INTERNATIONAL STANDARD

ISO 16792

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Technical product documentation — Digital product definition data practices

Documentation technique de produits — Données de définition d'un produit

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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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 10, *Technical product documentation*.

This second edition cancels and replaces the first edition (ISO 16792:2006), which has been technically revised mainly to incorporate the technical changes in ISO 1101:2012 and ISO 5459:2011. Clause 12 on indication for welds and Clause 13 on indications for surface texture have been added. A new informative annex on classification codes has also been added.

Introduction

Every effort was made during the preparation of the first edition of this International Standard, adapted from ASME Y14.41:2012, to apply existing requirements developed for two-dimensional (2D) presentation equally to the output from three-dimensional (3D) models. Where new geometrical product specification (GPS) rules have proved essential, these have been drafted with a view to their being equally applicable to both 2D and 3D. Therefore, in order to maintain the integrity of a single system, these new rules are being incorporated in the relevant existing ISO standards for cross-reference. Application examples have been included where, due to the specific requirements of 3D modelling, additional guidance was deemed beneficial.

It is recognized that there is a need to support drawings in conjunction with 3D models now and for the foreseeable future. This need has been addressed in this International Standard through the definition of the two methods for documenting digital models and specification of requirements to ensure that the information in a data set is consistent between the model and the drawing.

The figures in this International Standard are intended only as illustrations to aid the user in understanding the practices elaborated in the text. In some cases, figures show a level of detail as needed for emphasis; in others, they are only complete enough to illustrate a concept or facet thereof. The absence of figures has no bearing on the applicability of the specified requirement or practice.

In order to comply with the requirements of this International Standard, actual data sets shall meet the content requirements set forth in its text.

Most figures are illustrations of models in a 3D environment. Figures illustrating drawings in digital format include a border.

Text in uppercase letters used in the figures are intended to appear in digital product definition data, or data sets, while that in lowercase letters is for information only and is not intended to appear in data sets.

Technical product documentation — Digital product definition data practices

1 Scope

This International Standard specifies requirements for the preparation, revision, and presentation of digital product definition data, hereafter referred to as data sets. It supports two methods of application: model-only and model and drawing in digital format. Its structure presents requirements common to both methods followed by clauses providing for any essential, differing requirements for each method. Additionally, its use in conjunction with computer-aided design (CAD) systems could assist in the progression towards improved modelling and annotation practices for CAD and engineering disciplines, as well as serving as a guideline for IT engineers.

The aspects specified in this International Standard refer mainly, but not exclusively, to requirements that differ or are additional to those provided in existing, related standards. Where no such requirements are identified, it is safe to assume that the appropriate existing ISO standards are instead applicable.

2 Normative references

The following referenced documents are indispensable for the application 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 128 (all parts), *Technical drawings — General principles of presentation*

ISO 129-1:2004, *Technical drawings — Indication of dimensions and tolerances — Part 1: General principles*

ISO 286 (all parts), *Geometrical product specifications (GPS) — ISO code system for tolerances on linear sizes*

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

ISO 1302, *Geometrical Product Specifications (GPS) — Indication of surface texture in technical product documentation*

ISO 2553, *Welding and allied processes — Symbolic representation on drawings — Welded joints*

ISO 3098-1:2015, *Technical product documentation — Lettering — Part 1: General requirements*

ISO 3098-5:1997, *Technical product documentation — Lettering — Part 5: CAD lettering of the Latin alphabet, numerals and marks*

ISO 5456 (all parts), *Technical drawings — Projection methods*

ISO 5457:1999, *Technical product documentation — Sizes and layout of drawing sheets*

ISO 5459:2011, *Geometrical product specifications (GPS) — Geometrical tolerancing — Datums and datum systems*

ISO 7200:2004, *Technical product documentation — Data fields in title blocks and document headers*

ISO 10209:2012, *Technical product documentation — Vocabulary — Terms relating to technical drawings, product definition and related documentation*

ISO 11442:2006, *Technical product documentation — Document management*

ISO 14405-1, *Geometrical product specifications (GPS) – Dimensional tolerancing – Part 1: Linear sizes*

ISO 14405-2, *Geometrical product specifications (GPS) — Dimensional tolerancing — Part 2: Dimensions other than linear sizes*

ISO 16016, *Technical product documentation — Protection notices for restricting the use of documents and products*

ISO 17450-1:2011, *Geometrical product specifications (GPS) — General concepts — Part 1: Model for geometrical specification and verification*

ISO 80000-1, *Quantities and units — Part 1: General*

IEC 82045-2:2004, *Document management — Part 2: Metadata elements and information reference model*

3 Terms and definitions

For the purposes of this document, the terms and definitions in ISO 10209:2012 and the following apply.

3.1 General

3.1.1
absolute coordinate system
primary model coordinate system in the CAD model used to define the location of digital elements in the CAD model

3.1.2
datum system
set of two or more situation features established in a specific order from two or more datum features

Note 1 to entry: To define a datum system, it is necessary to consider the collection surface created by the considered datum features. The invariance class of a collection surface can be complex, prismatic, helical, cylindrical, revolute, planar, or spherical (see ISO 5459:2011, Table B.1).

[SOURCE: ISO 5459:2011, 3.10]

3.1.3
user defined coordinate system
model coordinate system which is created in the CAD model in addition to the absolute coordinate system

3.2 Classification codes for drawings and data sets (see Annex A)

3.2.1
classification code
designation assigned to product definition data that defines what data are included within the drawing, data set, or both

Note 1 to entry: A drawing can either be in physical or electronic format.

3.2.2
classification code 1
drawing with optional data set

Note 1 to entry: Classification code 1 identifies that the data elements are located on the drawing and the drawing is the original.

3.2.3
classification code 2
data set with model and drawing

Note 1 to entry: Classification code 2 identifies that data elements are located on a drawing and the drawing is the original. A computer is used as a tool to prepare the drawing and the model. Data elements are located in the digital data and the drawing.

3.2.4
classification code 3
data set with model and simplified drawing

Note 1 to entry: Classification code 3 identifies a model with a simplified drawing used to expedite communication of common part features and to define non-geometric part definitions.

3.2.5
classification code 4
data set with model and drawing

Note 1 to entry: Classification code 4 identifies that all data elements are located in both the digital data and the drawing. The data set is the original.

3.2.6
classification code 5
data set with model

Note 1 to entry: Classification code 5 identifies that all data elements are located in the data set with model. No drawing exists.

4 Data set identification and control

4.1 General

Data sets for which compliance with this International Standard is claimed shall include a reference to this International Standard, ISO 16792, either in the data set itself or in a document referenced by the data set.

The current revision of the data and the computer application(s) and version(s) used to develop the data set shall be specified with other management data (see 5.4).

The data set identifier shall be unique and shall consist of numeric, alphabetic, or special characters in any combination. Spaces are not permitted between any of the characters of the data set identifier.

The length of the data set identifier may be a direct function of the computer system and the operating system. When the part or identifying number is used as the data set identifier, the length shall be compatible with recognized limitations on number length in accordance with ISO 7200 and IEC 82045-2.

Special characters, such as hyphen (-), slash (/), or asterisk (*), shall be selected in a manner that does not hinder data set identification or have an adverse effect on the computer system operation.

A recognizable prefix or suffix may be included as part of the identifier to associate files and sets of related data.

See ISO 7200 and IEC 82045-2 for the description and use of drawings, drawing numbers, and identifying numbers.

An optional system for classification codes established to define what data are included within the drawing, data set, or both is presented in Annex A.

4.2 Related data

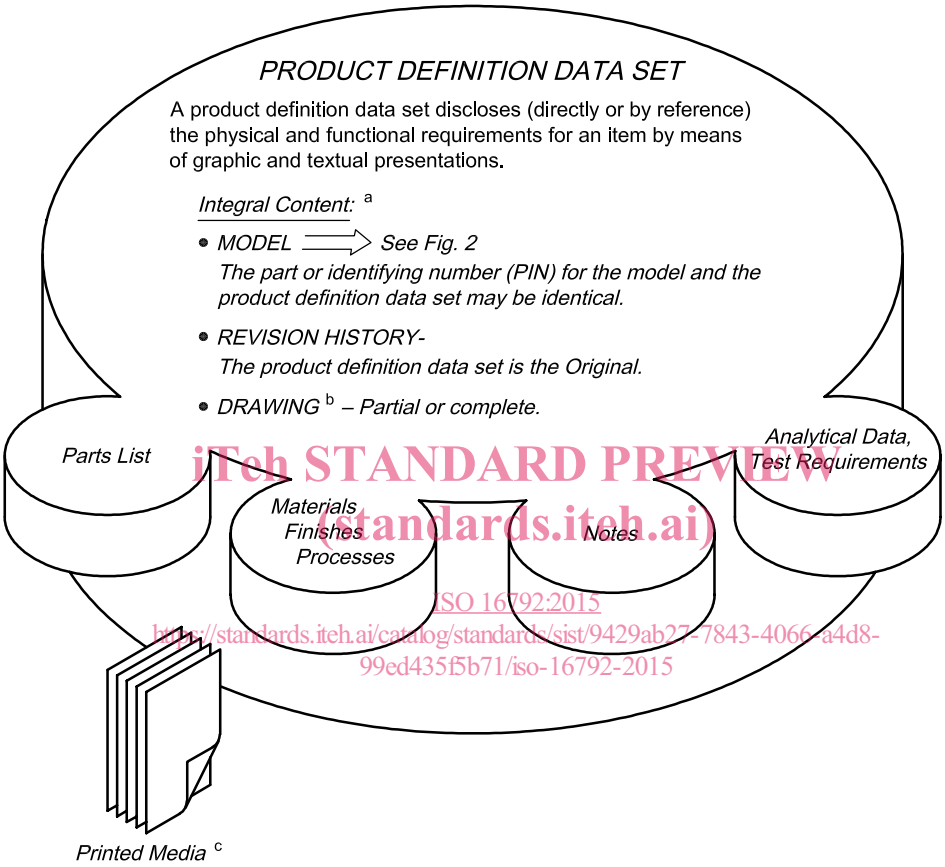
Related data shall be integral to, or referenced in, the data set. Related data consists of, but is not limited to, analytical data, parts lists, test requirements, material specifications, process, and finish requirements in accordance with Figure 1.

4.3 Data management

The following specifies the structure and control requirements for data management:

a) The data management system shall meet the requirements of ISO 11442, providing information to enable the control and tracking of data sets, throughout the life cycle of the product to which each relates. The system may include work in process, data review status, model checked status, release status, design tool and version, libraries, etc.

b) Revision history information per ISO 11442 shall be contained in the data set.



Key

a Related data (as applicable) required for complete definition may be integral to or referenced in the product definition data set. Data not integral to the product definition data set may be revised independently.

b A drawing is not required for Model Only data sets.

c Related data may be manually or computer generated.

Figure 1 — Content of a product definition data set

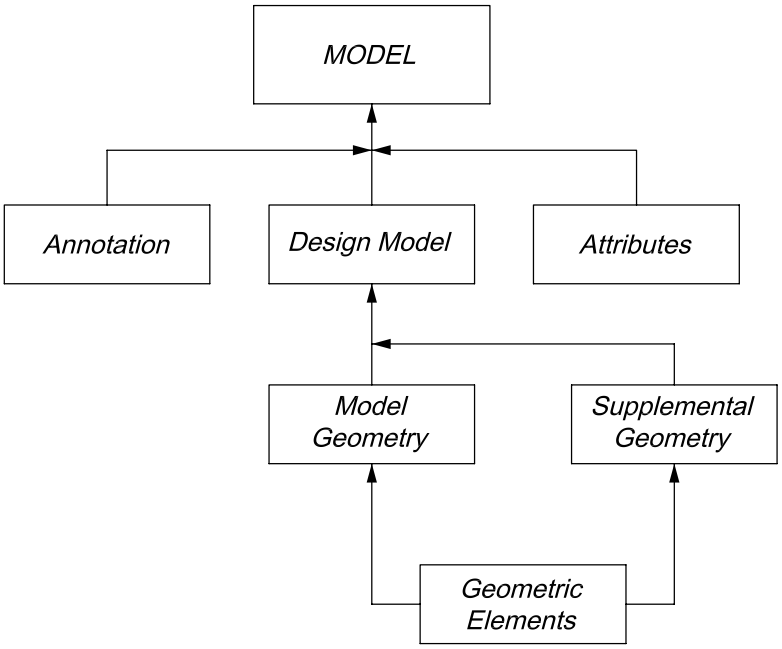


Figure 2 — Content of a model

5 Data set requirements

5.1 General

The data set shall provide complete product definition, for example, a design model, its annotation, and related documentation.

5.1.1 Fundamental requirements

The following are the fundamental requirements and other provisions applicable to both annotated models and drawings, specific to annotated models and specific to drawings.

a) **Common to annotated models and drawings**

- All model values and resolved dimensions shall be obtained from the model.
- Rounding requirements for resolved dimensions shall comply with 9.2.2.
- The ability to query the model shall be available (see 7.3.8).
- All angular values shall be queried from the model (see 9.3). Exceptions to this are model coordinate system(s), planes and axes in a datum system, and orthographic views.
- When query is required, a notation stating the requirement for query of the model or associated data shall be added to the drawing or in the general notes.
- When applying tolerances to features, alignment of the annotation plane to the nominal or theoretically exact profile is not required.
- Values obtained from the model for any feature(s) without any tolerance or datum target specifications assigned shall be auxiliary dimensions.
- Legibility requirements of ISO 3098-1 and ISO 3098-5 shall apply when the annotation is viewed perpendicular to the annotation plane.

— Annotation in any given annotation plane shall not overlap other annotation in the same annotation plane when the model is viewed perpendicular to the annotation plane.

— Annotation text within any given annotation plane shall not be placed over the design model when the model is viewed perpendicular to the annotation plane.

b) **Applicable only to models**

— All annotation shall be specified in one or more annotation planes. When CAD software does not support maintenance of annotation plane orientation relative to the model, the model-only method shall not be used (see 7.3.4).

— The associated entities, annotation, and attributes shall be in agreement (see 7.3.2).

— Resolved dimensions created from queried model values are considered the same as dimensions displayed on a model (see 9.2.1).

— Display of centrelines or centre planes for features of size is optional.

— To ensure that the annotation is readable — the text, for example, could be upside down or backwards following rotation of the model — one of the following techniques shall be used:

  a) ensuring that the reading direction is updated after rotation of a model;

  b) inclusion of means of determining the correct reading direction in each annotation plane applied to a model;

  c) when using saved views, ensuring that the model is orientated in the intended view direction — for example, by including a means of determining the correct reading direction in the view.

— Dimensions and tolerances to internal features can be shown without the use of a section [see Figure 25 c)].

c) **Applicable only to drawings**

— Annotation may be applied to orthographic or axonometric views.

— For axonometric views, the orientation of the annotation shall be parallel to, normal to, or coincident with the surface to which it applies. An annotation shall not overlap another or the geometrical representation of the part.

5.1.2 Design model requirement

A design model is required and shall be in accordance with 5.2 and Clause 6.

5.2 General model requirements

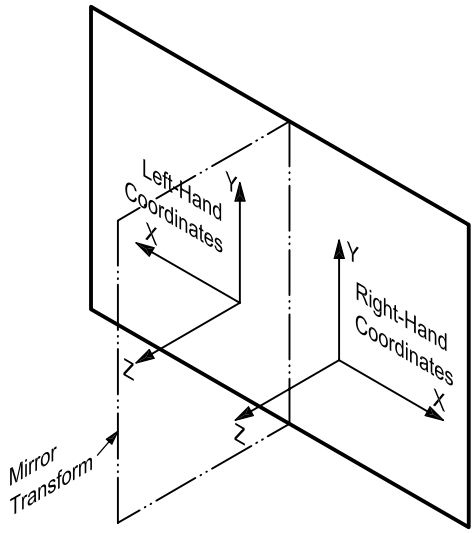
5.2.1 Associativity

The ability to associate digital elements shall be available and maintained. Associativity information shall be electronically accessible.

5.2.2 Model coordinate systems

A design model shall contain one or more model coordinate systems. A model coordinate system shall be depicted by three mutually perpendicular line segments with its origin located at the intersection of

the three axes. Each axis shall be labelled and the positive direction shown. Model coordinate systems shall be right-handed unless otherwise specified [see Figure 3 b)].



a) Mirror-image relationship

b) Recognizing the right-hand coordinate system

NOTE When observed in the Z direction, with positive Y ascending, positive X is directed to the right-hand side of the observer.

Figure 3 — Left- and right-hand model coordinate systems

5.2.3 Applications of supplemental geometry

When supplemental geometry is used, there shall be a clear distinction between the supplemental geometry and the model geometry.

a) **Represented line element**

When a represented line element is used to indicate the direction of a geometric tolerance application, the leader line from the tolerance frame shall terminate on the represented line element in an arrowhead (see Figure 41). The following geometric tolerances can use a represented line element to clarify the directionality of a two-dimensional tolerance zone of parallel lines:

— straightness applied to the line elements of a planar surface (see 11.3.2 and Figure 41);