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**Graphic technology — Colour data  
exchange format (CxF/X) —**

**Part 4:  
Spot colour characterisation data  
(CxF/X-4)**

**iTeh STANDARD PREVIEW**  
*Technologie graphique — Échange des données de couleur en  
utilisant CxF —  
(standards.iteh.ai)*  
*Partie 4. Données de caractérisation des points de couleur*

[ISO 17972-4:2015](#)

[https://standards.iteh.ai/catalog/standards/sist/0f7b3ace-f2b1-4794-a15d-  
7e662a8aa1dc/iso-17972-4-2015](https://standards.iteh.ai/catalog/standards/sist/0f7b3ace-f2b1-4794-a15d-7e662a8aa1dc/iso-17972-4-2015)



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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 130, *Graphic technology*.

ISO 17972 consists of the following parts, under the general title *Graphic technology — Colour data exchange format (CxF/X)*: <https://standards.iteh.ai/catalog/standards/sist/0f7b3ace-f2b1-4794-a15d-7e662a8aa1dc/iso-17972-4-2015>

- *Part 1: Relationship to CxF3 (CxF/X)*
- *Part 4: Spot colour characterisation data (CxF/X-4)*

The following parts are under preparation:

- *Part 2: Scanner target data (CxF/X-2)*
- *Part 3: Output target data (CxF/X-3)*

## Introduction

ISO 17972 (all parts) defines methods for the exchange of measurement data and associated metadata within the graphic arts industry and for the exchange of files between graphic arts users. It is a multi-part document where each part is intended to respond to different workflow requirements. The goal throughout the various parts of ISO 17972 has been to maintain the degree of flexibility required while minimizing the uncertainty of the data exchanged.

ISO 17972-1 defines the use of the publicly available Color Exchange Format, version 3 (CxF3), for prepress data exchange and verification.

ISO 17972-2 defines the use of a CustomResource for the creation of scanner target data.

ISO 17972-3 defines the use of a CustomResource when exchanging data from ISO 12642-1 and ISO 12642-2, Prepress digital data exchange — Colour targets — Input data for characterization of 4-colour process printing.

Communication of printing characteristics of inks is essential in order to ensure that a printed product has the appearance desired by a print buyer or brand manager. Traditionally, inks are thought of as being either process inks or spot inks. The term “process inks” is used to describe a set of inks that are frequently used in combination on a printing press (often cyan, magenta, yellow and black). Process inks are generally characterised in combination and the measurement data for combinations of inks is the subject of ISO 17972-3.

This part of ISO 17972 covers the use of CxF when exchanging spot colour characterisation data. There are many proprietary formats for this communication and it is hoped that this part of ISO 17972 will provide a more reliable means for the communication of spot colour characterisation data. It is usually impractical to print and measure combinations of spot colour inks, and instead, each ink is characterised in conjunction with a print substrate by means of its spectral characteristics and ink opacity.

In some cases, multiple impressions of single or multiple spot inks can be used and the details of the inks used and the production method are not provided in this part of ISO 17972. Similarly, the way in which an ink is produced is also outside of the scope. Information of this kind can be included using standard CxF extension mechanisms.

The measurement data for metallic and fluorescent colours as described in this part of ISO 17972 might not be sufficient to fully characterise these types of ink.

X-Rite Inc., the original creator of the CxF file format, claims no intellectual property rights to the materials used in this part of ISO 17972.

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# Graphic technology — Colour data exchange format (CxF/X) —

## Part 4: Spot colour characterisation data (CxF/X-4)

### 1 Scope

This part of ISO 17972 defines an exchange format for spectral measurement data of inks to provide a means to characterise spot colour inks to allow reliable printing and proofing of products that have been designed using these inks. Only isotropic (paper-like) substrates are within the scope of this part of ISO 17972 which is limited to application areas where the same ink and paper combination that has been characterised is used when printing.

This part of ISO 17972 describes the use of a CustomResource element within the CxF framework to define a minimum and recommended set of data for exchange.

### 2 Terms and definitions

## THE STANDARD PREVIEW (standards.iteh.ai)

#### 2.1

##### **ColorSpecification**

[ISO 17972-4:2015](#)

information about the [ColorValue](#) ([2.2](#)) including its source ([2.4](#)—[measurement specifications](#)), illuminant/observer calculation method ([tristimulus specifications](#)), and physical attributes of the [objects](#) ([2.5](#)) (size, quantity, finish, etc.)

[SOURCE: ISO 17972-1, 3.1.1]

#### 2.2

##### **ColorValue**

one of a number of defined colour space types that can hold values and associated information related to that specific type of device independent colour space

[SOURCE: ISO 17972-1, 3.1.2]

#### 2.3

##### **CustomResources**

“extensible” part of CxF3; additional information not included in the CxF3 Core about colour objects and the file itself that is considered application specific in nature and not generally of use to all other applications

[SOURCE: ISO 17972-1, 3.1.3]

#### 2.4

##### **element content**

XML text between the start-tag and end-tag of an element

[SOURCE: ISO 16684-1:2012, 3.2]

#### 2.5

##### **object**

used to identify each specific “colour item” that is being described

[SOURCE: ISO 17972-1, 3.1.5]

## 2.6

### resources

information about each colour object that is of interest to all readers of the CxF file

Note 1 to entry: This is also referred to as the “CxF3 Core”. It is defined by the CxF3-Core namespace schema.

[SOURCE: ISO 17972-1, 3.2.4]

## 2.7

### schema

XML document conforming to the specifications established by the World Wide Web Consortium, that defines the structure of a class of XML documents

[SOURCE: ISO 17972-1, 3.2.5]

## 2.8

### spot colour

non-process colour that is used in addition to, or in place of, a process colour and is normally applied with a single impression

## 2.9

### tint value

value usually in the range 0 to 1 that indicates how much of a marking substance (e.g. ink, toner) should be applied to a printed region

Note 1 to entry: This is often referred to as tone value.

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## 2.10

### XML

eXtensible Markup Language

set of rules for encoding documents electronically

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## 3 Symbols and abbreviated terms

The following documentation conventions are used.

- Names of XML elements are shown in bold type, for example, **Resources**.
- Names of XML attributes are shown in italics, for example, *SpotColorName*.
- XML XPaths are used to identify XML elements. For example, **container/contained** refers to an element (**contained**) that is a child of another element (**container**).
- Similarly, XML XPaths are used to refer to XML attributes, for example, **element1/@Name** refers to an attribute (*Name*) of an element (**element1**).

## 4 Requirements

### 4.1 Conformance levels

This specification defines three conformance levels identified as CxF/X-4, CxF/X-4a and CxF/X-4b. These conformance levels allow different methods of spot colour communication in common use to be described.

- a) CxF/X-4 Full Characterisation. The data provided by CxF/X-4 allows the colour and opacity of the ink to be specified. This is particularly important in situations where an accurate proof of the spot ink printed on top of other content is to be made.

- b) CxF/X-4a Single Background Characterisation. There are situations where it is useful to be able to communicate characterisation data for an ink where the ink will only be printed on a single background and so can be characterised using a single set of spectral measurements.
- c) CxF/X-4b Single Patch Characterisation. There are situations where it is useful to be able to communicate characterisation data for an ink where the ink will always be printed as a solid and so can be characterised using a single spectral measurement.

## 4.2 Characterisation chart preparation

### 4.2.1 General

Measurement data in a conforming CxF/X-4 file should be taken from a spot ink characterisation chart as shown in [Figure 1](#). This measurement data provides the characteristic colour response for the combination of ink and substrate.



**Figure 1 — Example characterisation chart**

### 4.2.2 Printed patches

For all conformance levels, patches of 0 % and 100 % shall be printed on the unmarked substrate.

The printing system to be characterised shall be suitably configured and calibrated to match normal operating conditions before the characterisation chart is printed.

Tint levels recorded in the CxF data shall be those requested by the characterisation chart, which is not guaranteed to match the percentage area covered on the print because of tone value increase or other factors.

Tint levels recorded in the CxF data shall be as percentage values in the range of 0 to 100, where 0 means no ink was requested and 100 means that the chart requested that the area be completely covered with ink.

For conformance levels CxF/X-4 and CxF/X-4a, sets of patches shall include at least one patch with an intermediate tint level, for example 50 %, and should include a minimum of eleven patches in total.

For conformance level CxF/X-4, a second set of patches shall be printed on the region printed with black ink. This set of patches shall include 0 % and 100% tint levels and should include 50% tint level.

This part of ISO 17972 does not provide guidance as to how to measure patches and users shall ensure that measurements are made in line with measurement instrument manufacturer's guidelines.

**NOTE** For most spot measurement systems, a patch width ( $w$ ) and height ( $h$ ) of 1 mm larger than the aperture size of the measuring device is a minimum requirement. See ISO 13655 for additional guidance.

The only difference in the ink characterisation data files for these conformance levels is the number and type of measurements required and this is shown in [Table 1](#) below.

**Table 1 — Patch measurements required for each conformance level**

Type of measurement	CxF/X-4	CxF/X-4a	CxF/X-4b
Solid ink printed on substrate	Required	Required	Required
Tints of ink printed on substrate	3 minimum, 11 recommended	3 minimum, 11 recommended	No requirement
Tints of ink printed on black background	3 minimum	No requirement	No requirement

#### 4.2.3 Substrate and ink identification

The substrate and ink combination to be characterised shall each be identified by a unique name.

#### 4.2.4 Preparation of black region (Standards iteration 1) STANDARD PREVIEW

A region of the substrate shall be printed with a black ink. The resulting colour  $L^*$  value should be less than 20 and shall be as dark as possible. Its  $a^*$  and  $b^*$  values shall not be greater than 3 and shall not be less than -3.

[ISO 17972-4:2015](#)

**NOTE** This range [-3 3] might be insufficient for some inks, and in addition the black region has to be spectrally non-selective.

[7e662a8aa1dc/iso-17972-4-2015](#)

The black ink should be completely dry before the spot ink patches are printed.

#### 4.2.5 Measurements

Measurements of each patch shall be made using the same measurement condition.

The measurement condition used when making measurements shall be reported as described in [4.3.4.3](#).

### 4.3 Measurement communication

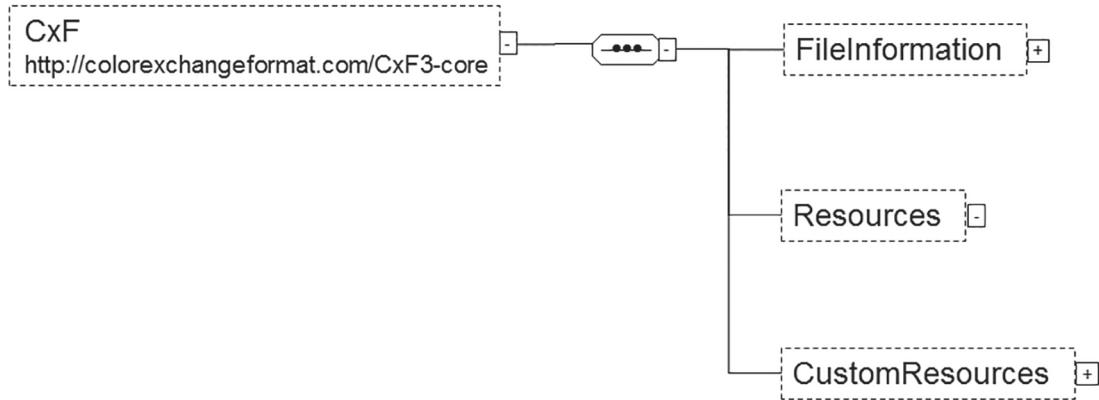
#### 4.3.1 General

The characterisation chart shall be measured and the measurements and required metadata shall be communicated using CxF as specified in this section of this part of ISO 17972.

#### 4.3.2 Structure

The document structure shall conform to the requirements of CxF 3.0 which has the form illustrated in [Figure 2](#).

The **FileInfo** and **Resources** elements shall conform to the CxF 3.0 requirements for core resources and in addition shall conform to requirements defined in this part of ISO 17972.



**Figure 2 — Structure of a CxF document**

#### 4.3.3 FileInformation element

A single **FileInformation** element shall be included and shall include the following attributes as defined by the CxF core.

- **FileInformation**/@*Creator* shall be specified and shall indicate the person, organisation or software that created the measurement data.
- **FileInformation**/@*CreationDate* shall be specified and shall indicate the date and time at which the measurements were made. **iTeh STANDARD PREVIEW (standards.iteh.ai)**
- **FileInformation**/@*Description* shall be included and shall start with the string “CxF/X”. Where the file is to be used in compliance with another ISO standard, it shall include the standard number in the comment [text:https://standards.iteh.ai/catalog/standards/sist/0f7b3ace-f2b1-4794-a15d-7e662a8aa1dc/iso-17972-4-2015](https://standards.iteh.ai/catalog/standards/sist/0f7b3ace-f2b1-4794-a15d-7e662a8aa1dc/iso-17972-4-2015)

#### 4.3.4 Core Resources

##### 4.3.4.1 Resources element

The **Resources** element shall include a set of **ReflectanceSpectrum** elements and an associated **ColorSpecification** element as shown below.

**EXAMPLE** The following example shows the structure of CxF Resources.

```

<Resources>
  <ObjectCollection>
    <Object ObjectType="Standard" Name="Red Spot" Id="A1">
      <ColorValues>
        <ReflectanceSpectrum ColorSpecification="CS001"
          Name="UniqueWithinThisObject">
          0.2852 0.3651 0.5526 0.7825 0.9326 0.9829 1.0031 1.0097 1.0059
          0.9989 0.9982 1.0019 1.0025 0.9954 0.9871 0.9794 0.9792 0.9805
          0.9766 0.9780 0.9754 0.9719 0.9691 0.9708 0.9753 0.9815 0.9893
          0.9940 0.9963 0.9952 0.9951 0.9928 0.9974 0.9997 1.0037 1.0137
        </ReflectanceSpectrum>
      </ColorValues>
    </Object>
    +++ other Object elements +++
  </ObjectCollection>

  <ColorSpecificationCollection>
    <ColorSpecification Id="CS001">
      <MeasurementSpec>
        <MeasurementType>Spectrum_Reflectance</MeasurementType>
      </MeasurementSpec>
    </ColorSpecification>
  </ColorSpecificationCollection>

```