
STEP geometry visualization services

Services de visualisation de la géométrie STEP



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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).

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

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 184, *Automation systems and integration*, Subcommittee SC 4, *Industrial data*.

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

There is a confirmed opportunity for industries to have a structured approach on 3D product visualization and to enable integration of product data in visualization applications across the life cycle of the product in all areas of a company.

The integrated standard for the exchange of product model data (STEP) in the enterprise processes has great value to contribute to this goal.

Business scenarios exist related to the visualization of product data other than geometry (e.g. metadata, production data, financial data).

The ability to trustfully share, distribute, collect, store, maintain, transfer, process and present product data associated with its geometry to support business processes distributed in enterprise networks is a key component of the digital transformation of our industries.

As long as data sets are managed by a single management system, we can ensure quality and traceability of the data set. However, when data is shared with partners in a supply chain, the data sets are usually copied and extracted from their initial management system and they lose all the traceability and links with the other product data. This document provides a solution to this problem.

This document is the first of a series of documents to provide an integrated framework using the ISO 10303 series to allow the consumption of product data in supply-chains and in companies using geometries as human-computer interface to access these product data through visualization applications. This is realized by using metadata to support the audit trail of the transformation of a geometry definition, and web services based on the utilisation of these metadata. This framework can also be used for automated product data consumption by software.

[Annex A](#) contains an identifier that unambiguously identifies this document in an open information system.

STEP geometry visualization services

1 Scope

This document defines a set of metadata to support the audit trail of the transformation of a geometry definition, while it is distributed and shared in supply-chains, to ensure the traceability of geometric model data. It also defines a set of web services based on the utilisation of these metadata.

The following are within the scope of this document:

- metadata definitions for geometry transformation audit trail:
 - syntax for storing these metadata in geometry data sets in various formats;
 - conformance level for implementers and business processes;
 - definitions of web services to query the geometric model data set and its associated metadata.

The following are outside the scope of this document:

- service specifications for CAD operations;
- specifications of a cybersecurity infrastructure to enable web services;
- the technical implementation of a STEP geometry services client or server;
- any geometric model definition;
- any product and manufacturing information (PMI) definition;
- archiving.

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 8601-1, *Date and time — Representations for information interchange — Part 1: Basic rules*

ISO 10303-21, *Industrial automation systems and integration — Product data representation and exchange — Part 21: Implementation methods: Clear text encoding of the exchange structure*

ISO 14306, *Industrial automation systems and integration — JT file format specification for 3D visualization*

ISO 16684-1, *Graphic technology — Extensible metadata platform (XMP) — Part 1: Data model, serialization and core properties*

ISO 16684-3, *Graphic technology — Extensible metadata platform (XMP) specification — Part 3: JSON-LD serialization of XMP*

ISO 17506:—¹⁾, *Industrial automation systems and integration — COLLADA digital asset schema specification for 3D visualization of industrial data*

ISO/IEC 19775-1, *Information technology — Computer graphics, image processing and environmental data representation — Extensible 3D (X3D) — Part 1: Architecture and base components*

1) Under preparation. Stage at the time of publication: ISO/FDIS 17506:2021.

ECMA-404, *The JSON data interchange syntax*

3 Terms and definitions

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

ISO and IEC maintain 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 <https://www.electropedia.org/>

3.1 boundary representation solid model

B-rep

type of geometric model in which the size and shape of a solid is defined in terms of the faces, edges and vertices which make up its boundary

[SOURCE: ISO 10303-42:2019, 3.1.2.5]

3.2 constructive solid geometry

CSG

type of geometric modelling in which a solid is defined as the result of a sequence of regularized Boolean operations operating on solid models

[SOURCE: ISO 10303-42:2019, 3.1.2.12]

3.3 derived geometry

geometric representation generated from another representation

Note 1 to entry: The derivation is realized by actions such as using another representation method, another format, approximations, simplification

EXAMPLE A "6-face *B-rep*" (3.1) is derived from a CSG (3.2) "solid block".

3.4 converted geometry

result of changing the data format of a geometry

Note 1 to entry: The import and export operations in a CAD system produce converted geometry.

Note 2 to entry: Converted geometry is a kind of *derived geometry* (3.3).

3.5 design intent

intentions of the designer of a model with regard to how it may be instantiated or modified

Note 1 to entry: The aspects of design intent relevant to ISO 10303-108 are concerned with the information represented in the parameters and constraints associated with a model. More generally, design intent also includes the procedural or construction history of a model, which is the subject of ISO 10303-55. All aspects of design intent influence the behaviour of a model under editing operations.

[SOURCE: ISO 10303-108, 3.7.10, modified — Changed "this part of ISO 10303" to "ISO 10303-108" in Note 1 to entry].