International Standard

ISO 14306-1

First edition
2024-08

# Industrial automation systems and integration — JT file format specification for 3D visualization —

## Part 1: Overview and fundamental principles

*Systèmes d'automatisation industrielle et integration — Spécification de format de fichier JT pour visualisation 3D. —*

*Partie 1: Aperçu et Principes Fondamentaux*



Reference number
ISO 14306-1:2024(en)



ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

# Contents

Page

**Foreword** ..... **iv**

**Introduction** ..... **v**

**1 Scope** ..... **1**

**2 Normative references** ..... **1**

**3 Terms, definitions and abbreviated terms** ..... **1**
3.1 Terms and definitions ..... 1
3.2 Abbreviated terms ..... 1

**4 Overview of the ISO 14306 series** ..... **2**
4.1 Overview of the purpose of the ISO 14306 series ..... 2
4.2 Overview of the scope of the ISO 14306 series ..... 2
4.3 Fundamental principles of the ISO 14306 series ..... 2
4.4 Structure of the ISO 14306 series ..... 2

**5 Conformance** ..... **3**
5.1 Conformance classes ..... 3
5.2 General file structure ..... 3
5.3 Precise geometry ..... 3

**Annex A** (normative) **Information object registration** ..... **4**

**Bibliography** ..... **5**

# 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 by Technical Committee ISO/TC 184, *Automation systems and integration*, Subcommittee SC 4, *Industrial data*.

A list of all parts in the ISO 14306 series can be found on the ISO website.

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

The ISO 14306 series describes a file format which is used in industry for the representation of computer-interpretable 3D product data. The objective of the industrial user when using data contained in the format described in the ISO 14306 format is 3D visualization to enable collaboration, validation and information sharing throughout the extended enterprise.

The file format description is flexible in design focusing on compression for compact and efficient 3D data representations. Computer Aided Design (CAD) models, represented as data according to the ISO 14306 format are significantly smaller than the size of the original authored CAD data. Software applications that use this description focus on workflows requiring high-performance, both capturing and repurposing of lightweight 3D data that includes content such as product assembly structure and product and manufacturing information (PMI) independent of the original CAD authoring application.

A typical screenshot display of the Product Assembly Structure and PMI data is shown in Figure 1.

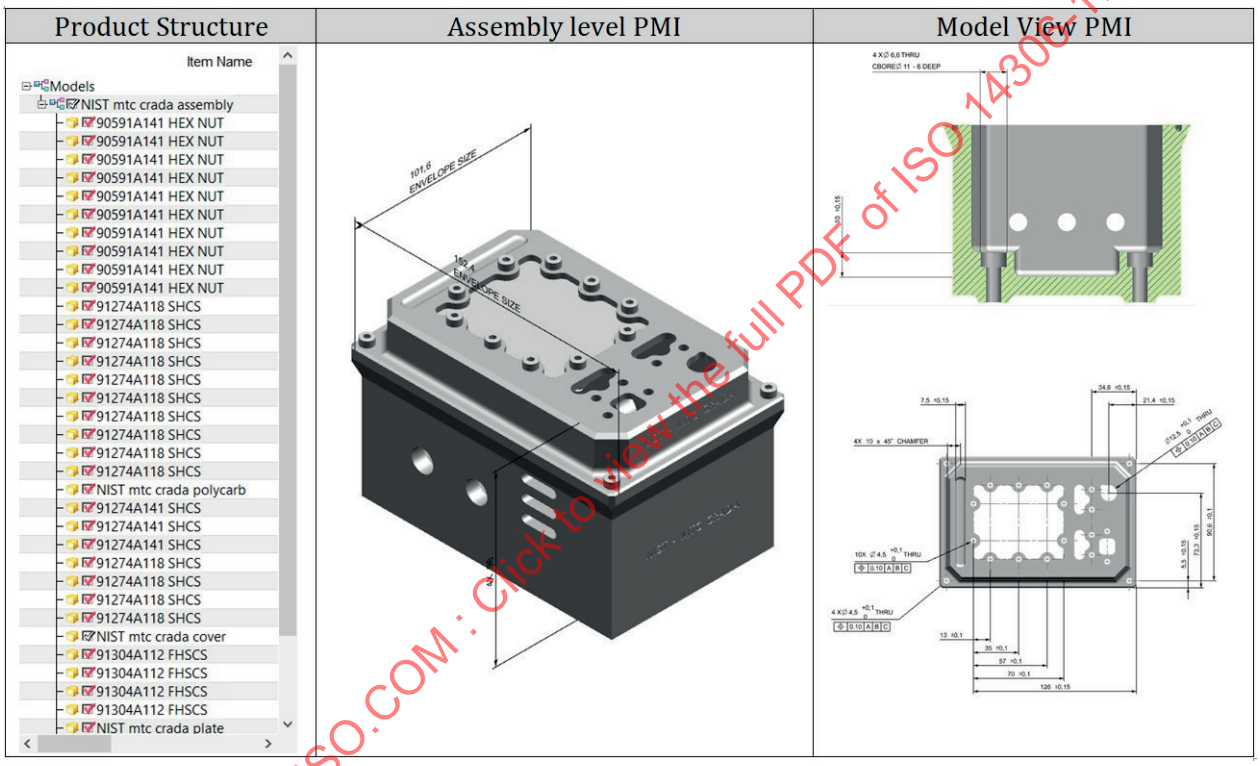


**Figure 1 — Example screenshot showing Product Structure and PMI images**

The ISO 14306 format file is stored on disk with a file extension of ".jt".

Beyond the data contents description of the ISO 14306 format, the overall organization of the format is designed to support operations such as:

— offline optimizations of the data contents, therefore file granularity and flexibility, are optimized to meet the needs of enterprise data sharing solutions

— asynchronous streaming of content, therefore viewing optimizations such as view frustum;

— occlusion culling and fixed-framerate display modes

— layers, and layer filters

Annex A contains an identifier that conforms to ISO/IEC 8824-1. The identifier unambiguously identifies this document in an open information system.

# Industrial automation systems and integration — JT file format specification for 3D visualization —

# Part 1: Overview and fundamental principles

## 1 Scope

This document provides an overview and defines the purpose and fundamental principles of the ISO 14306 series as well as the structure of the various parts within the series and an overview of the conformance for files created consistent with the standard.

The ISO 14306 series defines a binary file format description that is a representation of product information with the definitions necessary to enable 3D visualization among different computer systems and environments associated with a complete product lifecycle.

## 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 14306-2:2023, *Industrial automation systems and integration – JT file format specification for 3D visualization – Part 2: Vocabulary*

## 3 Terms, definitions and abbreviated terms

### 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14306-2 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/

### 3.2 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply.

CAD Computer Aided Design

URL Uniform Resource Locator

# 4 Overview of the ISO 14306 series

## 4.1 Overview of the purpose of the ISO 14306 series

The purpose of the ISO 14306 series is to specify a visualization format of shape and associated metadata that can be used independent of the original CAD authoring system. In doing so the geometric shape data can be interrogated using a faceted approximation of the shape. Alternatively, the precise geometric data can also be made available for interrogation and precise measurement.

This enables the information, originally authored within high-end CAD systems, to be available for use by a wider community of users.

## 4.2 Overview of the scope of the ISO 14306 series

The overall scope of the ISO 14306 series is to specify a visualization format of shape and associated metadata that can be used independently of the original CAD authored application.

This document is a 3D visualization capability complementary to the ISO 10303 series.

The ISO 14306 file format specification for 3D visualization includes data descriptions that can represent the following data in binary format:

— facet information (triangles), stored with geometry compression techniques.

— visual attributes such as lights, textures and materials.

— product and manufacturing information (PMI).

— in addition to a faceted representation, a precise boundary solid model (b-rep) shape representation may also be included in the file. The format of the precise boundary solid model (b-rep) shape representation is defined within the respective part of the ISO 14306 series;

— configuration representations.

The file format specification supports delivery methods such as asynchronous streaming of content.

The ISO 14306 file format specification for 3D visualization does not specify the implementation of, or definition of a run-time architecture for either viewing or processing ISO 14306 data, or both.

## 4.3 Fundamental principles of the ISO 14306 series

The ISO 14306 series separates the definition of representation of visualization information from the implementation methods used for the visualization process itself.

Approximated geometry representations and metadata are completely defined within their respective parts.

Precise geometry representations exist within the ISO 14306 series. The representations are defined within their respective parts.

The ISO 14306 series specifies the data structures required to define the visualization data in an unambiguous manner, therefore, enabling the visualization data to be accessed by various applications, independently of their original CAD authoring system.

The ISO 14306 series provides conformance class descriptions to assist with verification and testing of implementations.

## 4.4 Structure of the ISO 14306 series

The ISO 14306 series consists of several individual parts under the general title *Industrial automation systems and integration - JT file format specification for 3D visualization*:

The individual ISO 14306 series parts may also utilize external reference data libraries. The external reference data libraries contain descriptions for associated data, such as attribute values, which would otherwise make the physical specifications larger than necessary. The Reference Data Libraries are located by an associated URL specified in the individual part specification.

# 5 Conformance

## 5.1 Conformance classes

The specific conformance classes for each specific part of the ISO 14306 series are defined within their respective parts.

## 5.2 General file structure

All the ISO 14306 series files shall contain the following arrangement of data:

— File header

— Table of contents segment

— Data segments:

  — Required data segments

    — Logical scene graph (LSG) segment

    — Shape LOD segment

    — Meta data segment.

In addition, a file from the ISO 14306 series may contain additional data segments, for example:

— Precise geometry representation

— Wireframe geometry

— Alternate geometry representations

All ISO 14306 files shall provide the following arrangement of data :

— The first segment after the file header shall be the table of contents.

— There shall be at least one, but not more than ten, shape LOD segments.

— No more than one occurrence of any of the individual data segments may exist in the file.

## 5.3 Precise geometry

When implementing precise geometry segments the following guidelines apply:

— Geometry representing procedural curves and surfaces in the original CAD system shall be provided using an explicit definition such as non-uniform rational basis spline (NURBS) curves or surfaces.

— Procedural definitions may also be added.

— Non-manifold bodies shall not be used.