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Graphic technology — Prepress digital data exchange — Use of PDF —

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

Technologie graphique — Échange de données numériques de préimpression — Emploi de PDF —

Partie 3: Échange de fichiers complets aptes à la gestion des couleurs (PDF/X-3)

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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 3.

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 part of ISO 15930 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 15930-3 was prepared by Technical Committee ISO/TC 130, *Graphic technology*.

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

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

— *Part 2: Guidelines for partial exchange of printing data (PDF/X-2)*

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

Annexes A to D of this part of ISO 15930 are for information only.

Introduction

ISO 15930 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 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.

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 and/or CMYK data, in a form ready for final print reproduction, by transfer of a single file. This file must contain all the content information necessary to process and render the document, as intended by the sender, coded inside a single PDF file. No other parts – neither external files nor internally embedded files – are required or permitted. This exchange requires no prior knowledge of the sending and receiving environments and is sometimes referred to as “blind” exchange. It is platform and transport independent.

These goals are accomplished by defining a specific use of the publicly available Adobe Portable Document Format as specified in Version 1.3. In order to achieve a level of exchange that avoids any ambiguity in interpretation of the file, it identifies a limited set of PDF objects which may be used and adds restrictions to the use, or form of use, of those objects, and/or keys within those objects.

Whereas PDF/X-3 specifies the exchange of complete material, with all elements present, there are occasions where this is not appropriate. In certain workflows some or all of the referenced elements may be more logically present at the receiving site, or may be exchanged at a different time. These include fonts, high resolution contone image files, or line art files. These exchanges will generally require prior agreement between sender and receiver. The requirements for such situations are addressed in other parts of ISO 15930. Other exchanges may be more appropriately restricted to CMYK data only; such exchanges are accommodated in ISO 15930-1.

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

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.

Graphic technology — Prepress digital data exchange — Use of PDF —

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

1 Scope

This part of ISO 15930 specifies the use of the Portable Document Format (PDF) for the dissemination of complete digital data, in a single exchange, that contains all elements necessary for final print reproduction. These exchanges will support both colour-managed workflows and traditional CMYK workflows.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 15930. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 15930 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ICC.1:1998-09, *File Format for Color Profiles*, International Color Consortium

Adobe Portable Document Format, Version 1.3, second edition, 2000, Adobe Systems Incorporated (ISBN 0-201-61588-6)

Adobe Technical Note #5413 — *Recording Output Intentions for Color Critical Workflows*, 22 January 2001, Adobe Systems Incorporated

3 Terms and definitions

For the purposes of this part of ISO 15930, the following terms and definitions apply.

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

NOTE The bleed area includes the area that may be printed but does not include printers' marks of any kind.

3.2
characterized printing condition
printing condition (offset, newsprinting, publication gravure, flexographic, direct, etc.) for which process control aims are defined and for which the relationship between printing tone values (usually CMYK) and the colorimetry of the printed image is documented

NOTE 1 The relationship between 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.

3.3
complete exchange
exchange of compound entities in which all elements and element resources are present as part of a single PDF file and all of the information needed to process the compound entity is either in the compound entity or is specified within this part of ISO 15930 and its normative references

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

3.5
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

3.6
font
identified collection of graphics that may be glyphs or other graphic elements

3.7
glyph
recognizable abstract graphic symbol which is independent of any specific design

[ISO/IEC 9541-1:1991, 3.12]

3.8
glyph metrics
set of information in a glyph representation used for defining the dimensions and positioning of the glyph shape

[ISO/IEC 9541-1:1991, 3.16]

3.9
ICC
International Color Consortium
industry association formed to develop standardized mechanisms for colour management

3.10
ICC profile
set of colorimetric transforms prepared in accordance with ICC.1

3.11
PDF
Portable Document Format
file format defined in the *Adobe Portable Document Format*

3.12
PDF dictionary
associative table containing key-value pairs, specifying the name and value of an attribute for objects that is generally used to collect and tie together the attributes of a complex object

3.13
print element
element intended for final print reproduction

3.14
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 3.2 *characterized printing condition.*

3.15
reader
software application that is able to read and appropriately process files

3.16
spot colour
single colorant, identified by name, whose printing tone values are specified independently from colour values specified in a colour coordinate system

3.17
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 This is alternately referred to as chokes and spreads or grips and is not to be confused with the term “ink trapping”.

3.18
writer
software application that is able to write files

4 Symbols and notations

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

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

For the purpose of this part of ISO 15930, references to the “PDF Reference Manual” are to the *Adobe Portable Document Format*, as identified in clause 2, extended by Adobe Technical Note #5413.

5 Conformance

This part of ISO 15930 defines the use of the PDF file format for the exchange of digital data representing a compound entity.

NOTE See 3.4 for a definition of a compound entity.

A PDF/X-3 file is a PDF file in which those features necessary for the exchange of a compound entity adhere to this part of ISO 15930. A conforming file may also include other valid PDF features that do not affect final print reproduction of the compound entity.

Neither the version number in the 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 conformance with this part of ISO 15930.

A conforming writer is a software application that shall be able to write files conforming to the requirements of this part of ISO 15930.

A conforming PDF/X-3 reader is a software application that shall be able to read and appropriately process all conforming PDF/X-3 files as defined in this part of ISO 15930.

The PDF Reference Manual states that files complying with previous versions of PDF also comply with version 1.3. It is recommended that features that are described in versions of the PDF specification earlier than 1.3, but which are not described in the PDF Reference Manual, should not be used in a conforming PDF/X-3 file. Such features may be ignored by a PDF/X-3 reader. See Annex D.

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 conforming files shall be performed as defined in the PDF Reference Manual.

6 Requirements

6.1 Data structure

A PDF/X-3 file consists of four sections: header, body, cross-reference table, and trailer. The body of a PDF/X-3 file contains a sequence of numbered objects such as numbers, names, strings, dictionaries and streams representing the text characters, graphics, images and their associated resources describing the compound entity being exchanged. The specific PDF features required by this part of ISO 15930 are summarized in Annex A and are defined in 6.2 to 6.16, inclusive. These features shall be used as prescribed in the PDF Reference Manual and as further specified by this part of ISO 15930.

In order to achieve the requirements of a blind exchange (an exchange without recourse to additional technical communication), 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-3 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-3 file.

"Complete" means the exchanged files shall include:

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

— all print elements, properly prepared for the intended output condition.

6.2 Colour Spaces

6.2.1 General

A PDF/X-3 file makes provision for exchanging data either as output device code values or as colorimetrically defined data. Colorimetrically defined data shall be described either using a profile in an ICCBased colour space or using an equivalent mechanism, namely a CalGray, CalRGB or Lab colour space.

However, both types of data, if present in a PDF/X-3 file, shall be prepared for a single intended output condition. This intended output condition is defined by either a named condition or an ICC output profile.

6.2.2 Identification of intended output condition

The intended output condition (i.e., the process colour model for the output device) for which data has been prepared shall be identified by use of an **OutputIntents** array in the **Catalog** object as described in Adobe Technical Note #5413. Exactly one of the **OutputIntents** entries shall be a dictionary in which the value of the **S** key is the name **/GTS_PDFX**, henceforth referred to as the PDF/X output intent dictionary. Additional output intents may be present; if so, they shall use different values for the **S** key and shall be ignored by a PDF/X-3 compliant reader.

The PDF/X output intent dictionary shall include the **OutputConditionIdentifier** key.

Where the intended output condition is a characterized printing condition included in the registry of characterizations maintained by the ICC, the value of the **OutputConditionIdentifier** key shall be exactly the same as the name used in the ICC registry.

If the value of the **OutputConditionIdentifier** key matches a characterization name in the ICC registry the **RegistryName** key shall be present with the value (http://www.color.org). If it matches a characterization name in any other registry it is strongly recommended that the **RegistryName** key be present, preferably with a value that provides a URL at which more information regarding the registry may be obtained. See Annex B.

Where all colour data is supplied in the process colour model of the intended output condition, or in **Separation**, **DeviceN**, **Indexed** or **Pattern** colour spaces that only make use of those process colours and/or spot colours, a **DestOutputProfile** key is optional. If some or all colour data is not supplied in the process colour model of the intended output condition or the **OutputConditionIdentifier** key does not match a characterization name in the ICC registry, a **DestOutputProfile** key is required.

If present in the **DestOutputProfile** stream object, the **Alternate** key shall be ignored by a PDF/X-3 compliant reader.

The values of the **profileDescriptionTag** and **charTargetTag**, if present in the ICC profile, shall be ignored.

The PDF/X output intent dictionary should include the **Info** key. If the **Info** key is present its value should be a string describing the intended printing condition in a form that will be meaningful to a human operator at the site receiving the exchanged file.

The profile that is the value of the **DestOutputProfile** key, if present, shall be an Output Device profile (Device Class = 'prtr') as defined in ICC.1.

NOTE If some or all colour data is not supplied in the process colour model of the intended output condition, the intent is that the profile that is the value of the **DestOutputProfile** key is to be used to transform the colour data provided into the process colour model of the intended output condition.

6.2.3 DeviceCMYK

If a PDF/X-3 file includes colour data defined in **DeviceCMYK** and if the intended output device is not CMYK, a **DefaultCMYK** colour space shall be included in the **ColorSpace** dictionary of the **Resources** dictionary of the root object of the marking content. The **DefaultCMYK** shall provide a colorimetric definition.

6.2.4 DeviceGray

If the intended output condition is CMYK, **DeviceGray** shall be taken as referring to the black separation of the intended output condition.

If a PDF/X-3 file includes colour data defined in **DeviceGray**, and if the intended output device is not CMYK or Gray, a **DefaultGray** colour space shall be included in the **ColorSpace** dictionary of the **Resources** dictionary of the root object of the marking content. The **DefaultGray** shall provide a colorimetric definition