pxmp:MultiSpectralCaptureSet**
This part of ISO 12234	**SceneLuminance**	**pxmp:SceneLuma**
This part of ISO 12234	**Self-TimerMode**	**pxmp:Timer**

6.2 Metadata definitions

6.2.1 Value type

(Rational), (Ordered array of ProperName), (Text), etc. in the following subclauses show the value type of the property.

6.2.2 ApertureValue

This property shall encode the actual lens aperture (Av) used to capture the image with APEX notation. The maximum value is 99.99; the minimum value is –1.0. In APEX units, a value of –1.0 corresponds to f/0.7, and a value of 1.0 corresponds to f/1.4.

Photo XMP name: exif:ApertureValue (Rational)

6.2.3 Artist

This property shall encode the person(s) who captured the image, typically the camera owner. This property is defined in Dublin Core (*Dublin Core Metadata Element Set, Version 1.1* http://dublincore.org/documents/dces/) and the value type shall be Ordered array of ProperName. See D.2.3.4 for ProperName value type.

Photo XMP name: dc:creator (Ordered array of ProperName)

6.2.4 BodySerialNumber

This property shall encode the serial number of the digital camera used to capture the image. The value shall be an ASCII text string.

Photo XMP name: **exifEX:BodySerialNumber** (Text)

6.2.5 CameraOwnerName

This property shall encode the owner of a camera used in photography. The value type shall be ProperName but the text shall be limited to ASCII string.

Photo XMP name: **exifEX:CameraOwnerName** (ProperName)

6.2.6 CaptureSet

This property shall encode the image position within a series of captured images typically used in generating a derivative rendition such as focus series. Panoramic images are defined in 6.2.26, ImageTileSet.

The value type of the Capture Set metadata shall be a structured Capture Set (see Table 4) which includes a mode, image identification number, and the total number of images in the series. This metadata can be used to identify, for example, that an image is the second image of 12 images in a focus series.

Photo XMP name: pxmp:CaptureSet (CaptureSet)

The values of Capture Set fields shall be as listed in Table 4.

Table 4 — CaptureSet fields

Name	Type	Description
pxmp:CaptureSetMode	Closed choice of Integer	The capture set mode. One of: 0 = unknown 1 = time lapse series 2 = exposure series 3 = focus series 4 = object rotation series
pxmp:CaptureSetID	Integer	Identification number of current image in capture set
pxmp:CaptureSetTotal	Integer	Total number of images in capture set

6.2.7 CFAPattern

This property shall encode the actual colour filter array geometric pattern of the image sensor used to capture the single-sensor colour image. The value type shall be CFAPattern (see D.2.4.1).

Photo XMP name: **exif:CFAPattern** (CFAPattern)

6.2.8 ColourEncoding

This property shall encode the colour encoding information. The value type shall be Closed choice of Integer.

Photo XMP name: **pxmp:ColourEncoding** (Closed choice of Integer)

The ColourEncoding shall be one of the following values:

0 = colour encoding is defined by an ICC colour profile included in the image file;

1 = sRGB as defined in IEC 61966-2-1;

2 = other, as defined by the native metadata.

6.2.9 Copyright

This property shall encode the copyright holder of the image and an optional copyright statement as defined in the Dublin Core using a UCS string.

Photo XMP name: **dc:rights** (LanguageAlternative)

6.2.10 DateTimeDigitized

This property shall encode the date and time when the image was stored in its current location as digital data. The value shall be stored according to ISO 8601 format. The corresponding value type shall be Date (see D.2.2.2).

Photo XMP name: xmp:CreateDate (Date)

6.2.11 DateTimeOriginal

This property shall encode the date and time when the image was captured. It is normally provided using a real-time clock in the digital camera. It may include a time-zone offset. For long exposure times and high dynamic range imaging (HDR), the value should be the beginning of the first exposure.

Photo XMP name: **exif:DateTimeOriginal** (Date)

6.2.12 DateTime

This property shall encode the date and time that the image was last modified. It may include a time-zone offset. If the image has not been modified after the capture date, the value shall be the same at the **DateTimeOriginal** value. If the original image was stored as a "raw" image and later processed using a "raw converter", the value should be the date and time that the "raw processing" was performed unless the image was modified afterwards.

Photo XMP name: **xmp:ModifyDate** (Date)

6.2.13 DigitalZoomRatio

This property shall encode the digital zoom ratio when the image was shot.

Photo XMP name: exif:DigitalZoomRatio (Rational)

6.2.14 Editor

This property shall encode the name of the person(s) who modified the image after it was captured. The value type shall be Ordered array of ProperName. See D.2.3.4 for ProperName value type.

Photo XMP name: pxpm:editor (Ordered array of ProperName)

6.2.15 ExposureBiasValue

This property shall encode the number of stops by which the camera exposure is changed by the photographer (e.g. using a manual exposure bias control) or by the camera exposure system (e.g. using an automatic exposure series mode) relative to the nominal value determined by the camera's exposure metering system. The number of stops is specified using APEX notation. The range shall be between –99.99 and 99.99.

Photo XMP name: exif:ExposureBiasValue (Rational)

6.2.16 ExposureIndex

This property shall encode the exposure index used by the camera when the image was captured as defined using the methods in ISO 12232. It may be the exposure index and exposure bias set manually by the photographer or automatically by the camera.

Photo XMP name: exif:ExposureIndex (Rational)

6.2.17 ExposureProgram

This property shall encode the exposure mode and the program mode used when the image was captured.

Photo XMP name: exif:ExposureProgram (Closed choice of Integer)

The ExposureProgram shall be one of the following values:

0 = not defined;

1 = Manual;

2 = Normal program;

3 = Aperture priority;

4 = Shutter priority;

5 = Creative program;

6 = Action program;

7 = Portrait mode;

8 = Landscape mode.

6.2.18 Faces

This property shall encode the names and/or the locations of faces in the image. The value type shall be structured Faces defined in Table 5.

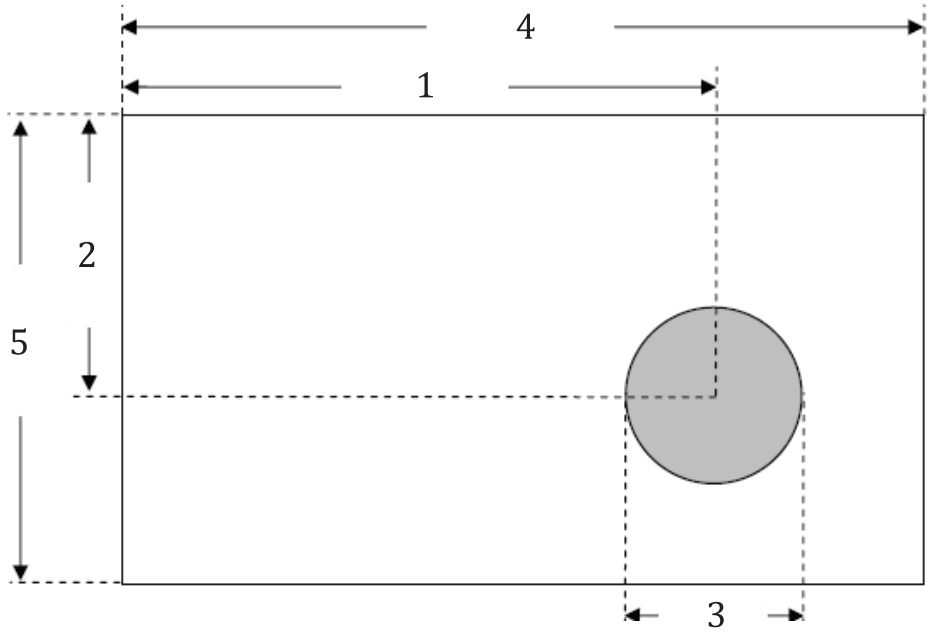
Photo XMP name: pxmp:Faces (Face)

The values of the structure shall be as listed in Table 5.

Table 5 — Faces fields

Name	Type	Description
pxmp:FaceName	ProperName	Name of person
pxmp:FaceLocation	Ordered array of Rational	X-coordinate, Y-coordinate, and diameter of circle centred on face

The locations and size of faces are indicated using the X-coordinate, Y-coordinate, and Diameter values shown in Figure 2.



Key

1 X-coordinate
2 Y-coordinate
3 diameter
4 image width
5 image height

Figure 2 — Location and size of faces

6.2.19 Favorites

This property shall encode whether the image has been selected as a "favourite" image. In some cases, this is determined automatically using a quality determination algorithm, or by determining image usage patterns. In other cases, one or more viewers assign "stars" or other ratings to the image.

Photo XMP name: pxmp:Favorites (Closed choice of Integer)

The Favorites value shall be one of the following values:

0 = not rated;

1 = lowest favourite rating;

2 = relating low favourite rating;

3 = middle favourite rating (e.g. 3 stars or "thumbs up");

4 = high favourite rating;

5 = highest possible favourite rating (e.g. 5 stars);

–1 = not liked (e.g. thumbs down).

6.2.20 Flash

This property shall encode the state of flash (e.g. flash on, flash turned off, fill-flash mode, camera does not have a flash) when the image was captured. The value type shall be structured Flash (see D.2.4.4).

Photo XMP name: exif:Flash (Flash)

6.2.21 FocalLength

This property shall encode the actual focal length of the lens (in mm) when the image was captured. The focal length is equal to the distance along the optical axis between the secondary (rearmost) principal point and the point of focus in image space when focusing on a subject at infinity.

Photo XMP name: exif:FocalLength (Rational)

6.2.22 FocalLengthIn35mmFilm

This property shall encode the focal length used with a 35 mm film camera that would capture the image with the same angle of view using the DSC. The units shall be in mm. A value of 0 shall be used if the focal length is unknown.

Photo XMP name: exif:FocalLengthIn35mmFilm (Integer)

6.2.23 GPS

This property shall encode Latitude and Longitude (and optionally, the Altitude) of the camera when the image was captured.

Photo XMP name: exif:GPS (GPS)

The values of the structure shall be as listed in Table 7.

— The field namespace URI is http://ns.adobe.com/exif/1.0/.

— The preferred field namespace prefix is **exif**.

Table 6 — GPS fields

XMP name	Type	Description
exif:GPSVersionID	Text	A decimal encoding of each of the four Exif bytes with period separators. The current value is "2.3.0.0".
exif:GPSLatitude	GPSCoordinate	Indicates latitude. Consists of position and North/South
exif:GPSLongitude	GPSCoordinate	Indicates longitude. Consists of position and East/West
exif:GPSAltitudeRef	Closed choice of Integer	Indicates whether the altitude is above or below sea level: 0 = above sea level 1 = below sea level
exif:GPSAltitude	Rational	Indicates altitude in metres
exif:GPSTimeStamp	Date	Time stamp of GPS data consists of Date and Time, in Coordinated Universal Time
exif:GPSSatellites	Text	Satellite information in an ASCII string; format is unspecified
exif:GPSStatus	Closed choice of Text	Status of GPS receiver at image creation time: "A" = measurement in progress "V" = measurement is interoperability
exif:GPSMeasureMode	Closed choice of Integer	GPS measurement mode: "2" = two-dimensional measurement "3" = three-dimensional measurement

[a] Prefix **exif:** is used for the backward compatibility with existing application software even though this field is an addition in Exif 2.3.

Table 6 *(continued)*

XMP name	Type	Description
exif:GPSDOP	Rational	Degree of precision for GPS data
exif:GPSSpeedRef	Closed choice of Text	Units used to speed measurement: "K" = kilometres per hour "M" = miles per hour "N" = knots
exif:GPSSpeed	Rational	Speed of GPS receiver movement
exif:GPSTrackRef	Closed choice of Text	Reference for movement direction: "T" = true direction "M" = magnetic direction
exif:GPSTrack	Rational	Direction of GPS movement; values range from 0 to 359.99
exif: GPSImgDirectionRef	Closed choice of Text	Reference for movement direction: "T" = true direction "M" = magnetic direction
exif: GPSImgDirection	Rational	Direction of image when captured; values range from 0 to 359.99.
exif:GPSMapDatum	Text	Geodetic survey data as an ASCII string
exif:GPSDestLatitude	GPSCoordinate	Indicates destination latitude. Consists of position and North/South
exif: GPSDestLongitude	GPSCoordinate	Indicates destination longitude. Consists of position and East/West
exif: GPSDestBearingRef	Closed choice of Text	Reference for movement direction: "T" = true direction "M" = magnetic direction
exif:GPSDestBearing	Rational	Destination bearing, values from 0 to 359.99.
exif: GPSDestDistanceRef	Closed choice of Text	Units used for distance measurement: "K" = kilometres "M" = miles "N" = nautical miles
exif:GPSDestDistance	Rational	Distance to destination
exif: GPSProcessingMethod	Text	An ASCII string recording the name of the method used for location finding
exif: GPSAreaInformation	Text	An ASCII string recording the name of the GPS area
exif:GPSDifferential	Closed choice of Integer	Indicates whether differential correction is applied to the GPS receiver: 0 = without correction 1 = correction applied
exif:GPSHPositioning-Error[a]	Rational	Indicates horizontal positioning errors in metres

[a] Prefix **exif:** is used for the backward compatibility with existing application software even though this field is an addition in Exif 2.3.

6.2.24 ImageAspectRatio

This property shall encode the ratio of image width to image height.

Photo XMP name: pxmp:ImageAspect (Rational)

Rational value shall be equal to image width divided by image height.

6.2.25 ImageDescription

This property shall encode the title of the image as UCS text. The value type shall be LanguageAlternative. It is typically supplied by the photographer.

Photo XMP name: dc:description (LanguageAlternative)

6.2.26 ImageLength

This property shall encode the number of pixel rows in the image. The value shall be Integer.

Photo XMP name: tiff:ImageLength (Integer)

6.2.27 ImageTileSet

This property encodes the image position of a series of captured images which form a one-dimensional or two-dimensional panoramic series. The value type shall be ImageTile.

Photo XMP name: pxmp:ImageTileSet (ImageTile)

The values of ImageTile fields shall be as listed in Table 7.

Table 7 — ImageTile fields

Name	Type	Description
pxmp:ImageTileMode	Closed choice of Integer	The image tile mode. One of: 1 = horizontal (left to right) panoramic set 2 = vertical (top to bottom) panoramic set 3 = two-dimensional (left to right, starting at top) panoramic set
pxmp:ImageTileID	Integer	Identification number of current image in capture set starting with 1 and sequential
pxmp:ImageRowTotal	Integer	Total number of rows in capture set
pxmp:ImageTileTotal	Integer	Total number of images in capture set

6.2.28 ImageWidth

This property shall encode the number of pixel columns in the image with the value type of Integer.

Photo XMP name: tiff:ImageWidth. (Integer)

6.2.29 LensMake

This property shall encode the lens manufacturer as an ASCII string. The value type shall be ProperName.

Photo XMP name: exifEX:LensMake (ProperName)

6.2.30 LensModel

This property shall encode the lens's model name and model number as an ASCII string. The value type shall be Text.

Photo XMP name: exifEX:LensModel (Text)

6.2.31 LensSerialNumber

This property shall encode the lens serial number as an ASCII string. The value type shall be Text.

Photo XMP name: exifEX:LensSerialNumber (Text)

6.2.32 LensSpecification

This property shall encode the minimum focal length, the maximum focal length, the minimum f/number for the minimum focal length, and the minimum f/number for the maximum focal length for the lens using an Ordered Array of Numeric Values.

Photo XMP name: exifEX:LensSpecification (Ordered array of Rational)

6.2.33 LightSource

This property shall encode the light source which illuminated the scene.

Photo XMP name: exif:LightSource (Closed choice of Integer)

The LightSource shall be one of the following values:

0 = unknown;

1 = Daylight;

2 = Fluorescent;

3 = Tungsten;

4 = Flash;

9 = Fine weather;

10 = Cloudy weather;

11 = Shade;

12 = Daylight fluorescent (D 5700 – 7100K);

13 = Day white fluorescent (N 4600 – 5500K);

14 = Cool white fluorescent (W 3800 – 4500K);

15 = White fluorescent (WW 3250 – 3800K);

16 = Warm white fluorescent (L2600 - 3250K);

17 = Standard light A;

18 = Standard light B;

19 = Standard light C;

20 = D55;

21 = D65;

22 = D75;

23 = D50;

24 = ISO studio tungsten;

255 = other.

6.2.34 Make

This property shall encode the manufacturer of the digital camera used to capture the image. The value shall be a UCS string in the value type of ProperName.

Photo XMP name: **tiff:Make** (ProperName)

6.2.35 MaxApertureValue

This property shall encode the value of the smallest available f/number of the lens (i.e. the maximum available diameter of the lens) using APEX notation.

Photo XMP name: exif:MaxApertureValue (Rational)

6.2.36 MeteringMode

This property shall encode the mode used for exposure metering when the image was captured.

Photo XMP name: exif:MeteringMode (Closed choice of Integer)

The MeteringMode value shall be one of the following values:

0 = unknown;

1 = Average metering;

2 = Center Weighted Average metering;

3 = Spot metering;

4 = Multi Spot metering;

5 = Pattern metering;

6 = Partial metering;

255 = other.

6.2.37 Model

This property shall encode the model number of the digital camera used to capture the image. The value shall be a UCS string.

Photo XMP name: **tiff:Model** (Text)

6.2.38 MultiSpectralCaptureSet

The property shall encode the spectral capture conditions of a multispectral image set. The spectral condition used to capture each image is defined using a text string (e.g “ultraviolet” or “filter type x” or “spectral sensitivity file 123”) as well as a corresponding ID number. The value type shall be MultiSpectral.

Photo XMP name: pxmp:MultiSpectralCaptureSet (multispectral)

The values of the Multispectral Fields shall be as listed in Table 8.

Table 8 — MultiSpectral fields

Name	Type	Description
pxmp:SpectralBand	Text	Description of spectral band
pxmp:SpectralID	Integer	Identification number of current spectral band image
pxmp:SpectralTotal	Integer	Total number of spectral band images in capture set

6.2.39 OECF

This property shall encode the Opto-Electronic Conversion Function as specified in ISO 14524. The value type shall be OECF/SFR (see D.2.4.5)

Photo XMP name: exif:OECF (OECF/SFR)

6.2.40 Orientation

This property shall encode the orientation of the captured image.

Photo XMP name: tiff:Orientation (Closed choice of Integer)

The Orientation value shall be one of the following values:

1 = 0th row at top, 0th column at left;

2 = 0th row at top, 0th column at right;

3 = 0th row at bottom, 0th column at right;

4 = 0th row at bottom, 0th column at left;

5 = 0th row at left, 0th column at top;

6 = 0th row at right, 0th column at top;

7 = 0th row at right, 0th column at bottom;

8 = 0th row at left, 0th column at bottom.

6.2.41 SceneLuminance

This property shall encode the measured average luminance of the scene in cd/m^2.

Photo XMP name: pxmp:SceneLuma (Rational)

6.2.42 Self-TimerMode

This property shall encode the self-timer delay in seconds. A value of 0 shall indicate that the self-timer was not used.

Photo XMP name: pxmp:Timer (Integer)

6.2.43 ShutterSpeedValue

This property shall encode the Time Value, using APEX notation. The Time Value equals the binary logarithm of the inverse ratio of the exposure time t in seconds to the nominal exposure time of one second.

Photo XMP name: exif:ShutterSpeedValue (Rational)

6.2.44 Software

This property shall encode the name of the first known tool used to create the resource. Tool includes software and firmware of the writer.

Photo XMP name: xmp:CreatorTool (AgentName)

6.2.45 SubjectArea

This property shall encode the X- and Y-coordinates of the area of the main subject in the image.

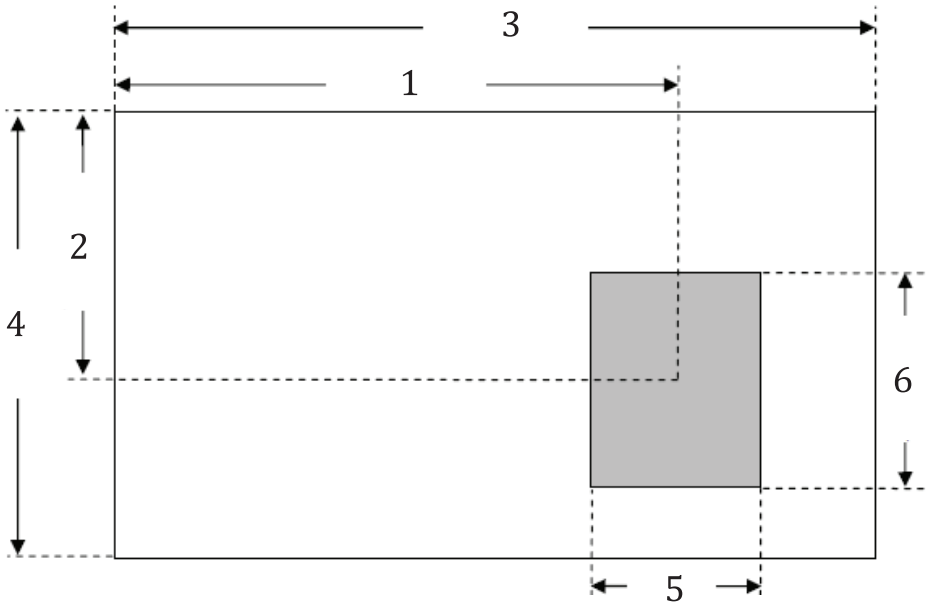
Photo XMP name: exif:SubjectArea (Ordered array of Integer)

The subject location and area are defined by Count values as follows:

Count = 2 identifies the location of the main subject using two coordinates. The first value is the X-coordinate and the second value is the Y-coordinate.

Count = 3 identifies the area of the main subject using a circle. The first value is the centre X-coordinate, the second value is the centre Y-coordinate, and the third coordinate is the diameter, as shown in Figure 2.

Count = 4 identifies the area of the main subject using a rectangle. The first value is the centre X-coordinate, the second value is the centre Y-coordinate, the third value is the width of the rectangle, and the fourth value is the height of the rectangle, as shown in Figure 3.



Key

1 X-coordinate
2 Y-coordinate
3 image width
4 image height
5 area
6 area height

Figure 3 — Subject area coordinates

Note that the coordinate values, width, and height are expressed in relation to the upper left as the origin, prior to rotation processing indicated by the orientation tag.

6.2.46 SubjectDistance

This property shall encode the distance in metres between the camera and the subject in the scene on which the camera is focused.

Photo XMP name: exif:SubjectDistance (Rational)

6.2.47 UserComments

This property shall encode comments concerning the image. Value type shall be LanguageAlternative.

Photo XMP name: exif:UserComment (LanguateAlternative)

Annex A
(normative)

XMP metadata use with Exif image format

A.1 Overview

Reference [6] defines how the native Exif metadata shall be mapped into XMP namespaces, and vice versa, which are stored in Exif image files. Users shall note that mapping from Photo XMP namespaces to native Exif metadata is not always possible because this part of ISO 12234 does not guarantee all the Exif required metadata appear in Photo XMP packet.

A.2 Uncompressed image data

When used with the uncompressed Exif image data format defined in Reference [7], the XMP metadata defined in this part of ISO 12234 shall be encoded using the XMP TIFF tag, which encodes the total byte count and byte offset of the XMP Packet.

Tag Name = **XMP**

Tag = 700

Type = BYTE

Count = total byte count of the XMP Packet

Value = byte offset of the XMP Packet

Usage: IFD0

A.3 Compressed image data

When used with the compressed EXIF image data format defined in Reference [7], the XMP metadata defined in this part of ISO 12234 shall be encoded using marker segment mechanism.

The compressed Exif image data format is built upon JPEG. The JPEG (Joint Photographic Experts Group) specification concerns itself almost entirely with the image compression algorithm and has very little to say about the remainder of the file format. It specifies a sequence of two-byte markers interspersed among data.

Each marker defines the interpretation of data that follows it. According to the JPEG standard, any number of marker segments may appear in any order. The Exif standard, which is built upon JPEG, defines some ordering restrictions. These restrictions are defined in Reference [7].

With the Exif standard, the compressed EXIF file shall start with the SOI marker followed by an Exif APP1 marker. The XMP APP1 marker shall be placed before the first SOF marker. For maximum compatibility, readers should tolerate finding them between the first SOF marker and first SOS marker. Placing the Exif APP1 first, followed by the XMP APP1, and then by all other marker segments provides the clearest sequence of markers.

After the type, the marker contains a length value and the identifying namespace string. The length value is 2 (the length field itself), the length of the namespace field, plus the length of the data in bytes. Metadata markers share the convention of having NULL-terminated namespace strings.

Table A.1 — Content and usage of APP markers

Marker	Signature, including NULLs	Usage
APP1	"Exif\0\0" (2 NULLs)	Exif metadata
APP1	"http://imaging.org/pxmp/1.0/"	XMP

Table A.2 shows the entry format for the XMP section.

Table A.2 — Entry format for XMP section in JPEG

Byte offset, length	Field value	Field name	Comments
0, 2 bytes	0xFFE1	APP1	APP1 marker identifies metadata section
2, 2 bytes	2 + 29 + length of XMP packet	Lp	Size in bytes of this count plus the following two portions
4, 29 bytes	Null-terminated ASCII string without quotation marks	Namespace	XMP namespace URI, used as unique ID: http://imaging.org/pxmp/1.0/
33, <65503	XMP packet		Encoded as UTF-8

The mechanism described in this Annex is found in Reference [10].

Annex B
(normative)

XMP metadata use with TIFF/EP image format

When used with the TIFF/EP image data format defined in ISO 12234-2, the XMP metadata defined in this part of ISO 12234 shall be encoded using the XMP TIFF tag, which encodes the total byte count and byte offset of the XMP Packet.

Tag Name = **XMP**

Tag = 700

Type = BYTE

Count = total byte count of the XMP Packet

Value = byte offset of the XMP Packet

Usage: IFD0

Annex C
(normative)

XMP metadata use with JPEG 2000 image format

When used with the JPEG 2000 image data format defined in ISO/IEC 15444-1 and ISO/IEC 15444-2, the XMP metadata defined in this part of ISO 12234 shall be stored in XML boxes in the JPX file.

Annex D
(normative)

Value forms and value types

D.1 Value forms

XMP value forms are defined in ISO 16684-1:2012, 6.3. “Ordered array” type is defined in ISO 16684-1:2012, 6.3.4.

D.2 Value types

D.2.1 Overview

Core value types are defined in ISO 16684-1. The following types shall be used in properties described in this specification when applicable.

D.2.2 Basic value types

D.2.2.1 Boolean

Boolean values shall be “True” or “False”.

D.2.2.2 Date

Date is a date-time value, which is represented using a subset of Date and Time Formats formatting.

```
YYYY
YYYY-MM
YYYY-MM-DD
YYYY-MM-DDThh:mmTZD
YYYY-MM-DDThh:mm:ssTZD
YYYY-MM-DDThh:mm:ss.sTZD
```

In which:

- `YYYY` = four-digit year
- `MM` = two-digit month (01 = January)
- `DD` = two-digit day of month (01 to 31)
- `hh` = two digits of hour (00 to 23)
- `mm` = two digits of minute (00 to 59)
- `ss` = two digits of second (00 to 59)
- `s` = one or more digits representing a decimal fraction of a second
- `TZD` = time zone designator (Z or +hh:mm or –hh:mm)

The time zone designator need not be present in XMP. When not present, the time zone is unknown, and an XMP processor should not assume anything about the missing time zone.

Local time-zone designators `+hh:mm` or `-hh:mm` should be used when possible instead of converting to UTC.

NOTE If a file was saved at noon on October 23, a timestamp of `2004-10-23T12:00:00-06:00` conveys more information than `2004-10-23T18:00:00Z`.

D.2.2.3 Integer

Integer is a signed or unsigned numeric string used as an integer number representation. The string consists of an arbitrary length decimal numeric string with an optional leading "+" or "–" sign.

D.2.2.4 Text

Text shall be a, possibly empty, UCS string.

D.2.3 Derived value types

D.2.3.1 AgentName

Value of Agent Name is the name of an XMP processor, a Text value. It is recommended that the value use this format convention:

Organization Software_name Version (token;token;...)

— Organization: The name of the company or organization providing the software, no SPACEs.

— Software_name: The full name of the software, SPACEs allowed.

— version: The version of the software, no SPACEs.

— tokens: Can be used to identify an operating system, plug-in, or more detailed version information.

EXAMPLE "Adobe Acrobat 9.0 (Mac OS X 10.5)".[1)]

D.2.3.2 Choice

Choice is a value chosen from a vocabulary of values. Vocabularies provide a means of specifying a limited and possibly extensible set of values for a property.

A choice can be open or closed:

— An open choice has one or more lists of preferred values, but other values can be used freely.

— A closed choice has one or more lists of allowed values; other values shall not be used.

NOTE An XMP reader would be more robust if it tolerates unexpected values for closed choice types when the set of allowed values can be expected to grow over time.

D.2.3.3 LanguageAlternative

Value of LanguageAlternative is an alternative array of simple text items. Language alternatives facilitate the selection of a simple text item based on a desired language. Each array item shall have an **xml:lang** qualifier. Each **xml:lang** value shall be unique among the items. As defined in Reference [13], the **xml:lang** value is composed of one or more parts: A primary language subtag and a (possibly empty) series of subsequent subtags. The same primary subtag may be used alone and in conjunction with one

1) Adobe Acrobat 9.0 is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.

or more lower-level subtags. A default value, if known, should be the first array item. The order of other array items is not specified by this part of ISO 12234.

An xml:lang value of “x-default” may be used to explicitly denote a default item. If used, the “x-default” item shall be first in the array and its simple text value should be repeated in another item in which xml:lang specifies its actual language. However, an “x-default” item may be the only item, in which case, there is only a default value in no defined language.

EXAMPLE 1 Language alternative with an “x-default” item is as follows.

```
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
         xmlns:dc="http://purl.org/dc/elements/1.1/">

   <rdf:Description rdf:about="">

<!-- Line wrapping of rdf:li elements is for presentation in this example. -->
<!-- Leading and trailing white space is part of the array item values. -->

      <dc:title>
         <rdf:Alt>
             <rdf:li xml:lang="x-default">
                XMP - Extensible Metadata Platform
             </rdf:li>
             <rdf:li xml:lang="en-us">
                XMP - Extensible Metadata Platform
             </rdf:li>
             <rdf:li xml:lang="fr">
                XMP - Une Platforme Extensible pour les Métadonnées
                  </rdf:li>
                </rdf:Alt>
             </dc:title>

         </rdf:Description>

      </rdf:RDF>
```

D.2.3.4 ProperName

ProperName is a simple text value denoting the name of a person or organization.

D.2.4 Exif namespace value types

D.2.4.1 General

The following clauses are citations from Reference [6].

These types are used only within Exif specific namespaces.

D.2.4.2 CFAPattern

Value type of CFAPattern is a structure describing the CFA pattern.

— The field namespace URI is http://ns.adobe.com/exif/1.0/.

— The preferred field namespace prefix is **exif.**

Table D.1 — CFAPattern fields

Name	Type	Description
exif:Columns	Integer	Number of columns, *n*
exif:Rows	Integer	Number of rows, *m*

exif:Values	Ordered array of Integer	CFA values; sequence should be in order:
		`value [0,0]`
		`...`
		`value [n - 1, 0]`
		`value [0, m - 1]`
		`...`
		`value [n - 1, m - 1]`

D.2.4.3 DeviceSettings

Value type of DeviceSettings is a structure describing the device settings.

— The field namespace URI is http://ns.adobe.com/exif/1.0/.

— The preferred field namespace prefix is **exif**.

Table D.2 — DeviceSettings fields

Name	Type	Description
exif:Columns	Integer	Display columns
exif:Rows	Integer	Display rows
exif:Values	Ordered array of Text	Camera settings, in order

D.2.4.4 Flash

Value type of Flash is a structure describing the flash state.

— The field namespace URI is http://ns.adobe.com/exif/1.0/.

— The preferred field namespace prefix is **exif**.

Table D.3 — Flash fields

Name	Type	Description
exif:Fired	Boolean	True if flash fired
exif:Function	Boolean	True if flash function is not present
exif:Mode	Closed choice of Integer	The flash mode. One of: 0 = unknown 1 = compulsory flash firing 2 = compulsory flash suppression 3 = auto mode
exif:RedEyeMode	Boolean	True if red-eye reduction is supported
exif:Return	Closed choice of Integer	Whether strobe return is supported and, if supported, detected. One of: 0 = no strobe return detection 2 = strobe return light not detected 3 = strobe return light detected

D.2.4.5 GPSCoodinate

Value type of GPSCoodinate is a Text value in the form "*DDD*,*MM*,*SSk*" or "*DDD*,*MM*.*mmk*", where

— *DDD* is a number of degrees,

— *MM* is a number of minutes,—

— *SS* is a number of seconds,

— *mm* is a fraction of minutes, and

— *k* is a single character N, S, E, or W indicating a direction (North, South, East, West).

Leading zeroes are not necessary for the for *DDD*, *MM*, and *SS* values. The *DDD,MM.mmk* form should be used when any of the native Exif component rational values has a denominator other than 1. There can be any number of fractional digits.

D.2.4.6 OECF/SFR

Value type of OECF/SFR is a structure describing the OECF/SFR.

— The field namespace URI is http://ns.adobe.com/exif/1.0/.

— The preferred field namespace prefix is **exif**.

Table D.4 — OECF/SFR fields

Name	Type	Description
exif:Columus	Integer	Number of columns, *n*
exif:Names	Ordered array of Text	Column item names, *n* entries
exif:Rows	Integer	Number of rows, *m*
exif:Values	Ordered array of Rational	OECF/SFR values; sequence should be in order: value [0,0] ... value [*n* – 1, 0] value [0, *m* – 1] ... value [*n* – 1, *m* – 1]

Bibliography

[1] ISO 12231, *Photography — Electronic still picture imaging — Vocabulary*

[2] ISO 15836, *Information and documentation — The Dublin Core metadata element set*

[3] ISO/IEC 10646, *Information technology — Universal Coded Character Set (UCS)*

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

[5] Adobe Systems Incorporated. *TIFF, Tag Image File Format*, Revision 6.0, June 1992

[6] CIPA. DC-010-2012, *Exif 2.3 Metadata for XMP*. Available at: http://www.cipa.jp/std/documents/e/DC-010-2012_E.pdf

[7] CIPA. DC-008-2012/JEITA CP-3451C, *Exchangeable image file format for digital still cameras; Exif Version 2.3*. Available at: http://www.cipa.jp/english/hyoujunka/kikaku/pdf/DC-008-2010_E.pdf

[8] CIPA. DC-009-2010/JEITA CP-3461B, *Design rule for Camera File system; DCF Version 2.0 (Edition 2010)*. Available at: http://www.cipa.jp/english/hyoujunka/kikaku/pdf/DC-008-2010_E.pdf

[9] Parulski K., & Reisch R. *Digital Camera Image Storage Formats*, Chapter 13 of *Single-Sensor Imaging: Methods and Applications for Digital Cameras*, Rastislav Lukac, editor, CRC Press, 2008

[10] Adobe Systems Incorporated. *The Adobe Systems XMP Specification Part 3*, April 2012

[11] Metadata Working Group. "Guidelines for Handling Image Metadata", Version 2.0, November 2010. Available at: http://www.metadataworkinggroup.com/pdf/mwg_guidance.pdf

[12] IETF. RFC 3986, *Uniform Resource Identifier (URI): Generic Syntax*, January 2005. Available at: http://www.ietf.org/rfc/rfc3986.txt

[13] IETF. RFC 3066, *Tags for the Identification of Languages, January 2001*. Available at: http://www.ietf.org/rfc/rfc3066.txt

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