INTERNATIONAL STANDARD

ISO 3547-1

Third edition
2018-07

Plain bearings — Wrapped bushes —

Part 1: Dimensions

Paliers lisses — Bagues roulées —

Partie 1: Dimensions

Reference number
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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 123, *Plain bearings*, Subcommittee SC 3, *Dimensions, tolerances and construction details*.

This third edition cancels and replaces the second edition (ISO 3547-1:2006), which has been technically revised. The main changes compared to the previous edition are as follows:

— Normative references have been updated.

— Formulae for the minimum and maximum inside diameters of the bush have been added.

— A formula for the expansion of the housing bore due to the pressing in of the bush has been added.

A list of all parts in the ISO 3547 series can be found on the ISO website.

Plain bearings — Wrapped bushes —

Part 1: Dimensions

1 Scope

This document specifies the dimensions and designations of cylindrical and flanged wrapped bushes made of mono and multi-layer bearing material for plain bearing applications.

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 4378-1, *Plain bearings — Terms, definitions, classification and symbols — Part 1: Design, bearing materials and their properties*

ISO 4378-4, *Plain bearings — Terms, definitions, classification and symbols — Part 4: Basic symbols*

ISO 12301, *Plain bearings — Quality control techniques and inspection of geometrical and material quality characteristics*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4378-1 and ISO 4378-4 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 and units

See Table 1.

Table 1 — Symbols and units

Symbol	Description	Unit
B	Width of the bush	mm
C_i	Inside chamfer	mm
C_o	Outside chamfer	mm
D_i	Inside diameter of the bush	mm
$D_{i,min}$	Minimum inside diameter of the bush	mm
$D_{i,max}$	Maximum inside diameter of the bush	mm
$D_{i,\,ch}$	Inside diameter of the bush in the ring gauge	mm
D_{fl}	Flange diameter	mm
a For bushes which are made of a single material, $s_1 = s_3$ or $s_2 = s_3$.		

Table 1 *(continued)*

Symbol	Description	Unit
D_H	Housing bore diameter	mm
$D_{H,min}$	Minimum housing bore diameter	mm
$D_{H,max}$	Maximum housing bore diameter	mm
D_o	Outside diameter of the bush	mm
$D_{o,m}$	Mean diameter of the bush	mm
$D_{H,m}$	Mean housing bore diameter	mm
D_S	Shaft diameter	mm
$d_{ch,1}$	Diameter of the checking block or ring gauge	mm
E	Expansion of the housing bore	mm
Ra	Surface roughness	µm
r	Flange radius	mm
s_1	Thickness of the bearing backing[a]	mm
s_2	Thickness of the bearing material layer[a]	mm
s_3	Wall thickness[a]	mm
$s_{3,min}$	Minimum wall thickness	mm
$s_{3,max}$	Maximum wall thickness	mm
s_{fl}	Flange thickness	mm

[a] For bushes which are made of a single material, $s_1 = s_3$ or $s_2 = s_3$.

5 Dimensions

See Figure 1 and Tables 2 to 4.

$$D_{i,max} = D_{H,max} - 2 \cdot s_{3,min} \quad (1)$$

$$D_{i,min} = D_{H,min} - 2 \cdot s_{3,max} \quad (2)$$

This assumes that there is no expansion of the bore in the housing caused by pressing in the bush. In reality, the expansion depends on several factors, such as the stiffness of the housing and the bush. An example of the calculation is given in Clause 7.

The wall thickness tolerance depends on whether or not there is a machining allowance in the bush bore and on the material type, as specified in ISO 3547-4. The preferred tolerance series (A to E) is specified in Table 5.

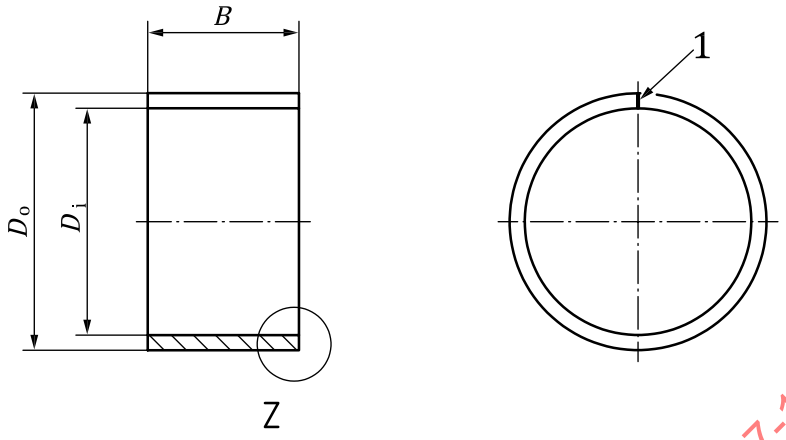
Instead of the wall thickness, the inside diameter, $D_{i,ch}$, of the bush may be specified. $D_{i,ch}$ is the inside diameter of the bush, when this is pressed into a ring gauge (Test C — gauging — in accordance with ISO 3547-2; see also ISO 3547-6).

For bushes which are supplied with a machined bore (Series W), the tolerances of the inside diameter of the bush, $D_{i,ch}$, checked in a ring gauge, are given in Table 6.

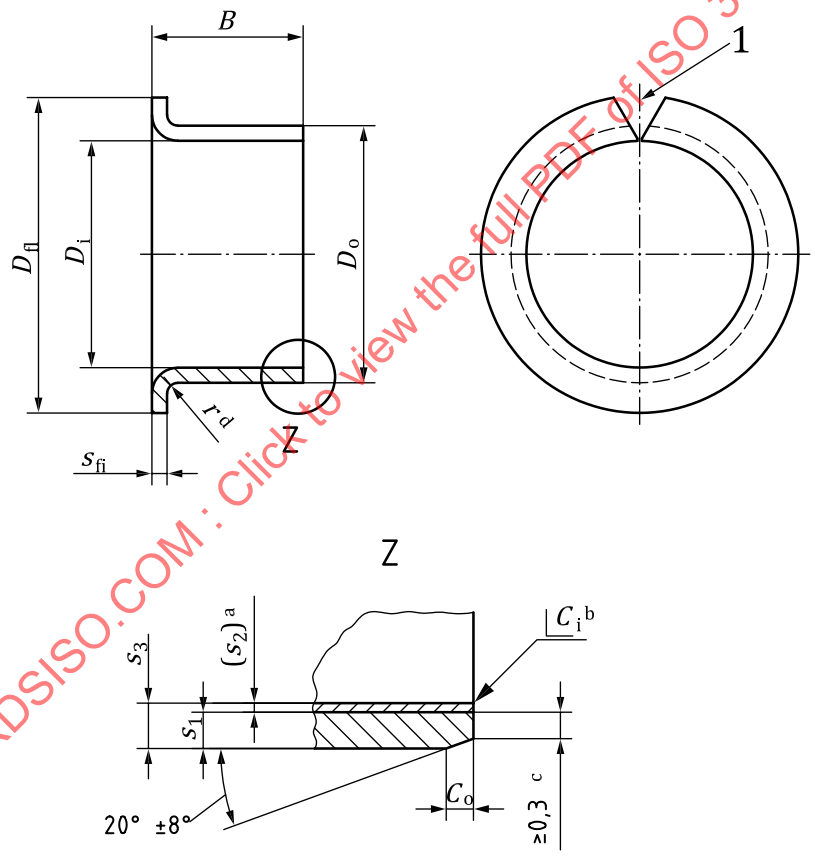
In no case shall wall thickness and inside diameter be given at the same time as the dimensions that are to be checked.

The tolerance for the inside diameter, $D_{i,ch}$, of the bush in the ring gauge is given in Table 6. The tolerance of the inside diameter of a bush pressed into a housing is found from the sum of the tolerance for, $D_{i,ch}$, and the tolerance of the housing bore. As in the case of the calculation of the inside diameter from the wall thickness, it is assumed that there is no expansion of the housing bore.

Dimensions for the outside diameter, D_o, of the bush are given in Table 7.



a) Type C cylindrical bush



b) Type F flanged bush

Key

1 butt joint

a Thickness of the bearing material layer: only valid as a basis for calculation in accordance with ISO 3547-2.

b C_i may be a chamfer or break edge, in accordance with ISO 13715.

c 0,2 mm min. for nominal wall thickness 0,5 mm.

d $r_{max} = s_3$.

Figure 1 — Cylindrical and flanged bush

Table 2 — Preferred nominal dimensions for inside diameter, D_i, outside diameter, D_o, wall thickness, s_3, and bush width, B

Dimensions and tolerances in millimetres

s_3 = 0,5												
D_i	D_o	s_3	B[a]									
			3	4	5	6	8	10	12			
2	3	0,5	a		a							
3	4	0,5	a		a	a						
4	5	0,5	a	a		a						
5	6	0,5			a		a	a				
6	7	0,5		a		a	a	a				
8	9	0,5				a	a	a	a			
10	11	0,5					a	a	a			
s_3 = 0,75												
D_i	D_o	s_3	B[a]									
			3	4	5	6	7	8	10			
2	3,5	0,75	a		a							
3	4,5	0,75	a		a	a						
4	5,5	0,75	a	a		a			a			
s_3 = 1,0												
D_i	D_o	s_3	B[a]									
			3	4	5	6	7	8	10	12	15	20	25
3	5	1,0	a	a	a	a							
4	6	1,0	a	a		a							
6	8	1,0			a	a	a	a	a				
7	9	1,0			a		a		a	a			
8	10	1,0			a	a	a	a	a	a			
9	11	1,0							a				
10	12	1,0				a	a	a	a	a	b	b	
12	14	1,0				a	a	a	a	a	b	b	b
13	15	1,0							a		b	b	
14	16	1,0							a	a	b	b	b
15	17	1,0							a	a	b	b	b
16	18	1,0							a	a	b	b	b
17	19	1,0									b	b	
18	20	1,0							a		b	b	b

Table 2 *(continued)*

s_3 = 1,5										
D_i	D_o	s_3	B^a							
			8	10	12	15	20	25	30	40
8	11	1,5		b	b					
10	13	1,5		a	a	a	a			
12	15	1,5		b	b	b				
13	16	1,5		b	b	b	b			
14	17	1,5		b	b	b	b			
15	18	1,5		a	a	a	a	a		
16	19	1,5		a	a	a	b	a		
18	21	1,5				a	b	b		
20	23	1,5			a	a	b	b	b	
22	25	1,5				a	b	b	b	
24	27	1,5				a	b	b	b	
25	28	1,5				a	b	b	b	
28	31	1,5					b	b	b	
s_3 = 2										
D_i	D_o	s_3	B^a							
			15	20	25	30	40	50	60	70	80
28	32	2,0	a	a	a	b		b			
30	34	2,0	a	a	a	b	b				
32	36	2,0		a		b	b				
35	39	2,0		a		b	b	b			
37	40	2,0		a		b	b				
38	42	2,0		a		b	b				
40	44	2,0		a		b	b	b			
s_3 = 2,5											
D_i	D_o	s_3	B^a								
			20	25	30	40	50	60	70	80	100	115
45	50	2,5	a		a	b	b					
50	55	2,5	a	a	a	b	b	b				
55	60	2,5	a		a	b		b				
60	65	2,5	a		a	b	b		c			
65	70	2,5			a		b		c			
70	75	2,5			a		b		c			
75	80	2,5				b		b		c		
80	85	2,5				b		b		c	c	
85	90	2,5				b		b		c	c	
90	95	2,5				b		b			c	
95	100	2,5						b			c	
100	105	2,5					b	b			c	c
105	110	2,5						b			c	c
110	115	2,5						b			c	c
115	120	2,5					b	b	b		c	
120	125	2,5					b	b			c	

Table 2 *(continued)*

125	130	2,5						b			c	
130	135	2,5						b			c	
135	140	2,5						b		b	c	
140	145	2,5						b			c	
150	155	2,5						b		b	c	
160	165	2,5						b		b	c	
170	175	2,5									c	
180	185	2,5									c	
200	205	2,5									c	
220	225	2,5									c	
250	255	2,5									c	
300	305	2,5									c	

[a] Tolerances for *B*:

a ±0,25

b ±0,5

c ±0,75

Bush widths *B* outside the tolerance ranges a, b or c should be agreed between the manufacturer and user and stated after the nominal sizes in the standard designation.

If it is necessary to use non-standard widths *B*, then these should be rounded to full mm to have an end figure of 2, 5 and 8 up to D_i = 50 mm, and an end figure of 5 over D_i = 50 mm. Check bush width *B* in accordance with ISO 12301.

Table 3 — Preferred nominal dimensions and tolerances for wrapped flanged bushes

Dimensions and tolerances in millimetres

D_i	D_o	s_3	D_{fl}		S_{fl}	B[a]														
			Nominal	Limit deviation		4	5,5	7	7,5	8	9	9,5	11,5	12	16	16,5	17	21,5	22	26
6	8	1	12	+0,5 −0,8	1,05 0,80	a				a										
8	10	1	15				a		a			a								
10	12	1	18					a			a			a			b			
12	14	1	20					a			a			a			b			
14	16	1	22											a			b			
15	17	1	23								a			a			b			
16	18	1	24											a			b			
18	20	1	26											a			b		b	
20	23	1,5	30	+1 −0,8	1,6 1,3								a			a		b		
25	28	1,5	35										a			a		b		
30	34	2	42		2,1 1,8										a					b
35	39	2	47	+2 −0,8											a					b
40	44	2	52												a					b
45	50	2,5	58		2,6 2,3										a					b

[a] Tolerances for *B*:

a ±0,25

b ±0,5

Table 4 — Outside, C_o, and inside, C_i, chamfers

Dimensions and tolerances in millimetres

Wall thickness s_3 Nominal dimension	Chamfer[a]		
	C_o[b]		C_i[c]
	Machined	Rolled	
0,5	0,2 ± 0,1		$^{-0,05}_{-0,30}$
0,75	0,5 ± 0,3	0,5 ± 0,3	$^{-0,1}_{-0,4}$
1	0,6 ± 0,4	0,6 ± 0,4	$^{-0,1}_{-0,6}$
1,5	0,6 ± 0,4	0,6 ± 0,4	$^{-0,1}_{-0,7}$
2	1,2 ± 0,4	1,0 ± 0,4	$^{-0,1}_{-0,7}$
2,5	1,8 ± 0,6	1,2 ± 0,4	$^{-0,2}_{-1,0}$

a For bushes which have to be machined to size in the bush bore, C_i should be made correspondingly bigger.

b C_o may be machined or rolled at the option of the manufacturer.

c C_i may be a chamfer or break edge in accordance with ISO 13715.

Table 5 — Nominal dimensions and tolerances for wall thickness, s_3

Dimensions and tolerances in millimetres

Nominal dimension		Tolerances for s_3[a]				
		No machining allowance in bush bore			Machining allowance in bush bore	
		Series A	Series B	Series D	Series C	Series E
0,5		$^{0}_{-0,015}$	$^{0}_{-0,030}$	—	—	—
0,75		$^{0}_{-0,015}$	$^{0}_{-0,020}$	—	$^{+0,25}_{+0,15}$	—
1		$^{0}_{-0,015}$	$^{+0,005}_{-0,020}$	$^{-0,020}_{-0,045}$	$^{+0,25}_{+0,15}$	$^{+0,11}_{+0,07}$
1,5		$^{0}_{-0,015}$	$^{+0,005}_{-0,025}$	$^{-0,025}_{-0,055}$	$^{+0,25}_{+0,15}$	$^{+0,11}_{+0,07}$
2		$^{0}_{-0,015}$	$^{+0,005}_{-0,030}$	$^{-0,030}_{-0,065}$	$^{+0,25}_{+0,15}$	$^{+0,11}_{+0,07}$
2,5	$D_o \leq 80$	$^{0}_{-0,020}$	$^{+0,005}_{-0,040}$	$^{-0,040}_{-0,085}$	$^{+0,30}_{+0,15}$	$^{+0,14}_{+0,07}$
	$80 < D_o \leq 120$	$^{0}_{-0,025}$	$^{-0,010}_{-0,060}$			
	$D_o > 120$	$^{0}_{-0,030}$	$^{-0,035}_{-0,085}$			

a Depending on the manufacturing process used, the back of bushes can show isolated slight depressions. The thickness of the walls shall, therefore, be measured at places away from these depressions.

Table 6 — Series W — Tolerances for inside diameter, $D_{i,\,ch}$, of bush in ring gauge in accordance with ISO 3547-2

Dimensions and tolerances in millimetres

D_i nominal		Tolerances for $D_{i,\,ch}$
	≤10	$^{+0,036}_{0}$
>10	≤18	$^{+0,043}_{0}$
>18	≤30	$^{+0,052}_{0}$
>30	≤50	$^{+0,062}_{0}$
>50	≤80	$^{+0,074}_{0}$
>80	≤120	$^{+0,087}_{0}$
>120	≤175	$^{+0,100}_{0}$
The concentricity of the inside and outside diameters of the bush should be 0,05 mm, unless otherwise agreed.		

Table 7 — Dimensions and tolerances for outside diameter, D_o

Dimensions and tolerances in millimetres

D_o nominal		Tolerances for bushes made of	
		Steel, steel/backed material	Aluminium alloys, copper alloys, aluminium alloy backed material, copper alloy backed material
	≤10	$^{+0,055}_{+0,025}$	$^{+0,075}_{+0,045}$
>10	≤18	$^{+0,065}_{+0,030}$	$^{+0,080}_{+0,050}$
>18	≤30	$^{+0,075}_{+0,035}$	$^{+0,095}_{+0,055}$
>30	≤50	$^{+0,085}_{+0,045}$	$^{+0,110}_{+0,065}$
>50	≤80	$^{+0,100}_{+0,055}$	$^{+0,125}_{+0,075}$
>80	≤120	$^{+0,120}_{+0,070}$	$^{+0,140}_{+0,090}$
>120	≤180	$^{+0,170}_{+0,100}$	$^{+0,190}_{+0,120}$
>180	≤305	$^{+0,255}_{+0,125}$	$^{+0,245}_{+0,145}$