INTERNATIONAL STANDARD

ISO 17450-3

First edition
2016-06-01

Geometrical product specifications (GPS) — General concepts —

Part 3: Toleranced features

Spécification géométrique des produits (GPS) — Concepts généraux —

Partie 3: Éléments tolérancés

Reference number
ISO 17450-3:2016(E)

COPYRIGHT PROTECTED DOCUMENT

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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 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 213, *Dimensional and geometrical product specifications and verifications*.

This first edition of ISO 17450-3 cancels and replaces ISO 14660-2:1999, which has been technically revised.

ISO 17450 consists of the following parts, under the general title *Geometrical product specification (GPS) — General concepts*:

— *Part 1: Model for geometrical specification and verification*

— *Part 2: Basic tenets, specifications, operators, uncertainties and ambiguities*

— *Part 3: Toleranced features*

— *Part 4: Geometrical characteristics for quantifying form, orientation, location and run-out deviations*

Introduction

This part of ISO 17450 is a geometrical product specifications (GPS) standard and is to be regarded as a fundamental GPS standard (see ISO 14638). It influences all chain links of all chains of standards in the general 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 of the relation of this part of ISO 17450 to the GPS matrix model, see Annex A.

Geometrical product specifications (GPS) — General concepts —

Part 3: Toleranced features

1 Scope

This part of ISO 17450 gives default definitions for the extracted features (integral or derived) of workpieces, which are toleranced features in GPS specifications (dimensional, geometrical, or surface texture specifications). This part of ISO 17450 defines default geometrical features used to define GPS characteristics.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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*

ISO 25378, *Geometrical product specification (GPS) — Characteristics and conditions — Definitions*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 17450-1, ISO 22432, ISO 25378 and the following apply.

3.1
opposing point pair
collection of two points established simultaneously, the separation of which is a local size of a feature of size

Note 1 to entry: The distance between the two points constituting an opposing point pair is a two point size (see ISO 14405-1).

Note 2 to entry: In the case of a feature of size defined as “two opposed planes”, the median point of the two points constituting an extracted opposing point pair belongs to its median extracted surface.

3.2
elementary toleranced feature
smallest part of a complete geometrical feature for which a GPS characteristic is defined

EXAMPLE 1 For an unrestricted flatness specification, a global GPS characteristic is defined for the complete integral feature, which in this case is an elementary toleranced feature.

EXAMPLE 2 For a straightness specification, a local GPS characteristic may be defined for each line feature in a given direction in the complete integral feature. Each of these line features is the intersection between a planar feature and the complete integral feature and is an elementary toleranced feature. The complete integral feature is the toleranced feature.

3.3
toleranced feature
complete toleranced feature
set of one or more geometrical features, for which a GPS characteristic is defined or a collection of elementary toleranced features

Note 1 to entry: "Toleranced feature" without a qualifier is a complete feature, not an elementary feature.

Note 2 to entry: A toleranced feature is a set of geometrical features on which a GPS specification is defined.

3.4
median centre
centre point calculated as the centre of an opposing point pair

Note 1 to entry: A centre of an associated sphere is a directly associated median point (see ISO 22432 and 5.3.2.1) and not a median centre.

4 General

A GPS characteristic (see ISO 25378) is a basic characteristic (an intrinsic characteristic or a location or an orientation situation characteristic).

— The size of a deviated feature (see ISO 22432), which is nominally a feature of size is an intrinsic characteristic (see ISO 17450-1), which is used for dimensional specification (see ISO 14405).

— The value calculated from the local distances between a deviated feature and a reference feature (see ISO 22432) is a situation characteristic (see ISO 17450-1), which is used for geometrical specification (see ISO 1101) or for surface texture characteristic (see ISO 25378 and ISO 1302).

A deviated feature is obtained from an input feature (see ISO 25378) by using or not using the operation of filtration and/or association.

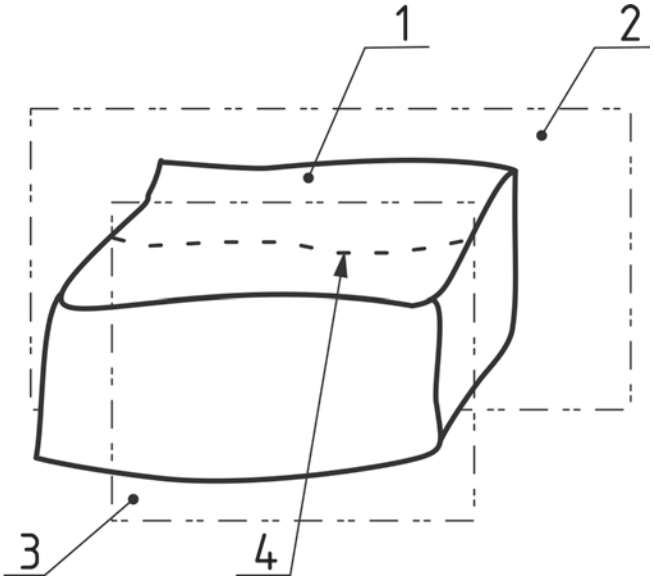
By default, the input integral feature is defined by an extraction of an infinite number of points from the real feature. In verification, the extracted integral feature does not contain an infinite number of points.

By default, the input feature is a single feature, see ISO 22432.

By default, a boundary belongs to both adjacent single extracted integral features.

If the complete extracted integral feature is a line, then the complete extracted line is defined by the intersection of the complete extracted integral surface feature with an intersection feature.

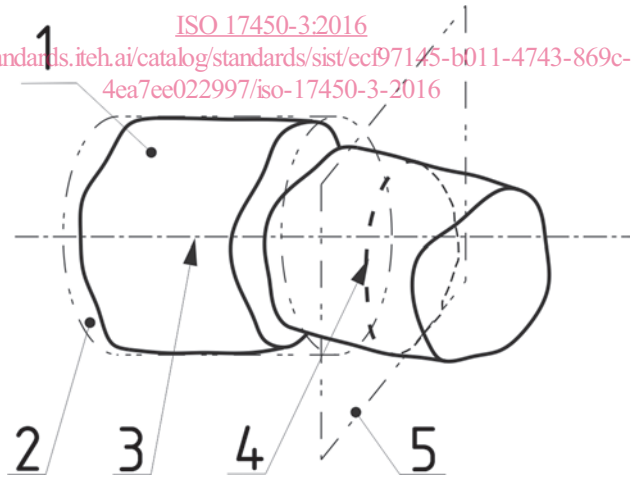
The intersection plane is a full plane (see Figure 1 and Figure 2) or a half plane (see Figure 3). The intersection plane can be explicitly or implicitly defined by GPS specification with or without a specific location. When the intersection has no specific location, then it belongs to a set of planes containing an axis or a set of parallel planes or a set of planes oriented from an associated feature.



Key

1 tolerance feature: complete extracted feature
2 associated feature
3 intersection plane which is established parallel to the associated surface
4 elementary toleranced feature: complete extracted section line

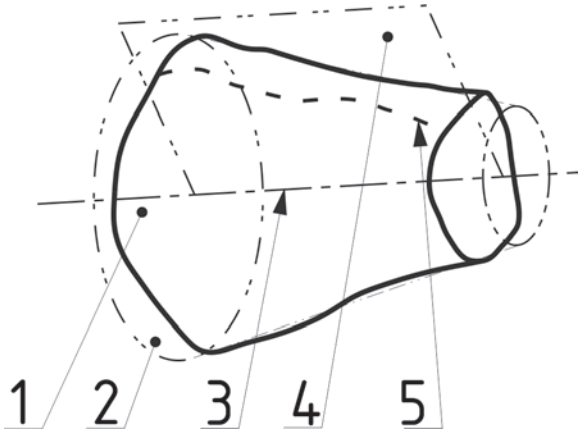
Figure 1 — Example of intersection plane used to establish an elementary toleranced feature



Key

1 complete extracted feature
2 associated feature
3 situation feature of the associated feature (in this case, its axis)
4 elementary toleranced feature: complete extracted section line
5 intersection plane perpendicular to the axis of the associated feature

Figure 2 — Example of intersection plane constrained in orientation used to establish an elementary toleranced feature



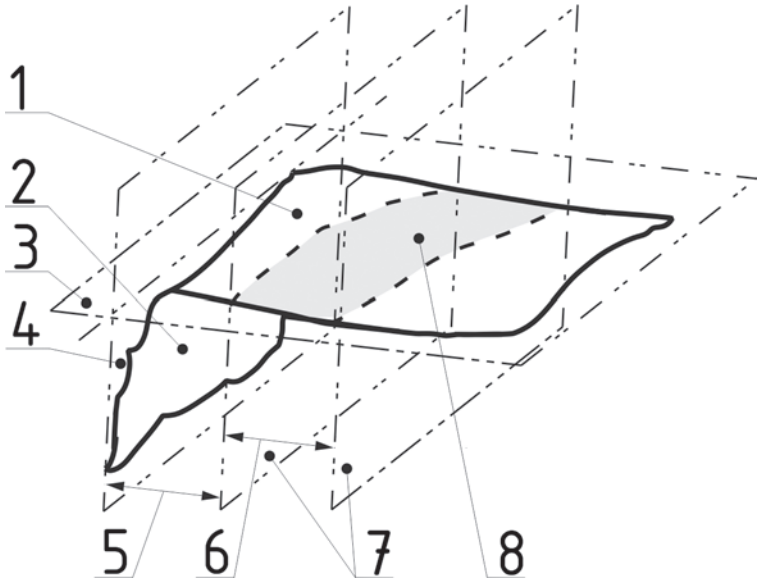
Key

1 toleranced feature: complete extracted feature
2 associated feature
3 situation feature of the associated feature (in this case, its axis)
4 intersection plane including the situation feature of the associated feature
5 elementary toleranced feature: complete extracted section line

Figure 3 — Example of intersection plane, as a half plane, used to establish an elementary toleranced feature

If the input feature is a restricted feature, then its boundaries are defined from the single feature's boundaries with other features. The nominal location of the boundaries of the restricted feature shall be given in the specification. To identify a location intrinsically defined on a single integral feature, a primary datum is defined from the single integral feature. The location is defined from this primary datum.

To identify a location on a single integral feature defined in a given distance from an adjacent feature, a primary datum is first defined from the single integral feature. Subsequently, a secondary datum as a single datum or a common datum is defined from one or more adjacent features from which the location is defined. The location is defined in this datum system (see Figure 4).



Key

1 toleranced feature: complete extracted feature
2 adjacent extracted integral surface
3 associated feature to the complete extracted surface establishing the primary datum
4 associated feature (to the adjacent surface) constrained in orientation from the primary datum (3)
5 theoretical exact dimension (TED) defining a location of a boundary of the restricted extracted surface (8)
6 theoretical exact dimension (TED) defining the extent of the restricted extracted surface (8)
7 intersection planes used to define boundaries of the restricted extracted surface (8)
8 elementary toleranced feature: restricted extracted surface

Figure 4 — Example of identification of a restricted area

5 Default rules for establishing geometrical features

5.1 General

By default, without specific indication, all intermediate associations for establishing a geometrical feature as a portion of an integral surface, an integral line, an integral point or a derived feature are established from the total least squares (Gaussian) objective function without material constraint.

The final association for establishing datums, wherever the datum is applied, depends on the specification.

The final association for establishing characteristics depends on the specification.

NOTE An unequal repartition of the points extracted on a surface can influence the result of an association. This includes the case, when a portion of the feature is removed from the complete mathematical definition of the feature, e.g. a cylinder with a key way: the key way creates an asymmetrical repartition of the points on the cylinder. This produces, e.g. with the total least square association criteria, an artificial shift of the location of the cylinder axis (compared to the associated location without the key way). This shift appears in the opposite direction of the key way.