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Geometrical product specifications (GPS) — Geometrical tolerancing — General geometrical specifications and general size specifications

Spécification géométrique des produits (GPS) — Tolérancement géométrique — Spécifications géométriques générales et spécifications de taille générales

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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*, 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 first edition cancels and replaces ISO 2768-2:1989, which has been technically revised.

The main changes to ISO 2768-2:1989 are as follows:

— tools have been added to specify a general geometrical specification and a general size specification;

— the rules for application of general geometrical specification and general size specification have been clarified.

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, B and C of the chain of standards on size, distance, form, orientation and location.

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 of the relation of this document to other standards and the GPS matrix model, see Annex C.

This document deals with general geometrical specification and general size specifications, which can be used to reduce the number of individual specification indications in technical product documentation (TPD). Many geometrical features have individual specifications which are similar or identical. As an alternative, general geometrical specifications, general size specifications or both may be applied.

All figures in this document for the 2D drawing indications have been drawn in first-angle projection with dimensions and tolerances in millimetres. It should be understood that third-angle projection and other units of measurement could have been used equally well without prejudice to the principles established.

The figures in this document represent either 2D drawing views or 3D axonometric views and are intended to illustrate how a specification can be fully indicated with visible annotation. For possibilities of illustrating a specification where elements of the specification may be available through a query function or other interrogation of information on the 3D CAD model, and rules for attaching specifications to 3D CAD models, see ISO 16792.

All figures are not complete and should not be seen as a way to fully specify a part. Theoretically exact dimensions (TED) which are not indicated are assumed to be obtained from the 3D CAD model.

Geometrical product specifications (GPS) — Geometrical tolerancing — General geometrical specifications and general size specifications

1 Scope

This document gives rules for definition and interpretation of general geometrical specifications and general size specifications defined according to ISO 8015:2011, 5.12.

General specifications defined in other standards, and the link to these standards, are not covered by this document.

The general geometrical specifications and general size (linear or angular) specifications defined in this document apply only to integral features (including features of size).

These specifications do not apply to derived features or integral lines (see ISO 17450-1 for the definitions of integral features and derived features).

Dimensions other than linear or angular sizes (see ISO 14405-2) are not covered by this document.

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 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 22432, *Geometrical product specifications (GPS) — Features utilized in specification and verification*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8015, ISO 17450-1, ISO 17450-2, ISO 22432 and ISO 25378 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/

3.1
general geometrical specification
geometrical specification indicated in the technical product documentation (TPD) which is not an individual specification

3.2
general size specification
size specification (linear size specification or angular size specification) indicated in the technical product documentation (TPD) which is not an individual specification

Note 1 to entry: Linear size specifications are defined in ISO 14405-1. Angular size specifications are defined in ISO 14405-3.

3.3
integral feature
geometrical feature belonging to the real surface of the workpiece or to a surface model

Note 1 to entry: An integral feature is intrinsically defined, e.g. skin of the workpiece.

Note 2 to entry: For the statement of specifications, features obtained from partition of the surface model or of real surface of workpiece shall be defined. These features, called "integral features", are models of the different physical parts of the workpiece that have specific functions, especially those in contact with the adjacent workpieces.

Note 3 to entry: An integral feature can be identified, for example, by:

— a partition of the surface model;

— a partition of another integral feature;

— a collection of other integral features.

[SOURCE: ISO 17450-1:2011, 3.3.5]

4 Basic principles

4.1 General

When using general geometrical specifications or general size specifications, the designer should be aware of the following risks:

— overlooking important functional requirements;

— selecting unnecessarily tight tolerances regarding the functional requirement.

It is the responsibility of the designer to ensure that:

— functional requirements are properly defined;

— the geometrical features influencing the functions are properly specified;

— the entire part, i.e. all geometrical features, is completely and unambiguously specified.

General geometrical specification and general size specification are ways of minimising the number of indications in a TPD.

4.2 Basic rule

This document defines two types of general specifications:

— general geometrical specifications;

— general size specifications.

Rule A: only the specifications defined in Tables 1 and 2 shall be used to define general geometrical specifications, general size specifications or both on integral features.

4.3 Indication in a technical product documentation (TPD)

Rule B: to apply general geometrical specifications, general size specifications or both according to this document, it shall be clearly indicated in or near the title block or in the product definition data set according to the following rules:

— wording 'General tolerances' followed by a reference to this document (i.e. ISO 22081), followed by the indication of the general geometrical specifications, the indication of the general size specifications or both (see Figure 1).
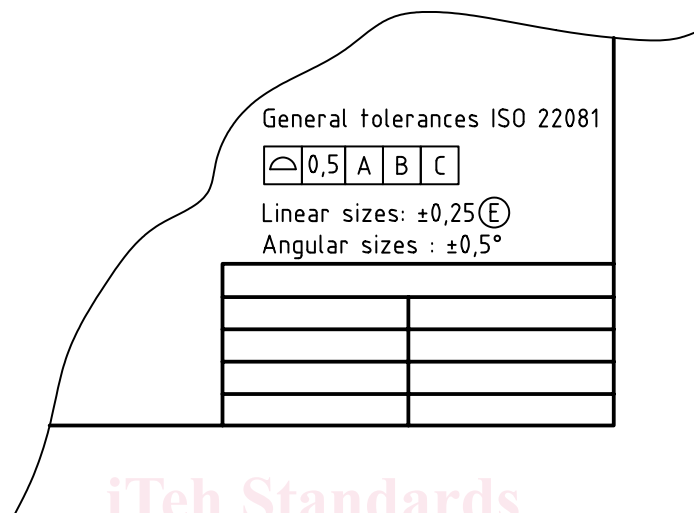
General tolerances ISO 22081

⌓ 0,5 | A | B | C

Linear sizes: ±0,25 Ⓔ
Angular sizes : ±0,5°

Figure 1 — Indication of general geometrical specifications and general size specifications

The tolerance values can be defined as:

— single values; or

— variable values.

Variable values may be dependent on either or both of:

— the dimensions of these integral features;

— the distance of the integral feature to the datum system (the TEDs).

When variable tolerance values are used, unambiguous rules should be defined to obtain these values from a table (see Annex A) or from other documents (see Figure 2).

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⌓ | t1 | A | B | C   See table 1 in document 123456
Linear sizes: ±t2 Ⓔ See table 2 in document 123456
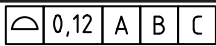Angular sizes : ±t3° See table 3 in document 123456

Figure 2 — Example of indications with the tolerance values tabled in a referenced document

5 General geometrical specification

5.1 Rule for indicating the general geometrical specification

Rule C: the general geometrical specification (see 3.1) shall be indicated with a surface profile specification (see Table 1 and Figure 3).

Table 1 — General geometrical specification

Type	Example of specification indications in or near the title block
General geometrical specification	⌒ 0,12 | A | B | C
NOTE See 5.3 for datum systems.	

Apart from the characteristic (which can only be surface profile), any specification element from ISO 5459 and ISO 1101 may be used in general geometrical specification as long as they do not contradict the rules given in this document.

5.2 Rule for the applicability of the general geometrical specification

Rule D: the general geometrical specification shall apply to each integral feature independently on the product, with the following exceptions (see Figure 3):

1) an integral feature specified by a size specification (individual size specification or general size specification);

2) an integral feature or its derived feature specified by an individual geometrical specification;

3) a datum feature used in the datum system defined in the datum section of the general geometrical specification (see 5.3);

4) an integral feature indicated with simplified representation and not included in the CAD model, for example edges, fillets or screw threads.

NOTE 1   General geometrical specification applies to integral features irrespective of a surface texture specification.

NOTE 2   The general geometrical specifications are in accordance with the independency principle and the feature principle.

NOTE 3   When individual specifications are applied on one or more portions of a single integral feature, any other portion is considered as another integral feature.