INTERNATIONAL STANDARD

ISO 15930-7

Second edition
2010-07-15

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

Reference number
ISO 15930-7:2010(E)

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Published in Switzerland

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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

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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