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

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

iTeh STANDARD PREVIEW

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

*Partie 1: Échange complet employant les données CMYK (PDF/X-1 et  
PDF/X-1a)*

[ISO 15930-1:2001](https://standards.iso.org/iso-15930-1:2001)

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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.

ISO 15930-1 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 — 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.

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## 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 minimising 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.

Part 1 of ISO 15930 defines a data format and its usage to permit the predictable dissemination of a compound entity to one or more locations as 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. 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. It includes two compliance levels, PDF/X-1 and PDF/X-1a, that differ only in their allowed use of OPI references, and encryption which are allowed in PDF/X-1 but not in PDF/X-1a.

Whereas PDF/X-1 and PDF/X-1a specify the exchange of complete material, primarily as CMYK data, 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. Further, evolving colour management capabilities may allow elements to be exchanged more expeditiously in colour spaces other than CMYK. The requirements for such situations are addressed in later parts of ISO 15930.

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-1, 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.

## ISO 15930-1:2001(E)

The PDF/X-1 conformance level of this part of ISO 15930 is generally similar to ANSI CGATS.12/1-1999, *Graphic technology — Prepress digital data exchange — Use of PDF for composite data — Part 1: Complete exchange (PDF/X-1)*. ANSI CGATS.12/1 is based on *Portable Document Format Reference Manual* Version 1.2 as extended by Adobe Technical Note #5188. This part of ISO 15930 is based on the *Adobe Portable Document Format* Version 1.3.

Users are cautioned that there are currently three different conformance levels that may be associated with PDF/X readers and writers. Two of these are generally referred to as PDF/X-1 and are those compatible with ANSI CGATS.12/1-1999 and the PDF/X-1 compatibility level of this part of ISO 15930. It is recommended that these be referred to as PDF/X-1:1999 and PDF/X-1:2001 respectively. Further this part of ISO 15930 makes provision for a 2nd conformance level which does not allow OPI references or encryption. This should be referred to as PDF/X-1a:2001. While a PDF/X-1:2001 reader should accept and properly read files conforming to both PDF/X-1:2001 and PDF/X-1a:2001 conformance levels, readers meeting the other two conformance levels should not be expected to properly read files outside of their own conformance level.

An ongoing series of Application Notes [1] is maintained for the guidance of developers and users of the ISO PDF/X family of International Standards. They are available from NPES The Association for Suppliers of Printing, Publishing and Converting Technologies in the standards section at <http://www.npes.org/standards/workroom.html>.

Attention is drawn to the fact that it is claimed that compliance with this part of ISO 15930 may involve the use of a patent concerning data encryption (clause 6.17). ISO takes no position concerning the evidence, validity and scope of this patent right. The holder of this patent right has assured ISO that they are willing to negotiate licenses under reasonable and non-discriminatory terms and conditions with applicants throughout the world. Information may be obtained from: RSA Data Security, Inc., 100 Marine Parkway, Redwood City, CA 94065-1031, USA. Attention is also drawn to the possibility that some of the elements of this part of ISO 15930 may be the subject of patent rights other than those identified above. ISO shall not be held responsible for identifying any or all such patent rights.

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

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

### 1 Scope

This part of ISO 15930 specifies the methods for the use of the Portable Document Format (PDF) for the dissemination of compound CMYK digital data, in a single exchange, that is complete and ready for final print reproduction.

### 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.

ISO 12639, *Graphic technology — Prepress digital data exchange — Tag image file format for image technology (TIFF/IT)*  
41514c87f888/iso-15930-1-2001

ANSI CGATS.12/1-1999, *Graphic technology — Prepress digital data exchange — Use of PDF for composite data — Part 1: Complete exchange (PDF/X-1)*

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

*Adobe Portable Document Format*, version 1.3, 2nd Ed., Adobe Systems Incorporated, Dated July 2000, ISBN 0-201-61588-6

Adobe Technical Note #5002 — *Encapsulated PostScript File Format Specification* — Version 3.0, 1 May 1992, Adobe Systems Incorporated

Adobe Technical Note #5044 — *Color Separation Conventions for PostScript Language Programs*, 12 February 1996, Adobe Systems Incorporated

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

*Desktop Color Separation Specification 2.0*, June 1993, revised May 1995, Quark Inc.

*Draft TIFF Technical Note #2*, 17 March 95, Tom Lane, the Independent JPEG Group

*PostScript Language Reference Manual*, third edition, 1999, Adobe Systems Incorporated, ISBN 0-201-37922-8

*TIFF, Revision 6.0*, June 3, 1992, 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 area that may be printed but does not include printers' marks of any kind.

#### 3.2

##### **blind exchange**

exchange of compound entities which 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

#### 3.3

##### **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.

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#### 3.4

##### **CMYK**

cyan-magenta-yellow-black used as a modifier of printing tone values, colours, process colorants, etc.

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#### 3.5

##### **complete exchange**

exchange of compound entities in which all elements and element resources are present as part of a single exchange and all of the information needed to process the compound entity is either in the compound entity or is specified within the applicable standard and its normative references

#### 3.6

##### **compound entity**

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

#### 3.7

##### **DCS**

desktop colour separation file formats as defined by *Desktop Color Separation Specification 2.0*

#### 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

##### **EPS**

Encapsulated PostScript as defined by Adobe Technical Note #5002

#### 3.10

##### **font**

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



**3.11****glyph**

recognizable abstract graphic symbol that is independent of any specific design (ISO/IEC 9541-1 [2])

**3.12****glyph metrics**

set of information in a glyph representation used for defining the dimensions and positioning of the glyph shape (ISO/IEC 9541-1 [2])

**3.13****ICC**

International Color Consortium, an industry association formed to develop standardized mechanisms for colour management

**3.14****non-print element**

an element not intended for final print reproduction such as previews, preview images or non-printing annotations

**3.15****OPI reference**

PDF dictionary of *OPI* type that has an *F* key the value of which is a file specification for an external file which is also referred to as an OPI dictionary in the PDF documentation

**3.16****partial exchange**

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

NOTE Examples of excluded elements or element resources are fonts and high resolution images.

**3.17****PDF (Portable Document Format)**

file format defined in the *Adobe Portable Document Format* [ISO 15930-1:2001](https://standards.iteh.ai/standards/sist/004a0a26-6068-4bcc-97be-41514c87f888/iso-15930-1-2001)

**3.18****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

**3.19****preview**

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

NOTE A visible placeholder 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. See 3.20

**3.20****preview image**

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

**3.21****print element**

element intended for final print reproduction

**3.22****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. See 3.3 *characterized printing condition*

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### 3.23

#### process colorant

one of a set of colorants that, when printed together, produce a range of colours able to reproduce the values specified by a colour co-ordinate system

NOTE The most common of these are the cyan, magenta and yellow dyes or pigments used to create images, often with the addition of black as a fourth process colorant.

### 3.24

#### reader

software application that is able to read and appropriately process files

### 3.25

#### spot colour

single colorant, identified by name, whose printing tone values are specified independently from colour values specified in a colour co-ordinate system

### 3.26

#### TIFF

tagged image file format as defined by revision 6.0 of TIFF

### 3.27

#### TIFF/IT

format for exchanging raster-based data as defined in ISO 12639

### 3.28

#### 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 Sometimes colloquially referred to as chokes and spreads or grips. This is not the same as ink trapping.

### 3.29

#### 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.

File type designations beginning with the string "TIFF/IT" refer to file data structures defined in ISO 12639.

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.

## 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.

A conforming PDF/X-1 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. A conforming PDF/X-1a file is a conforming PDF/X-1 file that adheres to the further restrictions set out in 6.5, 6.13, and 6.17.

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-1 reader is a software application that shall be able to read and appropriately process all conforming PDF/X-1 files as defined in this part of ISO 15930. A conforming PDF/X-1 reader may also be able to read and process all files conforming to ANSI CGATS.12/1-1999 having a value of (CGATS.12/1-1999) for the **GTS\_PDFXVersion** key in the **Info** dictionary.

NOTE The ability to read files prepared in accordance with ANSI CGATS.12/1-1999, the predecessor to this part of ISO 15930, is important to preserve upward compatibility.

A conforming PDF/X-1a reader is a software application that shall be able to read and appropriately process all conforming PDF/X-1a files. The processing of other PDF/X-1 files by a PDF/X-1a reader shall be at the discretion of the application software.

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 Technical requirements

### 6.1 General

The requirements contained in all parts of clause 6, except as noted in 6.5, 6.13, and 6.17, apply equally to PDF/X-1 and PDF/X1a.

### 6.2 Data structure

A PDF/X-1 file consists of four sections: header, body, cross-reference table, and trailer. The body of a PDF/X-1 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 6.3 to 6.21, 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, 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-1 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 previews, preview images or non-printing annotations. All components of a compound entity shall be contained in the body of a single PDF/X-1 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;
- any OPI externally referenced files embedded in the PDF/X-1 file as streams; and
- all print elements, properly prepared for a single intended printing condition.

NOTE For exchange of partial compound entities refer to ISO 15930-2 [3].

### 6.3 Colour

#### 6.3.1 General

All print elements shall be exchanged as CMYK data, gray scale data, or separation colour data. The CMYK and gray scale printing tone values in print elements, including those in OPI referenced files, shall be colour corrected and adjusted for a single characterized printing condition prior to exchange.