INTERNATIONAL STANDARD

ISO 14405-1

Second edition
2016-08-15

Geometrical product specifications (GPS) — Dimensional tolerancing —

Part 1: Linear sizes

Spécification géométrique des produits (GPS) — Tolérancement dimensionnel —

Partie 1: Tailles linéaires

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Reference number
ISO 14405-1:2016(E)

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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 213, *Dimensional and geometrical product specification and verification*.

This second edition cancels and replaces the first edition (ISO 14405-1:2010), which has been technically revised.

The main changes from the previous edition are:

— Clauses 1 and 3, 5.3, 6.1, 6.2, 7.3, 7.8, Tables 1 and 2, and the figures have been technically revised;

— Clause 8 and Annexes D and E have been added.

ISO 14405 consists of the following parts, under the general title *Geometrical product specifications (GPS) — Dimensional tolerancing*:

— *Part 1: Linear sizes*

— *Part 2: Dimensions other than linear sizes*

— *Part 3: Angular sizes*

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Introduction

This part of ISO 14405 is a geometrical product specification (GPS) standard and is to be regarded as a general GPS standard (see ISO 14638). It influences chain links A to C of the chain of standards on size.

The ISO GPS matrix model given in ISO 14638 gives an overview of the ISO GPS system of which this part of ISO 14405 is a part. The fundamental rules of ISO GPS given in ISO 8015 apply to this part of ISO 14405 and the default decision rules given in ISO 14253-1 apply to the specifications made in accordance with this part of ISO 14405, unless otherwise indicated.

For more detailed information of the relation of this part of ISO 14405 to other standards and the GPS matrix model, see Annex F.

Produced workpieces exhibit deviations from the ideal geometric form. The real value of the dimension of a feature of size is dependent on the form deviations and on the specific type of size applied.

The type of size to be applied to a feature of size depends on the function of the workpiece.

The type of size can be indicated on the drawing by a specification modifier for controlling the feature definition.

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Geometrical product specifications (GPS) — Dimensional tolerancing —

Part 1: Linear sizes

IMPORTANT — The illustrations included in this part of ISO 14405 are intended to illustrate the text and/or to provide examples of the related technical drawing specification. These illustrations are not fully dimensioned and toleranced showing only the relevant general principles. As a consequence, the illustrations are not a representation of a complete workpiece and are not of a quality that is required for use in industry (in terms of full conformity with the standards prepared by ISO/TC 10 and ISO/TC 213) and as such, are not suitable for projection for teaching purposes

1 Scope

This part of ISO 14405 establishes the default specification operator (see ISO 17450-2) for linear size and defines a number of special specification operators for linear size for features of size, e.g. “cylinder”, “sphere”, “torus,”[1)], “circle”, “two parallel opposite planes”, or “two parallel opposite straight lines”.

It also defines the specification modifiers and the drawing indications for these linear sizes.

This part of ISO 14405 covers the following linear sizes:

a) local size:
   - two-point size;
   - spherical size;
   - section size;
   - portion size;

b) global size:
   - direct global linear size:
     - least-squares size;
     - maximum inscribed size;
     - minimum circumscribed size;
     - minimax size;
   - indirect global linear size;

c) calculated size:
   - circumference diameter;
   - area diameter;
   - volume diameter;

1) A torus is a feature of size when its directrix diameter is fixed.

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d) rank-order size:

- maximum size;
- minimum size;
- average size;
- median size;
- mid-range size;
- range of sizes;
- standard deviation of sizes.

This part of ISO 14405 defines tolerances of linear sizes for the following:

- a + and/or – limit deviation (e.g. 0/–0,019) (see Figure 11);
- an upper limit of size (ULS) and/or lower limit of size (LLS) (e.g. 15,2 max., 12 min., or 30,2/30,181) (see Figure 13);
- an ISO tolerance class code in accordance with ISO 286-1 (e.g. 10 h6) (see Figure 12);

with or without modifiers (see Tables 1 and 2).

This part of ISO 14405 provides a set of tools to express several types of size characteristic. It does not present any information on the relationship between a function or a use and a size characteristic.

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 286-1, *Geometrical product specifications (GPS) — ISO code system for tolerances on linear sizes — Part 1: Basis of tolerances, deviations and fits*

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 17450-2:2012, *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*

ISO 81714-1, *Design of graphical symbols for use in the technical documentation of products — Part 1: Basic rules*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 286-1, ISO 8015, ISO 17450-1, ISO 17450-2, ISO 17450-3, and the following apply.

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