



BSI Standards Publication

Graphic technology — Prepress digital data exchange using PDF

Part 7: Complete exchange of printing data (PDF/X-4) and partial exchange of printing data with external profile reference (PDF/X-4p) using PDF 1.6

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National foreword

This British Standard is the UK implementation of ISO 15930-7:2010. It supersedes BS ISO 15930-7:2008 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PAI/43, Graphic technology.

A list of organizations represented on this committee can be obtained on request to its secretary.

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**Graphic technology — Prepress digital
data exchange using PDF —**

Part 7:

**Complete exchange of printing data
(PDF/X-4) and partial exchange of printing
data with external profile reference
(PDF/X-4p) using PDF 1.6**

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

*Partie 7: Échange complet de données d'impression (PDF/X-4) et
échange partiel de données d'impression avec une référence de profil
externe (PDF/X-4p) utilisant le PDF 1.6*



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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.

ISO 15930-7 was prepared by Technical Committee ISO/TC 130, *Graphic technology*.

This second edition cancels and replaces the first edition (ISO 15930-7:2008), of which it constitutes a minor revision to incorporate the following changes:

- move informative references, ISO 15930-1, ISO 15930-3, ISO 15930-4 and ISO 15930-6, from the normative references to the Bibliography (Clause 2);
- remove unnecessary definitions for PDF/X-1a and PDF/X-3 (Definitions 3.18 to 3.21);
- adopt the changes to the transparency blend mode algorithms as provided by Adobe Systems (Clause 4);
- remove inaccurate and confusing statements in the bulleted list as well as the note of Clause 5;
- correct issues with proper validation of font encoding and widths (6.5.2, 6.5.3 and 6.5.4);
- correct issues with how to encode metadata (6.10);
- clarify some issues about annotations (6.17);
- remove the restrictions on the Orders key in Optional Content, thus enabling more flexible workflows (6.24).

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)*

- *Part 7: Complete exchange of printing data (PDF/X-4) and partial exchange of printing data with external profile reference (PDF/X-4p) using PDF 1.6*
- *Part 8: Partial exchange of printing data using PDF 1.6 (PDF/X-5)*

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 form and the subsequent printing can take place at different locations. Some of these elements can 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 can be in either vector or raster data structures.

The various parts of ISO 15930 define a number of conformance levels intended to address different requirements; all define data formats and their usage to permit the predictable dissemination of a compound entity to one or more locations. These goals are accomplished by defining a specific use of the publicly available Adobe Portable Document Format (PDF). In order to achieve a level of exchange that avoids any ambiguity in interpretation of the file, a limited set of PDF objects that are permitted to be used is identified and restrictions to the use, or form of use, of those objects, and/or keys within those objects are added.

In some environments the data exchange needs to be 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 files, 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 “complete” or “blind” exchange. It is platform- and transport-independent. Whereas many production workflows benefit from the exchange of complete material, with all elements present, there are circumstances when this is not appropriate. In certain workflows, some or all of the referenced elements might be more logically present at the receiving site, or might be exchanged at a different time. These include high-resolution contone-image files, line-art files, ICC profiles, etc. These exchanges will generally require prior agreement between sender and receiver.

In some environments, the exchange needs to be restricted to CMYK (and spot colour) data, whilst in others it is more appropriate to convey it as colour-managed, CMYK, gray, RGB, and/or spot colour, or to use alternative process colour models.

Several new versions of the PDF specification have been issued since the publication of ISO 15930-1 in 2001. More recent parts of ISO 15930 expand and extend earlier parts by reference to later versions of the PDF specification.

Table 1 summarizes the conformance levels defined in the various parts of ISO 15930.

Table 1 — PDF/X conformance levels

Conformance level	Part of ISO 15930	Complete exchange	Colour-managed data permitted	Print characterization spaces supported	PDF version
PDF/X-1:2001	1	Yes	No	CMYK	1.3
PDF/X-1a:2001	1	Yes	No	CMYK	1.3
PDF/X-1a:2003	4	Yes	No	CMYK	1.4
PDF/X-2:2003	5	No	Yes	Gray, RGB, CMYK	1.4
PDF/X-3:2002	3	Yes	Yes	Gray, RGB, CMYK	1.3
PDF/X-3:2003	6	Yes	Yes	Gray, RGB, CMYK	1.4
PDF/X-4	7	Yes	Yes	Gray, RGB, CMYK	1.6
PDF/X-4p	7	No	Yes	Gray, RGB, CMYK	1.6
PDF/X-5g	8	No	Yes	Gray, RGB, CMYK	1.6
PDF/X-5n	8	No	Yes	n-colorant	1.6
PDF/X-5pg	8	No	Yes	Gray, RGB, CMYK	1.6

This part of ISO 15930 specifies the PDF/X-4 conformance level, which incorporates all of the features available in the PDF/X-1a and PDF/X-3 conformance levels defined in ISO 15930-1, ISO 15930-3, ISO 15930-4 and ISO 15930-6, and adds the following.

- The referenced version is PDF 1.6 (rather than PDF 1.3 in ISO 15930-1 and ISO 15930-3; and PDF 1.4 in ISO 15930-4 and ISO 15930-6).
- The use of PDF transparency, as defined in PDF 1.4 and later, has been allowed.
- The use of optional content (often known as layers) has been allowed, to enable regional versioning, for example.
- Some features of PDF, defined in PDF 1.6 and earlier versions, have been disallowed in this part of ISO 15930.

In addition, this part of ISO 15930 specifies the PDF/X-4p conformance level. PDF/X-4 requires that an ICC profile that describes the characterization of the printing condition for which the exchanged file was prepared be embedded. PDF/X-4p allows the ICC profile to be maintained externally to the exchanged file. This is especially useful in those situations where the size of the ICC profile is large in comparison with the size of the file to be exchanged; where there are a very large number of files to be exchanged that have been prepared for the same printing condition, tone and gamut compression and black generation; or where there are licensing issues that preclude embedding.

Due consideration needs to be given to the increased potential for issues requiring technical discussion between file submitters and receivers when determining whether to use the PDF/X-4p conformance level in preference to PDF/X-4. In addition, it is likely that a larger proportion of receiving sites will be capable of accepting and correctly processing PDF/X-4 files. PDF/X-4 is preferred to PDF/X-4p where there is no significant benefit in the use of the latter.

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 is required to be able to read and appropriately process all files conforming to a specified conformance level,

and all files that conform to sets of previously standardized conformance levels, as defined within this part of ISO 15930.

All parts of ISO 15930 define requirements and restrictions on the process of rendering PDF/X files for viewing and print, in addition to the requirements and restrictions of elements and structures within the files themselves. In some circumstances it might be appropriate to render files without rigid adherence to the provisions of ISO 15930, but it is important to be aware that such renderings do not conform to PDF/X.

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 can be accommodated.

Users of this part of ISO 15930 are cautioned that they are expected to be familiar with the documents listed as normative references and the terms used within those documents. This part of ISO 15930, like all of the other parts, prescribes specific uses of, and limitations on the use of, the *PDF Reference* and its associated supporting documents.

An ongoing series of Application Notes (see Reference [11]) 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/toolspdfx.html>>.

A number of other International Standards, defining focussed subsets of the Portable Document Format in areas other than the graphic arts, are either published or under development, including PDF/A (see Reference [8]). Where possible, PDF/X has been designed to allow a single file to comply both with PDF/X and with these other conformance levels.

Graphic technology — Prepress digital data exchange using PDF —

Part 7:

Complete exchange of printing data (PDF/X-4) and partial exchange of printing data with external profile reference (PDF/X-4p) using PDF 1.6

1 Scope

This part of ISO 15930 specifies the use of the Portable Document Format (PDF) Version 1.6 for the dissemination of digital data intended for print reproduction. When all elements necessary for final print reproduction are contained within the file, it is designated as PDF/X-4. If a required ICC profile is externally supplied and unambiguously identified, it is designated as PDF/X-4p.

Colour-managed, CMYK, gray, RGB or spot colour data are supported, as are PDF transparency and optional content. Files can be prepared for use with gray, RGB and CMYK printing characterizations.

2 Normative references

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

ISO/IEC 10646, *Information technology — Universal Multiple-Octet Coded Character Set (UCS)*

ISO/IEC 10918-1:1994, *Information technology — Digital compression and coding of continuous-tone still images: Requirements and guidelines*

ISO/IEC 14492:2001, *Information technology — Lossy/lossless coding of bi-level images*

ISO 15076-1:2005, *Image technology colour management — Architecture, profile format and data structure — Part 1: Based on ICC.1:2004-10*

ISO/IEC 15444-2:2004, *Information technology — JPEG 2000 image coding system: Extensions*

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

ICC.1:2001-12, *File Format for Color Profiles (Version 4.0.0)*, International Color Consortium (available from <<http://www.color.org/>>)

ICC.1:2003-09, *File Format for Color Profiles (Version 4.1.0)*, International Color Consortium (available from <<http://www.color.org/>>)

Adobe PDF Reference Guide, fifth edition, version 1.6, ISBN 0-321-30474-8 (available from <<http://www.npes.org/standards/toolspdfx.html>>)

Adobe Supplement to ISO 32000-1, BaseVersion 1.7, ExtensionLevel 5, Adobe Systems Incorporated. (available from <http://www.adobe.com/devnet/acrobat/pdfs/adobe_supplement_iso32000_1.pdf>)

Errata for Adobe PDF Reference, fifth edition, version 1.6, 31 August 2005 (available from <<http://www.npes.org/standards/toolspdfx.html>>)

*PDF Blend Modes: Addendum*¹⁾. Adobe Systems Incorporated, January 23, 2006 (available from <<http://www.npes.org/standards/toolspdfx.html>>)

XMP Specification, June 2005, Adobe Systems Incorporated (available from Internet <<http://www.npes.org/standards/toolspdfx.html>>)

Extensible Markup Language (XML), version 1.0. W3C Recommendation, 3rd edn., 4 February 2004 (available from <<http://www.w3.org/TR/2004/REC-xml-20040204>>)

RDF/XML Syntax Specification (Revised), W3C Recommendation, 10 February 2004 (available from <<http://www.w3.org/TR/2004/REC-rdf-syntax-grammar-20040210/>>)

RFC 3629, UTF-8, a transformation format of ISO 10646 (available from <<http://www.ietf.org/rfc/rfc3629.txt>>)

3 Terms and definitions

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

**3.1
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

**3.2
characterized printing condition**
printing condition 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 preferable 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.

**3.3
CMYK**
subtractive process colour model where the channels are called Cyan, Magenta, Yellow and Black

**3.4
compound entity**
unit of work with all text, graphics and image elements prepared for final print reproduction that might represent a single page for printing, a portion of a page or a combination of pages

**3.5
conformance level**
identified set of restrictions and requirements with which files, readers and writers are required to comply

1) Addendum to *Adobe PDF Reference Guide*, fifth edition, version 1.6, containing additional information about the blend modes for PDF transparency.

3.6

default colour space

PDF colour space named DefaultGray, DefaultRGB or DefaultCMYK that provides an indirect method of specifying the colour space of elements

3.7

device colour space

device colour space, as specified in the *PDF Reference*

NOTE This term is used within this part of ISO 15930 specifically within the context of the *PDF Reference*, and not in a more general way.

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 can be glyphs or other graphic elements

3.10

font metrics

set of information in a font representation used for defining the dimensions and positioning of each glyph shape

3.11

glyph

recognizable abstract graphic symbol that is independent of any specific design

NOTE Adapted from ISO/IEC 9541-1. See Reference [1].

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 ISO 15076-1:2005 or any one of the ICC.1

3.14

job ticket

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

NOTE Job tickets as defined here include only data intended to affect the rendered appearance of the file. See References [9] and [10].

3.15

non-print element

element not intended for final print reproduction

NOTE See 6.1.3.

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-4

PDF/X-4 conformance level defined in this part of ISO 15930

3.19

PDF/X-4p

PDF/X-4p conformance level defined in Annex A of this part of ISO 15930

3.20

print element

element intended for final print reproduction

NOTE See 6.1.

3.21

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** (3.2).

3.22

process colorant

additive or subtractive colorant whose characteristics (colour, transparency, etc.) make it suitable to combine with other colorants to form secondary or tertiary colours

3.23

process colour model

colours, defined in a colour coordinate system, produced by a set of **process colorants** (3.22)

NOTE See **CMYK** (3.3), **RGB** (3.25).

3.24

reader

software application that is able to read and appropriately process files

3.25

RGB

additive process colour model where the channels are called Red, Green and Blue

3.26

spot colour

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

3.27

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 registration

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

3.28

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 PDF 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 ISO 15930, references to “*PDF Reference*” are to the *Adobe PDF Reference Guide, fifth edition, version 1.6*, as modified by *Errata for PDF Reference, fifth edition, version 1.6*, by *Blend Modes: Addendum* and by *Adobe Supplement to ISO 32000-1, BaseVersion 1.7, ExtensionLevel 5, Section 3*.

5 PDF/X-4 conforming files and equipment

This part of ISO 15930 specifies the use of the PDF file format for the exchange of digital data representing a compound entity. Specific requirements for conformance with PDF/X-4p are given in Annex A.

A PDF/X-4 conforming file is a PDF file in which those features necessary for the exchange of a compound entity are in accordance with this part of ISO 15930. A PDF/X-4 conforming file may also include other valid PDF features that do not affect final print reproduction of the compound entity.

Conformance with PDF/X-4 is identified by use of the **pdfid:GTS_PDFXVersion** property, as specified in 6.11. 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 specifying conformance to PDF/X-4.

Although the *PDF Reference* permits compliance with earlier versions of PDF, features described in versions of the PDF specification earlier than PDF 1.6, but not described in the *PDF Reference*, this part of ISO 15930 recommends that such features not be used in a PDF/X-4 conforming file. Such features can be ignored by a PDF/X-4 reader.

A PDF/X-4 conforming writer is a software application that is able to write files in accordance with the requirements of the PDF/X-4 conformance level specified in this part of ISO 15930.

A PDF/X-4 conforming reader is a software application that is able to read and appropriately process, according to the rules defined in this part of ISO 15930, all files conforming to the requirements for PDF/X-4 files as defined in this part of ISO 15930.

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 PDF/X-4 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 ISO 15930 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 PDF/X-4 conforming file specifies **pdf: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 **pdf:Trapped=True**, a conforming reader is required to ignore any trapping information in an embedded job ticket.

EXAMPLE 2 (Screening) A PDF/X-4 conforming reader can use embedded job ticket information to determine the screening to be used to render the file. Note that a PDF/X-4 conforming reader is permitted to ignore screening information in the PDF/X-4 file (see 6.13). A conforming reader might use screening data from the PDF/X-4 file, from the job ticket, or from local system defaults.

6 Technical requirements

6.1 General

6.1.1 PDF/X-4 is a restricted subset of PDF, as defined in the *PDF Reference*. The PDF features that shall be required, prohibited or restricted are specified in 6.1.2 to 6.27 inclusively, and are summarized for information in Annex B. These features shall be used as prescribed in the *PDF Reference* and as further restricted by this part of ISO 15930.

6.1.2 In order to achieve blind exchange, 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 used.

NOTE 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.

6.1.3 A PDF/X-4 conforming file may contain two classes of elements:

- a) those intended for final print reproduction (print elements);
- b) those not intended for final print reproduction (non-print elements).

Except as specified below, print elements are those drawn or referenced (directly or indirectly), using keys and values defined in the *PDF Reference*, from:

- the **Contents** stream(s) of **Page** objects; or
- the **AP** stream of any **TrapNet** or **PrinterMark** annotation placed on any page.

All optional content that would be regarded as print elements if not contained in an optional content group shall be regarded as print elements, whether rendered in a specific instance or not.

Image XObjects that are only referenced from within the **Alternates** array of an **Image XObject** are non-print elements.

All other elements within the file are non-print elements.

6.1.4 A PDF/X-4 conforming file is created with a specific intended visual appearance. Where a PDF/X-4 file is printed or viewed on a system that differs from that intended by the creator, the PDF/X-4 conforming reader shall reproduce the intended visual appearance as closely as possible. Examples of such systems are those where the device colour space does not match that identified in the output intent (see 6.4.2.1), or where spot-colour separations specified in **Separation** or **DeviceN** colour spaces are printed using process colorants (see 6.4.3.4). This applies both to production printing and to hard- and soft-proofing that predicts that production print.

NOTE Amongst other things, transformations between colour spaces affect colour reproduction, overprints, trapping, transparency and smooth shading.

6.2 Non-print elements

Non-print elements may make use of any PDF feature that does not affect the rendered appearance of print elements (JavaScript and Actions may be used to change the rendered appearance and are therefore prohibited).

The requirements of this Clause 6 shall not apply to either the appearance stream of non-print elements, or to any resources referenced exclusively by those appearance streams.

Non-print elements may make use of any PDF colour space and the provisions of 6.4.2 and 6.4.3 do not apply to non-print elements.

6.3 Complete exchange

All components of a compound entity intended for PDF/X-4-compliant complete exchange that affect rendering shall be contained in the body of a single PDF/X-4 file.

In this context, “complete” means the exchanged files shall include

- all PDF resources (as listed in the *PDF Reference*) used in print elements, including all fonts, font metrics, font encodings, and colour space resources, and
- all print elements, properly prepared for a single characterized printing condition.

6.4 Colour

6.4.1 General

Print elements may be exchanged either as output device code values or as colorimetrically defined data. However, both types of data, if present in print elements in a PDF/X-4 file, shall be prepared for the single characterized printing condition identified in the PDF/X-4 output intent prior to exchange.

The characterized printing condition shall have one colour channel (grayscale), three colour channels (RGB) or four colour channels (CMYK).

NOTE For the use of n-colorant characterized printing conditions in PDF/X, see the PDF/X-5n conformance level, as specified in ISO 15930-8.

Colorimetrically-defined data shall be described either using an ICC profile in an **ICCBased** colour space or using an equivalent mechanism, namely a **CalGray**, **CalRGB** or **Lab** colour space. Device code values may be defined in **DeviceRGB**, **DeviceCMYK**, **DeviceGray**, **Separation**, and **DeviceN** colour spaces as specified and restricted by 6.4.3.

6.4.2 Identification of characterized printing condition

6.4.2.1 Output intents

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-4 conforming reader.

NOTE 1 Multiple output intent dictionaries might be required, for instance, if a file is created to conform with both PDF/X-4 and with PDF/A-1 (see Reference [8]). Creators of PDF/X-4 writers and readers need to be aware that the PDF/A-1 standard (ISO 19005-1) places restrictions on the value of **DestOutputProfile**, where present, in all output intent dictionaries, and not only in the PDF/A output intent dictionary.

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 **OutputConditionIdentifier** key is the mechanism provided in PDF/X-4 to uniquely identify the printing condition for which the data in the file is intended. This should be done using the ICC registry or some other public registry, where possible. Where that is not possible, unique descriptions of the intended printing condition should be included and such terms as Custom should not be used.

NOTE 2 The recipient of a PDF/X-4 file needs to be able to validate that it has been properly prepared for the printing condition under which it will be printed, or that it can be appropriately transformed for the printing condition in use.

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), the **RegistryName** key shall have the value <http://www.color.org>.

NOTE 3 At the time of publication of this part of ISO 15930, the registry can be found at <http://www.color.org/registry2.html>.

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 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.

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.

The **DestOutputProfile** key shall be present, and the **DestOutputProfileRef** key shall not be present, in the PDF/X output intent.

NOTE 4 The **DestOutputProfileRef** key is defined in Annex A.

If some or all colour data are not supplied in the process colour model of the characterized printing condition, the profile that is the value of the **DestOutputProfile** key shall be used to transform the colour data provided into the process colour model of the characterized printing condition.

The profile that is the value of the **DestOutputProfile** key shall be an Output Device Profile (Device Class = "prtr") as defined in ICC.1:1998-09, ICC.1:2001-12, ICC.1:2003-09 or ISO 15076-1:2005 and shall be interpreted as representing the intended printing condition. If present in the **DestOutputProfile** stream object, the **Alternate** key shall be ignored by a PDF/X-4 conforming reader. The values of the **profileDescriptionTag** and **charTargetTag**, if present in the ICC profile, shall not be used to identify the intended printing condition.

NOTE 5 The *PDF Reference* allows the use of all versions of ICC profiles up to ICC.1:2003-09. For practical reasons based on the behaviour of profile creation software, this part of ISO 15930 also allows the use of ISO 15076-1:2005, which is believed to be technically identical in all respects relevant to its use here, other than the value of the profile version number. This means that a PDF/X-4 conforming reader needs to be capable of using ICC v4 profiles. Therefore, ICC v4 profiles can be used whenever it is practicable to do so, in order to take advantage of the improved consistency of the definition of profile connection spaces and the capability of additional metadata.

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 6 For characterized printing conditions in the ICC registry, more information can be obtained at <http://www.color.org/<condition>.html>, where <condition> is the **OutputConditionIdentifier**, with spaces and other characters prohibited in a URL escaped following normal URL rules. Authors of PDF/X-4 writers might consider using the value of the **Printing process definition** on the ICC Web site for the value of the **OutputCondition** key, after suitable localization.

NOTE 7 The *PDF Reference* specifies that the **Info** key be present if **OutputConditionIdentifier** does not refer to a characterization in the ICC Registry. The PDF/X-1a:2001 and PDF/X-3:2002 conformance levels recommended the use of the **Info** key rather than the **OutputCondition** key.

6.4.2.2 Gray characterizations

If the characterized printing condition identified by the PDF/X output intent dictionary is a gray condition, the restriction of this subclause apply.

A PDF/X-4 conforming reader shall treat any data in the file using a **DeviceGray** colour space as being the same gray as identified by the PDF/X output intent object.

NOTE Interpretation of device spaces can be amended by the use of indirect colour spaces as described in 6.4.3.1.

6.4.2.3 RGB characterizations

If the characterized printing condition identified by the PDF/X output intent dictionary is an RGB condition, the restrictions of this apply.

A PDF/X-4 conforming reader shall treat any data in the file using a **DeviceRGB** colour space as being the same RGB as identified by the PDF/X output intent object.

NOTE Interpretation of device spaces can be amended by the use of indirect colour spaces as described in 6.4.3.1. If a **DeviceGray** colour space is used for print elements in association with an RGB characterization, the PDF Reference requires it to be accompanied by a **DefaultGray** colour space. See also 6.4.3.2.

6.4.2.4 CMYK characterizations

If the characterized printing condition identified by the PDF/X output intent dictionary is a CMYK condition, the restrictions of this subclause apply.

A PDF/X-4 conforming reader shall treat any data in the file using a **DeviceCMYK** colour space as being the same CMYK as identified by the PDF/X output intent object.

A PDF/X-4 conforming reader shall treat any data in the file using a **DeviceGray** colour space as colorimetrically the same as the black channel of the CMYK identified by the PDF/X output intent object.

NOTE 1 Interpretation of device spaces can be amended by the use of indirect colour spaces as described in 6.4.3.1.

NOTE 2 The overprint characteristics of **DeviceGray** and **DeviceCMYK** differ when overprint mode is set to 1. In that state, **DeviceGray** will continue to knock out all of the CMYK channels of any underlying element, whereas an element defined in **DeviceCMYK** (other than an image or smooth shading) will only knock out underlying elements in those process colorants where the colour value in the overprinting element is not zero.

6.4.3 Element colour spaces

6.4.3.1 Indirect colour spaces

The default colour space mechanism is an indirect method of specifying a colour space. A device colour space for which a matching default colour space is present shall be interpreted as if the elements were specified using the default colour space.

NOTE 1 In most cases, a default colour space is defined in a device independent manner, but this is not required by the *PDF Reference*.

NOTE 2 Elements drawn in **DeviceCMYK** when a **DefaultCMYK** colour space is defined (that is not, itself, **DeviceCMYK**) always knock out other CMYK elements; therefore, overprint mode is not applicable.

Indexed and **Pattern** colour spaces are also indirect methods of specifying colour. All the requirements of 6.4.3 apply to the *underlying* colour spaces of **Indexed** and **Pattern** colour spaces.

6.4.3.2 Device colour spaces

Device colour spaces may be used for print elements only if:

- they match the space specified in the PDF/X output intent; or
- the PDF/X output intent specifies a CMYK print characterization, and the device colour space is **DeviceGray**.

NOTE Default colour spaces can be used to provide indirection from device colour spaces to device-independent spaces (see 6.4.3.1).

6.4.3.3 ICCBased colour spaces

A PDF/X-4 conforming reader shall use the ICC profile and shall not use the **Alternate** colour space in the **Stream** dictionary of an **ICCBased** colour space.

The profile that forms the stream of the **ICCBased** colour space shall conform to ISO 15076-1:2005, ICC.1:1998-09, ICC.1:2001-12 or ICC.1:2003-09.

NOTE 1 The *PDF Reference* allows the use of all versions of ICC profiles up to ICC.1:2003-09. For practical reasons based on the behaviour of profile creation software, this part of ISO 15930 also allows the use of ISO 15076-1:2005, which is believed to be technically identical in all respects relevant to its use here, other than the value of the profile version number.

When a four-colour **ICCBased** colour space is used for strokes, fills, text or image masks that are set to overprint, and when the characterized printing condition is CMYK, overprint mode shall be zero.

NOTE 2 This avoids unpredictable overprinting behaviour when overprint mode is 1 if implicit colour conversion is applied as described on p. 229 of the *PDF Reference*.

A four-colour **ICCBased** colour space shall not be used where the profile is identical to that in the PDF/X output intent. Profiles shall be treated as identical if:

- the **ICCBased** colour space and the output intent use indirect references to the same embedded profile stream; or
- MD5 hash values for the two profiles are the same. MD5 values are read from the value of the **Profile ID** field within each profile, if present and if not set as zero. If no MD5 value is included in each profile, then a value shall be calculated following the methodology set out in of ISO 15076-1:2005, 7.2.18.

NOTE 3 This avoids the possibility of output differing depending on whether a renderer applies the implicit colour conversion described on p. 229 of the *PDF Reference*.

6.4.3.4 Separation and DeviceN (including NChannel) colour spaces

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

A PDF/X-4 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 colour names shall be assumed to be independent colorants on the intended output device.

It is the responsibility of the originator of the PDF/X-4 conforming file to ensure consistent use of spot colour names across all elements in the file. It is preferable that industry-recognized names be used wherever possible. The use of colour names “Red”, “Green”, “Blue” or “Gray” or any translated names of “Cyan”, “Magenta”, “Yellow”, “Black” or “Gray” as names for spot colours will lead to confusion and is therefore discouraged.

For any spot colour used in a **DeviceN** colour space, an entry in the **Colorants** dictionary shall be present. All **Separation** arrays within a single PDF/X-4 file (including those in **Colorants** dictionaries) that have the same *name* shall have the same *tintTransform* and *alternateSpace*. In evaluating equivalence, the PDF objects should be compared rather than the computational result of the use of those objects. Compression and whether or not an object is direct or indirect shall be ignored.

This implies that a PDF/X-4 writer might need to synchronize multiple *alternateSpace* and *tintTransform* entries when creating a PDF/X-4 file. Tools that aggregate PDF/X-4 files in a context where they will be further exchanged as PDF/X-4 also need to take special care with files that contain conflicting *tintTransforms* for spot colours with the same name.

The **Separation** arrays in the **Colorants** dictionary of **DeviceN** colour spaces should be consistent with the *tintTransform* and *alternateSpace* of the **DeviceN** colour space itself. All *NChannel* blending algorithms within a single PDF/X-4 file should produce a similar appearance for colours with the same name when they are used in **Separation** and **DeviceN** colour spaces.

Where a PDF/X-4 reader needs to convert a spot colour to process colours (e.g. for display on a screen or a proof simulation) the reader shall apply either the specified tint transformation function or invoke the same alternative blending algorithm for all **Separation** and **DeviceN** instances in the document using that spot colour.

NOTE In situations where spot-colour separations specified in **Separation** or **DeviceN** colour spaces are to be printed using process colorants, the alternative representation supplied in the **Separation** or **DeviceN** colour space can be used to perform that transformation. Alternatively, PDF/X-4 readers can use other data sources that better approximate the printed result, such as pre-defined look up tables or *NChannel* blending algorithms.

The **ColorSpace** entry of the **Process** dictionary referenced from the *attributes* dictionary of a **DeviceN** colour space shall represent **DeviceRGB**, **DeviceCMYK** or **DeviceGray**, to match the intended printing condition.

The **MixingHints** dictionary referenced from the colour space attributes dictionary of an *NChannel* **DeviceN** colour space shall not contain the **DotGain** key.

All **PrintingOrder** arrays within **MixingHints** dictionaries within a PDF/X-4 file shall be consistent with each other. All entries in all **Solidities** dictionaries within a PDF/X-4 file for the same ink shall have the same value.

A PDF/X-4 writer should only include values for **Solidities** and **PrintingOrder** keys in a **MixingHints** dictionary if specific information regarding the intended printing condition is available; default values should not be included.

The *alternateSpace* of **Separation** and **DeviceN** colour spaces shall be restricted by 6.4.

6.5 Fonts

6.5.1 Embedded fonts

Fonts that contain glyphs, related metrics, and font encodings for at least all the characters used shall be embedded within the file except for any font used exclusively with text rendering mode 3.

A PDF/X-4 reader shall use the embedded fonts (rather than other locally resident, substituted, or simulated fonts) for rendering and display.

NOTE The licence agreements for some fonts restrict their use, including embedding. The creator of the file is expected to ensure that all fonts are used in compliance with their licensing agreements.

6.5.2 Use of .notdef glyph

A PDF/X-4 compliant document shall not contain a reference to the .notdef glyph from any of the text drawing operators in any content stream.

NOTE 1 According to all applicable font specifications, the .notdef glyph is always required but only to be used as a fallback during rendering if the proper glyph is not available. This means that for any well-formed PDF file, there is never a need to use the .notdef glyph. At the same time, under certain circumstances, it can happen that a PDF file is not created properly, or that the necessary fonts are not properly embedded, which can lead to PDFs that happen to directly reference and thus use the .notdef glyph. Such instances of using the .notdef glyph are typically a clear indication that something went wrong.

NOTE 2 The .notdef glyph is a special glyph representing a missing character. As this part of ISO 15930 requires that all fonts be embedded (providing appropriate glyphs for all character codes used by a text rendering operator), the .notdef glyph is not allowed to be referenced.

6.5.3 Font metrics

For every font embedded in a conforming file and used for rendering, the glyph width information in the font dictionary and in the embedded font program shall be consistent.

NOTE This requirement is necessary to ensure predictable font rendering, regardless of whether a given reader uses the metrics in the font dictionary or those in the font program.

For additional consistency, a PDF/X-4 compliant reader shall ignore the glyph width information stored within the embedded font or CIDFont program if the **Widths, W** or **DW** key is present. If the **Widths, W** and **DW** keys are not present, the width data within the embedded font or CIDFont program shall be used.

6.5.4 Character encodings

All non-symbolic TrueType fonts shall specify *MacRomanEncoding* or *WinAnsiEncoding* either as the value of the **Encoding** entry in the font dictionary or as the value of the **BaseEncoding** entry in the dictionary that is the value of the **Encoding** entry in the font dictionary. If the value of the **Encoding** entry is a dictionary it shall not contain a **Differences** entry.

All symbolic TrueType fonts shall not specify an **Encoding** entry in the font dictionary, and their font programs' "cmap" tables shall contain exactly one encoding.

NOTE These requirements make normative the suggested guidelines described in PDF Reference, 5.5.5.

6.6 Encoding of name objects

Font names and separation names in PDF/X-4 conforming files (after expansion of # sequences, if any) shall be valid UTF-8 character sequences as defined in RFC 3629.

All characters in font names and separation names in a PDF/X-4 conforming file whose codes are outside the range 33 (!) to 126 (~) shall be represented by writing their 2-digit hexadecimal code, preceded by the number sign character (#).

NOTE These requirements make the recommendations set out in the *PDF Reference* 3.2.4 required for PDF/X-4.

All other name objects in a PDF/X-4 conforming file should adhere to the requirements set out in *PDF Reference* 3.2.4.

6.7 External and embedded files

Image and **Form XObjects** shall not contain the **OPI** key. **Form XObjects** shall not contain the **Ref** key.

All file specifications shall contain the **EF** key.

The **F** key shall not be used in a stream dictionary.

NOTE These provisions enforce the requirement that the entire job be submitted in a single file, whilst allowing the inclusion of embedded files that do not affect the rendered appearance of the pages.

6.8 Stream filters

All standard stream filters listed in the *PDF Reference* Table 3.5 may be used, with the exception of *LZWDecode* and *Crypt* which shall not be used. No filters that are not listed in *PDF Reference* Table 3.5 shall be used.

NOTE The *Crypt* filter is used to apply encryption and access control to the file.

Images compressed using the *DCTDecode* filter shall be created and read as defined in ISO/IEC 10918-1:1994.

Images compressed using the *JPXDecode* filter shall be created and read as defined in ISO/IEC 15444-2:2004.

Images compressed using the *JBIG2Decode* filter shall be created and read as defined in ISO/IEC 14492.

6.9 Trapping

The **pdf:Trapped** property in the document metadata stream shall be used when exchanging files. The **pdf:Trapped** property indicates the state of trapping within the file. If the entire file has not been trapped, then the value of the **pdf:Trapped** property shall be set to *False*. Otherwise, the entire file shall have been trapped as necessary, and the value of the **pdf:Trapped** property shall be set to *True*. Partially trapped files are not permitted. A value of *Unknown* for the **pdf:Trapped** property is prohibited in PDF/X-4 files. In a file that contains optional content the **pdf:Trapped** property indicates the status of trapping of all combinations of optional content that are intended for print production.

NOTE 1 See 6.10.2 for guidance concerning duplication of the **pdf:Trapped** property into the document information dictionary.

If a file contains one or more **TrapNet** annotations, the value of the **pdf:Trapped** property shall be *True*.

NOTE 2 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.

The value of the **PCM** key in the appearance dictionary of a **TrapNet** annotation shall match the colour space used by the characterized printing condition identified in the PDF/X output intent object.

6.10 Metadata and document identification

6.10.1 Properties

The document catalog dictionary of a PDF/X-4 conforming file shall contain the **Metadata** key. The metadata stream that forms the value of that key shall conform to *XMP Specification*. All metadata that are required by this part of ISO 15930 shall be embedded in the file in the form of one or more XMP packets. These packets shall be either defined by this part of ISO 15930 or as defined by the *XMP Specification*, Section 3.

The prefixes in Table 2 shall be used for all properties using the namespaces identified by the URIs listed.

Table 2 — Required mappings between namespace URIs and their prefixes

URI	Prefix
<http://purl.org/dc/elements/1.1/>	dc
<http://ns.adobe.com/pdf/1.3/>	pdf
<http://ns.adobe.com/xap/1.0/>	xmp
<http://ns.adobe.com/xap/1.0/mm/>	xmpMM
<http://www.npes.org/pdfx/ns/id/>	pdfxid

Metadata object stream dictionaries shall not contain the **Filter** key.

NOTE The explicit prohibition of the **Filter** key has the implicit effect of preserving the contents of XMP metadata streams as plain text that is visible to non-PDF aware tools.

6.10.2 Document information dictionary

A document information dictionary may appear within a PDF/X-4 conforming file. If it does appear, then all of its entries that have analogous properties in predefined XMP schemas, as defined by Table 3, shall also be embedded in the file in XMP form with equivalent values. Any document information dictionary entry not listed in Table 3 shall not be embedded using a predefined XMP schema property.

NOTE 1 Some XMP properties are required by this part of ISO 15930. There is no requirement that all such keys be mirrored in the document information dictionary.

NOTE 2 Most implementations of PDF and XMP will place “document information dictionary entries not listed in Table 3” into the PDF eXtension, pdfx, (<http://ns.adobe.com/pdfx/1.3/>) schema. The similarity of the “pdfx” name space to “PDF/X” as used in this document is coincidental.

Table 3 — Crosswalk between document information dictionary and XMP properties

Document information dictionary Entry	PDF type	XMP	
		Property	XMP type
Title	text string	dc:title["x-default"]	Text
Author	text string	dc:creator[0]	ProperName
Subject	text string	dc:description["x-default"]	Text
Keywords	text string	pdf:Keywords	Text
Creator	text string	xmp:CreatorTool	AgentName
Producer	text string	pdf:Producer	AgentName
CreationDate	date	xmp:CreateDate	Date
ModDate	date	xmp:ModifyDate	Date
Trapped	name	pdf:Trapped	Text
GTS_PDFXVersion	text string	pdfxid:GTS_PDFXVersion	Text

The value of **GTS_PDFXVersion** in the document information dictionary, if present, shall be encoded in PDFDocEncoding; Unicode encoding shall not be used.

The values of the document information dictionary entries and their analogous XMP properties shall be equivalent. For properties that map from the PDF *text string* type to the XMP *Text* type, value equivalence shall be on a character-by-character basis, independent of encoding, comparing the numeric ISO/IEC 10646 code points for the characters.

NOTE 3 The explicit requirement for equivalence between the values of the document information dictionary entries and their analogous XMP properties has the implicit effect of providing unambiguous interpretation of that property's value.

If the **Author** entry is present in the document information dictionary and the **dc:creator** property is present in XMP metadata then **dc:creator** shall be represented by an ordered Text array with a single entry. Equivalence between **Author** and **dc:creator[0]**, shall be on a character-by-character basis, independent of encoding, comparing the numeric ISO/IEC 10646-1 code points for the characters.

EXAMPLE 1 The document information dictionary entry:

```
/Author (Peter, Paul, Mary)
```

is equivalent to the XMP property:

```
<dc:creator>
  <rdf:Seq>
    <rdf:li>Peter</rdf:li>
    <rdf:li>Paul</rdf:li>
    <rdf:li>Mary</rdf:li>
  </rdf:Seq>
</dc:creator>
```

Date properties are formatted as a variable-length sequence of temporal components ranging in granularity: year, month, day, hour, minute, second. For properties that map between the PDF *date* type, defined by the *PDF Reference*, 3.8.3, and the XMP *Date* type, defined by *Date and Time Formats*, value equivalence shall be on a component-by-component basis, relative to Coordinated Universal Time (UTC), i.e. correcting for local time zone offset.

EXAMPLE 2 The document information dictionary entries:

```
/CreationDate (D:20040402)
/ModDate (D:20040408091132-05'00')
```

are equivalent to the XMP properties:

```
<xmp:CreateDate>2004-04-02</xmp:CreateDate>
<xmp:ModifyDate>2004-04-08T14:11:32Z</xmp:ModifyDate>
```

6.10.3 XMP header

The **bytes** and the **encoding** attributes shall not be used in the header of an XMP packet.

NOTE Both the **bytes** and **encoding** attributes are deprecated in *XMP Specification*.

6.10.4 File identifiers

A PDF/X-4 conforming file shall include metadata properties to identify the file. File identifiers shall be included through use of the **xmpMM:DocumentID**, **xmpMM:VersionID**, and **xmpMM:RenditionClass** properties in the document metadata stream. In most instances, the value of the **xmpMM:RenditionClass** will be *default*.

The value of the **xmpMM:DocumentID** should be a 128-bit number in the form of a uuid-schemed URI (e.g. *uuid:36fc6010-1f6c-4191-8696-7e92478da16c*). It 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 this part of ISO 15930 does not specify a particular scheme, the algorithms set out in ISO/IEC 11578:1996^[2] and DCE 1.1^[12] are recommended.

All PDF/X-4 conforming files shall contain the following properties in the document metadata stream and their values shall contain appropriate data prior to exchange: **xmp:CreateDate**, **xmp:ModifyDate**, **xmp:MetadataDate**, and **dc:title**. A zero-length string shall not be used for any of these four keys.

The **xmp:CreatorTool** and **pdf:Producer** properties should be present in the document metadata stream.

The **ID** key in the file 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*.

6.10.5 File provenance information

If the document's contents are modified, the value of the document information dictionary's **ModDate** key (if present), the **Metadata xmp:ModifyDate**, and **xmp:MetadataDate** shall be updated. However, if only the document information dictionary and/or **Metadata** values are updated, then only the value of **xmp:MetadataDate** should be changed.

If a PDF/X-4 conforming file is changed in any way, even if only by the addition or modification of metadata or digital signatures, then the PDF/X-4 writer shall modify the changing identifier part of the file trailer dictionary **ID** key as described in the *PDF Reference*, 10.3.

6.10.6 Validation

All content of all XMP packets shall be well-formed as defined by *Extensible Markup Language (XML) 1.0 (Third Edition)*, 2.1, and *RDF/XML Syntax Specification*, 10 February 2004, Clause 7. If possible, at the time a writer creates or resaves a conforming file, all of the content of that file's XMP packets should be validated.

6.11 PDF/X-4 file identification

A PDF/X-4 file shall be identified as such using the **pdfxid:GTS_PDFXVersion** property in the document metadata stream. The **pdfxid** prefix denotes the use of the PDF/X identification extension schema defined in this subclause.

The identification schema defined in Table 4 uses the namespace URI `<http://www.npes.org/pdfx/ns/id/>`. The required schema namespace prefix is **pdfxid**.

Table 4 — PDF/X identification schema

Property	Value type	Category	Description
pdfxid:GTS_PDFXVersion	Text	Internal	PDF/X conformance level identifier

The value of the **pdfxid:GTS_PDFXVersion** property for PDF/X-4 files prepared in accordance with this part of ISO 15930 is *PDF/X-4*.

The value of the **pdfxid:GTS_PDFXVersion** property does not in itself determine conformance with this part of ISO 15930. The actual determination of conformance shall be performed as specified in Clause 5.

NOTE 1 See 6.10.2 for guidance concerning duplication of the **pdfxid:GTS_PDFXVersion** property into the document information dictionary.

The document metadata of a PDF/X-4 file shall not contain any other properties in the **pdfxid** namespace, and the document information dictionary shall not contain a **GTS_PDFXConformance** key.

NOTE 2 The **GTS_PDFXConformance** key in the document information dictionary is defined in ISO 15930-1 and its use is inappropriate in a PDF/X-4 file. Use of a name that might be assumed for an analogous XMP property is also inappropriate.

6.12 Bounding boxes

Each **Page** object of a PDF file includes a **MediaBox**. Each **Page** object in a PDF/X-4 conforming 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**.

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

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

6.13 Extended graphics state

A PDF/X-4 conforming file shall not contain the transfer function (**TR**) or halftone phase (**HTP**) keys within an **ExtGState** resource. An **ExtGState** dictionary shall not contain the **TR2** key with a value other than *Default*.

A PDF/X-4 conforming reader may ignore the halftone key (**HT**).

NOTE 1 The general approach envisioned for PDF/X-4 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-4 file include the ability to specify screening parameters. Where an originator of a PDF/X-4 file feels that screening parameters are important to achieve a particular imaging requirement and ought not to 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.

The **TransferFunction** key in a halftone dictionary shall be used only as required by the *PDF Reference*.

All halftones in a conforming PDF/X-4 file shall have the value *1* or *5* for the **HalftoneType** key.

NOTE 2 By limiting PDF/X-4 conforming files to the value *1* or *5* for the **HalftoneType** key, the use of threshold screens that will produce different appearances at different resolutions is prohibited.

Halftones in a PDF/X-4 conforming file shall not contain a **HalftoneName** key.

The value of the **RI** key in an **ExtGState** dictionary, if present, shall be restricted by 6.23.

6.14 PostScript XObjects

A PDF/X-4 conforming file shall not contain instances of the **PostScriptXObject**.

Form XObjects in a PDF/X-4 conforming file shall not contain the key **Subtype2** with a value of *PS*.

6.15 Use of encryption and access control

A PDF/X-4 conforming file shall not contain an **Encrypt** dictionary.

NOTE The value *Crypt* for a stream filter is prohibited in 6.8.

No keys other than **UR** and **UR3** may be present in a permissions dictionary (see the *PDF Reference*, Table 8.103). This restriction prohibits the use of access control mediated through digital signatures.

6.16 Images

An **ImageXObject** in a PDF/X-4 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 **Alternates** 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.

Images referenced only from the Alternates array of an Image XObject are non-print elements (see 6.1.3), and therefore the colour space restrictions set out in 6.4.3 are not applicable.

6.17 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-4 conforming reader may completely ignore annotations except for PDF **TrapNet** annotations.

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

NOTE 2 This provision increases the likelihood that when a page from a PDF/X-4 conforming 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.

A **Rect** shall be regarded as completely outside a bounding box if all of the coordinates of the **Rect** lie either outside the bounding box or on its edge, and the intersection of the two rectangles is zero.

NOTE 4 Intersection of the rectangles is determined by use of standard mathematical properties on the values obtained from the Rect key in the Annotation and the respective page box values.

6.18 Actions and JavaScripts

A PDF/X-4 conforming file shall not include Actions or JavaScripts.

6.19 Use of the BX/EX operators

A PDF/X-4 conforming file shall not include operators in content streams that are not described in the *PDF Reference*, even if they are encapsulated between **BX** and **EX** operators.

NOTE 1 Early versions of the PDF specification defined a PS operator. Because that operator is not documented in the *PDF Reference*, the use of the PS operator in PDF/X-4 conforming files as defined in Clause 5 is therefore prohibited by this requirement.

A PDF/X-4 conforming reader shall process every page operator according to the *PDF Reference*, even when they are encapsulated between **BX** and **EX** operators.

NOTE 2 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* can 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-4 conforming writer not use the **BX/EX** operators.

6.20 Use of transparency

PDF transparency may be used in a PDF/X-4 conforming file.

If there is no **CS** key in the transparency group's attribute dictionary that is the value of the **Group** key in a page object, or if a page object does not contain a **Group** key, then the colour space implicit in the PDF/X

output intent (see 6.4.2.1) shall be used as the transparency blending colour space for the page group, rather than the blending colour space being derived from the environment in which the file is being rendered.

If there is a **CS** key in the transparency group's attribute dictionary, its value shall conform to the restrictions on colour spaces set out in 6.4.3.

Only blend modes that are specified in the *PDF Reference* shall be used for the value of the **BM** key in an extended graphic state dictionary.

A PDF/X-4 conforming reader shall implement all blend modes defined in the *PDF Reference*.

6.21 Viewer preferences

If the **ViewerPreferences** dictionary contains the **ViewArea**, **ViewClip**, **PrintArea** or **PrintClip** keys, each of these keys present shall have the value *MediaBox* or (if a **BleedBox** is present in all page objects of the file) *BleedBox*.

A PDF/X-4 conforming reader may ignore values supplied in the **ViewerPreferences** dictionary.

6.22 Use of alternate presentations

There shall be no **AlternatePresentations** entry in the document's name dictionary. There shall be no **PresSteps** entry in any page object.

NOTE These restrictions prohibit the use of the slide show alternate presentation, which can lead to very different on-screen presentation from that seen when printing the same document.

6.23 Rendering intents

Where a rendering intent is specified, its value shall be one of the four values defined in the *PDF Reference*:

- *RelativeColorimetric*;
- *AbsoluteColorimetric*;
- *Perceptual*; or
- *Saturation*.

NOTE The *PDF Reference* defines the default rendering intent to be *RelativeColorimetric*.

6.24 Use of optional content

Optional content may be used in PDF/X-4 conforming files to allow multiple variants of a document, which are intended to be printed, to be supplied in a single file. Common use cases for this include regional versioning, and the ability to easily suppress printing of a die line in an exchange for packaging.

A variant consists of one or more optional content groups (OCGs), which are associated through an optional content membership dictionary (OCMD) and an optional content configuration dictionary. Each optional content configuration dictionary determines which OCGs are grouped together to form a single variant.

The document catalog may contain the **OCProperties** key. The presence of **OCProperties** indicates that the file contains variants, and the requirements of this subclause apply.

In the absence of explicit instructions to the contrary a PDF/X-4 reader shall render the file in the default state set by the value of the **D** key in the **OCProperties** dictionary, as specified in "Determining the State of Optional Content Groups" (*PDF Reference*, 4.10.3).

The **OCProperties** dictionary may also contain the **Configs** key. If a **Configs** key is present, then each element of the array, that forms the value of the **Configs** key, shall define a single variant.

Each optional content configuration dictionary that forms the value of the **D** key, or is an element in the array that forms the value of the **Configs** key in the **OCProperties** dictionary shall contain the key, **Name**, the identifier of the variant, which shall be unique amongst all optional content configuration dictionaries within the PDF/X-4 file.

NOTE 1 It is good practice to select all values for the **Name** key in such a way as to allow unambiguous identification of the correct content that is to be printed or displayed.

If an optional content configuration dictionary contains the **Order** key, the array which is the value of this **Order** key shall be either empty or contain references to all OCGs in the conforming file.

A conforming interactive reader shall provide a means to display the contents of the **Order** key from any optional content configuration dictionaries (OCCDs) present in the conforming file that contain an **Order** key or that inherit the **Order** key from the default OCCD. In addition, if a conforming file contains OCCDs in addition to the default OCCD, then a conforming interactive reader shall provide a means to display the list of OCCDs from which a user can choose which one to view and print.

NOTE 2 The OCGs in an Order array can be structured using a hierarchy of arrays and not simply a flat list.

The **AS** key shall not appear in any optional content configuration dictionary.

NOTE 3 This prevents the automatic adjustment of states based on usage information (the *PDF Reference*, p. 352).

The requirements of 6.5 apply for all fonts used in all optional content, even where a particular exchange will not result in some optional content being rendered.

6.25 Architectural limits

A PDF/X-4 conforming file shall not violate any of the architectural limits specified in the *PDF Reference*, Table C.1.

NOTE By complying with these limits, a PDF/X-4 conforming file is compatible with the widest possible range of readers.

6.26 XFA forms

The document's interactive form dictionary that forms the value of the **AcroForm** key in the catalog object of a PDF/X-4 conforming file, if present, shall not contain the **XFA** key.

NOTE Because the **XFA** key is not permitted, the use of XML-based XFA forms is prohibited.

6.27 JPEG2000 images

Data used in **Image XObjects** using JPEG2000 compression (JPEG2000 data) shall be encoded according to the JPX file format specifications. Only the JPX baseline set of features, as restricted or extended by this subclause, shall be used.

NOTE 1 The JPX baseline set of features is defined in ISO/IEC 15444-2:2004, M.9.2.

The number of colour channels in the JPEG2000 data shall be 1, 3 or 4.

The maximum number of colour spaces in the JPEG2000 data shall be 1.

JPEG2000 enumerated colour space 19 (CIEJab) shall not be used.

JPEG2000 enumerated colour space 12 (CMYK), which is part of JPX but not JPX baseline, may be used. When CMYK data is used, an ICC profile may be used. When no profile is present for CMYK data and no ColorSpace entry is present in the **Image XObject**, the data shall be treated as equivalent to PDF **DeviceCMYK**, and the provisions of 6.4.3.2 apply.

NOTE 2 The *PDF Reference* states that a **ColorSpace** entry in an **Image XObject** containing JPEG2000-compressed data overrides any colour space defined within the JPEG2000 data stream itself. The *PDF Reference* further requires that the number of colour channels in the JPEG2000 data match the number of components in the colour space; thus it is the responsibility of the PDF producer to ensure that the samples are consistent with the colour space used.

The bit-depth of the JPEG2000 data shall have a value of 1, 8 or 16. All colour channels in the JPEG2000 data shall have the same bit-depth.

Annex A (normative)

Requirements for PDF/X-4p

A.1 Requirements

A PDF/X-4p compliant file, writer or reader shall meet the requirements for PDF/X-4 as defined in Clauses 5 and 6 as modified by this annex.

A PDF/X-4p file set consists of the PDF/X-4p containing document in combination with the external ICC profile referenced from its PDF/X output intent. A PDF/X-4p conforming file set is one where both files conform to the requirements of the PDF/X-4p conformance level defined in this annex. Only a complete PDF/X-4p file set (i.e. the exchange file with the externally referenced profile) may be fully validated against the requirements of this part of ISO 15930.

All provisions as to profile type, version and contents set out in 6.4.2.1 apply to the external ICC profile.

NOTE Although it is also possible to validate a PDF/X-4p file in isolation, such validation does not imply that the use of that file within a file set will necessarily lead to a conforming file set.

A PDF/X-4p conforming writer is a software application that shall be able to write files in accordance with the requirements of the PDF/X-4p conformance level specified in this part of ISO 15930.

A PDF/X-4p conforming reader is a software application that shall be able to read and appropriately process all file sets conforming to the requirements for the PDF/X-4p conformance level as defined in this part of ISO 15930, when used within the parameters for the exchange agreed between the sender and receiver. A PDF/X-4p conforming reader shall also be able to read and appropriately process all files for which a PDF/X-4 conforming reader is required.

A.2 Output intent

The PDF/X output intent in a PDF/X-4p file shall contain the **DestOutputProfileRef** key, the value of which shall be a dictionary containing all of the following key-value pairs.

ProfileName The value of the ICC *profileDescriptionTag* from the ICC profile, encoded as a text string.

URLs An array, containing at least one element, of which all the elements are URLs (see Reference [14]) file specifications as defined in “3.10.4 URL Specifications” in the *PDF Reference*. The **EF**, **DOS**, **Mac** and **Unix** keys shall not be present in the file specification dictionary.

Checksum An MD5 hash consisting of a 16 byte string that shall be computed as described in the *PDF Reference* under “3.10.3 Embedded File Streams” for the uncompressed ICC profile file.

NOTE 1 Any MD5 embedded within the ICC profile itself is computed differently and is inappropriate for use as the value of the **Checksum** key.

ProfileCS The *color space signature* of the ICC profile, as a string. The value of the string as defined in ISO 15076-1 shall be one of “GRAY”, “CMYK” or “RGB”. The trailing space in “RGB” is a part of the signature and shall be included.

NOTE 2 The PDF/X-5n conformance level for the use of xCLR colour space signatures in PDF/X is specified in ISO 15930-8.

ICCVersion The value of bytes 8 to 11 (ICC *profile version number*) from the header of the ICC profile, as a string.

The **DestOutputProfileRef** dictionary shall not contain the **ColorantTable** key.

The PDF/X-5n conformance level defined in ISO 15930-8 uses a **ColorantTable** key in the **DestOutputProfileRef** dictionary. It is inappropriate to include that key in a PDF/X-4p conforming file.

This part of ISO 15930 does not define the details of how a PDF/X-4p conforming reader should obtain the referenced ICC profile, although it is expected that the value of the **URLs** key will commonly be used in that process.

The value of the **Checksum** key shall be used to verify that any candidate ICC profile available to the PDF/X-4p conforming reader is the profile intended by the creator of the file.

The **DestOutputProfile** key shall not be present in the PDF/X output intent of a PDF/X-4p conforming file. If it is desired that an ICC profile be embedded in the output intent, then the file shall be constructed in conformance with PDF/X-4, and not with PDF/X-4p.

This part of this ISO 15930 places no restrictions on the use of absolute or relative URLs, or on the selection of a URL scheme. Prior agreement between the sender and receiver of the file may be required to set restrictions upon acceptable values of the URL key.

A.3 PDF/X-4p file identification

A PDF/X-4p conforming file shall be identified using the **pdfxid:GTS_PDFXVersion** property in the document metadata stream.

The value of the **pdfxid:GTS_PDFXVersion** property for PDF/X-4p conforming files prepared in accordance with this part of ISO 15930 is *PDF/X-4p*.

Annex B (informative)

PDF feature summary

Table B.1 lists those PDF objects, and keys within those objects, where the requirements of PDF/X-4 vary from those of the *PDF Reference*. Each record in the table notes the status of the object, or key, and the reference in this part of ISO 15930 where the status is defined.

Table B.1 — PDF objects for which the PDF/X-4 and PDF/X-4p requirements vary from the *PDF Reference*

Objects	Keys	Status ^a	Subclause
		PDF/X-4 and PDF/X-4p	PDF/X-4 and PDF/X-4p ^b
Trailer	Encrypt	Prohibited	6.15
	ID	Required	6.10.4
Info	All	Restricted	6.10.2
	GTS_PDFXConformance	Prohibited	6.11
	GTS_PDFXVersion	Restricted	6.10.2
Catalog	AcroForm	Restricted	6.26
	Metadata	Restricted	6.10, 6.11, A.3 ^b
	OCProperties	Restricted	6.24
	OutputIntents	Restricted	6.4.2, A.2 ^b
	Perms	Restricted	6.15
	Viewerpreferences	Restricted	6.21
Page	ArtBox	Restricted	6.12
	BleedBox	Restricted	6.12
	CropBox	Restricted	6.12
	Group	Restricted	6.20
	TrimBox	Restricted	6.12
Resources	ColorSpace	Restricted	6.4.3, 6.6
	Fonts	Required if text is used, restricted if present	6.5, 6.6
	XObject of type PS	Prohibited	6.14
Image XObject	Alternate	Restricted	6.16
	Intent	Restricted	6.23
	OPI	Prohibited	6.7
	Stream data	Restricted	6.27

Table B.1 (continued)

Objects	Keys	Status ^a	Subclause
		PDF/X-4 and PDF/X-4p	PDF/X-4 and PDF/X-4p ^b
ExtGState	HTP (Halftone Phase)	Prohibited	6.13
	HT (Halftone)	Restricted	6.13
	RI	Restricted	6.23
	TR (Transfer Function)	Prohibited	6.13
	TR2 (Transfer Function)	Restricted	6.13
Font	FontDescriptor	Restricted	6.5.1
	Encoding	Restricted	6.5.3
FontDescriptor	FontFile or FontFile2 or FontFile3	Required if text in Type 1, TrueType, or Type 1 Compact fonts is used, depending on font type ^c	6.5.1
Form XObject	Group	Restricted	6.20
	OPI	Prohibited	6.7
	Ref	Prohibited	6.7
	Subtype2	Restricted	6.14
Annotation dictionaries	Rect	Restricted	6.17
TrapNet annotation	FontFauxing	Restricted	6.9
	PCM	Restricted	6.9
Action Dictionaries	All	Prohibited	6.18
File specification	Type	Restricted	6.7
Streams	F	Prohibited	6.7
	Filter	Restricted	6.8
All Name objects		Restricted	6.6
All objects	All	Restricted	6.25
	Metadata	Restricted	6.10
<p>^a Status is defined as follows:</p> <p>Required A conforming file shall contain this object or key.</p> <p>Prohibited A conforming file shall not contain this object or key.</p> <p>Restricted Certain values or combinations of values with contents are required or prohibited. See the subclause(s) referenced for full details.</p> <p>^b Additional restrictions applicable only to PDF/X-4p are specified in Annex A.</p> <p>^c Type 1 Compact fonts are sometimes described as CFF fonts.</p>			

A PDF/X-4 conforming 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 PDF/X-4 conforming reader may support all other objects, keys and values as defined in the ISO 15930 parts listed in the normative references specifying PDF file structure as desired.

If a reference to a PDF dictionary object is included in Table B.1, 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 which is shown in Table B.1. If any keys within a dictionary object are explicitly listed in Table B.1, then a PDF/X-4

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*, nor are other keys prohibited.

An object is descendant from another object (called the ancestor) if

- 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, or
- 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 PDF/X-4 conforming files, except for those listed in Table B.2.

Table B.2 — Prohibited operators for PDF/X-4 conforming files

Operator	Effect	Subclause
PS	Execute in-line PostScript	6.19

Operators that are restricted in PDF/X-4 conforming files, or for which there are a restrictions for a conforming reader, are shown in Table B.3.

Table B.3 — Operators restricted in PDF/X-4 conforming files or having restrictions for a PDF/X-4 conformant reader

Operator	Effect	Subclause
BX	Begin section where undefined page operators are not reported	6.19
EX	End section where undefined page operators are not reported	6.19
ri	Set the rendering intent	6.23
CS, cs	Set colour space for stroking and nonstroking operations	6.4.3
G, g	Set colour in DeviceGray for stroking and nonstroking operations	6.4.3
RG, rg	Set colour in DeviceRGB for stroking and nonstroking operations	6.4.3
K, k	Set colour in DeviceCMYK for stroking and nonstroking operations	6.4.3

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- [3] ISO 12639, *Graphic technology — Prepress digital data exchange — Tag image file format for image technology (TIFF/IT)*
- [4] ISO 15930-1, *Graphic technology — Prepress digital data exchange — Use of PDF — Part 1: Complete exchange using CMYK data (PDF/X-1 and PDF/X-1a)*
- [5] ISO 15930-3, *Graphic technology — Prepress digital data exchange — Use of PDF — Part 3: Complete exchange suitable for colour-managed workflows (PDF/X-3)*
- [6] ISO 15930-4, *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)*
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