DRAFT AMENDMENT ISO 3040:2009/DAM 1

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

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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

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.

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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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

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

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

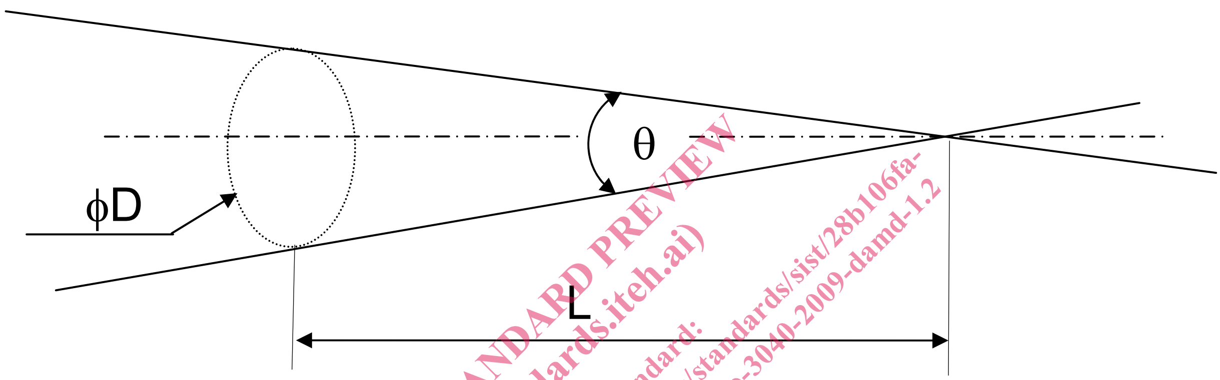
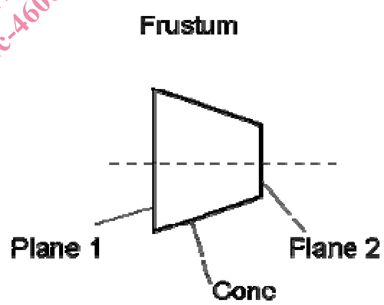


Figure 9 – Intrinsic representation of a cone

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).



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).

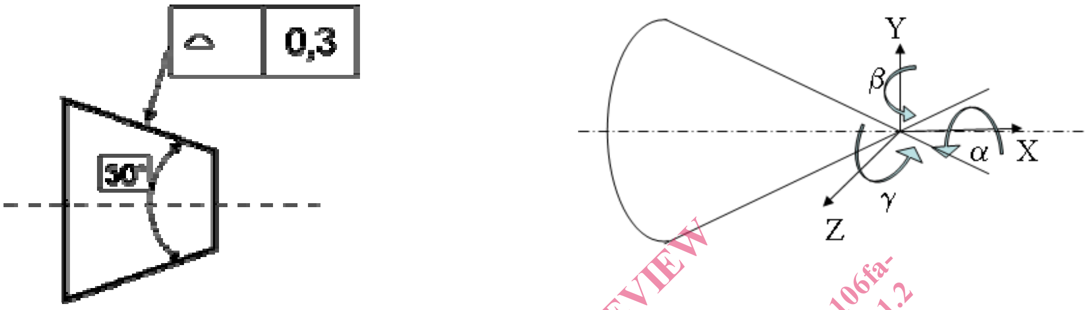
When a section plane is used in a specification, the section plane location shall be defined by TEDs (explicit or implicit: 0 mm).

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

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).



Controlled deviations							
Angle deviation	Form deviation	Location deviation			Orientation deviation		
		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.

a) Specification of the form of the cone

b) Deviations controlled by the specification

Figure 9 – Example of tolerancing of cone from the surface form considering its theoretical angle

The designer is responsible to the set of specifications related on the cone, to manage all degree 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 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

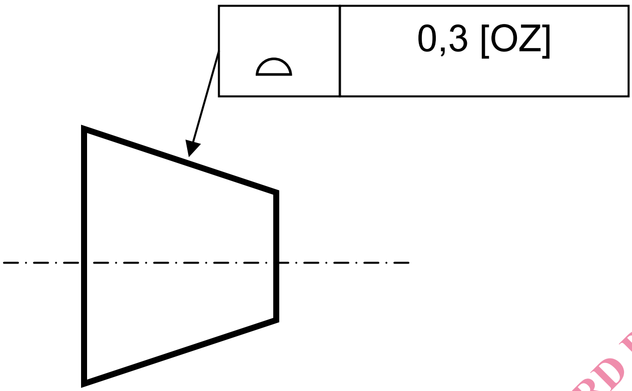
B.1 General

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:

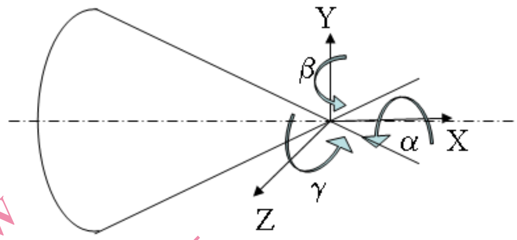
$$L = \frac{D}{2}\left(\tan\frac{\theta}{2}\right)$$

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)



a) Form specification of a cone with its size considered as variable

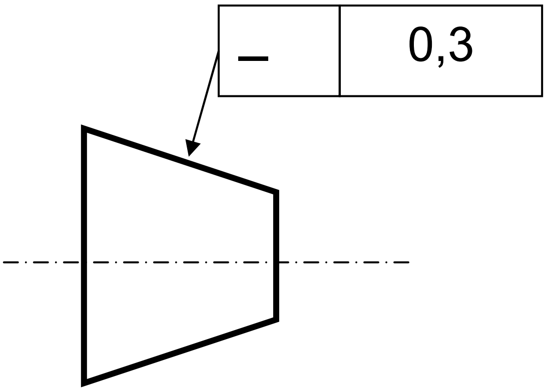


Controlled deviations							
Angle deviation	Form deviation	Location deviation			Orientation deviation		
		X	Y	Z	α	β	γ
No	Yes (surface)	No	No	No	Never	No	No

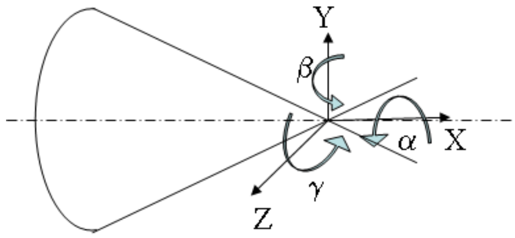
WARNING The orientation and location of the cone and its size are not locked.

b) Deviations controlled by the specification

EXAMPLE 2 Cone tolerancing - form of any generatrix



a) Form specification of any generatrix of the cone (straightness)

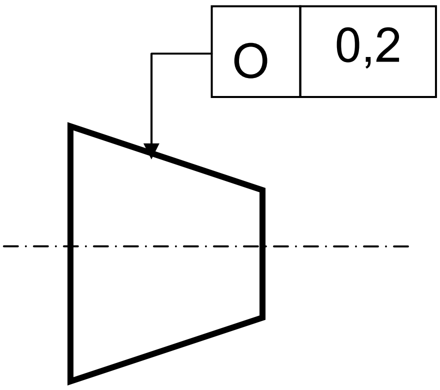


Controlled deviations							
Angle deviation	Form deviation	Location deviation			Orientation deviation		
		X	Y	Z	α	β	γ
No	Yes (Line: generatrix)	No	No	No	Never	No	No

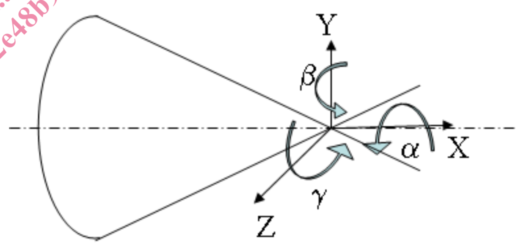
WARNING The orientation and location of the cone and its size are not locked. The form of the cone is partially locked

b) Deviations controlled by the specification

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



a) Form specification of any directrix of the cone (roundness)

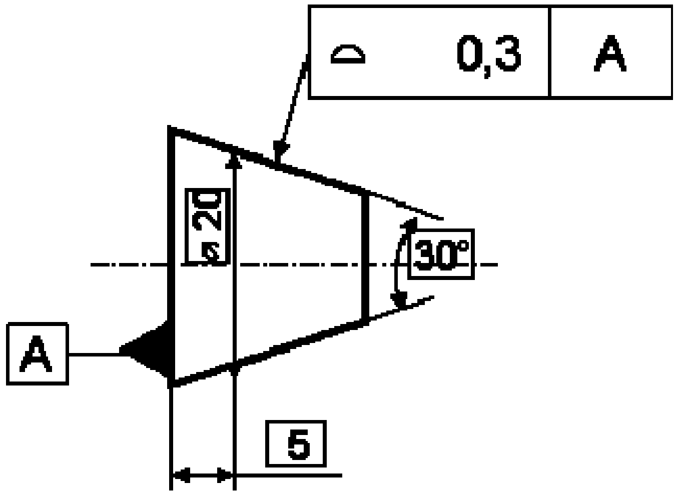


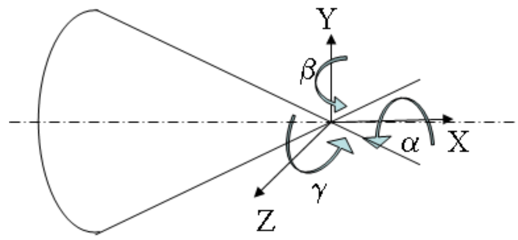
Controlled deviations							
Angle deviation	Form deviation	Location deviation			Orientation deviation		
		X	Y	Z	α	β	γ
No	Yes (Line: generatrix)	No	No	No	Never	No	No

WARNING The orientation and location of the cone and its size are not locked. The form of the cone is partially locked

b) Deviations controlled by the specification

EXAMPLE 4 Cone tolerancing - surface located from an end datum. The controlled degrees of freedom (X, Y, Z, β, γ) are dependent on the datum. Datum A locks the location and orientation. In this case, the orientation constraint and the location constraint are applied to lock the tolerance zone from datum A (no restriction is required).





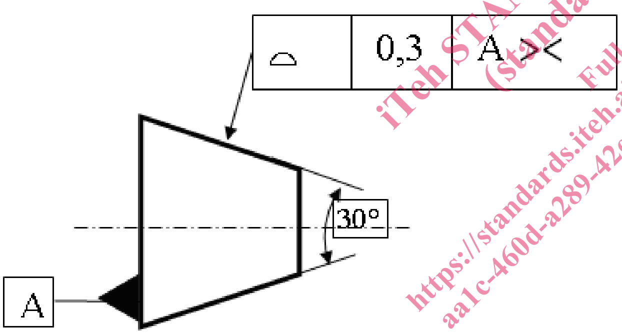
Controlled deviations							
Angle deviation	Form deviation	Location deviation			Orientation deviation		
		X	Y	Z	α	β	γ
Yes	Yes	Yes	No	No	Never	Yes	Yes

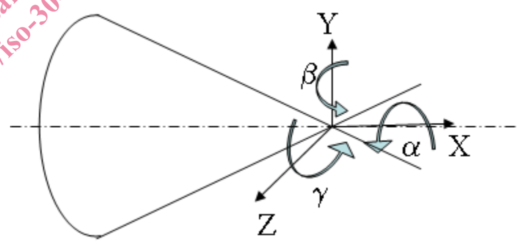
WARNING The size, the form and the orientation of the cone are locked and the location of the cone is partially locked

a) Location specification of a cone (with its size considered as fixed) from the datum A

b) Deviations controlled by the specification

EXAMPLE 5 Cone tolerancing - surface orientation from an end datum. Datum A can lock the location and orientation, the modifier > < retains only the orientation constraint of the tolerance zone from datum A.





Controlled deviations							
Angle deviation	Form deviation	Location deviation			Orientation deviation		
		X	Y	Z	α	β	γ
Yes	Yes	No	No	No	Never	Yes	Yes

WARNING The location of the cone is not locked.

a) Orientation specification of a cone (with its size considered as fixed) from the datum A

b) Deviations controlled by the specification