International Standard

ISO 14405-1

Third edition
2025-08

Geometrical product specifications (GPS) — Dimensional tolerancing —

Part 1: Linear sizes

Spécification géométrique des produits (GPS) — Tolérancement dimensionnel —

Partie 1: Tailles linéaires

Reference number
ISO 14405-1:2025(en)

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Published in Switzerland

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Foreword

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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).

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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).

This third edition cancels and replaces the second edition (ISO 14405-1:2016), which has been technically revised.

The main changes are as follows:

— the use of linear size specifications for cones, torus and two opposite circles is now reduced to the cases described in Annexes D, E and F;

— the syntax is changed, and is now defined with several indication areas, and a sequence of specification elements in each area;

— linear size specifications can be stacked upon each other and the rules for stacked specifications are defined;

— the indication *k*×/*n*× is now possible, in order to facilitate stacking with geometrical specifications;

— the graphical rules are modified;

— the specification element “/0” to mean “any restricted portion whose length is equal to zero” has been removed to use the modifier “ACS”;

— when different specification operators applied for the upper and the lower specification limits of size characteristic, the new rule is to indicate two different size specifications;

— the indication of several linear size specifications on the same dimension line or reference line with brackets is removed;

— it is now required to use the “between” symbol to indicate that a linear size specification applies to a fixed restricted portion of a feature of linear size;

— it is now required to indicate “SCS” with the identifier of the section for a specific cross-section;

— the rank-order size specification is now called statistical size specification.

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.

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 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 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 the specifications made in accordance with this document, unless otherwise indicated.

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

This document deals with linear size specifications on the following features of linear size:

— cylinders;

— spheres;

— two parallel opposite planes.

It also deals with the following cases:

— circles as sections of a cone;

— circles as sections of a torus;

— parallel opposite lines as longitudinal sections of cylindrical tubes.

Different specification elements allow specifying local linear sizes or global linear sizes of different types, and, for example, specifications on several features of linear size, specifications in sections and specifications on portions. The many specification elements allow for specifying a variety of functional needs.

Annex D provides the definition of a size for a circle as section of a cone. Annex E provides the definition of sizes for circles as sections of a torus. Annex F provides the definition of sizes for parallel opposite lines as longitudinal sections of cylindrical tubes in half planes containing a specified axis. Annex H gives an overview of the sequence of specification elements for linear size specifications.

ISO 14405-2 gives the difference between linear size, angular size and dimensions other than linear or angular sizes. ISO 14405-2 relies on this document for the rules about indication.

Geometrical product specifications (GPS) — Dimensional tolerancing —

Part 1: Linear sizes

IMPORTANT — The figures included in this document are intended to either illustrate the text or to provide examples of the related technical drawing specification, or both. These figures are not fully specified, showing only the relevant general principles. As a consequence, the figures are not a representation of a complete workpiece and are not of a quality that is required for use in industry and, as such, are not suitable for projection for teaching purposes. Figures are simplified 2D representations and show features that are unlikely (e.g. a minimum circumscribed cylinder with three contact points in the same section).

1 Scope

This document specifies requirements for indicating linear sizes.

This document establishes the default specification operator (see ISO 17450-2) and defines a special specification operator for linear sizes.

This document is applicable to the following features of linear size (see ISO 17450-1):

— cylinders;

— spheres;

— two parallel opposite planes.

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

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 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, *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*