AIAG
Automotive Industry Action Group

D-27

SASIG 3D Annotated Model Standard

SASIG
strategic automotive product data standards industry group

A Joint Publication

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FOREWORD

Technical drawings are information displayed in the form of models or diagrams, which are drawn based on rules and information media. They are often drawn to a set scale and are commonly used to convey the information needed to manufacture a product from product development.

Today's technical drawings usually include a combination of a 3D model and a 2D drawing. This is a more effective process than the traditional 2D only drawing because digital manufacturing processes today need the 3D model in order to develop tooling and fixtures, perform analysis, build prototypes, etc.

Tomorrow's technical drawings will incorporate only a complete annotated 3D model containing all of the information necessary to manufacture a part. This will enable more digital manufacturing uses/re-uses of product data, i.e., feeding dimensional information into a CMM machine along with a 3D model. This annotated 3D model, which is used as a single master, is more efficient for product development than two or more technical drawings used today. When the 3D annotated models are converted to a viewing format in a single location, they are much more accessible to the extended enterprise. These viewing tools also enable improved communication and collaboration at a lower cost than with CAD tools.

Existing standards for 2D drawings can only be partially applied to 3D annotated models. This standard, in conjunction with ISO 16792 "Digital Product Definition Data Practices," defines how to document all the information necessary for all areas (i.e., design, manufacturing, service) in the product creation process.

The method for showing the product characteristics in the 3D model is described in ISO 16792 "Digital Product Definition Data Practices." However, the method is incomplete as a 3D annotated model standard because it does not address all of the types of information required in a technical drawing. This SASIG 3D Annotated Model Standard will address the information not covered in ISO 16792 for a completely 3D annotated model.

This standard is intended to be tool independent. This standard will be used for further development of CAD tools.

This standard was developed by the Digital Engineering Visualization Work Group (DEV) of the Strategic Automotive product data Standards Industry Group (SASIG), which began its activities in October 2003.

This SASIG 3D Annotated Model Standard represents the consensus reached by all companies of the global automotive standards organizations (AIAG, JAMA/JAPIA, GALIA, VDA, Odette-Sweden). This standard can also serve as a reference to non-automotive industries as the issues are very similar.

Special Implementation Considerations and Disclaimers

- The SASIG DEV Work Group is making every possible effort to harmonize this SASIG 3D Annotated Model Standard with existing related Global standards.
- This SASIG 3D Annotated Model Standard closely follows the ISO 16792 standard.
- Ongoing efforts are in place to harmonize ISO 16792 and the SASIG 3D Annotated Model Standard with other ISO publications.
- The SASIG DEV Work Group has identified 'discrepancies' within different ISO standards.

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INTRODUCTION

Scope

This *SASIG 3D Annotated Model Standard* is the global automotive industry standard for creating 3D annotated models. Though developed by the automotive industry, this standard is applicable to all industries. The primary emphasis of this standard is to ensure that all of the information required to completely define a product is captured within the product definition data set, e.g., model geometry, 3D annotations, management data, etc… as defined in ISO 16792.

This document can be used for vehicle and manufacturing design documentation.

This document is an enabler for the complete replacement of 2D drawings by 3D annotated models. For additional details and use cases, see the *SASIG DEV Guideline Document* (D-21).

Legal or regulatory issues pertaining to 3D annotated models are not within the scope of this document.

References

The following documents were used in developing this standard. They may or may not be referenced throughout the document.

ISO 31-0:1992	Quantities and units -- Part 0: General principles, Annex B (Informative) (Guide to the rounding of numbers)
ISO 128-30:2001	Technical drawings -- General principles of presentation -- Part 30: Basic conventions for views
ISO 128-34:2001	Technical drawings -- General principles of presentation -- Part 34: Views on mechanical engineering drawings
ISO 128-44:2001	Technical drawings -- General principles of presentation -- Part 44: Sections on mechanical engineering drawings
ISO 129:1985	Technical drawings -- Dimensioning -- General principles, definitions, methods of execution and special indications
ISO 225:1983	Fasteners -- Bolts, screws, studs and nuts -- Symbols and designations of dimensions
ISO 406:1987	Technical drawings -- Tolerancing of linear and angular dimensions
ISO/DIS 1101:2004	Geometrical Product Specifications (GPS) -- Geometrical tolerancing -- Tolerances of form, orientation, location and run-out
ISO/FDIS 1101/DAMD1	Geometrical Product Specifications (GPS) -- Geometrical tolerancing -- Tolerances of form, orientation, location and run-out -- AMENDMENT 1: Representation of specifications in the form of a 3D model
ISO 1302:2002	Method of indicating surface texture on drawing
ISO 1503:1977	Geometrical orientation and directions of movements
ISO 1660:1987	Technical drawings -- Dimensioning and tolerancing of profiles
ISO 2553:1992	Welded, brazed and soldered joints -- Symbolic representation on drawings
ISO 2692:1988	Technical drawings -- Geometrical tolerancing -- Maximum material principle
ISO 2768-1:1989	General tolerances -- Part 1: Tolerances for linear and angular dimensions without individual tolerance indications
ISO 2768-2:1989	General tolerances -- Part 2: Geometrical tolerances for features without individual tolerance indications
ISO 3040:1990	Technical drawings -- Dimensioning and tolerancing -- Cones
ISO 4130:1999	Road vehicles -- Three-dimensional reference system and fiducial marks -- Definitions
ISO 4753:1999	Fasteners -- Ends of parts with external ISO metric thread
ISO 5457:1999	Technical product documentation -- Sizes and layout of drawing sheets
ISO/DIS 5458:1998	Geometrical Product Specifications (GPS) -- Geometrical tolerancing -- Positional tolerancing

References (continued)

ISO 5459:1981	Technical drawings -- Geometrical tolerancing -- Datums and datum-systems for geometrical tolerances
ISO 6410-1:1993	Technical drawings -- Screw threads and threaded parts -- Part 1: General conventions
ISO 6410-3:1993	Technical drawings -- Screw threads and threaded parts -- Part 3: Simplified representation
ISO 6413:1988	Technical drawings -- Representation of splines and serrations
ISO 8015:1985	Technical drawings -- Fundamental tolerancing principle
ISO 8826-2:1989	Technical drawings -- Rolling bearings -- Part 2: Detailed simplified representation
ISO 10209-1:1992	Technical product documentation -- Vocabulary -- Part 1: Terms relating to technical drawings: general and types of drawings
ISO 10209-2:1993	Technical product documentation – Vocabulary – Part 2: Terms relating to projection methods
ISO 10578:1992	Technical drawings – Tolerancing of orientation and location – Projected tolerance zone
ISO 10579:1993	Technical drawings – Dimensioning and tolerancing – Non-rigid parts
ISO 13567-1:1998	Technical product documentation -- Organization and naming of layers for CAD -- Part 1: Overview and principles
ISO 16792:2006	Technical product documentation -- Digital product definition data practices
JIS Z 8114:1999	Technical product documentation -- Terms relating to technical drawings
JIS B 3401:1993	Glossary of terms used in CAD
JAMAEIC020:2004	JAMA/JAPIA Guidelines for combining 3D models and 2D CAD documentation V1.0
SASIG	SASIG Guideline for combining 3D models and 2D CAD Documentation
SASIG	SASIG Guideline for Digital Engineering Visualization
SASIG	SASIG CAD functionality requirements lists www.sasig.com
SASIG	SASIG Viewer functionality requirements lists www.sasig.com

Terms and Definitions

For the purpose of this standard, the following terms and definitions apply. Only terms not defined in ISO 16792 are listed below. Please reference ISO 16792 for additional terms and definitions.

Note: When the term 'feature' is used in this standard in reference to a model or drawing, it is referring to the digital representation of the feature.

area

Expressing the size of a region of space by the surfaces.

CAD System

An authoring tool for creating and modifying 3D annotated models. Note: If the viewer is used to create the 3D annotations and / or markups, then the viewer would become an authoring tool as well.

coordinate, global

Large-area coordinate system that is defined for the target space, or the coordinate values represented by this coordinate system.

coordinate, local

Localized coordinate system that is defined relatively for global coordinates, or the coordinate values represented by this coordinate system.

create history

The history (records) of CAD modeling.

design change

Change of product shape, a product characteristic, management data.

design change content

Detail of design changes.

The "design change" means the change of product shape, a product characteristic, management data.

design change history

The history (records) of design changes.

design change number

Number(s) displayed on the model to identify the design change.

dimensional parameter

Input variables to change a product shape.

dimensional parameters, relational expression for

A numerical equation relating a dimensional parameter with a value to set a dimensional parameter.

dimensional parameters, table for

Reference chart of type and value constituting the dimensional parameter.

electronic format

Information represented in an electronic data saving file format used in the computer; for example, Excel-file and CAD-file, etc.

fillet surface

Curved surface that is inserted to smooth the connections between multiple surfaces or curved surfaces.

item block

Column provided on the drawing to enter the details (part name, material, quantity, etc.) of the object shown in the drawing or its component parts (members).

limited line

Expressing the size of a region of space by the linear (curve and line, etc.) elements.

models, 3D annotated

3D models that display product shape and product characteristics (notes and attributes), and models that contain information such as product characteristics and management data independently of 3D models.

model, 3D model, three-dimensional model

Model geometry displaying a three dimensional shape. They can be classified into solid models, surface models, and wire frame models. When an annotation to display product characteristics is added to a 3D model, this is also called a "3D model."

model, CAM

Models for processing.

model, solid

Model geometry displaying a 3Dimensional shape so that the space occupied by this shape is clearly specified.

model, surface

Model geometry displaying a 3Dimensional shape using surfaces.

model, wire frame

Model geometry displaying a 3Dimensional shape using edge lines.

parts list

A list of parts that defines an assembly or a sub-assembly. Also may be referred to as an *item list*.

product characteristics

Information regarding specification information such as product dimensions, tolerance and geometrical characteristic indications, surface texture, and surface treatment, and precautions for manufacturing and inspection.

product shape

Shape of the product that was actually manufactured. However, for 3D models that are handled for reference, the draft angle and fillet surface may not be included.

tabular

Annotation supplementing the content of the model in the form of a table. For example, a table containing multiple pieces of information necessary for processing, measuring, or testing.

texture mapping

Used in order to express the feel of a material of a 3D model.

title block, title panel

A table provided as part of a model for the entry of items required for model management and product management information related to the contents of the model such as part number, part name, company name, etc. in a single group.

viewers

Tools that enable reference to the data created by CAD systems even if a CAD system is not available. These tools can display and print the data but cannot edit it. Some types of viewers can display annotations and attributes attached to 3D models; make interference checks; perform measurements; or write data in red (additional notes). Essentially, the original data cannot be changed.

1 PRODUCT DEFINITION DATA (3D ANNOTATED MODELS)

1.1 Purpose

This chapter defines a 3D annotated model.

1.2 Requirements

The 3D annotated model contains the model, product characteristics, and management data (see Table 1.2-1 and Figure 1.2-1.) Figure 1.2-1 shows the information configuration of 3D annotated models. Figure 1.2-2 shows an example of a 3D annotated model.

The 3D annotated model may be contained in multiple files that are collectively called a product definition data set per ISO 16792.

Table 1.2-1 Examples of information needed to define a product

Group	Information necessary for definition of a product.
Model	3D shape, model coordinate system.
Product Characteristics	Dimensions with tolerances, notes, user-defined coordinate systems, and supplemental geometry.
Management Data	Follow ISO 16792 sec. 3.18 for management data (i.e., part name, part number, quantity used, approval signature/date, design change history, destination, and configuration).

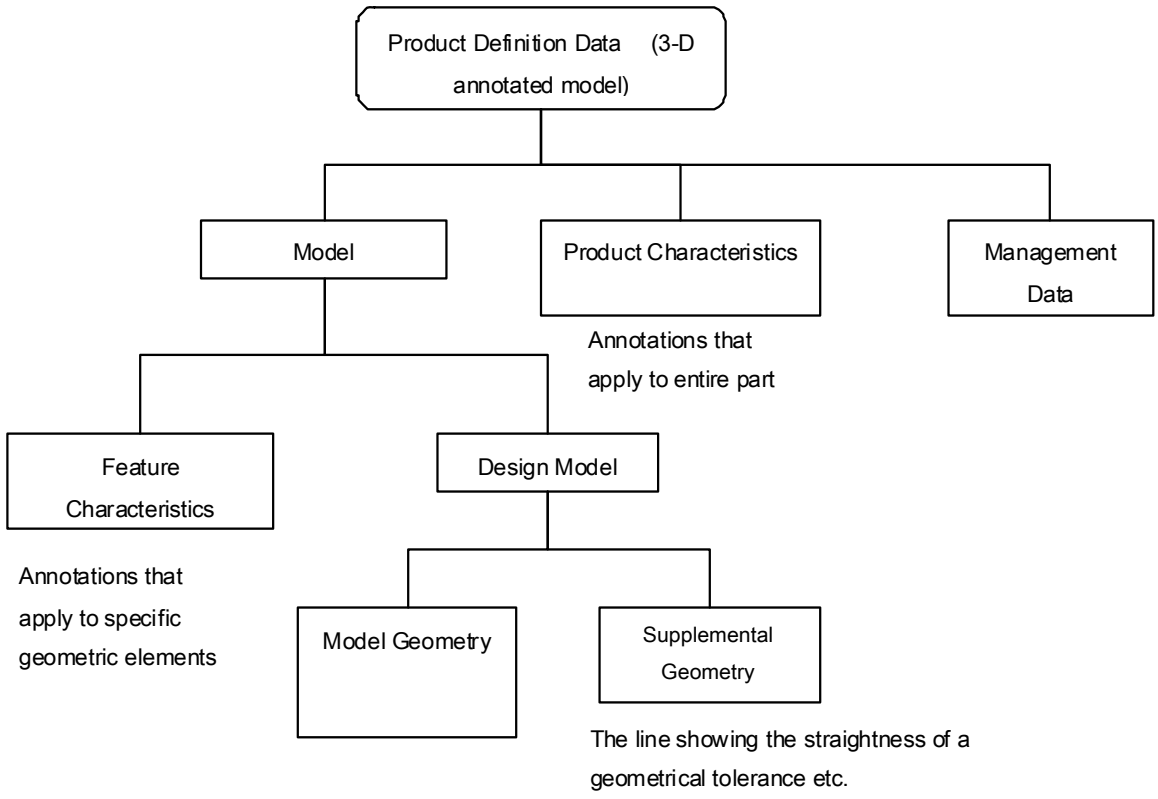

Figure 1.2-1 Information configuration of a 3D annotated model

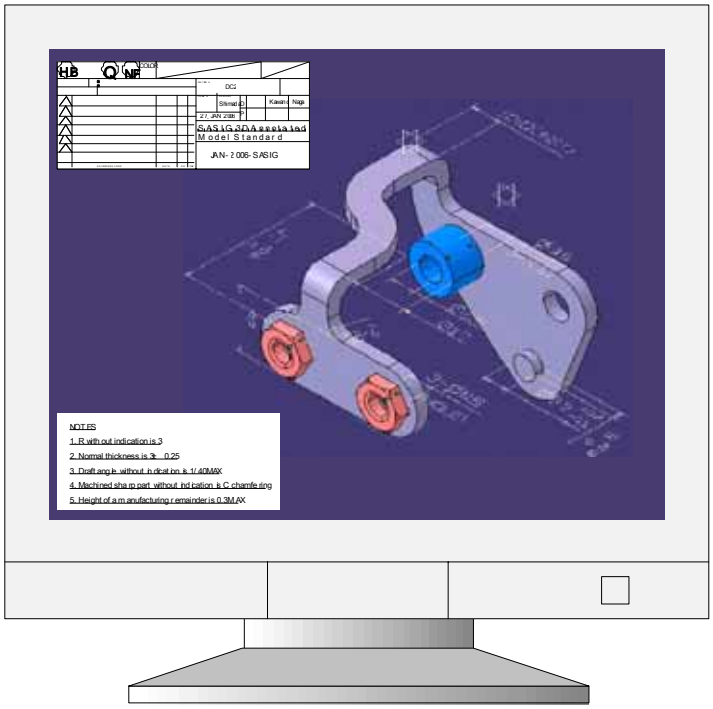

Figure 1.2-2 3D annotated model

1.3 Management Data Contained Outside of the 3D Annotated Model

Management data may be placed in other electronic information formats outside of the CAD model. When this occurs, the data structure will be as shown below.

Figure 1.3-1 shows the information configuration of 3D annotated models and management data. Figure 1.3-2 shows an example of a 3D annotated model including management data that are in another software package.

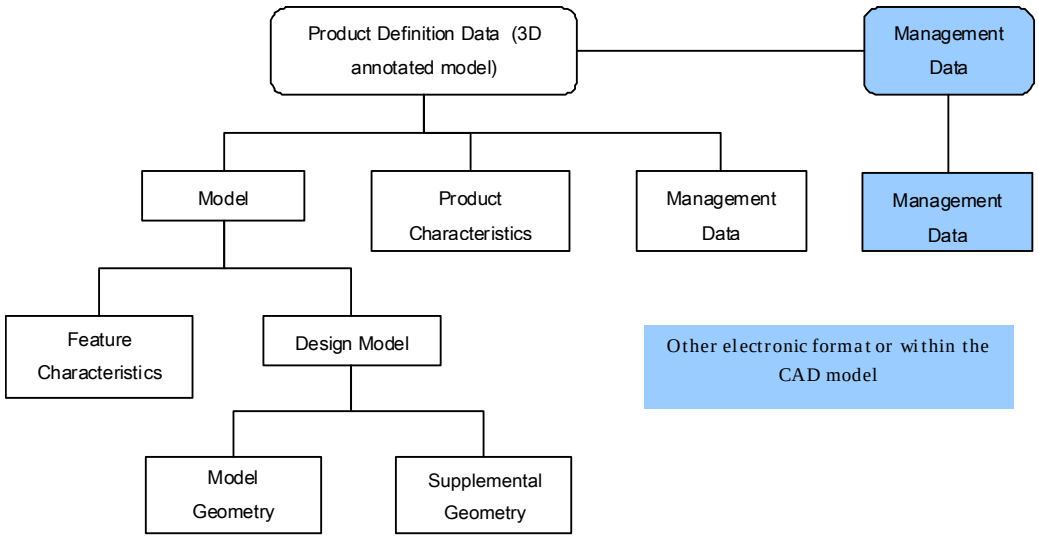

Figure 1.3-1 Management data are outside the 3D annotated model

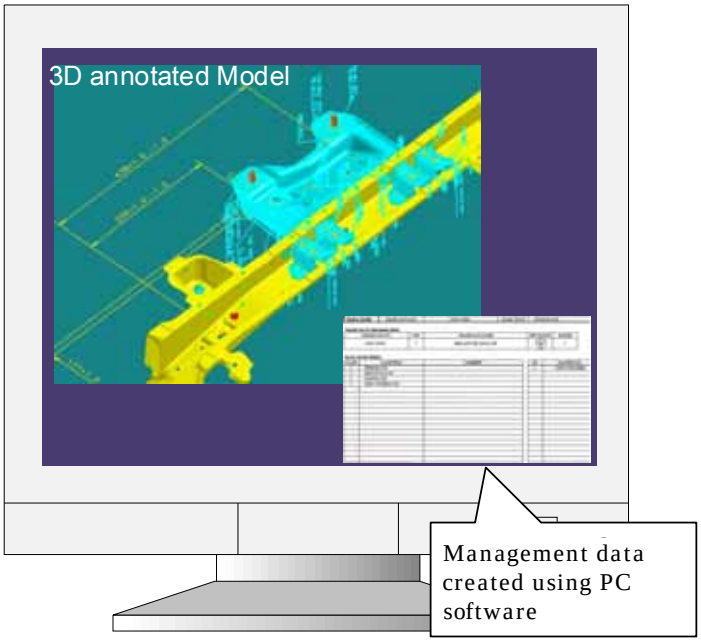

Figure 1.3-2 Management data created using non-CAD software

2 MANAGEMENT DATA

2.1 Purpose

This chapter outlines the methods for annotating management data.

2.2 General Requirements

a) Refer to ISO 16792, sec. 5.4 “Management data” for a general requirement for annotating management data.

b) For requirements regarding notes and special notations, see ISO 16792 sec. 8.2.

c) Management data can be created in the CAD system and/or other electronic formats. Whenever possible, the data should not be duplicated (see Figure 2.2-1 and Figure 2.2-2.)

d) The location of all data required to completely define a part needs to be identified from within all data files.

e) Management data location and structure are determined by company policy.

f) Title block, notes, item block, and other management data should be arranged to avoid overlapping.

g) In general, management data will apply to the entire product. Exceptions would include multiple material specifications, finishes, etc. When these exceptions exist, the features that they apply to must also be identified within the 3D model.