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Rolling bearings — Radial bearings — Geometrical product specifications (GPS) and tolerance values

Roulements — Roulements radiaux — Spécification géométrique des produits (GPS) et valeurs de tolérance

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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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 4, *Rolling bearings*, Subcommittee SC 4, *Tolerances, tolerance definitions and symbols (including GPS)*.

This fifth edition cancels and replaces the fourth edition (ISO 492:2002), which has been technically revised. 6fa58781ad03/iso-492-2014

This corrected version of ISO 492:2014 incorporates the correction of the title.

Introduction

This International Standard is a machine element geometry standard as defined in the geometrical product specification (GPS) system as presented in master plan of ISO/TR 14638.^[12]

The fundamental rules of ISO/GPS given in ISO 8015^[8] apply to this International Standard and the default decision rules given in ISO 14253-1^[10] apply to the specifications made in accordance with this International Standard, unless otherwise indicated.

The connection between functional requirements, measuring technique and measuring uncertainty is always intended to be considered. The traditionally used measuring technique is described in ISO 1132-2. ^[5] For measurement uncertainty it is intended that ISO 14253-2^[11] should be considered.

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Rolling bearings — Radial bearings — Geometrical product specifications (GPS) and tolerance values

1 Scope

This International Standard specifies dimensional and geometrical characteristics, limit deviations from nominal sizes, and tolerance values to define the interface (except chamfers) of radial rolling bearings. Nominal boundary dimensions are defined in ISO 15, ISO 355^[2] and ISO 8443^[9].

This International Standard does not apply to certain radial bearings of particular types (e.g. needle roller bearings) or for particular fields of application (e.g. airframe bearings and instrument precision bearings). Tolerances for such bearings are given in the relevant International Standards.

Chamfer dimension limits are given in ISO 582.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 15, Rolling bearings — Radial bearings — Boundary dimensions, general plan

ISO 582, Rolling bearings — Chamfer dimensions — Maximum values

ISO 492:2014

ISO 1101, Geometrical product specifications (GRS) ist in Geometrical tolerancing — Tolerances of form, orientation, location and run-out 6fa58781ad03/iso-492-2014

ISO 5593, Rolling bearings — Vocabulary

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

ISO/TS 17863, Geometrical product specification (GPS) — Geometrical tolerancing of moveable assemblies

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1101, ISO 5593, ISO 14405-1, and ISO/TS 17863 apply.

4 Symbols

To express that the ISO/GPS system, ISO $8015^{[8]}$, is applied, the dimensional and geometrical characteristics shall be included in the technical product documentation (for example, on the drawing). The dimensional and geometrical specifications, associated to these characteristics are described in Table 1 and Figures 1 to 17.

Descriptions for symbols are in accordance with GPS terminology; relationships with traditional terms are described in <u>Annex A</u>.

A tolerance value associated to a characteristic is symbolised by *t* followed by the symbol for the characteristic, for example $t_{\text{VBs.}}$

In this International Standard, the ISO default specification operator for size is in accordance with ISO 14405-1, i.e. the two-point size is valid. Some specification modifiers are described in <u>Annex D</u>.

The detailed definitions for terms in ISO 1101 and ISO 14405-1 and traditional terms in ISO 1132-1^[4] are not fully equal. For differences, see <u>Annex C</u>.

Symbol for nominal dimension (size and distance) ^a	Sym- bol for charac- teristic ^a	GPS symbol and specifica- tion modifier ^{bc}	Descriptiond	See Figure
			Nominal inner ring width	1; 2; 12
В	VBs	LPSR	Symmetrical rings : range of two-point sizes of inner ring width	1; 12
			Asymmetrical rings : range of minimum circumscribed sizes of inner ring width, between two opposite lines, obtained from any longitudinal section which includes the inner ring bore axis	2; 7
	ΔBs	LP	Symmetrical rings : deviation of a two-point size of inner ring width from its nominal size	1; 12
		GNALS (= e iTeh STAND (standa	Asymmetrical rings, upper limit: deviation of a minimum circumscribed size of inner ring width, between two opposite lines, in any longitudinal section which includes the inner ring bore axis, from its nominal size Asymmetrical rings, lower limit: deviation of a two-point size of inner ring width from	2; 7
			of a two-point size of inner ring width from its nominal size	

Table 1 —	Symbols for	nominal sizes.	characteristics.	and s	necification	modifiers
I ubic I	591110015101	nominal Sizes,	character istics,	unu 5	pecification	mounters

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Table 1 — (continued)

Symbol for nominal dimension (size and distance) ^a	Sym- bol for charac- teristic ^a	GPS symbol and specifica- tion modifier ^{bc}	Descriptiond	See Figure
			Nominal outer ring width	1; 7; 12
		LPSR	Symmetrical rings : range of two-point sizes of outer ring width	1; 7
	VCs		Asymmetrical rings : range of minimum circumscribed sizes of outer ring width between two opposite lines, obtained from any longitudinal section which includes the outer ring outside surface axis	2; 12
С		LP	Symmetrical rings : deviation of a two-point size of outer ring width from its nominal size	1; 7
	ΔCs	©nals (= Feh STANDAR	Asymmetrical rings, upper limit: deviation of a minimum circumscribed size of outer ring width, between two opposite lines, in any longitudinal section which includes the outer ring outside surface axis, from its nominal size Asymmetrical rings, lower limit: deviation	2; 12
		(standards	of a two-point size of outer ring width from its nominal size	
		<u>ISO 492:20</u>	Nominal outer ring flange width	12
<i>C</i> ₁	VChtsps://	standards.ite(LP)(SR):/standards/ 6fa58781ad03/iso-	Range of two-point sizes of outer ring flange width 492-2014	12
	∆C1s	LP	Deviation of a two-point size of outer ring flange width from its nominal size	12
			Nominal bore diameter of a cylindrical bore or at the theoretical small end of a tapered bore	1 to 7; 12 to 16
	Vdmp	LPSD ACS SR	Range of mid-range sizes (out of two-point sizes) of bore diameter obtained from any cross-section of a cylindrical bore	1; 2; 12
d	Δdmp	(LP)SD ACS	Cylindrical bore : deviation of a mid- range size (out of two-point sizes) of bore diameter in any cross-section from its nomi- nal size	1; 2; 12
		LP(SD)SCS f	Tapered bore: deviation of a mid-range size (out of two-point sizes) of bore diameter at the theoretical small end from its nominal size	7
	Vdsp	LPSRACS	Range of two-point sizes of bore diameter in any cross-section of a cylindrical or tapered bore	1; 2; 7; 12
	Δds	LP	Deviation of a two-point size of bore diam- eter of a cylindrical bore from its nominal size	1; 2; 12

Symbol for nominal dimension (size and distance ^a	Sym- bol for charac- teristi ^a	GPS symbol and specifica- tion modifier ^{bc}	Descriptiond	See Fig- ure
			Nominal diameter at the theoretical large end of a tapered bore	7
d_1	∆d1mp		Deviation of a mid-range size (out of two- point sizes) of bore diameter at the theo- retical large end of a tapered bore from its nominal size	7
			Nominal outside diameter	1 to 16
	VDmp	LPSD ACS SR	Range of mid-range sizes (out of two-point sizes) of outside diameter obtained from any cross-section	1; 2; 7; 12
D	ΔDmp	LPSDACS	Deviation of a mid-range size (out of two- point sizes) of outside diameter in any cross- section from its nominal size	1; 2; 7; 12
	VDsp	LPSRACS	Range of two-point sizes of outside diameter in any cross-section	1; 2; 7; 12
	ΔDs	iTelBTAND	Deviation of a two-point size of outside diameter from its nominal size	1; 2; 7; 12
<i>D</i> ₁		(standa	Nominal outside diameter of outer ring flange	12
	ΔD1s	LS https://standards.iteh.ai/catalog/st	Deviation of a two-point size of outside diameter of outer ring flange from its nomi- nalisizeist/1e9088c0-b632-4428-9a46-	12
	Кеа	6fa58781 1 g	hd03/iso-492-2014 Circular radial run-out of outer ring outside surface of assembled bearing with respect to datum, i.e. axis, established from the inner ring bore surface	4; 5; 6; 9; 10; 11; 14; 15; 16
	Kia	∫ g	Circular radial run-out of inner ring bore surface of assembled bearing with respect to datum, i.e. axis, established from the outer ring outside surface	4; 5; 6; 9; 10; 11; 14; 15; 16
	Sd	/ g	Circular axial run-out of inner ring face with respect to datum, i.e. axis, established from the inner ring bore surface	3; 8; 13
	SD	1	Perpendicularity of outer ring outside sur- face axis with respect to datum established from the outer ring face	3; 8
	SD1		Perpendicularity of outer ring outside sur- face axis with respect to datum established from the outer ring flange back face	13

Table 1 — (continued)

Symbol for nominal dimension (size and distance) ^a	Sym- bol for charac- teristic ^a	GPS symbol and specification modifier ^{bc}	Description ^d	See Fig- ure
	Sea	g g	Circular axial run-out of outer ring face of assembled bearing with respect to datum, i.e. axis, established from the inner ring bore surface	5; 6; 10; 11
	Sea1	₽ g	Circular axial run-out of outer ring flange back face of assembled bearing with respect to datum, i.e. axis, established from the inner ring bore surface	15; 16
	Sia	₽ g	Circular axial run-out of inner ring face of assembled bearing with respect to datum, i.e. axis, established from the outer ring outside surface	5; 6; 10; 11; 15; 16
SL h			Taper slope is the difference between nominal diameters at the theoretical large end and small end of a tapered bore $(d_1 - d)$	7
	ΔSL	Feh STANDARD	Deviation of taper slope of a tapered inner ring bore from its nominal size ⁱ	7
T		(standards it	Nominal assembled bearing width	17
	ΔTs	GN ISO 492:2014	Deviation of minimum circumscribed size of assembled bearing width from its nominal size	17
<i>T</i> ₁	nups://	6fa58781ad03/iso-492	Nominal effective width of inner subunit assembled with a master outer ring	17
	ΔT1s	GN g	Deviation of minimum circumscribed size of effective width (inner subunit assembled with a master outer ring) from its nominal size	17
<i>T</i> ₂			Nominal effective width of outer ring assembled with a master inner subunit	17
	ΔT2s	g	Deviation of minimum circumscribed size of effective width (outer ring assem- bled with a master inner subunit) from its nominal size	17

Table 1 — (continued)

 Table 1 — (continued)

Symbol for nominal dimension (size and distance) ^a	Sym- bol for charac- teristic ^a	GPS symbol and specifica- tion modifier ^{bc}	Descriptiond	See Fig- ure	
T _F			Nominal assembled flanged bearing width	17	
	ΔTFs	GN g	Deviation of minimum circumscribed size of assembled flanged bearing width from its nominal size	17	
T _{F2}			Nominal effective width of flanged outer ring assembled with a master inner subunit	17	
	ΔTF2s	GN	Deviation of minimum circumscribed size of effective width (flanged outer ring assem- bled with a master inner subunit) from its nominal size	17	
α			Frustum angle of tapered inner ring bore ^h	7; 8; 9; 10; 11	
a ^k			Distance from face to define the restricted area for SD or SD1	3; 8; 13	
 a Symbols as defined in ISO 15241[15] except for the format used. b Symbols as defined in ISO 1101 and ISO 14405-1 ANDARD PREVIEW c Specification modifier B shall not be indicated on a drawing, if the two-point size is applied for both specified limits. d Description based on ISO 1101, ISO 5459[2] and ISO 14405-1. e Specification modifier B is not appropriate in cases where no opposite material is existing, e.g. tapered roller bearing outer ring with large back face chamfer and small front face. Solutions need to be developed within the framework of the GPS system and considered in future revisions of this international Standard. f Specification modifier SCS can be omitted on the drawing. g Symbols for direction of gravity , fixed parts FP and movable parts MP, according to ISO/TS 17863; see Figures 4, 5, 6, 9, 10, 11, 14, 15, 16, and 17. h SL is a distance. 					
k For $r_{s,min} \le$ and $r_{s,max,axial}$	k For $r_{s,\min} \le 0.6$: $a = r_{s,\max,axial} + 0.5$; for $r_{s,\min} > 0.6$: $a = 1.2 \times r_{s,\max,axial}$; $r_{s,\max,axial}$ see ISO 582. For definitions of $r_{s,\min}$ and $r_{s,\max,axial}$ see ISO 582.				

The indications in Figures 1 to 17 illustrate the correlation of interface dimensions and corresponding dimensional and geometrical tolerance symbols.

The specifications for single components are illustrated in Figures 1, 2, 3, 7, 8, 12, and 13. The specifications for assembled components are illustrated in Figures 4, 5, 6, 9, 10, 11, 14, 15, 16, and 17.

NOTE Figures 1 to 17 are drawn schematically and do not necessarily show all design details.

Two examples of a real drawing indication are given in <u>Annex B</u>.



Figure 1 — Size specification for single components for bearing with cylindrical bore and symmetrical rings



NOTE t_{VBs} and t_{VCs} are not relevant for tapered roller bearings.

Figure 2 — Size specification for single components for bearing with cylindrical bore and asymmetrical rings



Figure 3 — Geometrical tolerances for single components for bearing with cylindrical bore



 $\langle 3 \rangle$ = the rolling elements shall be in contact with both the inner and outer ring raceways

Figure 4 — Geometrical tolerances for assembled bearing with cylindrical bore — Cylindrical roller bearing, spherical roller bearing, toroidal roller bearing and self-aligning ball bearing



Figure 5 — Geometrical tolerances for assembled bearing with cylindrical bore — Deep-groove ball bearing, double-row deep-groove ball bearing, double-row angular contact ball bearing and four-point-contact ball bearing