INTERNATIONAL STANDARD

ISO 15930-4

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Graphic technology — Prepress digital data exchange using PDF —

Part 4: Complete exchange of CMYK and spot colour printing data using PDF 1.4 (PDF/X-1a)

Technologie graphique — Échange de données numériques de préimpression utilisant le PDF —

Partie 4: Échange complet de données d'impression CMYK et «spot colour» utilisant le PDF 1.4 (PDF/X-1a)

Reference number
ISO 15930-4:2003(E)

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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.

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 15930-4 was prepared by Technical Committee ISO/TC 130, *Graphic technology*, with the support of ANSI Committee for Graphic Arts Technologies Standards (CGATS).

ISO 15930 consists of the following parts under the general title *Graphic technology — Prepress digital data exchange using PDF*:

— *Part 1: Complete exchange using CMYK data (PDF/X-1 and PDF/X-1a)*;

— *Part 3: Complete exchange suitable for colour-managed workflows (PDF/X-3)*;

— *Part 4: Complete exchange of CMYK and spot colour printing data using PDF 1.4 (PDF/X-1a)*;

— *Part 5: Partial exchange of printing data using PDF 1.4 (PDF/X-2)*;

— *Part 6: Complete exchange of printing data suitable for colour-managed workflows using PDF 1.4 (PDF/X-3)*.

Introduction

ISO 15930 (all parts) defines methods for the exchange of digital data within the graphic arts industry and for the exchange of files between graphic arts establishments. It is a multi-part document where each part is intended to respond to different workflow requirements. These workflows differ in the degree of flexibility required. However, increasing flexibility can lead to the possibility of uncertainty or error. The goal throughout the various parts of ISO 15930 has been to maintain the degree of flexibility required while minimizing the uncertainty.

Many printed documents are assemblies of partial pages and/or pages created at different locations and by different organizations. The merging of these individual elements into the final printing forme and the subsequent printing may take place at different locations. Some of these elements may also be routed to multiple sites for incorporation into other documents. Each of these elements is referred to in ISO 15930 as a compound entity.

A variety of data formats and structures are used for the creation of this type of material, but with two prevalent kinds of underlying data structures. These are vector-based data for the encoding of line art and textual information and raster-based data for the encoding of image information, including previously rasterized line art and textual information.

Both kinds of data structures are required along with page description information in an open electronic workflow. The exchange of raster-based data using the TIFF/IT file format is defined in ISO 12639. The subject of ISO 15930 is a format for the exchange of object-based data where individual objects may be in either vector or raster data structures.

PDF/X-1a (Parts 1 and 4 of this International Standard) defines a data format and its usage to permit the predictable dissemination of a compound entity to one or more locations as CMYK (and spot colour) data, in a form ready for final print reproduction, by transfer of a single file. This file contains all the content information necessary to process and render the document, as intended by the sender, coded inside a single PDF file. No other parts, neither external files nor internally embedded files, are required or permitted. This exchange requires no prior knowledge of the sending and receiving environments and is sometimes referred to as “blind” exchange. It is platform- and transport-independent. Part 1 of this International Standard also includes a second conformance level, identified as PDF/X-1, that allows the use of OPI.

These goals are accomplished by defining a specific use of the publicly available *Adobe Portable Document Format*. In order to achieve a level of exchange that avoids any ambiguity in interpretation of the file, a limited set of PDF objects that may be used is identified and restrictions to the use, or form of use, of those objects, and/or keys within those objects are added.

This version of PDF/X-1a (Part 4 of this International Standard) amplifies and refines the information provided in the earlier version (Part 1 of this International Standard), as follows.

— The referenced version of the *Adobe Portable Document Format* has been changed from 1.3 to 1.4.

— The use of OPI has been removed.

— This part of this International Standard contains only one conformance level, identified as PDF/X-1a:2003.

— The following features, introduced in PDF 1.4, have been disallowed in PDF/X-1a:2003: JBIG2, Transparency, and Referenced PDF.

Whereas PDF/X-1a specifies the exchange of complete material, primarily as CMYK data, with all elements present, there are circumstances when this is not appropriate. In certain workflows, some or all of the referenced elements may be more logically present at the receiving site, or may be exchanged at a different

time. These include high-resolution contone-image files, line-art files, etc. These exchanges will generally require prior agreement between sender and receiver. The requirements for such situations are addressed in PDF/X-2 (Part 5 of this International Standard). Further, colour-management capabilities allow elements to be exchanged in colour spaces other than CMYK. The requirements for such situations are addressed in PDF/X-3 (Parts 3 and 6) of this International Standard. In addition, the requirements for intended printing conditions using gray and RGB are included in Parts 3 and 6.

It is anticipated that a variety of products will be developed based on PDF/X, such as readers (including viewers) and writers of PDF/X files, and products that offer combinations of these features. Different products will incorporate various capabilities to prepare, interpret and process conforming files based on the application needs as perceived by the suppliers of the products. However, it is important to note that a conforming reader must be able to read and appropriately process all files conforming to a specified conformance level.

Users are cautioned that there are several different conformance levels that may be associated with PDF/X readers and writers. Two of these are generally referred to as PDF/X-1a. These are defined in Parts 1 and 4 of this International Standard. It is recommended that these be referred to as PDF/X-1a:2001 and PDF/X-1a:2003, respectively.

Although re-purposing of data is not a primary consideration or requirement of this part of ISO 15930, maximum flexibility will be maintained so that future requirements for re-purposing may be accommodated.

An ongoing series of *Application Notes*[5] is maintained for the guidance of developers and users of the PDF/X family of International Standards. These *Application Notes*, and other documents relevant to PDF/X, are available from NPES The Association for Suppliers of Printing, Publishing and Converting Technologies in the NPES Standards Workroom at <http://www.npes.org/standards/tools.html>.

Graphic technology — Prepress digital data exchange using PDF —

Part 4:
Complete exchange of CMYK and spot colour printing data using PDF 1.4 (PDF/X-1a)

1 Scope

This part of ISO 15930 specifies the use of the Portable Document Format (PDF) Version 1.4 for the dissemination of complete digital data, in a single exchange, that contains all elements ready for final print reproduction. CMYK and spot-colour data are supported in any combination.

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 15930-1:2001, *Graphic technology — Prepress digital data exchange — Use of PDF — Part 1: Complete exchange using CMYK data (PDF/X-1 and PDF/X-1a)*

ISO 15930-3:2002, *Graphic technology — Prepress digital data exchange — Use of PDF — Part 3: Complete exchange suitable for colour-managed workflows (PDF/X-3)*

ISO 15930-5:2003, *Graphic technology — Prepress digital data exchange using PDF — Part 5: Partial exchange of printing data using PDF 1.4 (PDF/X-2)*

ISO 15930-6:2003, *Graphic technology — Prepress digital data exchange using PDF — Part 6: Complete exchange of printing data suitable for colour-managed workflows using PDF 1.4 (PDF/X-3)*

PDF Reference: Adobe Portable Document Format, Version 1.4, Adobe Systems Incorporated — 3rd ed. (ISBN 0-201-75839-3)

PDF Reference: Adobe Portable Document Format, Version 1.4 errata dated 2003/6/18. Available from Internet <http://partners.adobe.com/asn/acrobat/docs/PDF14errata.txt>

ICC.1:1998-09*, File Format for Color Profiles,* International Color Consortium. Available from Internet <http://www.color.org/>

3 Terms, abbreviated terms and definitions

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

3.1
bleed
additional printing area outside the nominal printing area necessary for the allowance of mechanical tolerance in the trimming process

3.2
blind exchange
exchange of compound entities that requires no exchange of technical information between sender and receiver in order for the receiver to render the printed page as intended by the sender

3.3
characterized printing condition
printing condition (offset, gravure, flexographic, direct, etc.) for which process control aims are defined and for which the relationship between input data (printing tone values, usually CMYK) and the colorimetry of the printed image is documented

NOTE 1 The relationship between input data (printing tone values) and the colorimetry of the printed image is commonly referred to as characterization.

NOTE 2 It is generally preferred that the process control aims of the printing condition and the associated characterization data be made publicly available via the accredited standards process or industry trade associations.

3.4
CMYK
subtractive process colour model where the channels are called Cyan, Magenta, Yellow and Black

3.5
complete exchange
exchange of compound entities in which all elements and element resources are present as part of a single exchange and all of the information needed to process the compound entity is either in the compound entity or is specified within the applicable standard and its normative references

3.6
compound entity
unit of work with all text, graphics and image elements prepared for final print reproduction and that may represent a single page for printing, a portion of a page or a combination of pages

3.7
conformance level
identified set of restrictions and requirements with which files, readers and writers must comply

3.8
element
substructure of a compound entity relative to the current processing environment, such as a block of text, a contone picture or an outline graphic that, by itself, comprises the smallest logical composed unit of a compound entity

3.9
font
identified collection of graphics that may be glyphs or other graphic elements

3.10
glyph
recognizable abstract graphic symbol that is independent of any specific design

[ISO/IEC 9541-1][1]

3.11
glyph metrics
set of information in a glyph representation used for defining the dimensions and positioning of the glyph shape

3.12
ICC
International Color Consortium
industry association formed to develop standardized mechanisms for colour management

3.13
ICC profile
set of colorimetric transforms prepared in accordance with ICC.1:1998

3.14
job ticket
electronic specification of process control for print production in either a published or proprietary format

NOTE Job tickets as defined here include only data intended to affect the rendered appearance of the file. See References [3] and [4].

3.15
non-print element
element not intended for final print reproduction, including previews, preview images and all annotations of types other than **TrapNet** and **PrinterMark**

3.16
PDF
Portable Document Format
file format defined in the *PDF Reference*

3.17
PDF dictionary
associative table containing key-value pairs, specifying the name and value of an attribute for objects, which is generally used to collect and tie together the attributes of a complex object

3.18
PDF/X-1a:2001
PDF/X-1a conformance level defined in ISO 15930-1:2001

3.19
PDF/X-1a:2003
PDF/X-1a conformance level defined in this part of ISO 15930

3.20
PDF/X-2:2003
PDF/X-2 conformance level defined in ISO 15930-5:2003

3.21
PDF/X-3:2002
PDF/X-3 conformance level defined in ISO 15930-3:2002

3.22
PDF/X-3:2003
PDF/X-3 conformance level defined in ISO 15930-6:2003

3.23
print element
element intended for final print reproduction including **TrapNet** and **PrinterMark** annotations

3.24
printing tone-value
number, recorded as data in the computer, corresponding to that percentage area on a printing forme that is intended to accept ink for transfer to the final sheet in offset lithography, or the equivalent in other printing systems

NOTE See **characterized printing condition (**3.3).

3.25
process colorant
one of a set of colorants that, when printed together, produce a range of colours able to reproduce the values specified by a colour coordinate system and which, in the context of this part of this International Standard, always refers to C, M, Y, or K

NOTE See **CMYK** (3.4).

3.26
reader
software application that is able to read and appropriately process files

3.27
spot colour
single colorant, identified by name, whose printing tone-values are specified independently from the colour values specified in a colour coordinate system

3.28
trapping
modification of boundaries of colour areas to account for dimensional variations in the printing process by overprinting in selected colours at the boundaries between colours that might inadvertently be left uncoloured due to normal variations of printing press registration

NOTE Trapping is sometimes referred to as chokes and spreads or grips. This is not the same as ink trapping.

3.29
writer
software application that is able to write files

4 Notations

PDF operators, PDF keywords, the names of keys in PDF dictionaries, and other predefined names are written in a bold sans serif type font; for example, the key **Trapped**.

Operands of PDF operators or values of dictionary keys are written in an italic sans serif font; for example the *False* value for the **Trapped** key.

For the purposes of this part of this International Standard, references to the "*PDF Reference*" are to the *PDF Reference: Adobe Portable Document Format* corrected by the errata dated 2003/6/18 (see Clause 2).

5 Conforming files and equipment

This part of this International Standard defines the use of the PDF file format for the exchange of digital data representing a compound entity.

A conforming PDF/X-1a file is a PDF file in which those features necessary for the exchange of a compound entity are in accordance with this part of this International Standard. A conforming file may also include other valid PDF features that do not affect final print reproduction of the compound entity.

Neither the version number in the header of a PDF file, nor the value of the **Version** key in the **Catalog** of a PDF file shall be used in determining whether a file is in accordance with this part of this International Standard.

A conforming PDF/X-1a writer is a software application that shall be able to write files in accordance with the requirements of this part of this International Standard. A conforming PDF/X-1a reader is a software application that shall be able to read and appropriately process all conforming PDF/X-1a files as defined in this part of this International Standard. A conforming PDF/X-1a reader shall also be able to read and process all files in accordance with the PDF/X-1a conformance level specified in ISO 15930-1:2001 having a value of (*PDF/X-1:2001*) for the **GTS_PDFXVersion** key, and (*PDF/X-1a:2001*) for the **GTS_PDFXConformance** key in the **Info** dictionary and that also conform to 6.16 of this part of this International Standard. The processing of files conforming to the PDF/X-1 conformance level as specified in ISO 15930-1:2001 by a PDF/X-1a reader shall be at the discretion of the application software.

NOTE The ability to read files prepared in accordance with the PDF/X-1a:2001 conformance level as specified in ISO 15930-1:2001, the predecessor to this part of ISO 15930, is important to preserve compatibility. Users are cautioned that there are several different conformance levels that may be associated with PDF/X readers and writers. Two of these are generally referred to as PDF/X-1a. These are defined in Parts 1 and 4 of this International Standard. These are referred to as PDF/X-1a:2001 and PDF/X-1a:2003, respectively.

Although *PDF Reference* permits compliance with earlier versions of PDF, features described in versions of the PDF specification earlier than 1.4, but not described in *PDF Reference*, should not be used in a conforming PDF/X-1a file. Such features may be ignored by a PDF/X-1a reader.

All conforming readers shall parse all PDF files but may ignore those features not required by this part of ISO 15930. A reader may ignore an annotation's **Print** flag except for those in a **TrapNet** annotation.

Rendering of conforming files shall be performed as defined in the *PDF Reference* and as restricted by this part of ISO 15930. To the extent that the *PDF Reference* and this part of this International Standard permit more than one rendering of a conforming file, a conforming reader may use embedded job-ticket or metadata information to control the rendering of the file more precisely.

EXAMPLE 1 (Trapping) If a conforming PDF/X-1a file specifies **Trapped**=*False*, a conforming reader might use job-ticket information to determine details of how the file is to be trapped. If the file specifies **Trapped**=*True*, a conforming reader is required to ignore any trapping information in an embedded job ticket.

EXAMPLE 2 (Screening) A conforming reader may use embedded job-ticket information to determine the screening to be used to render the file. Note that a conforming PDF/X-1a reader is permitted to ignore screening information in the PDF/X-1a file (see 6.9). A conforming reader might use screening data from the PDF/X-1a file, from the job ticket, or from local system defaults.

6 Technical requirements

6.1 Data structure

A PDF/X-1a file consists of four sections: header, body, cross-reference table, and trailer. The body of a PDF/X-1a file contains a sequence of numbered objects (such as numbers, names, strings, dictionaries and streams) representing the text characters, graphics, images and their associated resources describing the compound entity being exchanged. The PDF features which shall be required are specified in 6.2 to 6.17, inclusively and are summarized in Annex A. These features shall be used as prescribed in the *PDF Reference* and as further restricted by this part of this International Standard.

In order to achieve the requirements of a blind exchange, the use of a pre-separated PDF file (where the separations for each page are described as separate page objects, each painting only a single colorant) shall not be permitted.

NOTE 1 This does not prohibit the use of pre-separated workflows in which the separations of a page are combined into a single PDF page object.

A PDF/X-1a file may contain two classes of elements: those intended for final print reproduction (print elements), and those not intended for final print reproduction (non-print elements). All components of a compound entity intended for complete exchange in compliance with this part of this International Standard shall be contained in the body of a single PDF/X-1a file.

“Complete” means the exchanged files shall include

— all PDF resources (listed in the *PDF Reference*) used in the file, including all fonts, font metrics, font encodings, and colour space resources;

and

— all print elements, properly prepared for a single characterized printing condition.

NOTE 2 For partial exchange of compound entities, refer to PDF/X-2 (ISO 15930-5:2003). For complete exchange using colour-managed data, refer to PDF/X-3 (ISO 15930-3:2002 and ISO 15930-6:2003).

6.2 Colour

6.2.1 General

Non-print elements may make use of any PDF colour space and the provisions of 6.2.2 to 6.2.4, inclusive, do not apply to non-print elements. Print elements shall be exchanged as CMYK data, gray scale data, or separation colour data. The CMYK and gray scale printing tone values in print elements shall be colour-corrected and adjusted for a single characterized printing condition prior to exchange. This characterized printing condition is defined by either a named condition or an ICC output profile.

Print elements in a PDF/X-1a file may be defined in **DeviceCMYK**, **DeviceGray**, **Separation**, **DeviceN**, **Indexed** and **Pattern** colour spaces as specified and restricted by 6.2.2 to 6.2.4.

NOTE *PDF Reference* allows a device colour space for which a matching default colour space is present to be interpreted as device-independent using the colorimetric data of the default colour space. The default colour space mechanism is an indirect method of specifying a colour space. Therefore, for PDF/X-1a files, it is not permissible to have a default colour space defined for any printing element.

6.2.2 Identification of characterized printing condition

The characterized printing condition (i.e. the process colour model for the output device) for which data have been prepared is identified by use of an **OutputIntents** array in the **Catalog** object. The **OutputIntents** array shall contain exactly one output intent dictionary in which the value of the **S** key is the name *GTS_PDFX*. This dictionary is referred to as the PDF/X output intent object. Additional output intent dictionaries may be present; if so, they shall use different values for the **S** key and shall be ignored by a PDF/X-1a conforming reader.

The PDF/X output intent object shall include the **OutputConditionIdentifier** key, the value of which shall be encoded in accordance with the rules of the PDF text string object type.

The **RegistryName** key shall be used only if the intended printing condition is defined in a characterization data registry. If the intended printing condition is defined in the ICC characterization registry at http://www.color.org/ (as identified in ICC.1:1998), the **RegistryName** key shall have the value (*http://www.color.org*).

If the **RegistryName** key is present, the value of the **OutputConditionIdentifier** key shall match exactly the reference name of an entry in that registry.

If the **RegistryName** key is not present, then no special meaning should be read into the value of the **OutputConditionIdentifier** key and any match between the name selected and a name in a registry shall be treated as coincidental.

NOTE 1 In such cases, the embedded profile needs to be used when colour management of the file is required.

If the **RegistryName** key is present with a value other than (*http://www.color.org*), then the value should provide a URL at which more information regarding the registry may be obtained.

The **DestOutputProfile** key shall be present if

— the **RegistryName** key is not present

or

— the **RegistryName** key is present with a value other than (*http://www.color.org*).

Even when not required, the **DestOutputProfile** key may be present.

The profile that is the value of the **DestOutputProfile** key, if present, shall be an Output Device Profile (Device Class = "prtr") as defined in ICC.1:1998, and should represent the intended printing condition. If present in the **DestOutputProfile** stream object, the **Alternate** key shall be ignored by a PDF/X-1a conforming reader. The values of the **profileDescriptionTag** and **charTargetTag**, if present in the ICC profile, shall be ignored.

The **OutputCondition** key should always be present, and its value should be a text string concisely identifying the characterized printing condition in a form that will be meaningful to a human operator at the site receiving the exchanged file.

NOTE 2 The PDF/X-1a:2001 and PDF/X-3:2002 conformance levels recommend the use of the **Info** key. *PDF Reference* specifies that the **Info** key be present under some circumstances. It should be used for a human-readable text string containing additional information or comments about the characterized printing condition.

All PDF print elements that are encoded in **DeviceCMYK** or **DeviceGray** colour spaces, either directly or as the *base* colour space of an **Indexed** colour space, shall be interpreted as having been prepared for the printing condition identified by the PDF/X output intent object.

6.2.3 Separation and DeviceN colour spaces

Separation and/or **DeviceN** colour spaces may be used for CMYK colours, for spot colours, and for information that is not colour related (e.g. varnishes, die cutting and other overlays).

NOTE It is the responsibility of the originator of the PDF/X-1a compliant file to assure consistent use of spot colour names across all objects in the file. It is preferable to use industry-recognized names wherever possible. The use of colour names "Red", "Green", or "Blue" as names for spot colours will lead to confusion.

All **Separation** and **DeviceN** colour space resources in a PDF/X-1a file shall use **DeviceGray** or **DeviceCMYK** for their *alternateSpace*.

A PDF/X-1a-conforming reader shall treat process separations specified, using either a **Separation** colour space or as values within the *names* array of a **DeviceN** colour space, as having been prepared for the characterized printing condition identified in the PDF/X output intent object.

In the absence of an agreement between sender and receiver to the contrary, all colorant names shall be assumed to be independent colorants on the intended output device.

In situations where spot-colour separations specified in **Separation** or **DeviceN** colour spaces are to be printed using process colorants, the *alternateSpace* and *tintTransform* supplied in the **Separation** or **DeviceN** colour space shall be used to perform that transformation. If the *alternateSpace* is **DeviceCMYK**, a PDF/X-1a-conforming reader shall treat that as being the same CMYK as identified by the PDF/X output intent object. If the *alternateSpace* is **DeviceGray**, a PDF/X-1a-conforming reader shall treat that as colorimetrically the same as the black channel of the CMYK identified by the PDF/X output intent object.

6.2.4 Indexed and Pattern colour spaces

The underlying colour spaces of **Indexed** and **Pattern** colour spaces shall be restricted by 6.2.1, 6.2.2 and 6.2.3.

6.3 Fonts

Fonts that contain glyphs, related metrics, and font encodings for at least all the characters used shall be embedded within the file. The receiver shall use the embedded fonts (rather than other locally resident, substituted, or simulated fonts) for rendering and display. Unless special agreements are in place with the font copyright holder, only fonts that are publicly identified as legally embeddable in a file for display and rendering shall be used.

NOTE The license agreements for some fonts do not permit their embedding. This prohibits the use of these fonts in PDF/X-1a files. The creator of the file is expected to ensure that all fonts are used in compliance with their licensing agreements.

6.4 File specifications

A PDF/X-1a file shall not contain file specifications as described in *PDF Reference*, 3.10.

NOTE File specifications are required in OPI dictionaries and **Reference XObjects**, and are also used for external streams, all of which are prohibited in a PDF/X-1a file.

6.5 Data compression

Data compression may be used as defined in *PDF Reference*, except for LZW and JBIG2 compression, which shall not be used.

6.6 Trapping

The **Trapped** key contained in the **Info** dictionary shall be used when exchanging files. The **Trapped** key indicates the state of trapping within the file. If the entire file has not been trapped, then the value of the **Trapped** key shall be set to *False*. Otherwise, the entire file shall have been trapped as necessary, and the value of the **Trapped** key shall be set to *True*. Partially trapped files are not permitted. A value of *Unknown* for the **Trapped** key is prohibited in PDF/X-1a files.

If a file contains a **TrapNet** annotation, the value of the **Trapped** key in the **Info** dictionary shall be *True*.

NOTE If the page contents are edited after the creation of a **TrapNet** annotation, the **TrapNet** annotation will no longer be valid.

The **FontFauxing** key in a **TrapNet** annotation either shall not be present or shall be an empty array. In a PDF/X-1a-conforming file, the value of the **PCM** key in the appearance dictionary of a **TrapNet** annotation shall be *DeviceCMYK.*

6.7 PDF file identification

A PDF/X-1a file shall be so identified using the **GTS_PDFXVersion** key in the **Info** dictionary. The type of the value of the **GTS_PDFXVersion** key is string.

The value of the **GTS_PDFXVersion** key for files prepared in accordance with this part of ISO 15930 is *(PDF/X-1a:2003)*.

All PDF/X-1a files shall contain the following key value pairs in the **Info** dictionary and their values shall contain appropriate data prior to exchange: **CreationDate**, **ModDate**, and **Title**. A zero-length string is not appropriate for any of these three keys.

The values of the **Creator** and **Producer** keywords in the **Info** dictionary should be filled in prior to exchange.

If the PDF file is modified, the value of its **ModDate** key shall be updated and any M**etadata** stream in the **Catalog** dictionary should also be updated. See Annex B.

NOTE 1 If the value of the **ModDate** key in the **Info** dictionary does not match the modification date in the metadata for the document, it indicates to other applications that either the metadata or the **Info** dictionary is possibly outdated.

The **ID** key in the **Trailer** shall be present. Document creators should ensure that the **ID** in the trailer is likely to be unique; for example, by following the recommendations in the *PDF Reference.*

NOTE 2 When a PDF/X-1a file is referenced from a PDF/X-2 file, and in other circumstances where positive file identification is advantageous, additional metadata are required. See Annex B.

6.8 Bounding boxes

Each **Page** object of a PDF file includes a **MediaBox**. Each **Page** object in a conforming PDF/X-1a file shall include a **TrimBox** or an **ArtBox,** but not both. The **MediaBox** may be included by inheritance.

If the **BleedBox** is present, the **ArtBox** or the **TrimBox** shall not extend beyond the boundaries of the **BleedBox**. If the **CropBox** is present, none of the **ArtBox**, the **TrimBox**, or the **BleedBox** shall extend beyond the boundaries of the **CropBox**.

None of the **ArtBox**, the **TrimBox**, the **CropBox**, or the **BleedBox** shall extend beyond the boundaries of the **MediaBox**.

NOTE 1 Some industry practices require the use of the **BleedBox**. Appropriate trade practices should be followed.

NOTE 2 The use of the **TrimBox** is recommended over the use of the **ArtBox**.

6.9 Extended graphics state

A conforming PDF/X-1a file shall not contain the transfer function key (**TR** or **TR2**) or halftone phase (**HTP**) keys within an **ExtGState** resource.

A conforming reader may ignore the halftone key (**HT**).

NOTE 1 The general approach envisioned for PDF/X-1a data exchanges is that the receiving system is responsible for the screening of the data consistent with the characterized printing condition specified for the file. However, in some workflows, there is a need to specify specific screening parameters for certain elements. All mechanisms for including elements of any kind within a PDF/X-1a file include the ability to specify screening parameters. Where an originator of a PDF/X-1a file feels that screening parameters are important to achieve a particular imaging requirement and should not be ignored, that requirement needs to be communicated to the receiver of the file as part of the business data relating to the particular advertisement or printing job.

Use of the halftone key (**HT**) shall be consistent with the characterized printing condition and shall make use of the **TransferFunction** key in a halftone dictionary only as specified by the *PDF Reference*.

All halftones in a conforming PDF/X-1a file shall have the value *1* or *5* for the **HalftoneType** key.

NOTE 2 This prohibits the use of threshold screens that will produce different appearances at different resolutions.

Halftones in a conforming PDF/X-1a file shall not contain a **HalftoneName** key.

6.10 PostScript XObject and the PS operator

A PDF/X-1a file shall not contain instances of the **PostScript XObject** and/or the **PS** operator.

Form XObjects in a PDF/X-1a file shall not contain the key **Subtype2** with a value of *PS*.

6.11 Use of the Encrypt dictionary

A PDF/X-1a-compliant file shall not contain an **Encrypt** dictionary.

NOTE The use of digital signatures provides an alternative method of verifying the integrity of the file.

6.12 Alternate images

An **Image XObject** in a PDF/X-1a-conforming file that includes alternate images shall have no alternate where **DefaultForPrinting** is set to *True*.

NOTE This means that the image that is viewed by default will also be printed by default.

All images included in the **Alternate** array of an **Image XObject,** and the base image, shall represent the same area of the same master image, and may differ only in colour space, bit depth, resolution, compression, and encoding.

6.13 Annotations

All annotations other than **TrapNet** and **PrinterMark** annotations shall have a value for **Rect** lying completely outside the **BleedBox** (or the **TrimBox** or the **ArtBox** if no **BleedBox** is present). All **PrinterMark** annotations shall have a value for **Rect** lying completely outside the **TrimBox** or **ArtBox**. A PDF/X-1a reader may completely ignore annotations except for PDF trapping annotations.

NOTE 1 A list of annotation types can be found in can be found in *PDF Reference*, 8.4.

NOTE 2 This provision guarantees that when a page from a PDF/X-1a file is rendered on a screen by a PDF viewing application, the visual impression of the actual page is not obscured by such annotations. Also, this provision avoids unexpected behaviour of PDF files viewed on screen by using invisible interactive elements inside the page area.

NOTE 3 Since Acrobat Forms elements are a special case of annotations, the same rules apply as for other annotation types.

6.14 Actions and JavaScripts

A conforming PDF/X-1a file shall not include Actions or JavaScripts.

6.15 Use of the BX/EX operators

A conforming PDF/X-1a file shall not include operators in a **Contents** stream that are not described in the *PDF Reference*, even if they are encapsulated between **BX** and **EX** operators.

A conforming PDF/X-1a reader shall process every page operator according to the *PDF Reference*, even when they are encapsulated between **BX** and **EX** operators.

NOTE The operators **BX** (begin section where undefined page operators are not reported) and **EX** (end section where undefined page operators are not reported) designate areas in a page description that according to the *PDF Reference* may be ignored and not rendered by a reader that does not understand some or all of the page operators in between **BX** and **EX**.

It is recommended that a PDF/X-1a writer not use the **BX**/**EX** operators.

6.16 Use of transparency

The **SMask** key shall not be used in an **ExtGState** object or in an **Image XObject** with any value other than *None*.

A **Group** object shall not be included in a **Form XObject** if it includes an **S** key with a value of *Transparency*.

The following keys, if present in an **ExtGState** object, shall have the following values:

— **BM** *Normal* or *Compatible*

— **CA** *1.0*

— **ca** *1.0*

NOTE These provisions prohibit the specification of partial or full transparency within the file. The visual effect of partially transparent graphics can be achieved using techniques other than the use of the PDF 1.4 transparency keys, including pre-rendered data or flattened vector objects. The use of such techniques does not prevent a file from being PDF/X compliant.

6.17 Viewer preferences

If **BleedBox** is present and if the **ViewerPreferences** dictionary contains the **ViewArea**, **ViewClip**, **PrintArea** or **PrintClip** keys, each of these keys present shall have the value *MediaBox* or *BleedBox*.

A PDF/X-1a reader may ignore values supplied in the **ViewerPreferences** dictionary.

Annex A
(informative)

PDF feature summary

Table A.1 lists those PDF objects, and keys within those objects, where the requirements of PDF/X-1a vary from those of the *PDF Reference*. Each record in the table notes the status of the object, or key, and the section of this specification where the status is defined. The following statuses are used:

— Required — A conforming file shall contain this object or key.

— Prohibited — A conforming file shall not contain this object or key.

— Restricted — Certain values or combinations of values with contents are required or prohibited. See the section(s) referenced for full details.

— Recommended — It is recommended that all conforming files include this key.

A conforming PDF/X-1a file also conforms to the *PDF Reference*; that is, it includes all objects, keys and values noted as required in that manual, and may not contain objects, keys or values which are prohibited by the manual, singly or in combination. A conforming reader may support all other objects, keys and values as defined in the normative references specifying PDF file structure as desired. If a reference to a PDF dictionary object is included in the table, but keys within that object are not explicitly listed, then all keys within that object and its descendants (if any) inherit their status from the item that is shown in the table. If any key within a dictionary object is explicitly listed in the table, then a conforming reader is not required to support any other keys (or their descendants) within that object type unless they are required by the *PDF Reference*; neither are other keys prohibited.

An object is descendant from another object (called the ancestor) if one of the following holds:

a) it is the value of a key in the ancestor object;

b) the ancestor object is an array and the descendant object is an element of that array;

c) the descendant object is a descendant of a descendant of the ancestor object.

If a key or object is noted as required, all ancestor objects required to access it from the document's **trailer** are also required; e.g. the **Trapped** key in the **Info** object is required; therefore, the **Info** object itself is required.

All operators defined in the normative references for use in PDF Contents streams may be included in a conforming PDF/X-1a file, except for the following.

— **PS** (execute in-line PostScript) see 6.10,

— **rg** (set fill colour in RGB) see 6.2.1,

— **RG** (set stroke colour in RGB) see 6.2.1.

The following are operators that a conforming reader is expected to parse in a **Contents** stream, but is not required to act on beyond removing appropriate numbers of objects from the operand stack.

— **BX** begin section where undefined page operators are not reported;

— **EX** end section where undefined page operators are not reported,

— **BMC** begin marked content;

— **BDC** begin marked content with property list;

— **EMC** end marked content;

— **MP** mark point;

— **DP** mark point with property list.

Table A.1 — PDF objects for which the PDF/X-1a requirements vary from the *PDF Reference*

Objects	Keys	Status	Reference
Trailer	**ID**	Required	6.7
	Encrypt	Prohibited	6.11
Info	**CreationDate**	Required	6.7
	Creator	Recommended	6.7
	GTS_PDFXVersion	Required	6.7
	ModDate	Required	6.7
	Producer	Recommended	6.7
	Title	Required	6.7
	Trapped	Required	6.6
Catalog	**OutputIntents**	Required	6.2.2
Page	**ArtBox**	Restricted	6.8
	TrimBox	Restricted	6.8
Resources	**ColorSpace**	Restricted	6.2
	PS XObject	Prohibited	6.10
Alternate	**Image XObject**	Restricted	6.12
ExtGState	**HTP** (Halftone Phase)	Prohibited	6.9
	HT (Halftone)	Restricted	6.9
	TR (Transfer Function)	Prohibited	6.9
	TR2 (Transfer Function)	Prohibited	6.9
	BM	Restricted	6.16
	CA	Restricted	6.16
	ca	Restricted	6.16
	SMask	Restricted	6.16
Font	**FontDescriptor**	Required if text in fonts other than Type 3 is used	6.3
FontDescriptor	**FontFile** or **FontFile2** or **FontFile3**	Required if text in Type 1, Truetype, or Type 1 Compact font is used, depending on font type[a]	6.3
Form XObject	**Group**	Restricted	6.16
	Subtype2	Restricted	6.10
Annotation dictionaries	**Rect**	Restricted	6.13
TrapNet annotation	**FontFauxing**	Restricted	6.6
	PCM	Restricted	6.6
Action Dictionaries	All	Prohibited	6.14
File specification	All	Prohibited	6.4
Streams	**Filter**	Restricted	6.5

[a] Type 1 Compact fonts are sometimes described as CFF fonts.

Annex B
(informative)

Metadata

The PDF/X-2 conformance level, specified in Part 5 of this International Standard, may reference either or both PDF/X-1a and PDF/X-3 files. When a PDF/X-1a file is referenced from a PDF/X-2 file, it must include some data beyond that required for conformance with this part of this International Standard. This allows the PDF/X-2-compliant file reader to verify that the correct file has been identified.

Inclusion of the same metadata is recommended in other circumstances where positive validation of file identity is of value, such as when PDF/X-1a files are referenced in EDI exchanges.

Vendors of PDF/X-1a-compliant writers are encouraged to design their products in such a way that this additional metadata can be included.

The additional PDF/X-2 requirements for referenced PDF/X-1a files are as follows.

a) The **Catalog** must contain the **Metadata** key. The metadata stream that forms the value of that key must conform to *XMP – Extensible Metadata Platform*[10] and must contain the **xapMM:DocumentID**, **xapMM:VersionID** and **xapMM:RenditionClass** properties. In most instances the value of the **xapMM:RenditionClass** will be *"default"*.

b) The value of the **xapMM:DocumentID** property must be a UUID style ID (a 128-bit number), and should be generated in such a way that there is a high probability that it is unique. There are various common schemes for generating a unique identifier. While Part 5 of this International Standard does not specify a particular scheme, the algorithms set out in ISO/IEC 11578:1996[2] and DCE 1.1[6] are recommended.

c) The metadata stream that forms the value of the **Metadata** keys in the **Catalog** dictionary may contain additional properties.

d) If the **Info** dictionary is modified, the value of its **ModDate** key must be updated and the metadata for the document should also be updated.

e) If the value of the **ModDate** key in the **Info** dictionary is later than the modification date in the metadata for the document, it indicates to other applications that the metadata is possibly outdated.

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