
Plain bearings — Tolerances —

Part 1: Fits

Paliers lisses — Tolérances —

Partie 1: Ajustements

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Contents

	Page
Foreword.....	iv
Introduction.....	v
1 Scope.....	1
2 Normative references.....	1
3 Terms and definitions.....	1
4 System of fits.....	1
5 Mean relative bearing clearance.....	2
6 Tolerance intervals.....	2
6.1 Tolerance.....	2
6.2 Fundamental deviation.....	2
6.3 Number.....	3
6.4 Symbol.....	3
7 Ranges of nominal dimensions.....	3
8 Limit deviations.....	3
9 Minimum and maximum clearances.....	3
10 Example.....	3
Bibliography.....	10

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 of 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 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 second edition cancels and replaces the first edition (ISO 12129-1:1995), which has been technically revised. The main changes compared to the previous edition are as follows:

- the title has been improved;
- normative references have been updated;
- [Table 1](#) has been corrected;
- [Table 2](#) has been added.

A list of all parts in the ISO 12129 series can be found on the ISO website.

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 has been established because it is not possible to use the ISO deviations given in ISO 286-1 and ISO 286-2 to develop clearance fits which correspond to the requirements of plain bearing engineering for approximately uniform mean relative bearing clearances for all nominal size ranges.

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Plain bearings — Tolerances —

Part 1: Fits

1 Scope

This document specifies a system of fits applicable to metallic plain bearings used in general engineering for mean relative bearing clearances, ψ_m , of 0,56 ‰ up to 3,15 ‰. Other clearance ranges can be used depending upon the requirements in specific applications.

This system of fits is not applicable to half-bearings and bushes which, due to their special characteristics, are not measured by diameter but by wall thickness, and which are dimensionally changed on assembly. It is not applicable to profile bore or tilting pad bearings, or to cases where specific tolerances have been established by consideration of the bearing performance at both extremes of clearance.

This document is applicable preferably to rotating machine parts and shafting, but it can be used similarly in other ranges of application.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

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 System of fits

The system of fits specified in this document is a normal system of fits, in which the fundamental deviation H of the bearing bore diameter is in accordance with ISO 286-2. The tolerance interval of the shaft is correlated to correspond to the mean relative bearing clearance, ψ_m .

5 Mean relative bearing clearance

The mean relative bearing clearance, ψ_m , in per thousand (‰), of a range of nominal dimensions is given by [Formula \(1\)](#):

$$\psi_m = \frac{C_{D,m}}{D_m} \quad (1)$$

where $C_{D,m}$ is the mean absolute bearing diametral clearance, in micrometres.

$$C_{D,m} = \frac{C_{D,max} + C_{D,min}}{2} \quad (2)$$

where

$C_{D,max}$ is the maximum value of the absolute bearing diametral clearance;

$C_{D,min}$ is the minimum value of the absolute bearing diametral clearance;

D_m is the arithmetic mean of the range of nominal dimensions, in millimetres.

EXAMPLE

For the nominal dimension range from 250 mm to 280 mm, the arithmetic mean of the range of nominal dimensions is given by

$$D_m = \frac{250 + 280}{2} \text{ mm} = 265 \text{ mm}$$

For $\psi_m = 1,6 \text{ ‰}$, [Table 1](#) and [Formula \(2\)](#) lead then to the mean bearing diametral clearance

$$C_{D,m} = \frac{0,466 + 0,382}{2} \text{ mm} = 0,424 \text{ mm}$$

and to the mean relative bearing clearance

$$\psi_m = \frac{0,424}{265} = 1,6 \text{ ‰}$$

6 Tolerance intervals

6.1 Tolerance

The tolerance is chosen so that, for a uniform mean relative bearing clearance, ψ_m , in each case from the minimum to the maximum range of nominal dimensions, an approximately uniform maximum deviation from the relative bearing clearance within a tolerance interval is not exceeded. The lower limit is dictated by economy and methods of production.

The tolerance interval of the shaft in each case is smaller by one IT grade (basic tolerance grade in accordance with ISO 286-1) than the tolerance interval of the correlated bearing bore.

6.2 Fundamental deviation

The fundamental deviation is determined by the mean relative bearing clearance, ψ_m .

6.3 Number

Each of the following values of ψ_m , in per thousand, corresponds to one tolerance interval:

- 0,56;
- 0,8;
- 1,12;
- 1,32;
- 1,6;
- 1,9;
- 2,24;
- 3,15.

6.4 Symbol

The symbol for the mean relative bearing clearance is ψ_m . If Greek letters are not available, the symbol C^* may be used instead of the Greek letter ψ .

7 Ranges of nominal dimensions

The ranges of nominal dimensions are more closely stepped than in ISO 286-2 so that the maximum deviation from the mean relative bearing clearance, ψ_m , can be more closely adhered to.

8 Limit deviations

The limit deviations for the shafts are given in [Table 1](#).

9 Minimum and maximum clearances

The minimum and maximum clearances between the shaft and bearing bore, together with the limit deviations for the shaft which are required for the calculation of the plain bearings, are given in [Table 1](#).

The corresponding tolerance intervals of the relative bearing clearance are given in [Table 2](#).

10 Example

Shaft fit dimension 200 mm for a mean bearing clearance $\psi_m = 1,12$ ‰.

Preferred form:

$\emptyset 200_{\psi 1,12}$

Alternative form where Greek letters are not available:

$\emptyset 200_{C^* 1,12}$

Alternative form where subscripts are not available:

$\emptyset 200 (C^* 1,12)$

Table 1 — Limit deviations and tolerance intervals

Nominal dimension range mm		Limit deviations for the shaft ^a μm								Maximum and minimum clearances between shaft and bearing bore ^b μm									
		Mean relative bearing clearance, ψ _m , ‰								Mean relative bearing clearance, ψ _m , ‰									
over	up to and incl.	0,56	0,8	1,12	1,32	1,6	1,9	2,24	3,15	0,56	0,8	1,12	1,32	1,6	1,9	2,24	3,15		
25	30	—	-15	-23	-29	-37	-41	-51	-76	—	30	38	44	52	63	73	98		
30	35	—	-21	-29	-35	-43	-50	-60	-85	—	15	23	29	37	41	51	76		
35	40	—	-17	-27	-34	-43	-48	-59	-89	—	35	45	52	61	75	86	116		
40	45	—	-24	-34	-41	-50	-59	-70	-100	—	17	27	34	43	48	59	89		
45	50	-12	-21	-33	-36	-47	-58	-71	-105	30	39	51	63	74	85	98	132		
50	55	-19	-28	-40	-47	-58	-69	-82	-116	12	21	33	36	47	58	71	105		
55	60	-14	-25	-34	-43	-55	-67	-82	-120	32	43	61	70	82	94	109	147		
60	70	-21	-32	-45	-54	-66	-78	-93	-131	14	25	34	43	55	67	82	120		
65	80	-18	-25	-40	-49	-63	-77	-93	-136	36	52	67	76	90	104	120	163		
70	80	-25	-36	-51	-60	-74	-88	-104	-147	18	25	40	49	63	77	93	136		
75	90	-19	-26	-43	-53	-68	-84	-102	-149	40	58	75	85	100	116	134	181		
80	90	-27	-39	-56	-66	-81	-97	-115	-162	19	26	43	53	68	84	102	149		
85	100	-22	-30	-48	-60	-76	-93	-113	-165	43	62	80	92	108	125	145	197		
90	100	-30	-43	-61	-73	-89	-106	-126	-178	22	30	48	60	76	93	113	165		
95	110	-20	-36	-57	-70	-80	-99	-121	-180	52	68	89	102	129	148	170	229		
100	120	-33	-49	-70	-83	-99	-118	-140	-199	20	36	57	70	80	99	121	180		
105	140	-26	-44	-60	-75	-96	-118	-144	-212	58	76	109	124	145	167	193	261		
110	160	-39	-57	-79	-94	-115	-137	-163	-231	26	44	60	75	96	118	144	212		
115	200	-29	-50	-67	-84	-108	-133	-162	-239	66	87	124	141	165	190	219	296		
120	250	-44	-65	-89	-106	-130	-155	-184	-261	29	50	67	84	108	133	162	239		
a		The limit deviations of the shaft correspond to IT4 above the upper bold stepped line, to IT5 between the stepped lines, and to IT6 below the lower bold stepped line.																	
b		The maximum and minimum clearances correspond to IT4/H 5 for the fit shaft/bearing bore above the upper bold stepped line, to IT5/H 6 between the bold stepped lines, and to IT6/h 7 below the lower bold stepped line.																	

^a The limit deviations of the shaft correspond to IT4 above the upper bold stepped line, to IT5 between the stepped lines, and to IT6 below the lower bold stepped line.^b The maximum and minimum clearances correspond to IT4/H 5 for the fit shaft/bearing bore above the upper bold stepped line, to IT5/H 6 between the bold stepped lines, and to IT6/H 7 below the lower bold stepped line.

Table 1 (continued)

Nominal dimension range mm	Limit deviations for the shaft ^a μm										Maximum and minimum clearances between shaft and bearing bore ^b μm									
	Mean relative bearing clearance, ψ_m , ‰										Mean relative bearing clearance, ψ_m , ‰									
over up to and incl.	0,56	0,8	1,12	1,32	1,6	1,9	2,24	3,15			0,56	0,8	1,12	1,32	1,6	1,9	2,24			
90	-35 -50	-58 -73	-78 -100	-97 -119	-124 -146	-152 -174	-184 -206	-271 -293			72 35	95 58	135 78	154 97	181 124	209 152	241 184			
100	-40 -55	-56 -78	-89 -111	-110 -132	-140 -162	-171 -193	-207 -229	-302 -324			77 40	113 56	146 89	167 110	197 140	228 171	264 207			
110	-36 -58	-64 -86	-100 -122	-123 -145	-156 -178	-190 -212	-229 -251	-334 -356			93 36	121 64	157 100	180 123	213 156	247 190	286 229			
120	-40 -65	-72 -97	-113 -138	-139 -164	-176 -201	-215 -240	-259 -284	-377 -402			105 40	137 72	178 113	204 139	241 176	280 215	324 259			
140	-52 -77	-88 -113	-136 -161	-166 -191	-208 -233	-253 -278	-304 -329	-440 -465			117 52	153 88	201 136	231 166	273 208	318 253	369 304			
160	-63 -88	-104 -129	-158 -183	-192 -217	-240 -265	-291 -316	-348 -373	-503 -528			128 63	169 104	223 158	257 192	305 240	356 291	413 348			
180	-69 -98	-115 -144	-175 -204	-213 -242	-267 -296	-324 -353	-388 -417	-561 -590			144 69	190 115	250 175	288 213	342 267	399 324	463 388			
200	-82 -111	-133 -162	-201 -230	-243 -272	-303 -332	-366 -395	-439 -468	-632 -661			157 82	208 133	276 201	318 243	378 303	441 366	514 439			
225	-96 -125	-153 -182	-229 -258	-276 -305	-343 -372	-414 -443	-495 -524	-711 -740			171 96	228 153	304 229	351 276	418 343	489 414	570 495			
250	-106 -138	-170 -202	-255 -287	-308 -340	-382 -414	-462 -494	-552 -584	-793 -825			190 106	254 170	339 255	392 308	466 382	546 462	636 552			

^a The limit deviations of the shaft correspond to IT4 above the upper bold stepped line, to IT5 between the stepped lines, and to IT6 below the lower bold stepped line.

^b The maximum and minimum clearances correspond to IT4/H 5 for the fit shaft/bearing bore above the upper bold stepped line, to IT5/H 6 between the bold stepped lines, and to IT6/H 7 below the lower bold stepped line.

Table 1 (continued)

Nominal dimension range mm		Limit deviations for the shaft ^a μm								Maximum and minimum clearances between shaft and bearing bore ^b μm							
		Mean relative bearing clearance, ψ _m , ‰								Mean relative bearing clearance, ψ _m , ‰							
over	up to and incl.	0,56	1,12	1,32	1,6	1,9	2,24	3,15	0,56	0,8	1,12	1,32	1,6	1,9	2,24	3,15	
280	315	-125 -157	-291 -323	-351 -383	-434 -466	-523 -555	-624 -656	-895 -927	209 125	280 196	375 291	435 351	518 434	607 523	708 624	979 895	
315	355	-141 -177	-329 -365	-396 -432	-490 -526	-590 -626	-704 -740	-1 009 -1 045	234 141	315 222	422 329	489 396	583 490	683 590	797 704	1 102 1 009	
355	400	-165 -201	-376 -412	-452 -488	-558 -594	-671 -707	-799 -835	-1 143 -1 179	258 165	349 256	469 376	545 452	651 558	764 671	892 799	1 236 1 143	
400	450	-187 -227	-425 -465	-510 -550	-629 -669	-756 -796	-901 -941	-1 287 -1 327	290 187	392 289	528 425	613 510	732 629	859 756	1 004 901	1 390 1 287	
450	500	-215 -255	-481 -521	-576 -616	-709 -749	-851 -891	-1 013 -1 053	-1 445 -1 485	318 215	432 329	584 481	679 576	812 709	954 851	1 116 1 013	1 548 1 445	
500	560	-240 -284	-537 -581	-643 -687	-791 -835	-950 -994	-1 130 -1 174	-1 613 -1 657	354 240	481 367	651 537	757 643	905 791	1 064 950	1 244 1 130	1 727 1 613	
560	630	-276 -320	-609 -653	-728 -772	-895 -939	-1 074 -1 118	-1 276 -1 320	-1 852 -1 896	390 276	533 419	723 609	842 728	1 009 895	1 188 1 074	1 390 1 276	1 966 1 852	
630	710	-310 -360	-685 -735	-819 -869	-1 007 -1 057	-1 208 -1 258	-1 436 -1 486	-2 046 -2 096	440 310	601 471	815 685	949 819	1 137 1 007	1 338 1 208	1 566 1 436	2 176 2 046	
710	800	-358 -408	-781 -831	-932 -982	-1 143 -1 193	-1 370 -1 420	-1 626 -1 676	-2 313 -2 363	488 358	669 539	911 781	1 062 932	1 273 1 143	1 500 1 370	1 756 1 626	2 443 2 313	
800	900	-403 -459	-879 -935	-1 049 -1 105	-1 287 -1 343	-1 542 -1 598	-1 831 -1 887	-2 605 -2 661	549 403	753 607	1 025 879	1 195 1 049	1 433 1 287	1 688 1 542	1 977 1 831	2 751 2 605	
^a The limit deviations of the shaft correspond to IT4 above the upper bold stepped line, and to IT5 between the stepped lines, and to IT6 below the lower bold stepped line.																	
^b The maximum and minimum clearances correspond to IT4/H 5 for the fit shaft/bearing bore above the upper bold stepped line, to IT5/H 6 between the bold stepped lines, and to IT6/H 7 below the lower bold stepped line.																	

Table 1 (continued)

Nominal dimension range mm		Limit deviations for the shaft ^a μm										Maximum and minimum clearances between shaft and bearing bore ^b μm									
		Mean relative bearing clearance, ψ _m , ‰										Mean relative bearing clearance, ψ _m , ‰									
over	up to and incl.	0,56	0,8	1,12	1,32	1,6	1,9	2,24	3,15	4,5	6,3	0,56	0,8	1,12	1,32	1,6	1,9	2,24	3,15		
900	1 000	-459 -515	-687 -743	-991 -1 047	-1 181 -1 237	-1 447 -1 503	-1 732 -1 788	-2 055 -2 111	-2 920 -2 976			605 459	833 687	1 137 991	1 327 1 181	1 593 1 447	1 878 1 732	2 201 2 055	3 066 2 920		
1 000	1 120	-508 -574	-763 -829	-1 102 -1 168	-1 314 -1 380	-1 611 -1 677	-1 929 -1 995	-2 289 -2 355	-3 254 -3 320			679 508	934 763	1 273 1 102	1 485 1 314	1 782 1 611	2 100 1 929	2 460 2 289	3 425 3 254		
1 120	1 250	-578 -644	-863 -929	-1 242 -1 308	-1 479 -1 545	-1 811 -1 877	-2 166 -2 232	-2 569 -2 635	-3 647 -3 713			749 578	1 034 863	1 413 1 242	1 650 1 479	1 982 1 811	2 337 2 166	2 740 2 569	3 818 3 647		
^a The limit deviations of the shaft correspond to IT4 above the upper bold stepped line, to IT5 between the stepped lines, and to IT6 below the lower bold stepped line.																					
^b The maximum and minimum clearances correspond to IT4/H 5 for the fit shaft/bearing bore above the upper bold stepped line, to IT5/H 6 between the bold stepped lines, and to IT6/H 7 below the lower bold stepped line.																					

Table 2 — Tolerance intervals of relative bearing clearance

Nominal dimension range mm		Maximum and minimum relative bearing clearances							
		μm							
		Mean relative bearing clearance, ψ_m , ‰							
over	up to and incl.	0,56	0,8	1,12	1,32	1,6	1,9	2,24	3,15
25	30	—	1,20	1,52	1,76	2,08	2,52	2,92	3,92
			0,50	0,77	0,97	1,23	1,37	1,70	2,53
30	35	—	1,17	1,50	1,73	2,03	2,50	2,87	3,87
			0,49	0,77	0,97	1,23	1,37	1,69	2,54
35	40	0,86	1,11	1,46	1,80	2,11	2,43	2,80	3,77
		0,30	0,53	0,83	0,90	1,18	1,45	1,78	2,63
40	45	0,80	1,08	1,53	1,75	2,05	2,35	2,73	3,68
		0,31	0,56	0,76	0,96	1,22	1,49	1,82	2,67
45	50	0,80	1,16	1,49	1,69	2,00	2,31	2,67	3,62
		0,36	0,50	0,80	0,98	1,26	1,54	1,86	2,72
50	55	0,80	1,16	1,50	1,70	2,00	2,32	2,68	3,62
		0,35	0,47	0,78	0,96	1,24	1,53	1,85	2,71
55	60	0,78	1,13	1,45	1,67	1,96	2,27	2,64	3,58
		0,37	0,50	0,80	1,00	1,27	1,55	1,88	2,75
60	70	0,87	1,13	1,48	1,70	2,15	2,47	2,83	3,82
		0,29	0,51	0,81	1,00	1,14	1,41	1,73	2,57
70	80	0,83	1,09	1,56	1,77	2,07	2,39	2,76	3,73
		0,33	0,55	0,75	0,94	1,20	1,48	1,80	2,65
80	90	0,83	1,09	1,55	1,76	2,06	2,38	2,74	3,70
		0,32	0,56	0,74	0,93	1,20	1,48	1,80	2,66
90	100	0,80	1,06	1,50	1,71	2,01	2,32	2,68	3,64
		0,35	0,58	0,78	0,97	1,24	1,52	1,84	2,71
100	110	0,77	1,13	1,46	1,67	1,97	2,28	2,64	3,59
		0,36	0,51	0,81	1,00	1,27	1,55	1,88	2,75
110	120	0,85	1,10	1,43	1,64	1,94	2,25	2,60	3,55
		0,30	0,53	0,83	1,03	1,30	1,58	1,91	2,78
120	140	0,88	1,14	1,48	1,70	2,01	2,33	2,70	3,68
		0,29	0,51	0,81	0,99	1,26	1,54	1,85	2,69
140	160	0,84	1,09	1,44	1,65	1,95	2,27	2,64	3,61
		0,33	0,55	0,85	1,04	1,30	1,58	1,90	2,75
160	180	0,80	1,06	1,39	1,61	1,91	2,23	2,58	3,55
		0,35	0,58	0,88	1,07	1,33	1,62	1,93	2,79
180	200	0,80	1,06	1,39	1,60	1,90	2,22	2,57	3,53
		0,35	0,58	0,88	1,07	1,34	1,62	1,94	2,81
200	225	0,79	1,04	1,38	1,59	1,89	2,21	2,57	3,54
		0,36	0,59	0,89	1,08	1,35	1,63	1,95	2,81
225	250	0,76	1,01	1,35	1,56	1,86	2,17	2,53	3,49
		0,38	0,61	0,92	1,10	1,37	1,66	1,98	2,84