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Geometrical product specifications (GPS) — Dimensional tolerancing —

Part 2: Dimensions other than linear or angular sizes

Spécification géométrique des produits (GPS) — Tolérancement dimensionnel —

Partie 2: Dimensions autres que tailles linéaires ou angulaires

Reference number
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Contents

Page

Foreword ... **iv**
Introduction ... **v**
1 Scope ... **1**
2 Normative references ... **1**
3 Terms and definitions ... **2**
4 Principles and rules for indication of dimensions and related tolerances ... **2**
5 Units used in drawings for dimensions ... **3**
6 Indication of tolerances for linear or angular dimensions ... **4**
7 Illustrations of ambiguous ± tolerancing vs. unambiguous geometrical specifications ... **4**
7.1 General ... 4
7.2 Linear distance between two integral features ... 4
7.3 Linear distance between an integral and a derived feature ... 6
7.4 Linear distance between two derived features ... 7
7.5 Radius dimension ... 8
7.6 Linear distance between non-planar integral features ... 8
7.7 Linear distance in two directions ... 9
8 Angular tolerancing ... **10**
8.1 Examples of geometrical specifications applied to angular distance between two integral features ... 10
8.2 Angular distance between an integral feature and a derived feature ... 11
Annex A (informative) **Explanations and examples of the ambiguity caused by using ± tolerances for dimensions other than linear size or angular size** ... **13**
Annex B (informative) **Relation to the GPS matrix model** ... **21**
Bibliography ... **22**

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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 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.*

This second edition cancels and replaces the first edition (ISO 14405-2:2011), which has been technically revised.

The main changes compared to the previous edition are as follows:

— the addition of angular sizes to reflect ISO 14405-3;

— clarifications around specification ambiguity and the use of geometrical tolerancing;

— a review and update of all normative references and other ISO GPS standards referenced in the text.

A list of all parts in the ISO 14405 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.

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Introduction

This document is a geometrical product specification (GPS) standard and is to be regarded as a general GPS standard (see ISO 14638). It influences chain link A of the chain of standards on distance.

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 dimensions other than linear or angular sizes, the requirement is ambiguous when applied to the real workpiece. It is the presence of form and angular deviations on all real workpieces that makes these requirements ambiguous, i.e. there is a specification ambiguity.

This specification ambiguity can only be avoided for features of size toleranced in accordance with ISO 14405-1 or ISO 14405-3. For all other dimensions, geometrical specifications should be used in order to control the specification ambiguity.

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

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Geometrical product specifications (GPS) — Dimensional tolerancing —

Part 2:
Dimensions other than linear or angular sizes

1 Scope

This document illustrates the ambiguity caused by the use of dimensional specifications to control properties other than linear or angular size and the benefit of using geometrical specifications instead.

Dimensional tolerancing can be indicated by ± tolerancing or geometrical specifications.

The ambiguity caused by using ± tolerances for dimensions other than linear or angular sizes (for individual tolerances and general tolerances according to, e.g. ISO 2768-1 and ISO 8062-3) is explained in Annex A.

NOTE 1 The figures, as shown in this document, merely illustrate the text and are not intended to reflect actual usage. The figures are consequently simplified to indicate only the relevant principles.

NOTE 2 For indications of dimensional specifications, see the following:

— ISO 14405-1 for linear size;

— ISO 14405-3 for angular size;

— ISO 2538-1 and ISO 2538-2 for wedges;

— ISO 3040 for cones.

NOTE 3 The rules for geometrical specifications are given in ISO 1101.

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 129-1, *Technical product documentation (TPD) — Presentation of dimensions and tolerances — Part 1: General principles*

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

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

ISO 13715, *Technical product documentation — Edges of undefined shape — Indication and dimensioning*

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

ISO 14405-3, *Geometrical product specifications (GPS) — Dimensional tolerancing — Part 3: Angular sizes*

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

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ISO 17450-2, *Geometrical product specifications (GPS) — General concepts — Part 2: Basic tenets, specifications, operators, uncertainties and ambiguities*

ISO 17450-3, *Geometrical product specifications (GPS) — General concepts — Part 3: Toleranced features*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 129-1, ISO 1101, ISO 8015, ISO 13715, ISO 14405-1, ISO 14405-3, ISO 17450-1, ISO 17450-2, ISO 17450-3 and the following apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

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

The term "drawing" is used in this document as a synonym for the 2D drawing, the 3D model and other representations of the workpiece.

3.1
± tolerancing
tolerancing using dimension and indication of limit deviations, dimension limit values or unilateral dimension limit

Note 1 to entry: The sign ± should not be understood in a way that the limit deviations are always symmetrical to the nominal size.

3.2
linear size
dimension in length units characterizing a feature of size

3.3
angular size
dimension in angle units characterizing a feature of size

3.4
distance
dimension between two geometrical features which are not considered as a feature of size

Note 1 to entry: Distance can be between two integral features or an integral feature and a derived feature or two derived features.

Note 2 to entry: *Linear distance* (3.4.1) and *angular distance* (3.4.2) exist.

3.4.1
linear distance
distance (3.4) in length units

3.4.2
angular distance
distance (3.4) in angle units

4 Principles and rules for indication of dimensions and related tolerances

The general rules and principles for indicating ± tolerances given in ISO 14405-1 and ISO 14405-3 apply to this document and are the basis for tolerancing on mechanical engineering drawings. In all other cases, special rules apply.

For rules on the indication of units, see Clause 5.

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