INTERNATIONAL STANDARD

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Graphic technology — Prepress digital data exchange using PDF —

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

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

Partie 5: Échange partiel de données d'impression utilisant le PDF 1.4 (PDF/X-2)

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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 15930-5 was prepared by Technical Committee ISO/TC 130, *Graphic technology*, with the support of ANSI Committee for Graphic Arts Technologies Standards (CGATS).

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

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

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

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

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

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

Introduction

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

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

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

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

PDF/X-2 (Part 5 of this International Standard) 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 this International Standard will often require communication between sender and receiver to select the mechanism by which elements not included may be identified.

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

While PDF/X-2 (this part of this International Standard) defines a data format and its usage to permit the predictable dissemination of a compound entity to one or more locations where some or all of the elements may be more logically present at the receiving site, or may be exchanged at a different time, there are circumstances when this is not appropriate. PDF/X-1a (Parts 1 and 4 of this International Standard) and PDF/X-3 (Parts 3 and 6 of this International Standard) specify methods for the exchange of material in which all elements and element resources are present as part of a single exchange and all of the information needed to process the material is either in the file or is specified within the appropriate part of this International Standard and its normative references.

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

An ongoing series of Application Notes[2] is maintained for the guidance of developers and users of the PDF/X family of International Standards. These Application Notes, and other documents relevant to PDF/X, are available from NPES The Association for Suppliers of Printing, Publishing and Converting Technologies in the NPES Standards Workroom at <http://www.npes.org/standards/tools.html>.

Graphic technology — Prepress digital data exchange using PDF —

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

1 Scope

This part of ISO 15930 specifies the use of the Portable Document Format (PDF) Version 1.4 for the dissemination of digital data, where all elements necessary for final print reproduction are either included or provision is made for unique identification. Colour-managed, CMYK, and spot colour data are supported in any combination.

2 Normative references

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

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

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

ISO 15930-4:2003, *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 15930-6:2003, *Graphic technology — Prepress digital data exchange using PDF — Part 6: Complete exchange of printing data suitable for colour managed workflows using PDF 1.4 (PDF/X-3)*

ISO/IEC 11578:1996, *Information technology — Open Systems Interconnection — Remote Procedure Call (RPC)*

DCE 1.1: *Remote Procedure Call*. Open Group Technical Standard Document Number C706, August 1997. <http://www.opengroup.org/publications/catalog/c706.htm>

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

PDF Reference: *Adobe Portable Document Format, Version 1.4 errata dated 2003/06/18*. Available from Internet <http://partners.adobe.com/asn/acrobat/docs/PDF14errata.txt>

XMP, *Extensible Metadata Platform, Version 1.5*, September 14, 2001, Adobe Systems Incorporated Available from Internet <http://www.npes.org/standards/tools.html>

3 Terms, abbreviated terms and definitions

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

3.1
characterized printing condition
printing condition (offset, gravure, flexographic, direct, etc.) for which process control aims are defined and for which the relationship between input data (printing tone values, usually CMYK) and the colorimetry of the printed image is documented

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

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

3.2
compound entity
unit of work with all text, graphics, and page elements prepared for final distribution, representing a single page, a portion of a page, or a combination of pages, whose contents may reside in one or more computer files, uniquely linked together

3.3
conformance level
identified set of restrictions and requirements with which files, readers and writers must comply

3.4
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

3.5
font
identified collection of graphics that may be glyphs or other graphic elements

Note ISO/IEC 9541-1 defines glyph as a recognizable abstract graphic symbol that is independent of any specific design.

3.6
FPO file
file containing a low-resolution rendition of, and information about, the full resolution file from which it was derived, used for placement in design applications

3.7
non-print element
element not intended for final print reproduction, including proxies and all annotations of types other than **TrapNet** and **PrinterMark**

3.8
partial exchange
exchange of composite entities in which some elements or element resources are intentionally excluded from the exchange, and are separately available

EXAMPLE High-resolution images.

3.9
PDF
Portable Document Format
file format defined in the *PDF Reference*

3.10
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

3.11
PDF/X-1a:2001
PDF/X-1a conformance level defined in ISO 15930-1:2001

3.12
PDF/X-1a:2003
PDF/X-1a conformance level defined in ISO 15930-4:2003

3.13
PDF/X-2:2003
PDF/X-2 conformance level defined in this part of ISO 15930

3.14
PDF/X-3:2002
PDF/X-3 conformance level defined in ISO 15930-3:2002

3.15
PDF/X-3:2003
PDF/X-3 conformance level defined in ISO 15930-6:2003

3.16
print element
element intended for final print reproduction including **TrapNet** or **PrinterMark**

3.17
printing tone value
data value corresponding to the relative area of a printing surface that is intended to transfer ink to the substrate being printed

NOTE See **characterized printing condition** (3.1).

3.18
proxy
visible placeholder representing at least the size and shape of the area to be replaced by the referenced object and may be something as basic as a rectangle of the appropriate size containing no image content, or may be a partial or complete representation of the intended content

3.19
reader
software application that is able to read and appropriately process files

3.20
spot colour
single colorant, identified by name, whose printing tone values are specified independently from colour values specified in a colour coordinate system

3.21
trapping
modification of boundaries of colour areas to account for dimensional variations in the printing process by overprinting in selected colours at the boundaries between colours that might inadvertently be left uncoloured due to normal variations of printing press registration

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

3.22
UUID style ID
128-bit number that is virtually guaranteed to be globally unique, e.g. with the probability of a duplication so enormously remote as to be effectively impossible

3.123
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 **GTS_PDFXVersion**.

Operands of PDF operators or values of dictionary keys are written in an italic sans serif font; for example the *(PDF/X-2:2003)* value for the **GTS_PDFXVersion** key.

For the purpose of this part of ISO 15930, references to the "*PDF Reference*" are to the *PDF Reference: Adobe Portable Document Format* corrected by the errata dated 2003/6/18 (see Clause 2).

5 Conforming files and equipment

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

Partial exchange means that components of the compound entity might not be included in the PDF/X-2 file, but that sufficient information can be made available to uniquely identify the missing elements. Unique identification may be completely and automatically resolvable using references in the PDF/X-2 file and its components, or they may require additional communication between sender and receiver to establish the identity with certainty.

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

A conforming PDF/X-2 file is a PDF file in which those features necessary for the exchange of a compound entity are in accordance with this part of this International Standard. A conforming file may also include other valid PDF features that do not affect the reproduction of the compound entity.

A conforming writer is a software application that shall be able to write conforming PDF/X-2 files.

A conforming reader is a software application that shall be able to read and appropriately process all conforming PDF/X-2, PDF/X-1a:2001, PDF/X-1a:2003, PDF/X-3:2002, and PDF/X-3:2003 files.

Although *PDF Reference* permits compliance with earlier versions of PDF, features described in versions of the PDF specification earlier than 1.4, but not described in *PDF Reference*, should not be used in a conforming PDF/X-2 file. Such features may be ignored by a PDF/X-2 reader.

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

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

EXAMPLE 1 (Trapping) If a conforming PDF/X-2 file specifies **Trapped**=*False*, a conforming reader may use job ticket information to determine details of how the file is to be trapped. If the file specifies **Trapped**=*True*, a conforming reader is required to ignore any trapping information in an embedded job ticket.

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

6 Technical requirements

6.1 General

The requirements of ISO 15930-6:2003, 6.2, 6.3, 6.5 and 6.8 through 6.17 shall apply.

6.2 Data structure

A PDF/X-2 file consists of four sections: header, body, cross-reference table, and trailer. The body of a PDF/X-2 file contains a sequence of numbered objects (such as numbers, names, strings, dictionaries and streams) representing the text characters, graphics, images and their associated resources describing the compound entity being exchanged. These features shall be used as prescribed in the *PDF Reference* and as further specified by this part of this International Standard.

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

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

A PDF/X-2 file may contain two classes of elements: those intended for final print reproduction (print elements), and those not intended for final print reproduction (non-print elements). Non-print elements include such incidental elements as non-printing annotations.

All components of a compound entity shall be contained in the body of a single PDF/X-2 file, or identified as specified in 6.4.

Print elements, whether included directly or identified within the body of the PDF/X-2 file, shall be properly prepared for the characterized printing condition identified, in accordance with ISO 15930-6:2003, 6.2.2.

Non-print elements may make use of any PDF colour space.

6.3 PDF file identification

A PDF/X-2 file shall be so identified using the **GTS_PDFXVersion** key in the **Info** dictionary. The type of the value of the **GTS_PDFXVersion** key is string.

The value of the **GTS_PDFXVersion** key for files prepared in accordance with this part of this International Standard is (*PDF/X-2:2003*).

All PDF/X-2 files shall contain the following key value pairs in the **Info** dictionary and their values shall contain appropriate data prior to exchange: **CreationDate**, **ModDate**, and **Title**. A zero-length string is not appropriate for any of these three keys.

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

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

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

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

6.4 Externally referenced elements

6.4.1 Architecture

Where print content is omitted from the PDF/X-2 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 *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, which would normally be derived from the data carried in an FPO file.

The **OPI** key shall not be used in **Form** or **Image XObjects** in a conforming PDF/X-2 file.

The target document of the **Reference XObject** shall be a PDF/X-1a:2001, PDF/X-1a:2003, PDF/X-3:2002, PDF/X-3:2003 or PDF/X-2:2003 file. Where the target is a PDF/X-2:2003 file, there shall be no circular references.

NOTE It may not be possible for writers to enforce this prohibition; therefore, practically, it falls to the reader to check for this condition because it has access to all of the files.

6.4.2 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 and shall contain the **xapMM:DocumentID**, **xapMM:VersionID** and **xapMM:RenditionClass** properties. In most instances the value of the **xapMM:RenditionClass** will be *"default"*.

NOTE This requirement is in addition to the requirements of the relevant PDF/X conformance level.

The **Form XObject** in the 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 **xapMM:RenditionOf** property, the value of which is a **ResourceRef** element, which shall include the **xapMM:DocumentID**, **xapMM:VersionID** and **xapMM:RenditionClass** properties.

The value of the **xapMM:DocumentID** properties shall be a UUID style ID (a 128-bit number), and should be generated in such a way that there is a high probability that it is unique. There are various common schemes for generating a unique identifier. While this part of this International Standard does not require any specific scheme for generating a unique identifier, the algorithms set out in ISO/IEC 11578:1996 and DCE 1.1 should be used.

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.

6.4.3 Selection of external documents

This International Standard does not specify the mechanism by which a PDF/X-2 reader will locate candidate target files, although it is expected that the reference dictionary will be used in that process.

PDF/X-2 files are intended to be usable across platforms and languages. Care should be taken 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-2 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 **xapMM:RenditionOf** in the containing file **Reference XObject** with the **xapMM:DocumentID**, **xapMM:VersionID** and **xapMM: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 **xapMM:DocumentID**, **xapMM:VersionID** and **xapMM:RenditionClass** properties are all identical, then the reader shall treat the candidate target as an exact match to the document for which the initial metadata was created.

If the **xapMM:DocumentID** properties or the first string of the value of each **ID** are identical, but the **xapMM:VersionID** or **xapMM:RenditionClass** properties, or the second string of the value of the **ID** keys are different, then the reader shall treat the candidate target as a different instance of the document for which the initial metadata was created.

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

6.4.4 Rendering of external documents

All print content in the PDF/X-2 file and in all targets shall be prepared for the same characterized printing condition.

NOTE 1 If the PDF/X-2 documents and/or one or more target PDF/X-2 or PDF/X-3 documents contain objects in device-independent colour spaces, and if the profiles embedded in the **OutputIntents** in those files are not identical, then the colours in those files must be transformed as part of any assembly process to ensure that the correct gamut and tone compression is performed for each entity.

A PDF/X-2 compliant reader that renders the file shall do so using all external data in target documents.

NOTE 2 This means that a PDF/X-2 compliant proof cannot be generated in the absence of one or more of the target documents.

A PDF/X-2 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.

Overprinting within and between content from the containing document and each target document shall be applied as defined in the *PDF Reference*.

Coordinates in the **BBox** entry of the proxy **Form XObject** are relative to the lower left corner of the **MediaBox** of the target document.

6.5 File specifications

A PDF/X-2 file shall not contain file specifications as described in *PDF Reference,* 3.10, except as defined in 6.4.

6.6 Trapping

The **Trapped** key contained in the **Info** dictionary shall be used when exchanging files. The **Trapped** key indicates the state of trapping within the PDF/X-2 file itself, but does not indicate the trapped state of referenced files or between objects within any combination of the PDF/X-2 file and referenced files.

If all print elements within the PDF/X-2 file have been trapped as necessary, then the value of the **Trapped** key shall be set to *True*. Otherwise, the value of the **Trapped** key shall be set to *False*. Partially trapped files are not permitted. A value of *Unknown* for the **Trapped** key is prohibited in PDF/X-2 files.

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

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

The **FontFauxing** key in a **TrapNet** annotation either shall not be present or shall be an empty array. In a PDF/X-2 conforming file, 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.