
Rolling bearings — Thrust needle roller and cage assemblies, thrust washers — Boundary dimensions, geometrical product specifications (GPS) and tolerance values

Roulements — Cages à aiguilles axiales et rondelles de butée — Dimensions d'encombrement, spécification géométrique des produits (GPS) et valeurs de tolérance

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Contents

	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Symbols	1
5 Thrust needle roller and cage assemblies	3
5.1 General	3
5.2 Dimensions and tolerances	3
5.3 Tolerances for the needle roller	4
6 Thrust washers	4
6.1 General	4
6.2 Dimensions and tolerances	4
Annex A (informative) General characteristics suggested for application of thrust needle roller and cage assemblies and thrust washers	6
Annex B (informative) Functional gauging of thrust needle roller and cage assemblies and thrust washers	7
Bibliography	9

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).

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For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 4, *Rolling bearings*, Subcommittee SC 5, *Needle, cylindrical and spherical roller bearings*.

This fourth edition cancels and replaces the third edition (ISO 3031:2000), which has been technically revised. The main change compared to the previous edition is the implementation of geometrical product specifications (GPS).

Introduction

This document is a machine element geometry standard as defined in the geometrical product specification system (GPS system) presented in the matrix model of ISO 14638^[8].

The fundamental rules of ISO/GPS given in ISO 8015^[5] apply to this document and the default decision rules given in ISO 14253-1^[6] apply to specifications made in accordance with this document, 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^[3]. For measurement uncertainty, it is intended that ISO 14253-2^[7] should be considered.

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Rolling bearings — Thrust needle roller and cage assemblies, thrust washers — Boundary dimensions, geometrical product specifications (GPS) and tolerance values

1 Scope

This document specifies the boundary dimensions and tolerances for thrust needle roller and cage assemblies. Furthermore, it recommends dimensions and tolerances for thrust washers, i.e. raceway members, which can be used either as shaft or housing washers.

[Annex A](#) gives general characteristics for application of thrust needle roller and cage assemblies and thrust washers.

Gauging method for thrust needle roller and cage assemblies and thrust washers is given in [Annex B](#).

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 5593, *Rolling bearings — Vocabulary*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5593 and ISO 14405-1 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/>

4 Symbols

To express that the ISO/GPS system, ISO 8015^[5], 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](#), [Figure 1](#) and [Figure 2](#).

Descriptions for symbols are in accordance with GPS terminology.

A tolerance value associated to a characteristic is symbolised by t followed by the symbol for the characteristic, in subscript, for example $t_{\Delta ds}$.

In this document, the ISO default specification operator for size is in accordance with ISO 14405-1, i.e. the two-point size is valid.

Table 1 — Symbols for nominal sizes, characteristics and specification modifiers

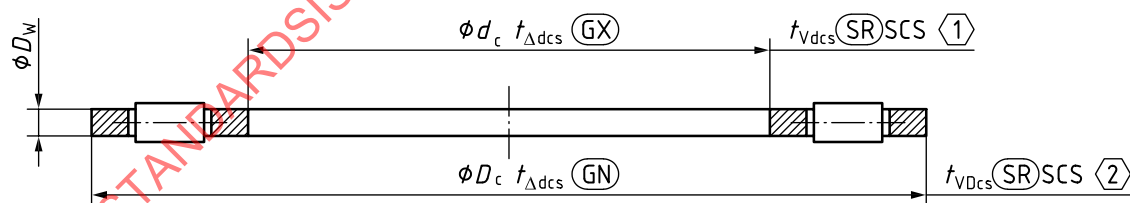
Symbol for nominal size ^a	Symbol for characteristic ^a	GPS symbol and specification modifier ^{bc}	Description ^d
d			nominal bore diameter of thrust washer
	Δds	$\textcircled{\text{GX}}$	deviation of a maximum inscribed size of bore diameter of thrust washer from its nominal size
	Vds	$\textcircled{\text{LP}} \textcircled{\text{SR}} \text{SCS}$	range of two-point sizes of bore diameter of thrust washer in a specific cross section
d_c			nominal bore diameter of cage
	Δdcs	$\textcircled{\text{GX}}$	deviation of a maximum inscribed size of bore diameter of cage from its nominal size
	$Vdcs$	$\textcircled{\text{LP}} \textcircled{\text{SR}} \text{SCS}$	range of two-point sizes of bore diameter of cage in a specific cross section
D			nominal outside diameter of thrust washer
	ΔDs	$\textcircled{\text{GN}}$	deviation of a minimum circumscribed size of outside diameter of thrust washer from its nominal size
	VDs	$\textcircled{\text{LP}} \textcircled{\text{SR}} \text{SCS}$	range of two-point sizes of outside diameter of thrust washer in a specific cross section
D_c			nominal outside diameter of cage
	ΔDcs	$\textcircled{\text{GN}}$	deviation of a minimum circumscribed size of outside diameter of cage from its nominal size
	$VDcs$	$\textcircled{\text{LP}} \textcircled{\text{SR}} \text{SCS}$	range of two-point sizes of outside diameter of cage in a specific cross section
D_w			nominal diameter of needle roller
s			nominal thickness of thrust washer
	Δs	$\textcircled{\text{LP}}$	deviation of a two-point size of thickness of thrust washer from its nominal size

^a Symbol as defined in ISO 15241^[9] except for the format used.

^b Symbol as defined in ISO 14405-1.

^c Specification modifier $\textcircled{\text{LP}}$ shall not be indicated on a drawing, if the two-point size is applied for both specified limits.

^d Definition based on ISO 14405-1.



Key

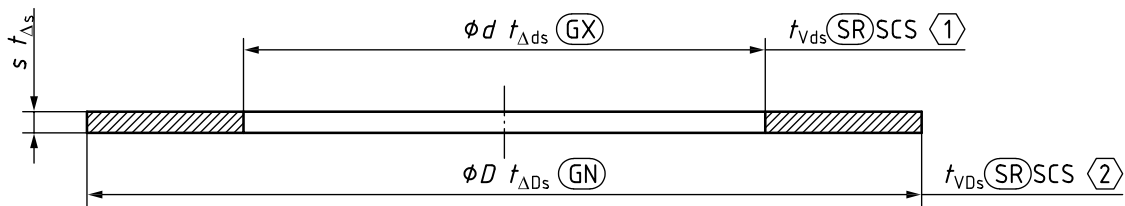
①

= the specific cross-section with the smallest bore diameter of the cage

②

= the specific cross-section with the largest outside diameter of the cage

Figure 1 — Thrust needle roller and cage assembly

**Key**

= the specific cross-section with the smallest bore diameter of the washer



= the specific cross-section with the largest outside diameter of the washer

Figure 2 — Thrust washer**5 Thrust needle roller and cage assemblies****5.1 General**

Dimensions and tolerance values for thrust needle roller and cage assemblies are given in [Table 2](#).

In [Table 2](#), the symbols U and L are used as follows:

U = upper limit deviation;

L = lower limit deviation.

5.2 Dimensions and tolerances

See [Table 2](#).

Table 2 — Dimensions and tolerances of thrust needle roller and cage assemblies

d_c mm	$t_{\Delta dcs}$ μm		t_{Vdcs} μm	D_c mm	$t_{\Delta Dcs}$ μm		t_{VDcs} μm	D_w^a mm
	U	L			U	L		
6	+95	+20	75	19	-110	-320	210	2
7	+115	+25	90	20	-110	-320	210	2
8	+115	+25	90	21	-110	-320	210	2
9	+115	+25	90	22	-110	-320	210	2
10	+115	+25	90	24	-110	-320	210	2
12	+142	+32	110	26	-110	-320	210	2
14	+142	+32	110	27	-110	-320	210	2
15	+142	+32	110	28	-110	-320	210	2
16	+142	+32	110	29	-110	-320	210	2
17	+142	+32	110	30	-110	-320	210	2
18	+142	+32	110	31	-120	-370	250	2
20	+170	+40	130	35	-120	-370	250	2
22	+170	+40	130	37	-120	-370	250	2
25	+170	+40	130	42	-130	-380	250	2

^a For needle roller diameter values and gauges, see ISO 3096[4].

Table 2 (continued)

d_c mm	$t_{\Delta dcs}$ μm		t_{Vdcs} μm	D_c mm	$t_{\Delta Dcs}$ μm		t_{VDcs} μm	D_w^a mm
	U	L			U	L		
28	+170	+40	130	45	-130	-380	250	2
30	+170	+40	130	47	-130	-380	250	2
32	+210	+50	160	49	-130	-380	250	2
35	+210	+50	160	52	-140	-440	300	2
40	+210	+50	160	60	-140	-440	300	3
45	+210	+50	160	65	-140	-440	300	3
50	+210	+50	160	70	-150	-450	300	3
55	+250	+60	190	78	-150	-450	300	3
60	+250	+60	190	85	-170	-520	350	3
65	+250	+60	190	90	-170	-520	350	3
70	+250	+60	190	95	-170	-520	350	4
75	+250	+60	190	100	-170	-520	350	4
80	+250	+60	190	105	-180	-530	350	4
85	+292	+72	220	110	-180	-530	350	4
90	+292	+72	220	120	-180	-530	350	4
100	+292	+72	220	135	-200	-600	400	4
110	+292	+72	220	145	-210	-610	400	4
120	+292	+72	220	155	-210	-610	400	4
130	+335	+85	250	170	-230	-630	400	5
140	+335	+85	250	180	-230	-630	400	5
150	+335	+85	250	190	-240	-700	460	5
160	+335	+85	250	200	-240	-700	460	5

^a For needle roller diameter values and gauges, see ISO 3096^[4].

5.3 Tolerances for the needle roller

Tolerances and "gauges" of needle rollers shall be in accordance with ISO 3096^[4].

6 Thrust washers

6.1 General

Dimensions and tolerance values for thrust washers are given in Table 3.

In Table 3, the symbols U and L are used as follows:

U = upper limit deviation;

L = lower limit deviation.

6.2 Dimensions and tolerances

See Table 3.

Table 3 — Dimensions and tolerances of thrust washers

d mm	$t_{\Delta ds}$ μm		t_{Vds} μm	D mm	$t_{\Delta Ds}$ μm		t_{VDs} μm	s mm		$t_{\Delta s}$ μm
	U	L			U	L		Series a	Series b	
6	+140	+20	120	19	-40	-370	330	0,8	1	±50 Tolerances for series a and b according to tolerance class js12 in ISO 286-2 ^[2]
7	+175	+25	150	20	-40	-370	330	0,8	1	
8	+175	+25	150	21	-40	-370	330	0,8	1	
9	+175	+25	150	22	-40	-370	330	0,8	1	
10	+175	+25	150	24	-40	-370	330	0,8	1	
12	+212	+32	180	26	-40	-370	330	0,8	1	
14	+212	+32	180	27	-40	-370	330	0,8	1	
15	+212	+32	180	28	-40	-370	330	0,8	1	
16	+212	+32	180	29	-40	-370	330	0,8	1	
17	+212	+32	180	30	-40	-370	330	0,8	1	
18	+212	+32	180	31	-50	-440	390	0,8	1	
20	+250	+40	210	35	-50	-440	390	0,8	1	
22	+250	+40	210	37	-50	-440	390	0,8	1	
25	+250	+40	210	42	-50	-440	390	0,8	1	
28	+250	+40	210	45	-50	-440	390	0,8	1	
30	+250	+40	210	47	-50	-440	390	0,8	1	
32	+300	+50	250	49	-50	-440	390	0,8	1	
35	+300	+50	250	52	-60	-520	460	0,8	1	
40	+300	+50	250	60	-60	-520	460	0,8	1	
45	+300	+50	250	65	-60	-520	460	0,8	1	
50	+300	+50	250	70	-60	-520	460	0,8	1	
55	+360	+60	300	78	-60	-520	460	0,8	1	
60	+360	+60	300	85	-72	-612	540	0,8	1	
65	+360	+60	300	90	-72	-612	540	0,8	1	
70	+360	+60	300	95	-72	-612	540	0,8	1	
75	+360	+60	300	100	-72	-612	540	0,8	1	
80	+360	+60	300	105	-72	-612	540	0,8	1	
85	+422	+72	350	110	-72	-612	540	0,8	1	
90	+422	+72	350	120	-72	-612	540	0,8	1	
100	+422	+72	350	135	-85	-715	630	—	1	
110	+422	+72	350	145	-85	-715	630	—	1	
120	+422	+72	350	155	-85	-715	630	—	1	
130	+485	+85	400	170	-85	-715	630	—	1	
140	+485	+85	400	180	-85	-715	630	—	1	
150	+485	+85	400	190	-100	-820	720	—	1	
160	+485	+85	400	200	-100	-820	720	—	1	

Annex A **(informative)**

General characteristics suggested for application of thrust needle roller and cage assemblies and thrust washers

A.1 General

This annex describes general characteristics suggested for application of thrust needle roller and cage assemblies and thrust washers.

Consult the bearing manufacturer for specific recommendations.

A.2 Characteristics for guidance surface

The shaft and housing diameters and the tolerances required for proper operation are important.

To reduce wear, the guidance surface for thrust needle roller cage assemblies and thrust washers should be hardened.

A.3 Characteristics for washer support surfaces

The geometry of the surfaces which support the washers affects bearing operation. Consult the bearing manufacturer for specific recommendations for flatness, perpendicularity to bearing axis from the surface plane, taking into account functional constraint conditions (e.g. deflection under load, strength of support, etc.).