PD ISO/TS 23301:2023



BSI Standards Publication

STEP geometry visualization services

National foreword

This Published Document is the UK implementation of ISO/TS 23301:2023. It supersedes PD ISO/TS 23301:2021, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee AMT/4, Industrial data and manufacturing interfaces.

A list of organizations represented on this committee can be obtained on request to its committee manager.

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

This publication is not to be regarded as a British Standard.

© The British Standards Institution 2024
Published by BSI Standards Limited 2024

ISBN 978 0 539 24979 8

ICS 03.080.99; 25.040.40

Compliance with a Published Document cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 29 February 2024.

Amendments/corrigenda issued since publication

Date	Text affected

PD ISO/TS 23301:2023

TECHNICAL SPECIFICATION

ISO/TS 23301

Second edition
2023-12-19

STEP geometry visualization services

Services de visualisation de la géométrie STEP

Reference number
ISO/TS 23301:2023(E)

© ISO 2023



COPYRIGHT PROTECTED DOCUMENT

© ISO 2023, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword ..... **v**
Introduction ..... **vi**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **2**
4 High level business scenarios **4**
4.1 General 4
4.2 Check for updates 4
4.3 Visualization number 1 4
4.4 Visualization number 2 5
4.5 Retrieve product lifecycle management (PLM) data of a product 5
4.6 Archiving 5
4.7 Spatial query 5
5 Information requirements **5**
5.1 Review of geometry, topology and shape definitions 5
5.2 Geometry data set definition 6
5.3 Metadata for STEP geometry services 7
5.3.1 General 7
5.3.2 Extensible metadata platform (XMP) 8
5.3.3 Included namespaces 8
5.3.4 sgs namespace 9
5.4 Large model presentation — Bounding boxes 10
5.5 Large model presentation — Occurrence tree 11
5.6 Cybersecurity context and requirements 11
6 Implementation requirements **11**
6.1 General principles 11
6.2 XMP sidecar file 12
6.3 ISO/IEC 21778:2017 JSON 12
6.4 ISO 10303-21 12
6.5 10303 XML implementations 13
6.6 QIF-XML 13
6.7 ISO/IEC 19775-1 (X3D) 13
6.8 ISO 17506 (COLLADA) 13
6.9 3D PDF 13
6.10 ISO 14306 13
7 Geometry services specification **13**
7.1 Description 13
7.2 REST API 14
7.3 Service definition 14
8 Conformance requirements **16**
Annex A (informative) **Information object registration** **17**
Annex B (informative) **Reference Data Library (RDL) listing** **18**
Annex C (informative) **XMP sidecar file example** **23**
Annex D (informative) **Example of XMP metadata in ISO 10303-21** **24**
Annex E (informative) **Example of XMP metadata set in X3D** **25**
Annex F (informative) **2021 pilot report** **26**
Annex G (informative) **Use case — Spatial query** **28**

© ISO 2023 – All rights reserved

Annex H (informative) **Occurrence tree** **29**
Bibliography **30**

© ISO 2023 – All rights reserved

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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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 jointly by Technical Committee ISO/TC 184, *Automation systems and integration*, Subcommittee SC 4, *Industrial data*, in collaboration with Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 24, *Computer graphics, image processing and environmental data representation* and ISO/TC 171, *Document management applications*, Subcommittee SC 2, *Document file formats, EDMS systems and authenticity of information*.

This second edition cancels and replaces the first edition (ISO/TS 23301:2021), which has been technically revised.

The main changes are as follows:

— addition of a new high-level business scenario: spatial query;

— addition of a new requirement: large model presentation: bounding boxes;

— addition of a new requirement: large model presentation: occurrence tree;

— addition of a new metadata: this URI defining the URI of the current data set;

— updates in the services definition;

— addition of a new service: get_available_formats.

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.

© ISO 2023 – All rights reserved

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.

© ISO 2023 – All rights reserved

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 14306:2017, *Industrial automation systems and integration — JT file format specification for 3D visualization*

ISO 16684-1:2019, *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, *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*

© ISO 2023 – All rights reserved