INTERNATIONAL STANDARD

ISO 15930-8

Second edition
2010-07-15

Graphic technology — Prepress digital data exchange using PDF —

Part 8: Partial exchange of printing data using PDF 1.6 (PDF/X-5)

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

Partie 8: Échange partiel de données d'impression utilisant le PDF 1.6 (PDF/X-5)

Reference number
ISO 15930-8:2010(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 15930-8 was prepared by Technical Committee ISO/TC 130, *Graphic technology*.

This second edition cancels and replaces the first edition (ISO 15930-8:2008), of which it constitutes a minor revision to incorporate the following changes:

— correct issues with metadata and identification (8.3 and 8.4);

— fix some minor issues in Annex A.

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)*

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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 might 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-independent 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 has 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 on and extend earlier parts by reference to later versions of the PDF specification.

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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 complements the other parts by defining a data format and its usage to permit the predictable dissemination of a compound entity to one or more locations, as colour-managed data, CMYK data, and/or spot colour data, by transfer of a file with some elements not included, but with provision for unique identification. An exchange identified by this part of ISO 15930 might require communication between sender and receiver to select the mechanism by which elements not included can be identified.

This part of ISO 15930 specifies PDF/X-5 conformance levels, which can be seen as expansions and extensions of the PDF/X-4 and PDF/X-4p conformance levels defined in ISO 15930-7, in that it allows the use of an n-colorant print characterization, and allows some data necessary for final printing to be supplied externally to the main file being exchanged, as follows.

— PDF/X-4 requires all raster and vector data to be imaged on the final print to be included within the single file being exchanged; PDF/X-5 allows such data to be held in external files.

  This allows the use of workflows similar to those using Open Prepress Interchange (OPI) comments in PostScript, or OPI objects in baseline PDF. These can have value in reducing the demands on design applications and the computers that they are used on, by allowing designers to work with low-resolution versions of images. They also enable parallel processing of work on an image or other graphic, and the page onto which it will be placed. In a publication or newsprint workflow, they allow advertising and editorial submissions to be composited together late in the workflow, without requiring that files submitted by third parties be amended in any way before the final prepress processes.

— PDF/X-4 is restricted to preparation for a gray, RGB or CMYK print characterization. PDF/X-5 enables the use of n-colorant print characterizations, using colorant sets that differ from or expand on gray, RGB or CMYK. The technical mechanism by which this is achieved requires that the ICC profile for the print characterization be external to the exchanged file.

In all cases, this part of ISO 15930 places restrictions on the external data, and requirements for metadata within the exchanged file that provide for an unambiguous determination as to whether the external data has been correctly associated with the PDF/X-5 file during processing after the exchange.

These differences from PDF/X-4 provide benefit in a variety of different sets of circumstances. Three conformance levels are therefore defined in this part of ISO 15930, as follows.

— PDF/X-5g External graphical content.

— PDF/X-5n External output intent ICC profiles for n-colorant print characterizations.

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— PDF/X-5pg External graphical content and external output intent ICC profiles describing a characterized printing condition using a gray, RGB or CMYK process colour model. This conformance level makes use of mechanisms defined in the PDF/X-4p conformance level specified in ISO 15930-7.

No conformance level defining the use of n-colorant printing conditions in combination with external graphical content is defined.

Thus, a file that requires external ICC profiles for use in the output intent, and external content data to be identified is a “PDF/X-5pg file”. A reader capable of processing a file that requires compositing with external content data, but that does not have the capability of processing a file with an external ICC profile, would be referred to as a “PDF/X-5g reader”.

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.

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 any of the PDF/X-5 conformance levels 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 any of the PDF/X-5 conformance levels where there is no significant benefit in the use of the latter.

This part of ISO 15930 does not define a reader that can read all PDF/X-5 files. Rather, each conforming reader is required to support at least one of the conformance levels listed above, and the documentation provided for each such reader needs to identify which conformance levels that reader is capable of supporting. A reader is required to read and appropriately process all files conforming to the conformance level(s) that it supports, when used within the parameters for the exchange agreed between the sender and receiver.

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 this part 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 [3]) is maintained for the guidance of developers and users of the PDF/X family of 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 [6]). Where possible, PDF/X has been designed to allow a single file to comply both with PDF/X and with these other conformance levels.

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Graphic technology — Prepress digital data exchange using PDF —

Part 8:
Partial exchange of printing data using PDF 1.6 (PDF/X-5)

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, whereby all elements necessary for final print reproduction are either included or provision is made for unique identification of externally supplied graphical content or n-colorant ICC profiles.

Colour-managed, CMYK, gray, RGB or spot colour data are supported in any combination; as are PDF transparency and optional content. Files can be prepared for use with gray, RGB, CMYK and n-colorant 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 15076-1:2005, *Image technology colour management — Architecture, profile format and data structure — Part 1: Based on ICC.1:2004-10*

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)*

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

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)*

ISO 15930-6, *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)*

ISO 15930-7:2010, *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*

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

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

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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>)

3 Terms and definitions

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

3.1
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.

3.2
CMYK
subtractive process colour model where the channels are called Cyan, Magenta, Yellow and Black

3.3
color space signature
value of bytes 16 to 19 of the header of an ICC profile (variously described as “color space signature” or “data color space”)

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

3.6
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

3.7
font
identified collection of graphics that can be glyphs or other graphic elements

3.8
FPO file
file containing a low resolution rendition of an external file and information about the full resolution file from which it was derived, used for placement in design applications

1) This is an addendum to Adobe PDF Reference, fifth edition, version 1.6, containing additional information about the blend modes for PDF transparency.

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3.9
glyph
recognizable abstract graphic symbol that is independent of any specific design

NOTE Adapted from ISO/IEC 9541-1. See Reference [7].

3.10
ICC
International Color Consortium
industry association formed to develop standardized mechanisms for colour management

3.11
ICC profile
set of colorimetric transforms prepared in accordance with ISO 15076-1:2005 or any one of the ICC.1

3.12
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 [1] and [2].

3.13
n-colorant
process colour model other than gray, RGB or CMYK, and comprising at least two colorants

3.14
PDF
Portable Document Format
file format defined in the *PDF Reference*

3.15
PDF/X-1a:2001
PDF/X-1a conformance level defined in ISO 15930-1

3.16
PDF/X-1a:2003
PDF/X-1a conformance level defined in ISO 15930-4

3.17
PDF/X-3:2002
PDF/X-3 conformance level defined in ISO 15930-3

3.18
PDF/X-3:2003
PDF/X-3 conformance level defined in ISO 15930-6

3.19
PDF/X-4
PDF/X-4 conformance level defined in ISO 15930-7

3.20
PDF/X-4p
PDF/X-4p conformance level defined in ISO 15930-7

3.21
PDF/X-5g
PDF/X-5g conformance level defined in this part of ISO 15930

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3.22
PDF/X-5n
PDF/X-5n conformance level defined in this part of ISO 15930

3.23
PDF/X-5pg
PDF/X-5pg conformance level defined in this part of ISO 15930

3.24
preview image
preview consisting of a raster image representing a compound entity at a resolution suitable for viewing on a computer display

3.25
process colour model
set of colorants that, when printed together, produce a range of colours able to reproduce the values specified by a colour coordinate system

NOTE See **CMYK** (3.2), **n-colorant** (3.13), **RGB** (3.28).

3.26
proxy
visible placeholder representing at least the size and shape of the area to be replaced by the referenced object

NOTE A visible placeholder can be something as basic as a rectangle of the appropriate size containing no image content, or can be a partial or complete representation of the intended content. See **preview image** (3.24).

3.27
reader
software application that is able to read and appropriately process files

3.28
RGB
additive process colour model where the channels are called Red, Green and Blue

3.29
spot colour
single colorant, identified by name, whose printing-tone values are specified independently from the colour values specified in a colour coordinate system

3.30
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.

3.31
writer
software application that is able to write files

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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 **PCM** key.

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

For the purposes of this part of ISO 15930, the terms “PDF/X-5 file”, “PDF/X-5 reader” and “PDF/X-5 writer” should be read as specifying requirements for files, readers and writers respectively that comply with at least one of the conformance levels defined in this part of ISO 15930.

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,* and by *Addendum on Blend Modes*.

5 PDF/X-5 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.

This part of ISO 15930 defines the following three conformance levels, all based on PDF/X-4, as specified in ISO 15930-7.

— PDF/X-5g adds the capability that one or more compound entities representing graphical content required to render the file are not embedded within the file and are required to be specified by the writer in such a way that identification of the target document can be properly validated by the reader.

— PDF/X-5n adds the capability to use an externally referenced n-colorant ICC profile that conforms to ISO 15076-1.

— PDF/X-5pg adds the capabilities that the ICC profile representing the characterized printing condition is provided externally in the same way as PDF/X-4p, and that one or more compound entities representing graphical content are provided externally in the same way as PDF/X-5g.

No conformance level defining the use of n-colorant printing conditions in combination with external graphical content is specified.

The specific technical requirements for each conformance level are defined in Clauses 7 to 9. A PDF/X-5 conforming file is a PDF file in which those features necessary for the exchange of a compound entity are in accordance with one conformance level defined in this part of ISO 15930. A PDF/X-5 conforming file may also include other valid PDF features that do not affect final print reproduction of the compound entity.

Files that do not require external data (graphical content data or ICC profiles) and that are prepared for a gray, RGB or CMYK printing condition, but that otherwise conform to the requirements of this part of ISO 15930 shall be identified as PDF/X-4, rather than as PDF/X-5.

PDF/X-5 conformance is identified by use of the **pdfxid:GTS_PDFXVersion** property, as specified in 6.2. 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 ISO 15930.

A PDF/X-5 file set consists of the PDF/X-5 containing the document and all referenced external elements. A PDF/X-5 conforming file set consists of elements, all together, that conform to the requirements of a conformance level defined in this part of ISO 15930. A PDF/X-5 conforming file may be validated against the requirements of this part of ISO 15930 in isolation. In addition, a file set may be validated. Successful validation of a PDF/X-5 file in isolation should not be taken to imply that the use of that file within a file set will necessarily lead to a PDF/X-5 conforming file set.

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Although the *PDF Reference* permits compliance with earlier versions of PDF, features described in versions of the PDF specification earlier than 1.6, but not described in the *PDF Reference*, should not be used in a PDF/X-5 conforming file. Such features may be ignored by a PDF/X-5 reader.

A PDF/X-5 conforming writer is a software application that shall be able to write files in accordance with the requirements of at least one conformance level specified in this part of ISO 15930.

A PDF/X-5 conforming reader is a software application that shall be able to read and appropriately to process all file sets conforming to the requirements for at least one 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-5 conforming reader shall also be able to read and appropriately to process all files conforming to the PDF/X-4 and PDF/X-4p conformance levels, and shall be able to read and appropriately to process all files that are required of a PDF/X-4 conforming reader.

The documentation, packaging, etc., supplied with a PDF/X-5 conforming writer or reader should clearly state which PDF/X conformance level(s) the application supports.

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-5 conforming file sets 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 A PDF/X-5 conforming reader can use embedded job ticket information to determine the screening to be used to render the file. Note that a PDF/X-5 conforming reader is permitted to ignore screening information in the PDF/X file (see 6.1 and ISO 15930-7:2010, 6.13). A PDF/X-5 conforming reader might use screening data from the PDF/X-5 conforming file, from the job ticket, or from local system defaults.

6 Technical requirements

6.1 General

A compound entity intended for PDF/X-5 exchange shall meet all the requirements of the PDF/X-4 conformance level as specified in ISO 15930-7, with the exceptions that:

— any compound entities representing graphical content and output intent ICC profiles may be referenced externally, as defined in Clauses 7 to 9; and

— a PDF/X-5n conforming file may be prepared for an n-colorant printing condition, identified by use of an ICC profile conforming to ISO 15076-1 [which is technically identical to ICC.1:2004-10 (see Reference [14])], and as defined in Clause 7.

A PDF/X-5 conforming file shall be identified as such in accordance with 6.2.

The PDF features that shall be required, prohibited or restricted are summarized in Annex A. These features shall be used as prescribed in *PDF Reference* and as further restricted by this part of ISO 15930.

6.2 PDF/X-5 file identification

A PDF/X-5 conforming file shall be identified as such using the **pdfxid:GTS_PDFXVersion** property in the document metadata stream.

The value of the **pdfxid:GTS_PDFXVersion** property for PDF/X-5 conforming files prepared in accordance with this part of ISO 15930 is as shown in Table 2.

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Table 2 —pdfxid:GTS_PDFXVersion values

Conformance level	pdfxid:GTS_PDFXVersion
PDF/X-5g	*PDF/X-5g*
PDF/X-5n	*PDF/X-5n*
PDF/X-5pg	*PDF/X-5pg*

7 PDF/X-5n conforming files prepared for n-colorant printing conditions

7.1 General

A PDF/X-5n conforming file, writer or reader shall conform to the requirements of the PDF/X-4p conformance level as specified in ISO 15930-7 as modified by this Clause 7.

The referenced ICC profile shall conform to ISO 15076-1.

The *PDF Reference* does not permit n-colorant ICC profiles conforming to ISO 15076-1 to be embedded within a PDF file, but they can be used in the context of a PDF/X-5n file exchange. N-colorant profiles conforming to earlier versions of ICC.1 are not supported.

If a PDF/X-5n file contains **TrapNet** annotations, the value of the **PCM** key in the appearance stream(s) of those annotations shall be *DeviceN*, and the colorants of the process colour model of the intended printing condition as identified by the PDF/X output intent shall be included in the **SeparationColorNames** array.

7.2 Output intent

The **EF** key may be present in the URL file specifications that form the elements of the **URLs** array in the PDF/X output intent.

NOTE 1 A PDF/X-4p conforming or PDF/X-5pg conforming file set can be converted into a PDF/X-4 or PDF/X-5g file by embedding the ICC profile as the value of **DestOutputProfile**. The *PDF Reference* prohibits the embedding of an n-colorant ICC profile in the output intent, which prevents a PDF/X-5n file from being converted in the same way. The **EF** key can be used to embed the ICC profile within the body of a PDF/X-5n file. This allows the construction of a single file for exchange when using a profile for a characterized printing condition that is not gray, RGB or CMYK.

The value of **ProfileCS** shall be an ICC *xCLR color space signature*. The value *3CLR* shall not be used to represent an RGB process colour model. The value *4CLR* shall not be used to represent a CMYK process colour model.

NOTE 2 A PDF/X-5n conforming reading system intended for preparing files for printing using the intended printing condition needs to contain a colour management module (CMM) capable of transforming colours using the PCS to device tables of an ICC profile for an xCLR colour space as part of a system used to render files for final printing. A PDF/X-5n conforming reading system intended for creation of proof prints to simulate a printing condition using an xCLR process colour model requires a CMM capable of transforming colours using both the device to PCS tables and the PCS to device tables of an ICC profile for an xCLR colour space. PDF/X-5n conforming readers performing other processes also require CMMs to process xCLR profiles appropriately.

The characterized printing condition represented by the referenced ICC profile shall be based on a subtractive process colour model.

The **DestOutputProfileRef** dictionary shall contain the **ColorantTable** key, the value of which is an array of colorant names. Each colorant name shall be encoded as a name object. The order and names of the colorants in **ColorantTable** shall be identical to those in the ICC *colorantTableTag* in the referenced ICC profile.

NOTE 3 ISO 15076-1 requires that colorant names be encoded in (and therefore limited to) the 7-bit encoding defined in ISO/IEC 646:1991. ISO 15930-7:2010, 6.6, requires that the colorant names in the PDF/X file be encoded as UTF-8, and all 7-bit character codes defined in ISO/IEC 646 exactly match those used in UTF-8. Therefore, no re-mapping of character codes is required when copying values from the ICC profile into the PDF name objects.

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7.3 Source colour spaces and transparency

A colour name used in a **DeviceN** or **Separation** colour space in a PDF/X-5n conforming file that exactly matches a colorant name in **ColorantTable** shall be treated as representing that colorant. Comparisons of names shall be case-sensitive.

If **ColorantTable** includes a colorant named exactly *Black*, data in the **DeviceGray** colour space shall be treated as representing that Black colorant; otherwise the **DeviceGray** colour space shall not be used.

If **ColorantTable** includes colorants named exactly *Cyan, Magenta, Yellow* and *Black*, data in the **DeviceCMYK** colour space shall be treated as representing those colorants; otherwise the **DeviceCMYK** colour space shall not be used.

NOTE 1 The *PDF Reference* states that non-zero overprinting of **DeviceCMYK** when overprint mode is 1, can only be applied when the device being rendered has a native colour space of **DeviceCMYK**. The native colour space of the intended output device of a PDF/X-5n file is not **DeviceCMYK**, meaning that non-zero overprinting can never be applied.

The **DeviceRGB** colour space shall not be used in a PDF/X-5n conforming file.

NOTE 2 The PDF graphical operators that would normally be used to paint in **DeviceGray**, **DeviceRGB** and **DeviceCMYK** can be used even when one or more of those colour spaces are prohibited, by provision of a suitable colorimetrically defined default colour space; see ISO 15930-7:2010, 6.4.3.1.

If present in the attributes dictionary of a **DeviceN** colour space, the **Subtype** key shall have the value *DeviceN.* The **Process** key shall not be present in the *attributes* dictionary of a **DeviceN** colour space.

NOTE 3 A PDF/X-5n conforming file is required to use a **DeviceN** colour space in order to represent the process colour model of the intended output for an *NChannel* colour space, but the *PDF Reference* prohibits the use of a **DeviceN** colour space for the value of the **ColorSpace** key in the **Process** dictionary.

All pages containing objects using PDF transparency shall contain the **Group** key. The transparency group attribute dictionary that forms the value of the **Group** key shall contain the **CS** key.

NOTE 4 ISO 15930-7:2010, 6.20, requires that the colour space implicit in the PDF/X output intent be used as the blending colour space if the **CS** key is not present. This requirement prohibits the use of n-colorant colour spaces as transparency blending colour spaces.

8 PDF/X-5g conforming external graphical content

8.1 General

A PDF/X-5g conforming file, writer or reader shall conform to the requirements of the PDF/X-4 conformance level as specified in ISO 15930-7 as modified by 8.2 to 8.7.

8.2 Architecture

If print content is omitted from the PDF/X-5g conforming file, the file shall contain a proxy, encoded as a **Form XObject**, for each such instance. The proxy shall use the reference XObject mechanism described in the *PDF Reference* to include a pointer to the target of the element replacement. The reference dictionary shall include the **ID** key.

The proxy may also include a preview image, which would normally be derived from the data carried in an FPO file.

The target document of the reference XObject shall be a file conforming to PDF/X-1a:2001, PDF/X-1a:2003, PDF/X-3:2002, PDF/X-3:2003, PDF/X-4, PDF/X-4p, PDF/X-5g or PDF/X-5pg. In cases where the target is a PDF/X-5g or PDF/X-5pg file, there shall be no circular references.

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NOTE 1 It might not be possible for writers to enforce this prohibition; therefore, in practice, it then becomes necessary for the reader to check for this condition because it has access to all of the files.

NOTE 2 Because PDF/X-2:2003 (as defined in ISO 15930-5:2003) is not included as an allowed conforming file in the list above, a PDF/X-2:2003 file cannot be used as the target of a reference XObject in a PDF/X-5g or PDF/X-5pg file.

8.3 Identification of target documents

The catalog dictionary of the target of the reference XObject shall contain the **Metadata** key. The metadata stream that forms the value of that key shall conform to *XMP Specification* and shall contain the **xmpMM:DocumentID**, **xmpMM:VersionID** and **xmpMM:RenditionClass** properties. In most instances, the value of the **xmpMM:RenditionClass** will be *default*.

NOTE This is a supplementary requirement to the requirements of the PDF/X-1a and PDF/X-3 conformance levels; PDF/X-4, PDF/X-4p, PDF/X-5g and PDF/X-5pg require the presence of these properties.

The **Form XObject** in the containing document that contains the **Ref** key for the reference XObject shall also include the **Metadata** key, the value of which shall be a metadata stream. The metadata stream shall contain a **xmpMM:RenditionOf** property, the value of which is an **stRef:ResourceRef** element, which shall include the **stRef:DocumentID**, **stRef:VersionID** and **stRef:RenditionClass** properties.

The value of the **xmpMM:DocumentID** property 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 specified in ISO/IEC 11578:1996 and DCE 1.1 (see Reference [5]) are recommended.

The metadata streams that form the value of the **Metadata** keys in the catalog dictionary of the target and in the **Form XObject** of the containing document may contain additional properties.

8.4 Selection of target documents

This part of ISO 15930 does not define the mechanism by which a PDF/X-5g reader will locate candidate target documents, although it is expected that the PDF reference dictionary would be used in that process.

NOTE 1 PDF/X-5 files are intended to be usable across platforms and languages. It is necessary to be careful to follow the recommendations for portability of file specifications set out in the *PDF Reference*.

Once a candidate target has been located, the PDF/X-5 reader shall compare the **ID** in the **Ref** object with the **ID** in the **trailer** of the candidate target, and shall compare the properties of **xmpMM:RenditionOf** in the containing file reference XObject with the **xmpMM:DocumentID**, **xmpMM:VersionID** and **xmpMM:RenditionClass** properties in the candidate target's catalog dictionary **Metadata** in order to determine if it is the correct target.

If the values of the **ID** keys and **xmpMM:DocumentID**, **xmpMM:VersionID** and **xmpMM:RenditionClass** properties in the candidate target are all identical to, respectively, the **stRef:documentID**, **stRef:versionID** and **stRef:renditionClass** fields of the **xmpMM:RenditionOf** property in the containing document, then the reader shall treat the candidate target as an exact match for the same version of the document from which the reference metadata was derived.

If the **xmpMM:DocumentID** property in the candidate target is identical to the **stRef:documented** field of the **xmpMM:RenditionOf** property in the containing document and the first strings of the values of each **ID** are identical, but the **xmpMM:VersionID** or **xmpMM:RenditionClass** properties in the candidate target, or the second strings of the values of the **ID** keys are different from the respective entries in the containing document, then the reader shall treat the candidate target as being a different version of the document from which the reference metadata was derived.

NOTE 2 Some workflows will require that the proxy be replaced with exactly the same target document for which the initial metadata was created. In others, such as those where page design and image retouching are performed in parallel, the proxy would normally be replaced with a different version derived from that original document.

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8.5 Rendering of external documents

All print content in the PDF/X-5 conforming file and in all targets shall be prepared for the same characterized printing condition.

NOTE 1 If the PDF/X-5 containing document and/or one or more target PDF/X-5, PDF/X-4 or PDF/X-3 documents contain objects in device-independent colour spaces, and if the profiles embedded in the PDF/X output intents in those files are not identical, then the colours in those files need to be transformed as part of any assembly process to ensure that the correct gamut and tone compression and (in the case of a PDF/X-5 file prepared for CMYK) black generation is performed for each entity.

A PDF/X-5 conforming reader that renders the file shall do so using all external data in target documents.

NOTE 2 This means that a PDF/X-5 conforming proof cannot be generated in the absence of one or more of the target documents. Non-conforming proofs produced in this way can still have considerable value as process control steps in a document creation workflow.

A PDF/X-5 reader that renders the file shall render the containing document and each target document using the fonts embedded in that specific file; the fonts embedded in one file shall not be used to render text from a different file.

If an element or compound entity from one file of a PDF/X-5 file set overlaps an element or compound entity from another file, and if the overlaying graphical element uses PDF transparency or is set to overprint, then the resulting visual effect shall be the same as if the two elements had been stored within a single file.

Coordinates in the **BBox** entry of the proxy **Form XObject** are relative to the corner of the **MediaBox** of the target document page that is at the lower left after application of the **Rotate** key in the target document page.

NOTE 3 This means that the required rotation of the target document's page is performed prior to its placement in the containing document.

8.6 Trapping

As specified in 6.1, the **pdf:Trapped** property in the document metadata stream is required to be used when exchanging files, and with reference to ISO 15930-7:2010, 6.9.

The **pdf:Trapped** property indicates the state of trapping within the PDF/X-5 file itself, but does not indicate the trapped state of target documents, or of any trapping between the PDF/X-5 file and target documents.

8.7 Use of optional content

PDF/X-4 and PDF/X-5 conforming files that form the target documents in a PDF/X-5g file exchange shall not contain optional content groups.

9 PDF/X-5pg conforming external ICC profiles and external graphical content

A PDF/X-5pg conforming file, writer or reader shall conform to the requirements of the PDF/X-4p conformance level as specified in ISO 15930-7 and as modified by the requirements for PDF/X-5g files specified in 8.2 to 8.7.

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Annex A
(informative)

PDF feature summary

Table A.1 lists those PDF objects, and keys within those objects, where the requirements of PDF/X-5 vary from those of the *PDF Reference*. Each record in the table notes the status of the object, or key, and the portion this part of ISO 15930 where the status is defined.

Table A.1 — PDF objects for which the PDF/X-5 requirements vary from the *PDF Reference*

Objects	Keys	Status[a] — subclause		
		PDF/X-5n	PDF/X-5g	PDF/X-5pg
Trailer	**Encrypt**	Prohibited — *6.15*[b]		
	ID	Required — *6.10.4*[b]		
Info	All	Restricted — *6.10.2*[b]		
	GTS_PDFXConformance	Prohibited — *6.11*[b]		
Catalog	**AcroForm**	Restricted — *6.26*[b]		
	Metadata	Restricted — *6.9*[b], *6.10*[b], Required — *6.11*[b], *A.3*[b] and 6.2	Restricted — *6.9*[b], *6.10*[b], Required — *6.11*[b] and 6.2	
	OCProperties	Restricted — *6.24*[b]		
	OutputIntents	Restricted — *6.4.1*[b], *6.4.2*[b], *A.2*[b]	Restricted — *6.4.1*[b], *6.4.2*[b]	Restricted — *6.4.1*[b], *6.4.2*[b], *A.2*[b]
	Perms	Restricted — *6.15*[b]		
	Viewerpreferences	Restricted — *6.21*[b]		
Page	**ArtBox**	Restricted — *6.12*[b]		
	BleedBox	Restricted — *6.12*[b]		
	CropBox	Restricted — *6.12*[b]		
	Group	Restricted — *6.20*[b]		
	TrimBox	Restricted — *6.12*[b]		
Resources	**ColorSpace**	Restricted — *6.4.3*[b], *6.6*[b], and 7.3	Restricted – *6.4.3*[b], *6.6*[b]	
	Fonts	Required if text is used, restricted if present — *6.5*[b], *6.6*[b]		
	PS XObject	Prohibited — *6.14*[b]		
Image XObject	**Alternate**	Restricted — *6.16*[b]		
	Intent	Restricted — *6.23*[b]		
	OPI	Prohibited — *6.7*[b]		
	Stream data	Restricted — *6.27*[b]		

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Table A.1 (*continued*)

Objects	Keys	Status[a] — subclause		
		PDF/X-5n	PDF/X-5g	PDF/X-5pg
ExtGState	**HTP** (Halftone Phase)	Prohibited — *6.13*[b]		
	HT (Halftone)	Restricted — *6.13*[b]		
	RI	Restricted — *6.23*[b]		
	TR (Transfer Function)	Prohibited — *6.13*[b]		
	TR2 (Transfer Function)	Restricted — *6.13*[b]		
Font	**FontDescriptor**	Restricted — *6.5.1*[b]		
	Encoding	Restricted — *6.5.3*[b]		
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*[b]		
Form XObject	**BBox**	—	Restricted — 8.5	
	Group	Restricted — *6.20*[b]		
	Metadata	—	Required when **Ref** key is present — 8.3	
	OPI	Prohibited — *6.7*[b]		
	Ref	—	Required — *6.7*[b]	
	Subtype2	Restricted — *6.14*[b]		
Annotation dictionaries	**Rect**	Restricted — *6.17*[b]		
TrapNet annotation	**FontFauxing**	Restricted — *6.9*[b]		
	PCM	Restricted — *6.9*[b] and 7.1	Restricted — *6.9*[b]	
	SeparationColorNames	Restricted — 7.1	—	
Action Dictionaries	All	Prohibited — *6.18*[b]		
File specification	Type	Restricted — *6.7*[b]		
Streams	F	Prohibited — *6.7*[b]		
	Filter	Restricted — *6.8*[b]		
All Name objects		Restricted — *6.6*[b]		
All objects	**All**	Restricted — *6.25*[b]		
	Metadata	Restricted — *6.10*[b]		
Reference dictionary	ID	—	Required — 8.2	

[a] The status is defined as follows:

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 subclause(s) referenced for full details.

[b] Refer to subclause (*italics*) in ISO 15930-7:2010.

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

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A PDF/X-5 conforming file also conforms to the *PDF Reference*; that is, it includes all objects, keys and values noted as required in the 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 which is shown in the table. If any keys within a dictionary object are explicitly listed in the table, then a PDF/X-5 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* or other keys are 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.

All operators defined in the normative references for use in PDF **Contents** streams may be included in PDF/X-5 conforming files, except as indicated in Tables A.2 and A.3.

Operators that are prohibited for use in PDF/X-5 files are shown in Table A.2.

Table A.2 — Prohibited operators for PDF/X-5 files

Operator	Effect	Reference
PS	Execute in-line PostScript	*6.19* [a]
[a] Refer to subclause (*italics*) in ISO 15930-7:2010.		

Operators that are restricted in PDF/X-5 files, or for which there are restrictions for a conforming reader, are shown in Table A.3.

Table A.3 — Operators restricted in PDF/X-5 files or having restrictions for a conforming reader

Operator	Effect	Status		
		PDF/X-5n	PDF/X-5g	PDF/X-5pg
BX	Begin section where undefined page operators are not reported	*6.19*[a]		
EX	End section where undefined page operators are not reported	*6.19*[a]		
ri	Set the rendering intent	*6.23*[a]		
CS, cs	Set colour space for stroking and nonstroking operations	*6.4.3*[a], 7.3	*6.4.3*[a]	
G, g	Set colour in **DeviceGray** for stroking and nonstroking operations	*6.4.3*[a], 7.3	—	
RG, rg	Set colour in **DeviceRGB** for stroking and nonstroking operations	*6.4.3*[a], 7.3	*6.4.3* [a]	
K, k	Set colour in **DeviceCMYK** for stroking and nonstroking operations	*6.4.3*[a], 7.3	*6.4.3*[a]	
[a] Refer to subclause (*italics*) in ISO 15930-7:2010.				

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[9] ISO/IEC 646:1991, *Information technology — ISO 7-bit coded character set for information interchange*

[10] 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)*

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

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