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

Part 4: Version 3

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

Partie 4: Version 3

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Contents

Page

Foreword ..... **vii**
Introduction ..... **ix**
1 Scope **1**
2 Normative references **1**
3 Terms, definitions and abbreviated terms **2**
3.1 Terms and definitions 2
3.2 Abbreviated terms 2
4 Notational conventions **3**
4.1 Diagrams and field descriptions 3
4.2 Data types 6
4.3 Empty field 8
5 File format **9**
5.1 General 9
5.2 Object types 9
5.3 File structure 9
5.3.1 File header 10
5.3.2 TOC segment 11
5.3.3 Data segment 12
5.4 Data segments 17
6 LSG segment **18**
6.1 Segment overview 18
6.2 Graph elements 18
6.3 Node elements 19
6.3.1 Base node element 19
6.3.2 Base node data 19
6.3.3 Partition node element 20
6.3.4 Group node element 22
6.3.5 Instance node element 23
6.3.6 Part node element 24
6.3.7 Metadata node element 25
6.3.8 LOD node element 25
6.3.9 Range LOD node element 26
6.3.10 Switch node element 27
6.3.11 Base shape node element 28
6.3.12 Vertex shape node element 31
6.3.13 Tri-strip set shape node element 32
6.3.14 Polyline set shape node element 32
6.3.15 Point set shape node element 33
6.3.16 Polygon set shape node element 34
6.3.17 NULL shape node element 34
6.3.18 Primitive set shape node element 34
6.4 LSG attribute elements 36
6.4.1 Material attribute element 38
6.4.2 Texture image attribute element 42
6.4.3 Draw style attribute element 54
6.4.4 Light set attribute element 56
6.4.5 Linestyle attribute element 57
6.4.6 Pointstyle attribute element 59
6.4.7 Geometric transform attribute element 60
6.4.8 Palette map attribute element 62
6.4.9 Infinite light attribute element 63
6.4.10 Point light attribute element 65
6.5 Property atom elements 68

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6.5.1 Base property atom element 68
6.5.2 String property atom element 69
6.5.3 Integer property atom element 70
6.5.4 Floating point property atom element 70
6.5.5 JT object reference property atom element 71
6.5.6 Date property atom element 72
6.5.7 Late loaded property atom element 73
6.5.8 Vector4f Property atom element 74
6.6 Property table 74

7 Shape LOD segment 76
7.1 Shape LOD segment overview 76
7.1.1 Tri-strip set shape LOD element 76
7.1.2 Polyline set shape LOD element 77
7.1.3 Point set shape LOD element 77
7.1.4 Polygon set LOD element 78
7.1.5 Null shape LOD element 89
7.1.6 Primitive set shape element 89

8 Geometry segments 96
8.1 Geometry segments overview 96
8.2 STEP B-Rep segment 96
8.3 Wireframe segment 96
8.4 XT B-Rep element 97

9 MetaData segment 97
9.1 MetaData segment overview 97
9.2 Property proxy MetaData element 97
9.3 PMI manager MetaData element 100
9.3.1 PMI design group entities 101
9.3.2 PMI associations 103
9.3.3 PMI user attributes 105
9.3.4 PMI string table 106
9.3.5 PMI model views 107
9.3.6 Generic PMI entities 109
9.3.7 PMI CAD tag data 119
9.3.8 PMI polygon data 120
9.3.9 PMI model view sort orders 123
9.3.10 PMI association properties 123
9.3.11 Generic PMI additions 125

10 Info segment 128

11 Data compression and encoding 129
11.1 Data compression and encoding overview 129
11.2 Common compression data collection formats 130
11.2.1 Int32 compressed data packet 130
11.2.2 Int64 compressed data packet 135
11.2.3 Compressed vertex coordinate array 137
11.2.4 Compressed vertex normal array 138
11.2.5 Compressed vertex texture coordinate array 140
11.2.6 Compressed vertex colour array 141
11.2.7 Compressed vertex flag array 143
11.2.8 Compressed auxiliary fields array 143
11.2.9 Point quantizer data 147
11.2.10 Texture quantizer data 147
11.2.11 Colour quantizer data 148
11.2.12 Uniform quantizer data 149
11.2.13 Compressed entity list for non-trivial knot vector 149
11.2.14 Compressed control point weights data 153
11.2.15 Compressed curve data 153

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11.2.16 Compressed CAD Tag Data 156
11.3 Encoding algorithms 158
11.3.1 Uniform data quantization 158
11.3.2 Bitlength CODEC 158
11.3.3 Arithmetic CODEC 159
11.3.4 Deering normal CODEC 164
11.4 LZMA compression 166

12 Conformance requirements 166
12.1 General conformance 166
12.2 Conformance classes 166
12.2.1 Approximated geometry visualization (CC01) 167
12.2.2 Precise geometry visualization (CC02) 167

13 Common data conventions and constructs 167
13.1 Overview 167
13.2 Late-loading data 167
13.3 TOC segment location 167
13.4 Bit fields 167
13.5 Empty field 168
13.6 Hash value 168
13.7 Scene graph construction 168
13.8 Metadata conventions 169
13.8.1 Property key naming conventions 169
13.8.2 PMI properties 170
13.8.3 CAD properties 171
13.8.4 Tessellation properties 172
13.8.5 Miscellaneous properties 173
13.8.6 The SUBNODE property and reference sets 174
13.8.7 Material and surface designation properties 178
13.9 LSG attribute accumulation semantics 178
13.10 LSG part structure 179
13.11 Range LOD node alternative rep selection 179
13.12 B-Rep face group associations 180
13.13 Smart topology table (STT) segment 180
13.14 Watermark image 181
13.15 State flags 181

Annex A (normative) **Information object registration 182**

Annex B (informative) **Object type identifiers 183**

Annex C (informative) **Coding algorithms – An implementation 185**

Annex D (informative) **Hashing – An Implementation 208**

Annex E (informative) **Polygon mesh topology coder 211**

Annex F (informative) **Per face group attributes 229**

Annex G (normative) **STEP B-Rep 233**

Annex H (normative) **STEP schema 236**

Annex I (informative) **XT B-Rep data segment 303**

Annex J (informative) **Smart topology table (STT) segment 405**

Annex K (normative) **Wireframe segment 431**

Annex L (informative) **Mapping table 14306-4 XT B-Rep to STEP 434**

Annex M (informative) **Procedural geometry – Evaluation and approximation 440**

Annex N (normative) **Information Object Registration Scheme 475**

Annex O (informative) **Change history 477**

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Bibliography **479**

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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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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*.

This first edition of ISO 14306-4, together with ISO 14306-1, ISO 14306-2, ISO 14306-3, cancels and replaces the second edition ISO 14306:2017, which has been technically revised.

The main changes are as follows:

— this document defines the requirements based upon the JT 10.5 file format requirements, whereas ISO 14306:2017 defines the requirements based upon the JT 9.5 file format requirements. A detailed list of the changes are shown in Annex O;

— the version string in the File Header has been updated to reflect ISO 14306-4 Version 3;

— the file compression format has changed from Z-Lib to the publicly available LZMA format;

— the technical description for MbStrings Composite Data Types has been updated to include UTF 16;

— new segment types have been added for Smart Topology Table (STT) and Info Segment;

— the Base Attribute Data description has been expanded to include the logical collection Base Attribute Data Fields V2;

— a new attribute element has been added to the LSG definition, Palette Map Attribute Element;

— a new attribute element, “Sabot Attribute Element”, has been added to the LSG definition. Sabot is used to insulate earlier readers from attributes with non-fallback palette Index attributes in order to preserve forward compatibility;

— new PMI Association values have been included to support partial scene sectioning;

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— a complete description of all PMI String Property Atom Element values is made available as a Reference Data Library in electronic format;

— generic PMI Entity Type values have a new value; 0x0309 Weld Note Type;

— an Annex F (Per Face Group Attributes) has been added;

— two new PMI Associations Reason Code values have been added, code 256 and code 257;

— Annex I is related to the XT BREP geometry definition. The following changes have been made in I.1.1.1.5

  Updates in the “Topology” description.

  Updates in the “World Topologies” table.

  Updates to the “Body fields” table.

  Updates to the “Region fields” table.

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.

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Introduction

The ISO 14306 format is an industry focused, high-performance, lightweight, flexible file format for capturing and repurposing 3D product definition data for visualization to enable collaboration and validation throughout the extended enterprise. The ISO 14306 format is streamable and contains compression for compact and efficient representation.

Some of the highlights of the ISO 14306 format include:

— built-in support for assemblies, sub-assemblies and part constructs;

— flexible partitioning scheme, supporting single or multiple files;

— b-rep solid shape representations to provide precision to the light-weight viewing processes;

— product manufacturing information in support of paperless manufacturing initiatives;

— precise and imprecise wireframe shape representations;

— discrete purpose-built levels of detail;

— triangle sets, polygon sets, point sets, line sets and implicit primitive sets (such as cylinder, cone and sphere);

— full array of visual attributes such as for materials, textures, lights;

— hierarchical bounding box and bounding spheres;

— data compression that allows producers of ISO 14306 files to fine tune the trade-off between compression ratio and fidelity of the data.

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

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

— asynchronous streaming of content, therefore viewing optimizations;

— occlusion culling and fixed-framerate display modes;

— layers, and layer filters.

NOTE This document is based on the JT Open version 10.5 specification, which defines a logical scene graph with geometry specific node and attribute support, extended to support the ISO 10303 series.

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

Annex A contains an identifier that conforms to ISO/IEC 8824-1. The identifier unambiguously identifies this document and the schema in an open information system. The ISO 14306 series applies the method as described in Annex N.

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

Part 4:
Version 3

1 Scope

This document defines the syntax and semantics of a file format for the 3D visualization and interrogation of lightweight geometry and product manufacturing information derived from CAD systems, using visualization software tools that do not need the full capability of a CAD system.

This document has been adopted as a 3D visualization capability in addition to the ISO 10303 series.

The ISO 10303 series are the ISO standards adopted for the engineering data exchange, sharing and long-term archiving of product definition information throughout the product lifecycle.

In this document 3D visualization is defined as the visual presentation on a screen or another media of graphical and textual 3-dimensional representations of a set of data representing an object, information or results of a computational process in order to enable decision process by a human looking at the data visualized in a medium.

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

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

— visual attributes such as lights, textures and materials;

— product manufacturing information (PMI);

— boundary representation (b-rep) solid model shape representation and associated metadata;

— configuration representations; and

— delivery methods such as asynchronous streaming of content.

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

2 Normative references

ISO 10303-21:2016, *Industrial automation systems and integration — Product data representation and exchange — Part 21: Implementation methods: Clear text encoding of the exchange structure*

ISO 10303-42:2024, *Industrial automation systems and integration — Product data representation and exchange — Part 42: Integrated generic resource: Geometric and topological representation*

ISO 14306-2:2024, *Industrial automation systems and integration — JT file format specification for 3D visualization — Part 2: Vocabulary*

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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.

Abs	absolute value
Bbox	bounding box
B-Rep	boundary representation
CAD	computer aided design
CODEC	coder-decoder
GD&T	geometric dimensioning and tolerancing
GUID	globally unique identifier
HSV	hue, saturation, value
LCS	local coordinate system
LsbFirst	least significant byte first
LZMA	Lempel–Ziv–Markov
Max	maximum
MCS	machine coordinate system
Min	minimum
MsbFirst	most significant byte first
N/A	not applicable
PCS	parameter coordinate space
PLM	product lifecycle management
RGB	red, green, blue
RGBA	red, green, blue, alpha
TOC	table of contents
VPCS	viewpoint coordinate system

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