International Standard

ISO 18183-1

Geometrical product specifications (GPS) — Partition —

Part 1: Vocabulary and basic concepts

Spécification géométrique des produits (GPS) — Partition —

Partie 1: Vocabulaire et concepts de base

First edition
2024-03

Reference number
ISO 18183-1:2024(en)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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

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 213, *Dimensional and Geometrical product specifications and verification*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 290, *Dimensional and Geometrical product specification and verification*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

A list of all parts in the ISO 18183 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.

Introduction

This document is a geometrical product specification (GPS) standard and is to be regarded as a general ISO GPS standard (see ISO 14638). It influences chain links B, C and E of all the chains of standards in the ISO GPS matrix model.

The ISO GPS matrix model given in ISO 14638 gives an overview of the ISO GPS system, of which this document is a part. The fundamental rules of ISO GPS given in ISO 8015 apply to this document and the default decision rules given in ISO 14253-1 apply to specifications made in accordance with this document, unless otherwise indicated.

For more detailed information on the relation of this document to other standards and the ISO GPS matrix model, see Annex B.

Partition is one of the feature ISO GPS operations defined in ISO 17450-1.

The partition can be applied to the surface of the nominal model (reading of an ISO GPS specification) or to the model of non-ideal surface (skin model) of a part (verification).

The information needed to apply a partition to a nominal model is:

— geometrical information contained in the nominal model;

— partition information contained in the ISO GPS specification, such as nature of the specification, symbols such as CZ or UF, restricted areas and so on;

— the method and criterion used for partition.

The information needed to apply a partition to a model of non-ideal surface (skin model) is:

— the result of the partition applied to the nominal model for the corresponding considered ISO GPS specification;

— the method and criterion used for partition.

The approach taken for partition is based on the concept of a single surface (single line), where a nominal model is first separated into a set of single surfaces which become an initial set of partitioned features. This initial set of partition features can then be modified, if required, by ISO GPS modifiers from the specification to obtain the required set of partitioned features of design intent.

This approach taken for partition allows interpretation of the specification to determine the required set of partitioned features of design intent in specification and also allows algorithms to be developed that compute the linked measured partitioned features in verification.

The ISO 18183 series addresses the description of the methods and criteria that can be used to apply a partition.

Both the data and the methods used for the partition of the nominal model or the model of non-ideal surface (skin model) are different. This motivates the splitting of the series into several parts: ISO 18183-2 for partition of the nominal model, ISO 18183-3 for partition of the model of non-ideal surface (skin model) and this document for terms and concepts applicable to partition in general. ISO 18183-4 is foreseen to deal with explicit partition with one or more specific section tools.

Geometrical product specifications (GPS) — Partition —

Part 1:
Vocabulary and basic concepts

1 Scope

This document defines the basic terms for partitioned features and establishes a framework for the fundamental procedures used in partition.

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.

ISO 8015, *Geometrical product specifications (GPS) — Fundamentals — Concepts, principles and rules*

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

ISO 22432, *Geometrical product specifications (GPS) — Features utilized in specification and verification*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8015, ISO 17450-1 and ISO 22432 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/

3.1
geometrical feature
point, line, surface, volume or a set of these terms

[SOURCE: ISO 17450-1:2011, 3.3, modified — Notes 1 and 2 to entry removed.]

3.2
partition
feature operation used to identify a portion of a *geometrical feature* (3.1) belonging to the real surface of the workpiece or to a surface model of the workpiece

[SOURCE: ISO 17450-1:2011, 3.4.1.1.]

3.3
nominal model
<of a workpiece> model of the perfect shape defined by the designer

Note 1 to entry: Nominal model represents the design intent.

Note 2 to entry: Partition information is part of the nominal model.

[SOURCE: ISO 17450-1:2011, 3.2.1, modified — Note 2 to entry added.]

3.4
non-ideal surface model
skin model
<of a workpiece> model of the physical interface of the workpiece with its environment

Note 1 to entry: See Reference [7] for different types of physical interfaces of the workpiece with its environment.

[SOURCE: ISO 17450-1:2011, 3.2.2, modified — Note 1 to entry added.]

3.5
fuzzy set
set whose elements have degrees of membership

Note 1 to entry: These degrees of membership range from 1, when the element is in the set, to 0, when it is out of the set, see Reference [8] for more details.

3.5.1
feature uncertainty zone identity set
fuzzy set (3.5) of a cloud of points representing a *geometrical feature* (3.1) or its boundary in specification or verification

Note 1 to entry: There are three types of feature uncertainty zone identity sets: surface, line and point.

Note 2 to entry: Feature uncertainty zone identity set is the geometrical realization of fuzzy sets.

3.5.2
surface feature uncertainty zone identity set
(F2)
feature uncertainty zone identity set (3.5.1) generated from a *geometrical feature* (3.1) of type surface

EXAMPLE Planar face, facet, cylinder.

Note 1 to entry: Different partition algorithms (see ISO 18183-3) can generate different surface feature uncertainty zone identity sets.

3.5.3
line feature uncertainty zone identity set
(F1)
feature uncertainty zone identity set (3.5.1) generated from a *geometrical feature* (3.1) of type line

EXAMPLE Edge between facets, line profile, roundness profile, line on a surface.

Note 1 to entry: Different partition algorithms (see ISO 18183-3) can generate different line feature uncertainty zone identity sets.

3.5.4
point feature uncertainty zone identity set
(F0)
feature uncertainty zone identity set (3.5.1) generated from a *geometrical feature* (3.1) of type point

EXAMPLE Corner between three or more facets, datum of type point, end point of a line.

Note 1 to entry: Different partition algorithms (see ISO 18183-3) can generate different point feature uncertainty zone identity sets.

3.6
invariance class
group of ideal features defined by the same displacement(s) of the ideal feature for which the feature is kept identical in the space

[SOURCE: ISO 17450-1:2011, 3.3.1.2]

3.7
feature discontinuity
<partition> unintentional break in the continuity of a *geometrical feature* (3.1)

Note 1 to entry: Feature discontinuity can never appear in the nominal model, see 4.3.2 for an example.

Note 2 to entry: The concept of continuity used here is by open sets in a topology, since this also allows for point cloud 'surfaces'[9]. The open sets in the topological space (surface, line) are defined from the basis of open disks and open intervals, respectively.

3.8
feature transition
<partition> meeting or merging of features by design

Note 1 to entry: Feature transition shall appear in the nominal model.

3.9
selection
identification of the partitioned feature(s) required to be modified

Note 1 to entry: Examples appear in ISO 18183-2.

Note 2 to entry: This term is an abstraction, abstracted from all the different ways, within the ISO GPS system, to identify partitioned feature(s).

3.10
subdivision
identification of a portion of the selected partitioned feature

Note 1 to entry: This term is an abstraction, abstracted from all the different ways, within the ISO GPS system, to identify a portion of the selected partitioned feature.

3.11
simplification
merging of the selected partitioned features into one partitioned feature

Note 1 to entry: This term is an abstraction, abstracted from all the different ways, within the ISO GPS system, to merge partitioned features.

3.12
face
<nominal> single surface bounded by one or more vertices or edges

3.13
edge
<nominal> line along which two single surfaces meet

Note 1 to entry: the edge is bounded by two vertices or has no vertices

3.13.1
blend edge
<nominal> edge defined by a line along which two single surfaces meet that have a continuous gradient orthogonal to the edge

3.14
vertex
<nominal> meeting point of three or more different single surfaces or the meeting point of two or more edges or the point of intersection of a pencil of lines

Note 1 to entry: An example of a pencil of lines is the vertex of a cone.

3.14.1
blend vertex
<nominal> vertex that has a smooth gradient, in all directions, through the vertex

3.14.2
sharp vertex
<nominal> vertex that is not a blend vertex

3.15
single feature
geometrical feature which is a single point, a single line or a single surface

[SOURCE: ISO 22432:2011, 3.2.9, modified — Note 1 to entry and example removed.]

3.15.1
single surface
continuous surface which is nominally a plane, a cylinder, a sphere, a cone, a torus, another surface of revolute invariance class, a surface of prismatic invariance class, a helix, a surface of complex invariance class or a restricted part of one of them

Note 1 to entry: A revolute surface is a single surface if its generatrix is a single line (see ISO 22432:2011, Figure 11).

Note 2 to entry: ISO 17450-1:2011, Table 1 illustrates the types of single surfaces with their invariance degree.

Note 3 to entry: If a surface contains a surface portion of higher invariance degree than itself, then it is not a single surface. A partial ordering of single-surface types, based on whether they can contain each other, is given in ISO 22432:2011, Figure 12. The ordering is partial because some surface types cannot be contained within each other.

[SOURCE: ISO 22432:2011, 3.2.9.4]

3.15.2
single line
continuous line which is nominally a straight line, a circle or a complex line

Note 1 to entry: An arc is a restricted circle (see ISO 22432:2011, Figure 10).

Note 2 to entry: A single line does not intersect itself.

[SOURCE: ISO 22432:2011, 3.2.9.2]

3.16
compound feature
geometrical feature which is a collection of several single features

[SOURCE: ISO 22432:2011, 3.2.10]

3.17
integral feature
surface or line on a surface

[SOURCE: ISO 22432:2011, 3.3, modified - Notes 1 to 4 to entry removed.]

3.17.1
integral surface portion
integral surface which is a portion of the complete surface

[SOURCE: ISO 22432:2011, 3.3.1]

3.17.2
integral line portion
integral line which is a portion of the complete line

[SOURCE: ISO 22432:2011, 3.3.2]