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Specifikacija geometrijskih veliļ in izdelka - Specifikacije - Znaļ ilnosti in razmere (ISO/DIS 25378:2007)

Geometrical product specifications (GPS) - Specification - Characteristics and conditions (ISO/DIS 25378:2007)

Geometrische Produktspezifikation (GPS) - Technische Beschreibung (Spezifikation) - Merkmale und Bedingungen (ISO/DIS 25378:2007)

Spécification géométrique des produits - Spécifications - Caractéristiques et conditions (ISO/DIS 25378:2007)

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Spécification géométrique des produits - Spécifications - Caractéristiques et conditions (ISO/DIS 25378:2007)

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Foreword

This document (prEN ISO 25378:2007) has been prepared by Technical Committee ISO/TC 213 "Dimensional and geometrical product specifications and verification" in collaboration with Technical Committee CEN/TC 290 “Dimensional and geometrical product specification and verification” the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

Endorsement notice

The text of ISO/DIS 25378:2007 has been approved by CEN as a prEN ISO 25378:2007 without any modification.

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Geometrical product specifications (GPS) — Specification — Characteristics and conditions

Spécification géométrique des produits — Spécifications — Caractéristiques et conditions

ICS 17.040.01

ISO/CEN PARALLEL ENQUIRY

The CEN Secretary-General has advised the ISO Secretary-General that this ISO/DIS covers a subject of interest to European standardization. **In accordance with the ISO-lead mode of collaboration as defined in the Vienna Agreement, consultation on this ISO/DIS has the same effect for CEN members as would a CEN enquiry on a draft European Standard.** Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month FDIS vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

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Foreword

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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 25378 was prepared by Technical Committee ISO/TC 213, *Geometrical product specifications and verification*.

Introduction

This document is a Geometrical Product Specifications (GPS) standard and is to be regarded as a global GPS standard (see ISO/TR 14638). It influences all chain links of all chains of standards in the general GPS matrix.

NOTE To facilitate the reading and the understanding of this standard it is essential to refer to ISO/TS 17450-1 and ISO/TS 17450-2.

Geometrical characteristics exist in three “worlds”:

— the world of nominal geometrical definition, where an ideal representation of the future workpiece is defined by the designer;

— the world of specification, where several representations of the future workpiece are imagined by the designer;

— the world of verification, where one (or several) representation(s) of a given workpiece is (are) identified in the application of measuring procedure(s).

GPS specification defines requirements through geometrical characteristic and condition

In the world of verification, mathematical operations can be distinguished from physical operations. The physical operations are the operations based on physical procedures, they are generally mechanical, optical or electromagnetic. The mathematical operations are mathematical treatments of the sampling of the workpiece. This treatment is generally achieved by computing or electronic treatment.

It is important to understand the relationship between these three worlds.

These specifications, characteristics and conditions, generically defined in this document, are well suited to define requirements of rigid parts and assemblies and may also be applied to non-rigid parts and assemblies.

Geometrical product specifications (GPS) — Specification — Characteristics and conditions

1 Scope

This document defines general terms for geometrical specifications, characteristics and conditions. These definitions are based on concepts developed in ISO/TS 17450-1 and ISO 22432 and they are given by using a mathematical description based on Annex B of ISO/TS 17450-1.

This document is not intended for industrial use as such among designers, but is aimed to serve as the "road map" mapping out the requirements based on geometrical features, thus enabling future standardisation for industry and software makers in a consistent manner.

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 3534-1:2006, *Statistics - Vocabulary and symbols - Part 1: General statistical terms and terms used in probability*

ISO 3534-2, *Statistics - Vocabulary and symbols-- Part 2: Applied statistics*

ISO/TS 17450-1:1999, *Geometrical product specifications (GPS) — General concepts — Part 1 : Model for geometric specification and verification*

ISO/TR 14638, *Geometrical product specification (GPS) – Masterplan*

ISO 22432[1)] , *Geometrical Product Specifications (GPS) — Features utilized in specification and verification*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TS 17450-1, ISO 3534-1 and ISO 3534-2 and the following apply.

3.1
GPS specification
expression of a set of one or more condition(s) on one or more characteristic(s)

NOTE 1 A specification can express a combination of individual conditions on an individual characteristic or a population condition on a population characteristic.

1) In preparation

NOTE 2 A specification consists of one or more single specifications. These single specifications can be individual specifications, population specifications or any combination.

3.1.1
single (GPS) specification
expression of a set of one or more condition(s) on one characteristic

EXAMPLE of single specification with one condition: the local diameter evaluated on any workpiece shall be less than 10,2 (the expression of this specification can be for instance ϕ 10,2 max).

EXAMPLE of single specification with two conditions: the local diameter evaluated on any workpiece shall be greater than 9,8 and less than 10,2 (the expression of this specification can be for instance ϕ 10 ± 0,2).

EXAMPLE of single specification with two conditions : the mean of minimum circumscribed diameters taken on the population of the workpieces shall be less than 10,1 and greater than 9,9.

3.1.1.1
individual specification
specification applicable on each workpiece

EXAMPLE of individual specification with one single specification: the local diameter evaluated on any workpiece shall be less than 10,2 (the expression of this specification can be for instance ϕ 10,2 max).

EXAMPLE of individual specification with two single specifications: any local diameter evaluated on any workpiece shall be greater than 9,8 and the minimum circumscribed diameter shall be less than 10,2 (the expression of this specification can be for instance for a shaft ϕ 10 ± 0,2 Ⓔ).

3.1.1.2
population specification
specification applicable to a set of the population of workpieces

NOTE a population specification consists of a set of one or more single specifications

EXAMPLE of population specification with two conditions : the mean of minimum circumscribed diameters taken on the population of the workpieces shall be less than 100,1 and greater than 99,9.

3.2
condition
combination of a limit value and a binary relational mathematical operator

NOTE 1 A binary relational mathematical operator is a mathematical concept which generalise the notion as “greater or equal to….” in arithmetics, or “…. is item of the set…. » in set theory .

NOTE 2 The limit value can be defined for any individual workpiece or for populations of workpieces.

NOTE 3 The limit value can be independent of a coordinate system or dependent upon it. In this last case the limit value depends on the function of the ordinates of the coordinate system or graphical ordinate system.

NOTE 4 The limit value can be a determined by a statistical tolerancing approach, by an arithmetical tolerancing (worst case) approach or by other means. The manner of determining the limit value and the choice of condition is not the subject of this standard.

NOTE 5 Two possible inequality relations exist:

- the characteristic value can be less than or equal to the limit value (upper limit)
- the characteristic value can be greater than or equal to the limit value (lower limit)

EXAMPLE 1 "be less than or equal to 6,3", the expression of this condition can be for instance : 6,3 max or U 6,3. Mathematically : let X be the considered value of characteristic, the condition is $X \leq 6,3$

EXAMPLE 2 "be greater than or equal to 0,8", the expression of this condition can be for instance : 0,8 min or L 0,8.
Mathematically : let X be the considered value of characteristic, the condition is $0,8 \leq X$

EXAMPLE 3 a set of two complementary conditions (lower and upper limits) can be expressed through, for instance:
$10,2 - 9,8$, $9,8\ ^{+0,4}_{0}$, $10 \pm 0,2$, or $9,9^{+0,3}_{-0,1}$.
Mathematically : let X be the considered value of characteristic, the condition is $9,8 \leq X \leq 10,2$

EXAMPLE 4 “be less than or equal to R, R being given by a function, $R= (X^2 + Y^2)*0,85$: X and Y being the ordinates of the coordinate system.

3.2.1
individual condition
condition where the limit value applies to any value of an individual characteristic coming from any workpiece

NOTE an individual condition can be used alone or in combination with a population condition on the corresponding population characteristic.

EXAMPLE of individual condition used in an individual specification: the individual characteristic value shall be less than or equal to 10,2.
Mathematically : let X be the considered value of individual characteristic, the condition is $X \leq 10,2$

3.2.2
population condition
condition where the limits apply to the value of population characteristic coming from of the population of values of individual characteristic taken on the workpieces.

NOTE the population condition can be used for example, for statistical process control (SPC).

EXAMPLE of population condition used in a population specification: the value of a population characteristic shall be less than or equal to 10,1.
Mathematically : let $\overline{X}$ be the considered value of population characteristic (mean value of the population of global individual characteristic values), the condition is $\overline{X} \leq 10,1$

3.3
geometrical characteristic
individual characteristic or population characteristic

NOTE 1 A characteristic could be geometrical, optical, mechanical, chemical, etc.

NOTE 2 This standard applies to the field of geometry and therefore, throughout this document, only "geometrical characteristics" are used. Characteristic is defined in ISO 9000.

NOTE 3 The geometrical characteristic permits the evaluation of a quantity which could be associated to, for instance an angular dimension, a linear dimension, a square dimension, a volume dimension, etc.

3.3.1
individual (geometrical) characteristic
single geometrical property of one or more feature(s)

NOTE 1 A local characteristic can be single or calculated.

NOTE 2 The evaluation of an individual characteristic does not necessarily give a unique result (it can be qualified by local individual characteristic or global individual characteristic).

EXAMPLE The two points diameter is an individual characteristic and the result is mathematically varying along the cylindrical feature: it is a local individual characteristic.
The minimum circumscribed cylinder diameter is an individual characteristic and the result is mathematically unique: it is a global individual characteristic.

3.3.1.1
local individual characteristic
individual characteristic whose result of evaluation is not unique

NOTE A local individual characteristic is evaluated on portion feature(s) and can be a single characteristic or a calculated characteristic.

EXAMPLE 1 The two points diameter is an individual characteristic and the result is mathematically varying along the cylindrical feature: it is a local individual characteristic.

EXAMPLE 2 see 5.1.2

3.3.1.2
global individual characteristic
individual characteristic whose result of evaluation is unique.

NOTE The result of evaluation of a global individual characteristic can come from a unique evaluation or a statistic of a set of results of evaluation of local individual characteristic, called respectively qualified single and calculated.

EXAMPLE 1 The minimum circumscribed cylinder diameter is a global individual characteristic (the result is mathematically unique).

EXAMPLE 2 The maximum of two points diameters along a given cylinder is a global individual characteristic (the result coming from a statistic and is mathematically unique).

3.3.2
population characteristic
statistic defined from the characteristic values, obtained on the population of workpieces or the population of assemblies

NOTE 1 population characteristics are used to consider a total population of workpieces

EXAMPLE 1 The arithmetic mean or the standard deviation on the population of workpieces, of a global individual characteristic are population characteristics.

NOTE 2 Population characteristics are only statistically meaningful when the value is the result of global individual characteristics .

EXAMPLE 2 The minimum circumscribed cylinder diameter has one unique value for a given cylindrical feature. Therefore a population characteristic based on this individual characteristic value will be statistically meaningful. The 2-point diameter for a given cylindrical feature will vary within a range, dependent upon the form deviations of the feature. In this case, a population characteristic can not be defined from the population of values. It could be possible in this case to establish a population characteristic from the maximum value of two point diameter along the feature. In this case the individual characteristic is a global individual characteristic which is the maximum two point diameter on a given workpiece.

NOTE 3 The population characteristic can be used for example, for statistical process control (SPC).

3.4
statistic
completely specified function of random variables

[ISO 3534-1:2006, 1.8]

NOTE 1 In GPS, the random variables, which are used are in most of cases one-dimensional (scalar). Multi-dimensional (vector) variables also exist.

NOTE 2 For a population or a sample of individual characteristic values, at least one statistic can be applied. In GPS, statistic can be used on a population of local individual characteristic values taken on one workpiece or, on a population of global individual characteristic values taken on a population of workpieces.

The statistic can, for example, be one listed in Table 1.

EXAMPLE See Table 1. More information can be found in the ISO 3534 series of standards.

Table 1 — Non exhaustive list of statistics

	Description of the statistic	Mathematical description according to ISO 3534-1 [a)]
A)	the minimum,	minimum (X)
B)	the maximum,	maximum (X)
C)	the expected value (mean),	$\mu = E(X^k) = \frac{1}{n}\sum_{i=1}^{n} X_i^k$, or $\mu = E[g(X)] = \int g(X)\mathrm{d}p = \int g(x)dF(x)$
D)	the difference between the average and the target value (TV),	$\mu - TV$
E)	the standard deviation,	$\sigma = \sqrt{V(X)}$
F)	the variance,	$V(X) = E[X - E(X)]^2$
[a] Where X is the characteristic value		

NOTE 3 For some statistical applications (like SPC), it may be necessary to define a "Target Value" (see ISO 7966:1993 and ISO 3534-2:2002).

3.5
calculated characteristic
local or global individual characteristic obtained from a collection of a set of values of one local individual characteristic by using a function

EXAMPLE 1 The normal vector obtained from three local individual characteristic vector values is a calculated characteristic, which is a local individual characteristic (see Figure 1)

EXAMPLE 2 The expected value (mean value) obtained from the population of values of local diameter of the cylinder in a specific section is a local individual characteristic.

EXAMPLE 3 The expected value (mean value) obtained from the population of values of local diameter of the cylinder (taking into account all section) is a global individual characteristic.