SLOVENSKI STANDARD
SIST EN 9300-110:2018

01-oktober-2018

Aeronavtika - LOTAR - Dolgotrajno arhiviranje in iskanje digitalne tehnične dokumentacije o izdelkih, kot so podatki o 3D, CAD in PDM - 110. del: CAD mehanske 3D eksplicitne informacije o geometriji

Aerospace series - LOTAR -LOng Term Archiving and Retrieval of digital technical product documentation such as 3D, CAD and PDM data - Part 110: CAD mechanical 3D Explicit geometry information

Luft- und Raumfahrt - LOTAR - Langzeitarchivierung und Bereitstellung digitaler technischer Produktdokumentationen beispielsweise 3D CAD und PDM Daten - Teil 110: Explizite Geometrie

Série aérospatiale - LOTAR - Archivage long terme et récupération des données techniques produits numériques telles que CAD 3D et PDM - Partie 110 : Archivage long terme et récupération des informations CAO

Ta slovenski standard je istoveten z: EN 9300-110:2018

ICS:

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

SIST EN 9300-110:2018 **en,fr,de**

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 9300-110

June 2018

ICS 01.110; 35.240.30; 49.020

English Version

Aerospace series - LOTAR -LOng Term Archiving and Retrieval of digital technical product documentation such as 3D, CAD and PDM data - Part 110: CAD mechanical 3D Explicit geometry information

Série aérospatiale - LOTAR - Archivage long terme et récupération des données techniques produits numériques telles que 3D, CAO et PDM - Partie 110 : Données de géométrie 3D explicite en CAO mécanique

Luft- und Raumfahrt - LOTAR - Langzeit-Archivierung und -Bereitstellung digitaler technischer Produktdokumentationen, wie zum Beispiel von 3D-, CAD- und PDM-Daten - Teil 110: Eindeutige 3D-Geometrieinformationen für mechanische CAD-Teile

This European Standard was approved by CEN on 25 September 2017.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 9300-110:2018) 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 Standard has received the approval of the National Associations and the Official Services of the member countries of ASD, 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 December 2018, and conflicting national standards shall be withdrawn at the latest by December 2018.

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.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Foreword

This standard 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, 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 EN 9300 geometric dimensioning & tolerancing will be referenced in ISO 1101 and ISO 16792, and for NAS 9300 the same information will be referenced in ASME Y14.5M and Y 14.41). The document formatting etc., will follow that of the respective editorial rules of ASD-STAN and AIA.

1 Scope

1.1 Introduction

This document defines the requirements on a digital archive to preserve for the long term the 3D explicit geometry of single CAD parts. The goal is to preserve the 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”, including the use of an open data format.

1.2 In scope

The following is in scope of this part of EN 9300:

— business specification for long term archiving and retrieval of CAD 3D explicit geometry (see Clause 5);

— essential information of CAD 3D explicit geometry (solids, curves, surfaces, and points) to be preserved (see Clause 6);

— data structures detailing the main fundamentals and concepts of CAD 3D explicit geometry (see Clause 7);

— verification rules to check CAD 3D explicit geometry for consistency and data quality (see Clause 8);

— validation rules to be stored with the CAD 3D explicit geometry in the archive to check essential characteristics after retrieval (see Clause 9).

NOTE This includes the geometrical external shape resulting from CAD disciplines 3D entities (e.g., 3D Structural components, 3D Tubing, 3D electrical harness, 3D composite, etc.).

1.3 Out of scope

The following is outside the scope of this part of EN 9300:

— the formal definition of validation and verification rules to check 3D explicit geometry for consistency and data quality using a machine-readable syntax;

— implicit or parametric geometry;

— Geometric Dimensioning & Tolerancing (GD&T), Product & Manufacturing Information (PMI);

— assembly structures;

— presentation of explicit geometry.

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 1101:2012, *Geometrical product specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out*

ISO 2768-1:1989, *General tolerances — Part 1: Tolerances for linear and angular dimensions without individual tolerance indications (First Edition)*

ISO 2768-2:1989, *General tolerances — Part 2: Geometrical tolerances for features without individual tolerance indications (First Edition)*

ISO 10303-42:2003, *Industrial automation systems and integration — Product data representation and exchange — Part 42: Integrated generic resource: Geometric and topological representation*

ISO 10303-59:2014, *Industrial automation systems and integration — Product data representation and exchange — Part 59: Integrated generic resource — Quality of product shape data*

ISO 10303-203:2011, *Industrial automation systems and integration — Product data representation and exchange — Part 203: Application protocol: Configuration controlled 3D design of mechanical parts and assemblies*

ISO 10303-214:2010, *Industrial automation systems and integration — Product data representation and exchange — Part 214: Application protocol: Core data for automotive mechanical design processes*

ISO 10303-242:2014, *Industrial automation systems and integration — Product data representation and exchange — Part 242: Application protocol: Managed model-based 3D engineering*

ISO 10303-514:1999, *Industrial automation systems and integration — Product data representation and exchange — Part 514: Application interpreted construct: Advanced boundary representation*

ISO 16792:2006, *Technical product documentation — Digital product definition data practices*

ASME Y14.5:2009, *Dimensioning and Tolerancing*

ASME Y14-41:2012, *Digital Product Definition Data Practices*

FAA Part 21, *Certification for Products, Parts & PMA*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/

- ISO Online browsing platform: available at http://www.iso.org/obp

4 Applicability

Refer to applicability of EN 9300-001, Clause 4.

5 Business specifications for the long term archiving and retrieval of CAD mechanical 3D explicit geometry information

5.1 Introduction

General specifications for long term archiving of CAD mechanical design information are described in EN 9300-100, in the clause “Fundamentals and concepts for long term archiving of CAD 3D mechanical information”.

According to the clause “5.1 Different generations of CAD systems and associated methods of design”, there are several methods of design:

— The first generation of CAD design method allowed the engineer to digitally create a 2D drawing (without a 3D model). The essential information as well as the regulatory authority of the design intent is represented by the 2D drawing.

— The second generation of CAD design method is based primarily on the use of 3D models with the output being both 2D representation (drawings) and a 3D CAD dataset to drive CAM/CAI. The regulatory authority of the design intent is represented by the 2D drawing.

— The third generation of CAD design method is based on the use of parametric and relational design. The essential information as well as the regulatory authority of the design intent is represented by the 3D model.

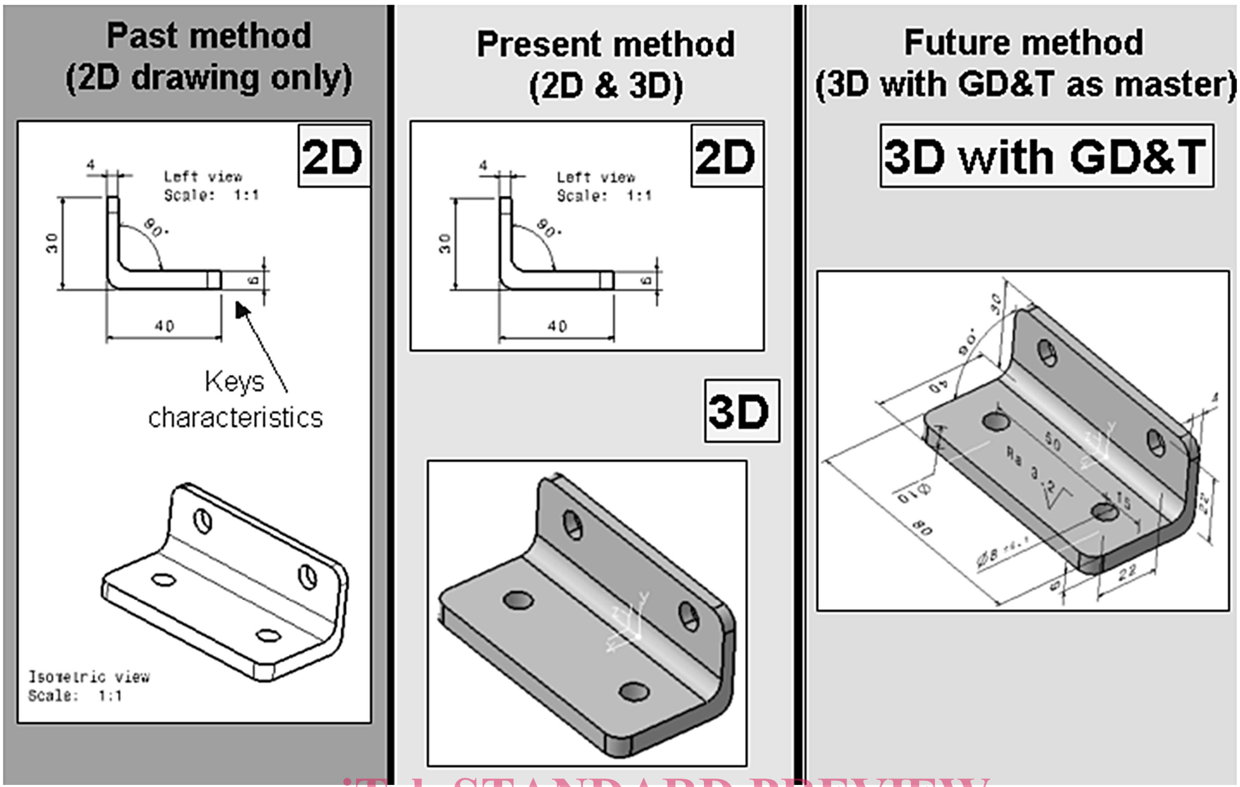

Figure 1 — Illustration of the major generations of CAD systems

EN 9300-110 part specifies long term archiving for CAD mechanical 3D explicit geometry generated in CAD systems of the second and third generation.

5.2 Description of use cases for retrieval of CAD mechanical 3D explicit geometry

Use cases for long term archiving and retrieval of CAD mechanical are used to verify that the specifications meet the business requirements, to identify any gaps that occur over time, and to fix them. This is illustrated in Figure 2, extracted from EN 9300-100 Figure 2: “Links between Use Cases, essential information and EN 9300-1xx parts”.

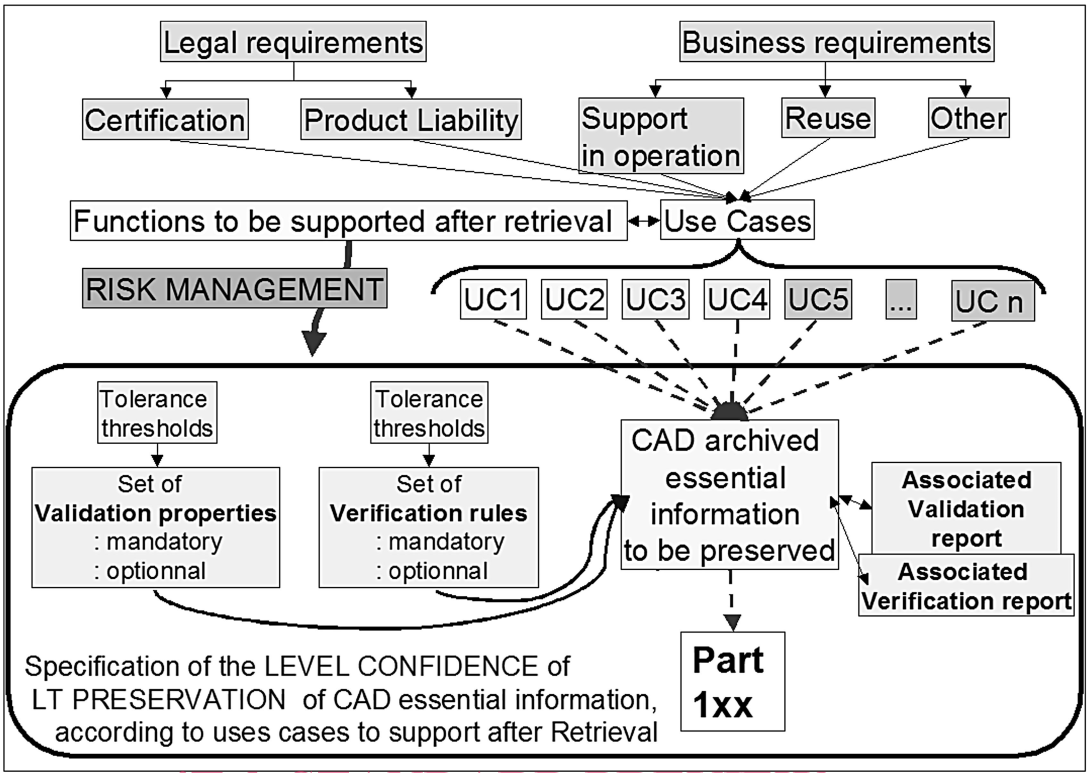

Figure 2 — Links between use cases, essential information and EN 9300-1xx parts

This clause sums up general requirements common to the aerospace industries, for the preservation of the 3D external shape of the product. These requirements should be reviewed and adapted by each company, according to its products and its business practices.

After retrieval from the long term archiving system, the CAD 3D information may be not exactly the same as the original. This may result, for example, from the changes in mathematical representation of the CAD modeller (“change of generation of CAD systems”), or from the evolution of their internal data models through successive versions. The objective is to demonstrate that the process still preserves the essential information for the 3D shape of the product, as defined by the original CAD system the moment that the CAD information was released.

The type of CAD representation to be preserved differ according to the use cases (see EN 9300-100 Figure 4: Links between use cases, essential information and EN 9300-1xx parts). In the same way, the tolerance thresholds for the verification rules and geometric validation properties are related to the different use cases and to the specific requirements of each company. Such thresholds will not be normatively defined in this standard, but values will be proposed in associated recommended practices. Such tolerances depend on the precision of the CAD modeller; it is assumed that the precisions of the modellers will increase overtime. They are also related to the categories of parts and to their functions.

As mentioned in the EN 9300-002, there are 4 main use cases for long-term archiving and retrieval of CAD 3D exact geometry, and its complementary 2D drawings:

— documentation of aerospace & defence product design for regulatory and contractual compliance;

— aerospace & defence industry incident investigation (product liability);

— design re-use – product modification;

— product lifecycle support and disposal.

These use cases are detailed in the context of long term preservation of CAD mechanical 3D explicit geometry information.

For more information, see Annex A.

5.3 Description of file content

— Scenario 1: part file with exact geometry only;

— Scenario 2: part file with tessellated geometry only;

— Scenario 3: part file with exact and tessellated geometry;

— Scenario 4: part file containing an assembly mixing exact and tessellated geometry (example: Equipment internal geometry, see EN 9300-115 and EN 9300-125).

6 Essential information of explicit geometry

Essential information of 3D explicit geometry, captured in archive files, is defined as:

— the exact boundary representation shape of a single part within free tolerances of manufacturing (e.g. according to ISO 2768 general tolerances);

— the tessellated boundary representation shape;

— the exact representation of curves;

— the tessellated representation of curves;

— the exact representation of surfaces;

— the tessellated representation of surfaces;

— the representation of points.

The EN 9300 standards shall be applied to any additional information not covered by this standard.

7 Definition of core model for an explicit geometry

To preserve the essential information of explicit 3D geometry the shape should be represented at nominal size precisely and completely within the defined tolerances independent of tool specific generation functions for geometry. Therefore a boundary representation as an accumulative topological and geometric volume model has been chosen as core model for this part of EN 9300.

This core model is defined by ISO 10303-514 (advanced boundary representation) and ISO 10303-42 (geometric and topological representation). This representation is used by ISO 10303-203 (configuration controlled 3D design of mechanical parts and assemblies) CC08, ISO 10303-214 (core data for automotive mechanical design processes) CC02 and ISO 10303-242 (managed model based 3D Engineering). Therefore STEP physical files meeting ISO 10303-203 CC08 or ISO 10303-214 CC02 or ISO 10303-242 may be used for the ingest of explicit geometry. The descriptive information of the AIP shall document the versions of both EN 9300-110 and ISO 10303 application protocol that are basis for the AIP[1].

Other geometric information or information related to geometry such as design history, layer information, auxiliary geometry or technical attributes like roughness or tolerances as modelled in typical CAD systems may be maintained together with the 3D explicit geometry within the same STEP file, assuming that this information can be represented by the chosen application protocol of ISO 10303. In this case additional validation properties and verification rules defined in the respective parts of EN 9300 should be applied to ensure the preservation of this additional information.

8 Verification rules of explicit geometry

8.1 Introduction

As described in “Authentication and Verification” (EN 9300-005), verification is one of the two basic qualification methods to reduce the risk of losing essential information during long term archiving.

The verification of the source and the target CAD model are not required in this standard, but the quality of the exported file in the archival format is strongly dependant of the quality of the source CAD model, and lack of verification creates a risk that the retrieval process will fail.

The verification for 3D explicit geometry described in this clause concerns only the archival file during the ingest process (EN 9300-012).

To improve the longevity of the archive, companies may decide to add new verification rules and to check a selection of the archived files. In this case, the company may decide to archive the new verification report, and according to the result, to carry out the appropriate action to ensure the long term preservation of the CAD archived information.

If a verification of the native target CAD model is implemented in the retrieval process (EN 9300-014), the CAD model shall pass the validation process before the model will be fully acceptable. Verification process is required to minimize the risk of data loss or unacceptable change between archival and retrieval. This process shall be applied to the STEP file during archival ingestion, to the STEP file after any archival preservation conversion. It is strongly recommended that this process is also applied to the target CAD model after STEP import.

1 AIP: Archive Information Package. (see part EN 9300-007 “Terms and definitions”).