
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

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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 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	65	-21	-32	-45	-54	-66	-78	-93	-131	14	25	34	43	55	67	82	120
65	70	-18	-25	-40	-49	-63	-77	-93	-136	36	52	67	76	90	104	120	163
70	75	-25	-36	-51	-60	-74	-88	-104	-147	18	25	40	49	63	77	93	136
75	80	-19	-26	-43	-53	-68	-84	-102	-149	40	58	75	85	100	116	134	181
80	85	-27	-39	-56	-66	-81	-97	-115	-162	19	26	43	53	68	84	102	149
85	90	-22	-30	-48	-60	-76	-93	-113	-165	43	62	80	92	108	125	145	197
90	95	-30	-43	-61	-73	-89	-106	-126	-178	22	30	48	60	76	93	113	165
95	100	-20	-36	-57	-70	-80	-99	-121	-180	52	68	89	102	129	148	170	229
100	105	-33	-49	-70	-83	-99	-118	-140	-199	20	36	57	70	80	99	121	180
105	110	-26	-44	-60	-75	-96	-118	-144	-212	58	76	109	124	145	167	193	261
110	115	-39	-57	-79	-94	-115	-137	-163	-231	26	44	60	75	96	118	144	212
115	120	-29	-50	-67	-84	-108	-133	-162	-239	66	87	124	141	165	190	219	296
120	125	-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.

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	3,15	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
280	315	-125	-196	-291	-351	-434	-523	-624	-895	-895	209	280	375	435	518	607	708	979	125	196	291	351	434	523	624	895
315	355	-141	-222	-329	-396	-490	-590	-704	-1 009	-1 009	234	315	422	489	583	683	797	1 102	141	222	329	396	490	590	704	1 009
355	400	-165	-256	-376	-452	-558	-671	-799	-1 143	-1 143	258	349	469	545	651	764	892	1 236	165	256	376	452	558	671	799	1 143
400	450	-187	-289	-425	-510	-629	-756	-901	-1 287	-1 287	290	392	528	613	732	859	1 004	1 390	187	289	425	510	629	756	901	1 287
450	500	-215	-329	-481	-576	-709	-851	-1 013	-1 445	-1 445	318	432	584	679	812	954	1 116	1 548	215	329	481	576	709	851	1 013	1 445
500	560	-240	-367	-537	-643	-791	-950	-1 130	-1 613	-1 613	354	481	651	757	905	1 064	1 244	1 727	240	367	537	643	791	950	1 130	1 613
560	630	-276	-419	-609	-728	-895	-1 074	-1 276	-1 852	-1 852	390	533	723	842	1 009	1 188	1 390	1 966	276	419	609	728	895	1 074	1 276	1 852
630	710	-310	-471	-685	-819	-1 007	-1 208	-1 436	-2 046	-2 046	440	601	815	949	1 137	1 338	1 566	2 176	310	471	685	819	1 007	1 208	1 436	2 046
710	800	-358	-539	-781	-932	-1 143	-1 370	-1 626	-2 313	-2 313	488	669	911	1 062	1 273	1 500	1 756	2 443	488	669	911	1 062	1 273	1 500	1 756	2 443
800	900	-408	-589	-831	-982	-1 193	-1 420	-1 676	-2 363	-2 363	538	739	971	1 132	1 343	1 570	1 837	2 524	538	739	971	1 132	1 343	1 570	1 837	2 524
		-403	-607	-879	-1 049	-1 287	-1 542	-1 831	-2 605	-2 605	549	753	1 025	1 195	1 433	1 688	1 977	2 751	549	753	1 025	1 195	1 433	1 688	1 977	2 751
		-459	-663	-935	-1 105	-1 343	-1 598	-1 887	-2 661	-2 661	403	607	879	1 049	1 287	1 542	1 831	2 605	403	607	879	1 049	1 287	1 542	1 831	2 605

^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								
	over	upto 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	
		Mean relative bearing clearance, ψ_m , ‰																	
900	1 000	-515	-743	-1 047	-1 237	-1 503	-1 747	-1 732	-2 055	-2 920	459	687	991	1 181	1 447	1 732	2 055	2 920	
1 000	1 120	-508	-763	-1 102	-1 314	-1 611	-1 929	-1 995	-2 289	-3 254	679	934	1 273	1 485	1 782	2 100	2 460	3 425	
1 120	1 250	-578	-863	-1 242	-1 479	-1 811	-2 166	-2 569	-3 320	-3 647	508	763	1 102	1 314	1 611	1 929	2 289	3 254	
		-644	-929	-1 308	-1 545	-1 877	-2 232	-2 635	-3 713	-3 713	578	863	1 242	1 479	1 811	2 166	2 569	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							
over	up to and incl.	Mean relative bearing clearance, ψ_m , ‰							
		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