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Rolling bearings — Needle rollers — Boundary dimensions, geometrical product specifications (GPS) and tolerance values

Roulements — Aiguilles — Dimensions d'encombrement, spécification géométrique des produits (GPS) et valeurs de tolétance

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Foreword

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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 third edition cancels and replaces the second edition (ISO 3096:1996), which has been technically revised. It also incorporates the Technical Corrigendum ISO 3096:1996/Cor. 1:1999. The main changes compared to the previous edition are as follows:

— Terms, definitions, symbols and dimensional tolerance indications in figures and tables have been revised according to rules of geometrical product specification (GPS) system.

— In Table 3, all dimensions have been added with D_w = 4,5 mm and 5,5 mm and with L_w = 31,8 mm and 37,8 mm.

— Annex A has been added.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

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

The fundamental rules of ISO GPS given in ISO 8015 apply to this document and the default decision rules given in ISO 14253-1 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. For measurement uncertainty, it is intended that ISO 14253-2 be considered.

Rolling bearings — Needle rollers — Boundary dimensions, geometrical product specifications (GPS) and tolerance values

1 Scope

This document specifies dimensional and geometrical characteristics, nominal boundary dimensions and tolerance values for finished steel needle rollers used as rolling elements.

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 1101, *Geometrical product specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out*

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 1101, ISO 5593, ISO 14405-1 and the following 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/

3.1
needle roller diameter gauge
diameter deviation range limited by the upper and lower limits of ΔDwmp

Note 1 to entry: A gauge is designated by the upper and lower limit deviation expressed in micrometres, for example –2 –4.

Note 2 to entry: For ΔDwmp, see Table 1.

3.2
needle roller diameter gauge lot
quantity of needle rollers, of the same needle roller grade and nominal dimensions, all having a mid-range size of needle roller diameter Dwmp within the same needle roller diameter gauge

Note 1 to entry: Needle rollers of any needle roller grade and nominal dimensions are supplied in diameter gauge lots as given in Table 3.

Note 2 to entry: For Dwmp, see Table 1.

3.3
needle roller grade
G
specific combination of dimensional, form, surface roughness and sorting tolerances for needle rollers

Note 1 to entry: A needle roller grade is designated by letter G and a number, e.g. G2.

4 Symbols

To express that the ISO/GPS system as specified in ISO 8015 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. Relationships with traditional terms are described in Table A.1.

A tolerance value associated to a characteristic is symbolized by t followed by the symbol for the characteristic, for example $t_{\Delta Dwmp}$.

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 dimensions, characteristics and specification modifiers

Symbol for nominal dimension (size and distance)[a]	Symbol for characteristic[a]	GPS symbol and specification modifier[b,c]	Description[d]	Reference
D_w	—	—	Nominal needle roller diameter	Figures 1 and 2
	Dwmp	—	Mid-range size (out of two-point sizes) of needle roller diameter in a cross section in the middle of the needle roller length[e]	—
	ΔDwmp	LP SD SCS	Deviation of a mid-range size (out of two-point sizes) of needle roller diameter in a cross section in the middle of the needle roller length from its nominal size	Figures 1 and 2
	VDwL	—	Variation of needle roller diameter in a same gauge lot: Difference between the largest and the smallest mid-range size (out of two-point sizes) of needle roller diameter (Dwmp) in a gauge lot, obtained from a cross section in the middle of the needle roller length	—
L_w	—	—	Nominal needle roller length	Figures 1 and 2
	ΔLw	GN ⟵ // A	Deviation of minimum circumscribed size of needle roller length from its nominal size, parallel to datum, i.e. axis, established from the needle roller outside surface	Figures 1 and 2
L_1	—	—	Length of measuring zone A <–> B for roundness measurement	Figures 1 and 2

[a] Symbols as defined in ISO 15241 except for the format used.

[b] Symbols as defined in ISO 1101 and ISO 14405-1.

[c] Specification modifier (LP) 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 and ISO 14405-1.

[e] Only to calculate VDwL.

Table 1 *(continued)*

Symbol for nominal dimension (size and distance)[a]	Symbol for characteristic[a]	GPS symbol and specification modifier[b,c]	Description[d]	Reference
	r_{1s}	—	Single radial chamfer dimension of a needle roller	Figure 1
	r_{2s}	—	Single axial chamfer dimension of a needle roller	Figure 1
	Rw	◯	Roundness (according to ISO 1101) of the cylindrical surface of needle roller in any cross-section within measuring zone L_1	Figures 1 and 2

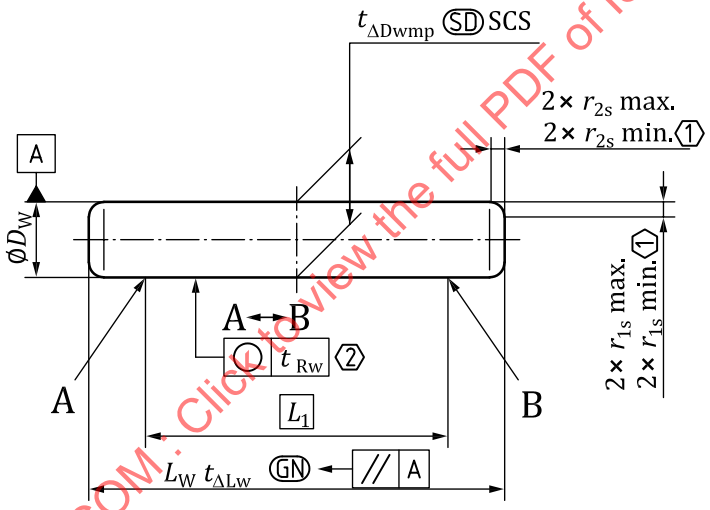
a Symbols as defined in ISO 15241 except for the format used.

b Symbols as defined in ISO 1101 and ISO 14405-1.

c Specification modifier (LP) 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 and ISO 14405-1.

e Only to calculate VDwL.

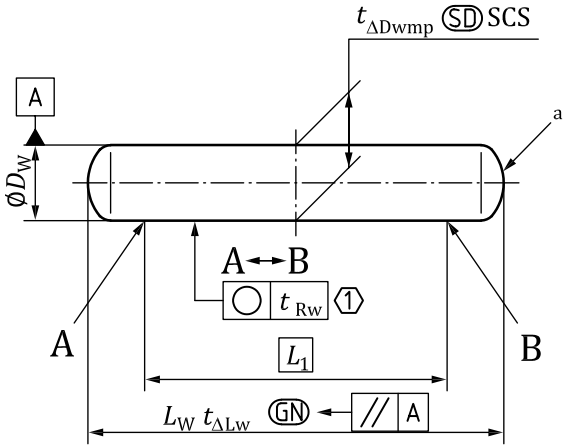


Key

① No material is allowed to project beyond an imaginary circular arc, which has a radius r_{1s} min. or r_{2s} min. in an axial plane and is tangential to the needle roller diameter outside surface and the needle roller side face.

② Length of measuring zone L_1 (A <-> B) has to be agreed between manufacturer and customer.

Figure 1 — Needle roller with flat ends



Key

1 Length of measuring zone L_1 (A<->B) has to be agreed between manufacturer and customer.

a Needle roller end profile which may not necessarily be a true radius but shall fall within the limits of $D_w/2$ and $L_w/2$.

Figure 2 — Needle roller with rounded ends

5 Dimensions

The preferred nominal dimensions of needle roller diameter, D_w, and needle roller length, L_w, are given in Table 2.

Table 2 — Dimensions

Dimensions in millimetres

D_w	L_w																			
	5,8	6,8	7,8	9,8	11,8	13,8	15,8	17,8	19,8	21,8	23,8	25,8	27,8	29,8	31,8	34,8	37,8	39,8	49,8	59,8
1	X	X	X	X																
1,5	X	X	X	X	X	X														
2		X	X	X	X	X	X	X	X											
2,5			X	X	X	X	X	X	X	X	X									
3				X	X	X	X	X	X	X	X	X	X	X						
3,5					X	X	X	X	X	X	X	X	X	X	X	X				
4						X	X	X	X	X	X	X	X	X	X	X	X	X		
4,5							X	X	X	X	X	X	X	X	X	X	X	X		
5							X	X	X	X	X	X	X	X	X	X	X	X	X	
5,5								X	X	X	X	X	X	X	X	X	X	X		
6								X	X	X	X	X	X	X	X	X	X	X	X	X

6 Tolerances

6.1 General

The tolerances for needle rollers are given in Tables 3 to 5. In the Tables 3 and 4, the symbols U and L are used as follows:

U = upper limit deviation

L = lower limit deviation

6.2 Diameter tolerances and diameter surface roughness

Table 3 gives, for each grade specified, dimensional tolerances related to the needle roller diameter, and surface roughness of the needle roller outside diameter surface.

In addition, no single diameter within the entire length of a needle roller shall exceed the actual maximum diameter at the middle of its length by more than

a) 0,5 µm for needle roller grade G2,

b) 0,8 µm for needle roller grade G3, and

c) 1 µm for needle roller grade G5.

Table 3 — Diameter tolerances and diameter surface roughness

Tolerance values in micrometres

Needle roller grade	Applicable for single needle roller					Applicable for needle roller lot
	Diameter surface roughness Ra	t_{Rw}[a]	$t_{\Delta Dwmp}$[b]		Designation of diameter gauges[b,c]	t_{VDwL}[b]
			U	L		
G2	0,2	1	0	−2	0 −2	2
			−1	−3	−1 −3	
			−2	−4	−2 −4	
			−3	−5	−3 −5	
			−4	−6	−4 −6	
			−5	−7	−5 −7	
			−6	−8	−6 −8	
			−7	−9	−7 −9	
			−8	−10	−8 −10	
G3	0,25	1,5	0	−3	0 −3	3
			−1,5	−4,5	−1,5 −4,5	
			−3	−6	−3 −6	
			−4,5	−7,5	−4,5 −7,5	
			−6	−9	−6 −9	
			−7	−10	−7 −10	
G5	0,25	2,5	0	−5	0 −5	5
			−3	−8	−3 −8	
			−5	−10	−5 −10	

a t_{Rw} shall be measured within the length of measuring zone L_1 according to Figure 1 and Figure 2.

b Tolerance values apply only at the middle of the needle roller length.

c If nothing to the contrary is agreed between the customer and the supplier, needle rollers of any nominal dimensions and any of the quoted grades are supplied sub-divided into the gauges listed in this table at the discretion of the supplier.

6.3 Tolerances on needle roller length

The tolerances on needle roller length for needle rollers of all grades are given in Table 4. It is equal to tolerance class h13 according to ISO 286-2.

Table 4 — Tolerances on needle roller length of all grades

Tolerance values in millimetres

L_w		$t_{\Delta Lw}$ (h13)	
>	≤	U	L
3	6	0	−0,18
6	10	0	−0,22
10	18	0	−0,27
18	30	0	−0,33
30	50	0	−0,39
50	80	0	−0,46

6.4 Chamfer dimension limits

Chamfer dimension limits for flat end needle rollers of all grades are specified in Table 5.

Table 5 — Chamfer dimension limits for needle roller with flat ends

Dimensions in millimetres

D_w		r_{1s}, r_{2s} min.	r_{1s} max.	r_{2s} max.
>	≤			
—	1	0,1	0,3	0,5
1	1,5	0,1	0,4	0,6
1,5	3	0,1	0,6	0,8
3	6	0,1	0,9	1