SLOVENSKI STANDARD
SIST EN 9300-121:2024

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Aeronavtika - LOTAR - Dolgotrajno arhiviranje in iskanje digitalne tehnične dokumentacije o izdelkih, kot so podatki o 3D, CAD in PDM - 121. del: Semantična predstavitev CAD 3D eksplicitnih informacij o geometriji z grafičnim izdelkom in izdelavo

Aerospace series - LOTAR - LOng Term Archiving and Retrieval of digital technical product documentation such as 3D CAD and PDM data - Part 121: Semantic representation of CAD 3D Explicit Geometry with Product and Manufacturing Information

Luft- und Raumfahrt - LOTAR - Langzeit-Archivierung und -Bereitstellung digitaler technischer Produktdokumentationen, wie zum Beispiel von 3D-, CAD- und PDM-Daten - Teil 121: Semantische Darstellung von eindeutiger 3D-CAD-Geometrie mit Produkt- und Fertigungsinformationen

Série aérospatiale - LOTAR - Archivage long terme et récupération des données techniques produits numériques, telles que CAO 3D et PDM - Partie 121 : Représentation sémantique de la géométrie CAO 3D explicite avec données de produit et de fabrication

Ta slovenski standard je istoveten z: **EN 9300-121:2023**

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01.110	Tehnična dokumentacija za izdelke	Technical product documentation
35.240.30	Uporabniške rešitve IT v informatiki, dokumentiranju in založništvu	IT applications in information, documentation and publishing
49.020	Letala in vesoljska vozila na splošno	Aircraft and space vehicles in general

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English Version

Aerospace series - LOTAR - LOng Term Archiving and Retrieval of digital technical product documentation such as 3D CAD and PDM data - Part 121: Semantic representation of CAD 3D Explicit Geometry with Product and Manufacturing Information

Série aérospatiale - LOTAR - Archivage long terme et récupération des données techniques produits numériques telles que CAO, 3D et PDM - Partie 121 : Représentation sémantique de la géométrie CAO 3D explicite avec données de produit et de fabrication

Luft- und Raumfahrt - LOTAR - Langzeit-Archivierung und -Bereitstellung digitaler technischer Produktdokumentationen, wie zum Beispiel von 3D-, CAD- und PDM-Daten - Teil 121: Semantische Darstellung von eindeutiger 3D-CAD-Geometrie mit Produkt- und Fertigungsinformationen

This European Standard was approved by CEN on 22 December 2019.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 9300-121:2023) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this document has received the approval of the National Associations and the Official Services of the member countries of ASD-STAN, prior to its presentation to CEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2024, and conflicting national standards shall be withdrawn at the latest by May 2024.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

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According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Introduction

This document was prepared jointly by AIA, ASD-STAN, PDES, Inc., and the prostep ivip Association. The prostep ivip Association is an international non-profit association in Europe. For establishing leadership in IT-based engineering it offers a moderated platform to its nearly 200 members from leading industries, system vendors and research institutions. Its product and process data standardization activities at European and worldwide levels are well known and accepted. The prostep ivip Association sees this standard and the related parts as a milestone of product data technology.

PDES Inc. is an international non-profit association in USA. The mission of PDES Inc. is to accelerate the development and implementation of ISO 10303 series, enabling enterprise integration and PLM interoperability for member companies. PDES Inc. gathers members from leading manufacturers, national government agencies, PLM vendors and research organizations. PDES Inc. supports this standard as an industry resource to sustain the interoperability of digital product information, ensuring and maintaining authentic longevity throughout their product lifecycle.

Readers of this standard should note that all standards undergo periodic revisions and that any reference made herein to any other standard implies its latest edition, unless otherwise stated. The Standards will be published under two different standards organizations using different prefixes. ASD-STAN will publish the standard under the number EN 9300-xxx. AIA will publish the standard under the number NAS 9300-xxx. The content in the EN 9300 and NAS 9300 documents will be the same. The differences will be noted in the reference documentation (i.e. for EN9300 Geometric Dimensioning & Tolerancing will be referenced in ISO 1101 and ISO 16792, and for NAS 9300 the same information will be referenced in ASME Y14.5 and Y 14.41). The document formatting etc., will follow that of the respective editorial rules of ASD-STAN and AIA.

This document specifies the requirements for the long term digital preservation of the Semantic Representation of Product and Manufacturing Information (PMI) with their possible links to the 3D explicit shape and geometry of single CAD parts. The goal is to preserve this 3D information, without loss, with respect to the geometry produced by the original CAD system, following the principles laid down in EN 9300-003 “Fundamentals and Concepts”.

The requirements of EN 9300-110 concerning the preservation of the 3D explicit shape shall apply within this Part.

The term “semantic representation” is specified in Clause 3 “Terms, definitions and abbreviations”.

1 Scope

1.1 In scope

This document is applicable to:

— machine-interpretable PMI “Semantic Representation” (Refer to Clause 3 for definition);

— the association of the above with 3D geometric shapes;

— the possible association of the above with Presentation of 3D Product and Manufacturing Information (PMI), and 3D annotations as specified in EN 9300-120.

In EN 9300-121, the technology used to preserve this 3D information is based on semantic representation. The main use cases are Certification, Product Liability and Design re-use.

For the purpose of this document, the semantic definition is at the level that supports associative “Cross-highlighting” for the purpose of human readability.

1.2 Out of scope

This document is applicable to:

— PMI presentation (specified in EN 9300-120);

— User defined attributes that are assigned to 3D geometric entities or at the part level. The archiving of the UDA is specified in EN 9300-120.

— How to preserve additional information:

  — property rights;

  — form features;

  — CAD Assemblies.

— The semantics of special Notes outside the scope of PMI: ITAR/EAR, proprietary, and title block information, etc.

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.

EN 9300 (all parts), *Aerospace series — LOTAR — Long Term Archiving and Retrieval of digital technical product documentation such as 3D, CAD and PDM data*

ISO 10303-203, *Industrial automation systems and integration — Product data representation and exchange — Part 203: Application protocol: Configuration controlled 3D design of mechanical parts and assemblies*[1]

[1] Document is withdrawn.

ISO 10303-214, *Industrial automation systems and integration — Product data representation and exchange — Part 214 — Application protocol: Core data for automotive mechanical design processes*

ISO 10303-242, *Industrial automation systems and integration — Product data representation and exchange — Part 242: Application protocol: Managed model-based 3D engineering*[1]

ISO 10303-514, *Industrial automation systems and integration — Product data representation and exchange — Part 514: Application interpreted construct: Advanced boundary representation*

ISO 10303-519, *Industrial automation systems and integration — Product data representation and exchange — Part 519: Application interpreted construct: Geometric tolerances*

ISO 1101, *Geometrical product specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out*

ISO 16792, *Technical product documentation — Digital product definition data practices*

ASME Y14.5, *Dimensioning and Tolerancing*

ASME Y14.41, *Digital Product Definition Data Practices*

CAx-IF Recommended Practices for the Representation and Presentation of Product Manufacturing Information (PMI) (AP242), Available on the website managed by the CAX Implementer Forum

3 Terms, definitions and abbreviations

For the purposes of this document, the terms and definitions given in EN 9300-007 and EN 9300-100 and the following 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/

Figure 1 illustrates the terms introduced in this Part:

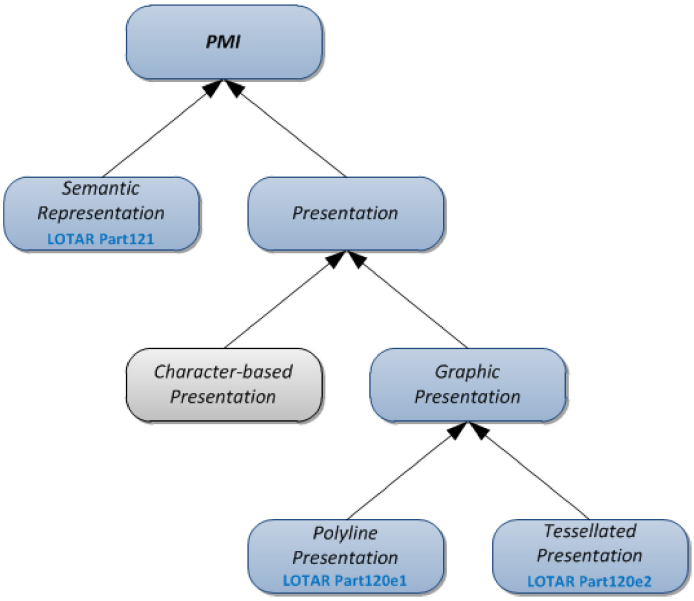

Figure 1 — Hierarchy of PMI Terms

3.1
Product and Manufacturing Information (PMI)

Product and Manufacturing Information (PMI) is used in 3D Computer-aided Design (CAD) systems to convey information about the definition of a product's components for manufacturing, inspections and sustainment, which supplements the geometric shape of the product. This includes – but is not limited to – data such as dimensions, tolerances, surface finish, weld symbols, material specifications, 3D annotations and user defined attributes. The term PMI, used by itself, relates to a certain information content within a product definition; i. e. it indicates what information is being stored, independent from how it is being stored.

Note 1 to entry: Though PMI is generally accepted to be the generic designation, the term Geometric Dimensions and Tolerances (GD&T; sometimes also listed as Geometric Dimensioning and Tolerancing) is often used synonymously, as it is the main type of PMI that is currently in focus. Other synonymously used terms are: General Tolerances and Annotations, Annotation, Smart Dimensions, Functional Tolerancing and Annotation (FT&A) or Geometric Product Specification (GPS). Some of these are specific to a particular CAD system. Industry standards for defining PMI include standards such as ASME Y14.5, ASME Y14.41 and ISO 1101, ISO 16792 respectively.

3.2
Geometric Dimensions & Tolerances (GD&T)

Geometric Dimensions & Tolerances (GD&T) are a type of Product and Manufacturing Information (PMI) that can be either computed automatically by a CAD system, or entered manually by the user. The definitions below are additions to the terms mentioned in EN 9300-100:2018, 3.6:

— *Explicit Tolerance:* Any tolerance with a stated (numeric) value, regardless of how or where it is applied. Explicit tolerances can be applied through general notes, flag notes, PMI or tolerance dimensions. This must be attributable to a specific feature, feature set and/or datum reference (e. g. position, orientation). Standard +/− 0,03 notes may be explicit, depending on their use.

— *Implicit Tolerance:* Any tolerance where there is no stated value and acceptability of the feature is specified by engineering to be through visual comparison to the appearance shown in the CAD model. Standard +/− 0,03 notes may also be implicit, depending on their use.

— *Explicit Dimension:* The required nominal value is stated in the CAD model so that it can be obtained without interrogation.

— *Implicit Dimension:* The nominal value can only be obtained by interrogation (i. e. feature to feature measuring) of the CAD model.

3.3
Semantic Representation

Semantic Representation designates a certain way how information is being stored; it does not relate to the information content itself. Semantic Representation captures the meaning (intent) and relationships (context) of a character, word, phrase, sentence, paragraph, specification, or symbol without using any of the visual characters or constructs that are needed for a human to understand it – such as the letters, graphical symbols, lines and arrows used on engineering drawings.

The main purpose of Semantic Representation is to facilitate automated consumption of the data, e. g. for later re-use or for downstream applications. It applies to various types of data, such as PMI, Composite Material Definition, and others.

EXAMPLE The Semantic Representation of a Linear Dimension includes all of the information needed to understand the specification (the type of dimension, between which features it is specified…), without any of the graphic components such as dimension lines and extension lines, their direction, arrowheads and the dimension value.

3.4
Presentation

Presentation designates a certain way how information is being stored; it does not relate to the information content itself. Presentation defines the visual representation of a character, word, phrase, sentence, paragraph, specification, or symbol in way that is understandable by humans. Presentation is a generic term that applies to any form of human-readable information transfer; this can for instance be a handwritten note, an engineering drawing, or the display of a 3D CAD model on a computer screen.

Note 1 to entry: The main purpose of Presentation is to facilitate human comprehension of the data, e.g. to manufacture, inspect, assemble or maintain the product described by the data. For a correct interpretation of the presented data, it is required that the reader is familiar with the alphabet used and the general type of information being presented.

In the context of 3D CAD, the term Presentation relates to elements that are visible in the display of a 3D model and are either located (positioned) in 3D space, i.e. they rotate and move with the model, or in a fixed 2D plane. Elements of Presentation can typically by styled (e. g. coloured), organized (e. g. in specific views), and associated with other elements of the model. Presented types of data typically are geometry (3D shapes, surfaces, curves, points) and characters (letters, numbers, symbols).

3.4.1
Character-based Presentation

Character-based Presentation is a type of Presentation where the conveyed information is stored as characters (letters, numbers, and symbols). These characters are typically stored in a string variable that can be retrieved and edited in a consuming application. The appearance of Character-based Presentation depends on the font being used and may change if the originating system and the consuming application use different fonts. To ensure no characters are lost from creation to consumption, the alphabet (character encoding) used shall be specified as well. (This supports both semantic and non-sematic PMI)?

EXAMPLE In ASCII, the letter ‘A’ is stored as character code ‘0x41’ (hexadecimal).