DRAFT AMENDMENT
ISO 3040:2009/DAM 1.2

ISO/TC **213** Secretariat: **DS**

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Geometrical product specifications (GPS) — Dimensioning and tolerancing — Cones

AMENDMENT 1

Spécification géométrique des produits (GPS) — Cotation et tolérancement — Cônes

AMENDEMENT 1

ICS: 01.100.20

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval 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.

Reference number
ISO 3040:2009(E)/DAM 1.2

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.

Amendment 1 to ISO 3040:2009 was prepared by Technical Committee ISO/TC 213, *Dimensional and geometrical product specifications and verification*.

Geometrical product specifications (GPS) — Dimensioning and tolerancing — Cones

In Clause 2, replace "ISO 1119:1998" by "ISO 1119:2011".

Replace Clause 6 "Tolerancing of cones" by the following:

A cone is intrinsically defined by its angle (see Figure 9).

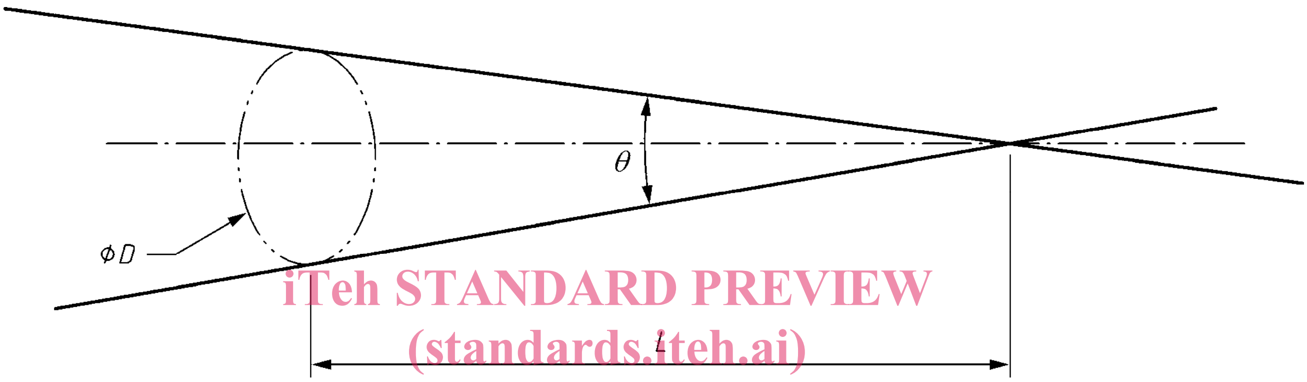
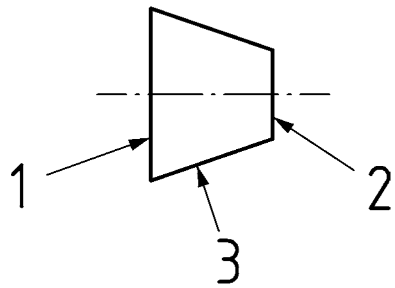


Figure 9 – Intrinsic representation of a cone

NOTE A cone is different from a frustum which is defined by three geometrical entities (one of them is a cone).

EXAMPLE A frustum defined by a cone and two end planes (not necessarily perpendicular to the axes of this cone).



Key

1 Plane 1
2 Plane 2
3 Cone

Figure 10 – Example

Tolerancing controls deviations from the nominal definition observed on a real workpiece. The shape of the cone cannot be perfect. The size of the cone (its angle) cannot be equal to the nominal value. Orientation and/or the location of the cone from other features can also deviate from the nominal target value.

The objective of tolerancing is to define a set of one or more GPS specifications. Each GPS specification defines a particular characteristic and its permissible extent by the mean of one or two tolerances limits (see Figure 9).

When a section plane is used in a specification, the section plane location shall be defined by TEDs (explicit or implicit: 0 mm).

When a datum or datum system is used to locate or orientate the tolerance zone, the angular or linear dimensions constraining the tolerance zone shall be defined by TEDs (explicit or implicit :0 mm, 0°, 90 °, 180°, 270°).

When a geometrical specification is applied to a cone with the any surface characteristic symbol without datum or datum system and the intrinsic characteristic of the cone shall be taken into account as fixed, then:

— the symbol OZ shall not be indicated in the second compartment of the tolerance frame; and

— the angle of the cone shall be indicated by a direct indication, with the cone angle, or with the taper value as TED.

Each characteristic controls a set of degrees of freedom on the real workpiece.

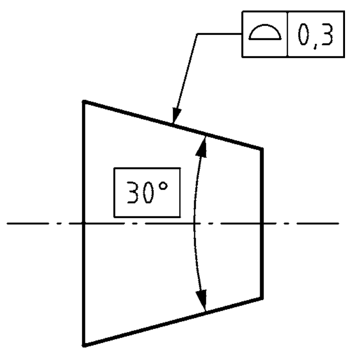
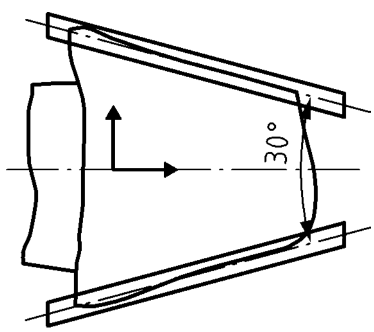
The set of degrees of freedom, which are possible to consider individually or collectively, is:

— the angle deviation;

— the form deviation on a section line or the surface;

— the location deviation (X, Y, Z : in Cartesian system);

— the orientation deviation (β, γ : in Cartesian system).

Indication of a form specification of the cone surface with its size considered as fixed	Meaning
	The extracted surface of the cone is requiered to be inside of the tolerance zone without orientation or location constraint coming. The tolerance zone consists to the space included between two coaxial conical surfaces with specified theoritical angle and 0,3 mm apart. 

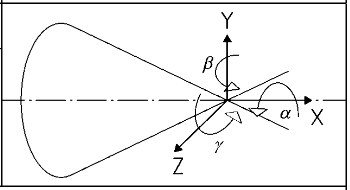
Controlled deviations								
Angle deviation	Form deviation	Location deviation			Orientation deviation			Illustration of degrees of freedom
		X	Y	Z	α	β	γ	
Yes	Yes	No	No	No	Never	No	No	
WARNING The orientation and location of the cone are not locked.								

Figure 11 – Example of tolerancing of a cone : specification of the surface form considering its theoretical exact angle

The designer is responsible to the set of specifications related on the cone, to manage all degrees of freedom according to the functions. To perform that, for the cone, the designer may indicate on the same drawing one or more specifications given independently in Figure 11 and in the different examples of Annex B.

Annex B presents various individual (independent) examples of possible dimensional or geometrical specifications in relation with a cone, in accordance with ISO 1101 and ISO 14405. Each of these examples shall be considered independently from each other, but could also be combined, the combination depending on the design intent.

Add the following informative Annex B "Tolerancing of cone – Examples " and renumber Annex B "Relation to the GPS matrix model" in Annex C

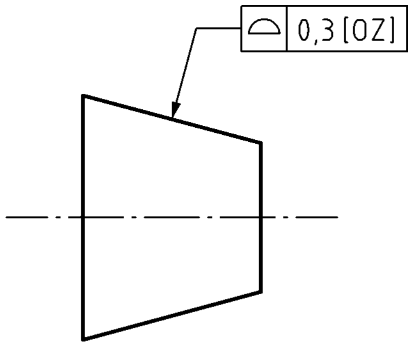
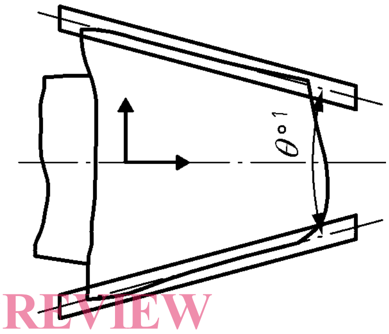
B.1 General

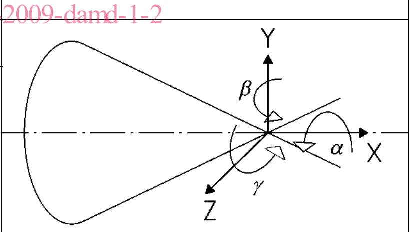
Cones belong to the invariance class of revolute surface. This implies that it is never possible to lock rotation about the cone's axis. The six degrees of freedom of the cone can be represented in a Cartesian or cylindrical coordinate system. The origin of the coordinate system is situated on the axis located at the apex of the cone (where the diameter of the cross section is equal to zero) or any other location along to the axis, where a given cross sectional diameter, D, is located at a distance, L, from another geometrical feature (trigonometrically related by considering the cone angle θ, so that):

$$L = \frac{D}{2}\left(\tan\frac{\theta}{2}\right)$$

B.2 Examples

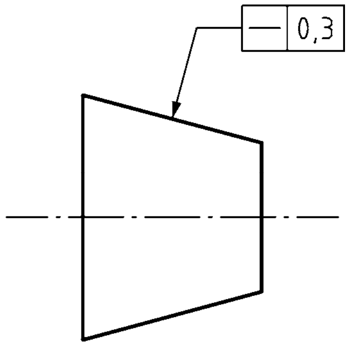
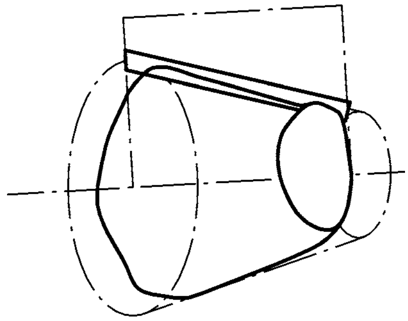
EXAMPLE 1 Cone tolerancing - surface form without considering the cone angle (illustration of the closeness to a perfect conical shape, without taking into account a predefined cone angle)

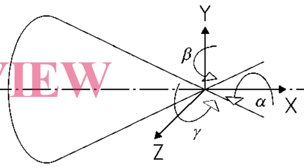
Indication of a form specification of the cone surface with its size considered as variable	Meaning
	The extrated surface of the cone is required to be inside of the tolerance zone without orientation or location constraint coming. The tolerance zone consists to the space included between two coaxial conical surfaces with a same unspecified angle and 0,3 mm apart. 

Controlled deviations by the specification								
Angle deviation	Form deviation	Location deviation			Orientation deviation			Illustration of degrees of freedom
		X	Y	Z	α	β	γ	
No	Yes (conical surface)	No	No	No	Never	No	No	
WARNING The orientation and location of the cone are not locked.								

This kind of specification combines two requirements (any straightness of generatrixes and any roundness of directrixes).

EXAMPLE 2 Cone tolerancing - form of any generatrix lines

Indication of a form specification of any generatrix of the cone (straightness)	Meaning
	

Controlled deviations by the specification								
Angle deviation	Form deviation	Location deviation			Orientation deviation			Illustration of degrees of freedom
		X	Y	Z	α	β	γ	
No	Yes (Line: generatrix)	No	No	No	Never	No	No	
WARNING The orientation and location of the cone and its size are not locked. The form of the cone is partially locked.								

EXAMPLE 3 Cone tolerancing - form of any directrix lines at any cross section perpendicular to the axis of associated feature with the real surface of the cone, using the least squares criteria.

Indication of a form specification of any directrix of the cone (roundness)	Meaning