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Document management — Portable ~~Document Format~~document format — RichMedia
annotations conforming to the ISO 10303-242 (STEP AP 242) specification

~~DTS stage~~

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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.

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Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

0.1 PDF: ISO 32000

ISO 32000-2 is able to embed 3D CAD models as either 3D or RichMedia annotations. 3D node, stream and view dictionaries can only reference data saved in either the ECMA-363, Universal 3D (U3D) file format or ISO 14739-1, Product Representation Compact (PRC) file format. This often requires the authoritative CAD data to be translated to either U3D or PRC solely to embed the data in a PDF file.

0.2 STEP: ISO 10303

STEP is a set of specifications and methods that enable the exchange and sharing of enterprise engineering information. It is an international standard (ISO 10303) with many *application protocols* (APs) that have a common core data definition. For example, AP 203, AP 214, and AP 242 use the same definitions for three-dimensional geometry, assembly data and basic product information. ISO 10303-42 and ISO 10303-46 are the key standard parts for geometry representation and visual presentation. Most 3D design, engineering and manufacturing software can read and/or write data stored in the STEP format.

The latest AP of STEP, AP 242, was developed to converge the AP 203 and AP 214 standards. STEP AP 242 contains all the functionality covered by the AP 203 and AP 214. In addition, it adds new functionality including 3D tessellated geometry, composites and 3D ~~Product~~product and ~~Manufacturing Information~~manufacturing information (PMI). The major technical impact of the STEP AP 242 standard covers the areas of:

- Model ~~Based Definition~~based definition (MBD).
- Long ~~Term Archiving~~term archiving (LTA).
- Engineering data exchange including composites.
- Manufacturing data exchange including PMI.

0.3 Extending PDF to support STEP

The purpose of this document is to extend the PDF specification to allow RichMedia annotations to include 3D assets saved in the STEP AP 242 (ISO 10303-242) format.

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Document management — Portable ~~Document Format~~document format — RichMedia annotations conforming to the ISO 10303-242 (STEP AP 242) specification

1 Scope

This document specifies how to extend the ISO 32000-2 specification by adding the ISO 10303-242 (STEP AP 242) format as a valid format for 3D assets contained in a RichMedia annotation. It is intended for:

- developers of software that creates PDF files (PDF writers);
- software that reads existing PDF files and usually interprets their contents for display (PDF readers);
- software that reads and displays PDF content and interacts with the computer users to possibly modify and save the PDF file (PDF processors);
- PDF products that read and/or write PDF files for a variety of other purposes (PDF processors).

Note PDF writers and PDF readers are more specialised classifications of PDF processors.

This document does not specify the following:

- specific processes for converting paper or electronic documents to the PDF file format;
- specific technical design, user interface implementation, or operational details of rendering;
- specific physical methods of storing these documents such as media and storage conditions;
- methods for validating the conformance of PDF files or PDF processors;
- required computer hardware and/or operating system.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 10303-242, *Industrial automation systems and integration — Product data representation and exchange — Part 242: Application protocol: Managed model-based 3D engineering*

ISO 32000-2:2020, *Document management — Portable ~~Document Format~~document format — Part 2: PDF 2.0*

3 Terms and definitions

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

ISO/TS 24064:2023(E)

ISO and IEC maintain ~~terminological~~terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/><https://www.electropedia.org/>

~~3.1—~~ **PDF (Portable Document Format)**

3.1 portable document format PDF

file format defined in ISO 32000-2

3.2 STEP AP 242

file format defined in ISO 10303-242

4 RichMedia annotations conforming to the ISO 10303-242 (STEP AP 242) specification

4.1 Document ~~Requirements~~requirements

4.1.1 General

Document requirements identify PDF features that are required for correct handling of a document. Requirements ~~are~~shall be stored as requirement dictionaries ~~(see in accordance with ISO 32000-2, PDF 2.0:2020, 12.11, "Document requirement")~~.

4.1.2 Requirement types

Requirements types shall be as defined in ISO 32000-2, PDF 2.0:2020, 12.11.2, "Requirement types" states:

The S entry in a requirement dictionary identifies a feature of the PDF language or a capability that may be present in a PDF processor. Such entries enable the document to identify feature(s) of PDF beyond those commonly expected, such as 2D graphics rendering, and are required for correct handling in accordance with this standard. In addition, although not required for viewing, a document may also use requirement values that stipulate required features of PDF processors such as the ability to interact with or modify the document.

4.1.3 STEP requirement

ISO 32000-2, ~~PDF 2.0:2020~~, Table-275, "Requirement types" lists requirement types that have been defined through PDF 2.0. ~~A~~As shown in Table 1, a new requirement type STEP, specifies that a STEP AP 242 RichMedia annotation is stored in a PDF file.

Table 1 — ISO 32000-2, ~~PDF 2.0:2020~~, Table-275 — Requirement types

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Field Code Changed

Type	Description
STEP	Requires support for RichMedia annotations (ISO 32000-2, PDF 2.0:2020, 13.7.2.2, "RichMediaSettings dictionary") conforming to the ISO 10303-242 (STEP AP 242) specification. This also includes support for associated ECMAScripts. If a V key is present in its Requirementsrequirement dictionary, it shall represent the version of the STEP AP 242 data in the PDF file and not the PDF version.

4.1.4 Identifying STEP AP 242 3D Artwork in a requirement dictionary

PDF documents containing RichMedia annotations with assets conforming to the STEP AP 242 specification shall have a Requirementsrequirement dictionary containing an S key with the value of STEP.

A V key in a requirement dictionary is used to specify the version number for a specific technology related to the requirement in question (see ISO 32000-2, PDF 2.0: "Requirement versions");:2020, 12.11.4).

RichMedia annotations with assets conforming to the STEP AP 242 specification shall have a V key that specifies the version of ISO 10303-242 used by the asset, represented as a year (decimal integer) followed by a period and a zero. For example, "2014.0" or "/2020.0" for edition 1 or 2 respectively.

4.2 3D views

4.2.1 General

ISO 32000-2, PDF 2.0: 13.6.4, "3D views" states:

A 3D view (or simply view) specifies parameters that shall be applied to the virtual camera associated with a 3D annotation as defined in ISO 32000-2:2020, 13.6.4.

Named views are specified in PDF as 3D view dictionaries.

4.2.2 Changes to the MS key in a 3D view dictionary

The MS key in a 3D view dictionaries specifies how the 3D camera-to-world transformation matrix is determined. The description of this key is modified to include the STEP AP 242 format as shown in Table 2.

Table 2 — ISO 32000-2, PDF 2.0:2020, Table 315 — Entries in a 3D view dictionary

Key	Type	Description
MS	name	(Optional) A name specifying how the 3D camera-to-world transformation matrix shall be determined. The following values are valid: M Indicates that the C2W entry shall specify the matrix. U3D Indicates that the view node selected by the U3DPath entry in the 3D stream object shall specify the matrix.
MS	name	NOTE 1 (Optional) A name specifying how the 3D camera-to-world transformation matrix shall be determined. The following values are valid: M Indicates that the C2W entry shall specify the matrix

Merged Cells

Merged Cells

Inserted Cells