INTERNATIONAL STANDARD

ISO 286-1

Second edition
2010-04-15

Geometrical product specifications (GPS) — ISO code system for tolerances on linear sizes —

Part 1: Basis of tolerances, deviations and fits

Spécification géométrique des produits (GPS) — Système de codification ISO pour les tolérances sur les tailles linéaires —

Partie 1: Base des tolérances, écarts et ajustements

Reference number
ISO 286-1:2010(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web 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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 286-1 was prepared by Technical Committee ISO/TC 213, *Dimensional and geometrical product specifications and verification*.

This second edition of ISO 286-1 cancels and replaces ISO 286-1:1988 and ISO 1829:1975, which have been technically revised.

ISO 286 consists of the following parts, under the general title *Geometrical product specifications (GPS) — ISO code system for tolerances on linear sizes*:

— *Part 1: Basis of tolerances, deviations and fits*

— *Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts*

Introduction

This International Standard is a geometrical product specification (GPS) standard and is to be regarded as a general GPS standard (see ISO/TR 14638). It influences chain links 1 and 2 of the chain of standards on size in the general GPS matrix.

For more detailed information on the relation of this part of ISO 286 to the GPS matrix model, see Annex C.

The need for limits and fits for machined workpieces was brought about mainly by the requirement for interchange ability between mass produced parts and the inherent inaccuracy of manufacturing methods, coupled with the fact that "exactness" of size was found to be unnecessary for the most workpiece features. In order that fit function could be satisfied, it was found sufficient to manufacture a given workpiece so that its size lay within two permissible limits, i.e. a tolerance, this being the variation in size acceptable in manufacture while ensuring the functional fit requirements of the product.

Similarly, where a specific fit condition is required between mating features of two different workpieces, it is necessary to ascribe an allowance, either positive or negative, to the nominal size to achieve the required clearance or interference. This part of ISO 286 gives the internationally accepted code system for tolerances on linear sizes. It provides a system of tolerances and deviations suitable for two features of size types: "cylinder" and "two parallel opposite surfaces". The main intention of this code system is the fulfilment of the function fit.

The terms "hole", "shaft" and "diameter" are used to designate features of size type cylinder (e.g. for the tolerancing of diameter of a hole or shaft). For simplicity, they are also used for two parallel opposite surfaces (e.g. for the tolerancing of thickness of a key or width of a slot).

The pre-condition for the application of the ISO code system for tolerances on linear sizes for the features forming a fit is that the nominal sizes of the hole and the shaft are identical.

The previous edition of ISO 286-1 (published in 1988) had the envelope criterion as the default association criterion for the size of a feature of size; however, ISO 14405-1 changes this default association criterion to the two-point size criterion. This means that form is no longer controlled by the default specification of size.

In many cases, the diameter tolerances according to this part of ISO 286 are not sufficient for an effective control of the intended function of the fit. The envelope criterion according to ISO 14405-1 may be required. In addition, the use of geometrical form tolerances and surface texture requirements may improve the control of the intended function.

Geometrical product specifications (GPS) — ISO code system for tolerances on linear sizes —

Part 1: Basis of tolerances, deviations and fits

1 Scope

This part of ISO 286 establishes the ISO code system for tolerances to be used for linear sizes of features of the following types:

a) cylinder;

b) two parallel opposite surfaces.

It defines the basic concepts and the related terminology for this code system. It provides a standardized selection of tolerance classes for general purposes from amongst the numerous possibilities.

Additionally, it defines the basic terminology for fits between two features of size without constraints of orientation and location and explains the principles of "basic hole" and "basic shaft".

2 Normative references

The following referenced documents are indispensable for the application 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 286-2[1)], *Geometrical product specifications (GPS) — ISO code system for tolerances on linear sizes — Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts*

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

ISO 14660-1:1999, *Geometrical Product Specifications (GPS) — Geometrical features — Part 1: General terms and definitions*

ISO 14660-2:1999, *Geometrical Product Specifications (GPS) — Geometrical features — Part 2: Extracted median line of a cylinder and a cone, extracted median surface, local size of an extracted feature*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14405-1 and ISO 14660-1 and the following apply. It should be noted, however, that some of the terms are defined in a more restricted sense than in common usage.

1) To be published. (Revision of ISO 286-2:1988)