
**Rolling bearings — Internal clearance —
Part 1:
Radial internal clearance for radial
bearings**

Roulements — Jeu interne —

Partie 1: Jeu interne radial pour roulements radiaux

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ISO 5753-1:2009

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 5753-1 was prepared by Technical Committee ISO/TC 4, *Rolling bearings*, Subcommittee SC 4, *Tolerances*.

This first edition of ISO 5753-1 cancels and replaces ISO 5753:1991, which has been technically revised and extended. Internal clearance values for larger bore sizes have been added for each bearing type, together with values for cylindrical roller bearings with tapered bore and toroidal roller bearings with both cylindrical and tapered bores.

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ISO 5753 consists of the following parts, under the general title *Rolling bearings* — *Internal clearance*:

— *Part 1: Radial internal clearance for radial bearings*

Axial internal clearance will form the subject of a future part 2.

Introduction

The radial internal clearance values apply to bearings, designed in such a way that they can take purely radial load, which are not mounted or preloaded and are not subjected to any external load (i.e. with no measuring load being applied). Since measurements of radial clearance can only be made with a measuring load applied, the radial displacement resulting from the elastic deformation of the rings and rolling elements has to be added to the clearance values specified in this part of ISO 5753. The magnitude of these clearance values depends on the number and diameter of the rolling elements and the extent of contact between the rolling elements and the raceways. Methods for the measurement of radial internal clearance are given in ISO 1132-2.

Depending on the design of the bearing and measuring method, some scatter of the results of repeated measurements can be experienced. Manufacturers are expected to take such scatter into consideration by applying correspondingly reduced manufacturing tolerances.

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Rolling bearings — Internal clearance —

Part 1: Radial internal clearance for radial bearings

1 Scope

This part of ISO 5753 specifies values of radial internal clearance for the following types of radial rolling bearings:

- radial contact groove ball bearings, except those for insert bearings,
- double-row self-aligning ball bearings,
- cylindrical roller bearings,
- needle roller bearings, except drawn cup needle roller bearings,
- toroidal roller bearings,
- double-row self-aligning roller bearings.

It gives radial internal clearance values for all six types of bearing with cylindrical bore and also for double-row self-aligning ball bearings, cylindrical roller bearings, toroidal roller bearings and double-row self-aligning roller bearings with tapered bore.

Values of radial internal clearance for insert bearings are specified in ISO 9628.

2 Normative references

The following referenced documents are indispensable for the application 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 1132-1:2000, *Rolling bearings — Tolerances — Part 1: Terms and definitions*

ISO 5593, *Rolling bearings — Vocabulary*

ISO 9628, *Rolling bearings — Insert bearings and eccentric locking collars — Boundary dimensions and tolerances*

ISO 15241, *Rolling bearings — Symbols for quantities*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1132-1, ISO 5593 and the following apply.

3.1

radial internal clearance

(bearing capable of taking purely radial load, non-preloaded) arithmetical mean of the radial distances through which one of the rings may be displaced relative to the other, from one eccentric extreme position to the diametrically opposite extreme position, in different angular directions and without being subjected to any external load

NOTE 1 The mean value includes displacements with the rings in different angular positions relative to each other and with the set of rolling elements in different angular positions in relation to the rings.

NOTE 2 For a measurement to be valid, at each limiting eccentric position of the rings in relation to each other, their relative axial position, and the position of the rolling elements relative to the raceways, shall be such that one ring has actually assumed the extreme eccentric position in relation to the other ring.

[ISO 1132-1:2000, definition 8.1.1]

3.2

toroidal roller bearing

single-row self-aligning radial roller bearing with convex rollers as rolling elements with raceway radii of axial plane of both outer and inner rings larger than half the outer ring raceway diameter

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4 Symbols

For the purposes of this document, the symbols given in ISO 15241 and the following apply.

The symbols (except those for clearance values) and the values given in Tables 1 to 9 denote nominal dimensions unless specified otherwise.

d bore diameter

G_r radial internal clearance

5 Radial internal clearance

5.1 Radial contact groove ball bearings

Radial internal clearance values for radial contact groove ball bearings with cylindrical bore are given in Table 1.

The values in Table 1 are not valid for insert bearings; see ISO 9628 for insert bearings.

Table 1 — Radial contact groove ball bearings with cylindrical bore

Clearance values in micrometres

d mm		G_r									
		Group 2		Group N		Group 3		Group 4		Group 5	
>	≤	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
2,5	6	0	7	2	13	8	23	—	—	—	—
6	10	0	7	2	13	8	23	14	29	20	37
10	18	0	9	3	18	11	25	18	33	25	45
18	24	0	10	5	20	13	28	20	36	28	48
24	30	1	11	5	20	13	28	23	41	30	53
30	40	1	11	6	20	15	33	28	46	40	64
40	50	1	11	6	23	18	36	30	51	45	73
50	65	1	15	8	28	23	43	38	61	55	90
65	80	1	15	10	30	25	51	46	71	65	105
80	100	1	18	12	36	30	58	53	84	75	120
100	120	2	20	15	41	36	66	61	97	90	140
120	140	2	23	18	48	41	81	71	114	105	160
140	160	2	23	18	53	46	91	81	130	120	180
160	180	2	25	20	61	53	102	91	147	135	200
180	200	2	30	25	71	63	117	107	163	150	230
200	225	2	35	25	85	75	140	125	195	175	265
225	250	2	40	30	95	85	160	145	225	205	300
250	280	2	45	35	105	90	170	155	245	225	340
280	315	2	55	40	115	100	190	175	270	245	370
315	355	3	60	45	125	110	210	195	300	275	410
355	400	3	70	55	145	130	240	225	340	315	460
400	450	3	80	60	170	150	270	250	380	350	520
450	500	3	90	70	190	170	300	280	420	390	570
500	560	10	100	80	210	190	330	310	470	440	630
560	630	10	110	90	230	210	360	340	520	490	700
630	710	20	130	110	260	240	400	380	570	540	780
710	800	20	140	120	290	270	450	430	630	600	860
800	900	20	160	140	320	300	500	480	700	670	960
900	1 000	20	170	150	350	330	550	530	770	740	1 040
1 000	1 120	20	180	160	380	360	600	580	850	820	1 150
1 120	1 250	20	190	170	410	390	650	630	920	890	1 260
1 250	1 400	30	200	190	440	420	700	680	1 000	—	—
1 400	1 600	30	210	210	470	450	750	730	1 060	—	—

5.2 Double-row self-aligning ball bearings

Radial internal clearance values for double-row self-aligning ball bearings with cylindrical bore and tapered bore are given in Tables 2 and 3 respectively.

Table 2 — Double-row self-aligning ball bearings with cylindrical bore

Clearance values in micrometres

d mm		G _r									
		Group 2		Group N		Group 3		Group 4		Group 5	
>	≤	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
2,5	6	1	8	5	15	10	20	15	25	21	33
6	10	2	9	6	17	12	25	19	33	27	42
10	14	2	10	6	19	13	26	21	35	30	48
14	18	3	12	8	21	15	28	23	37	32	50
18	24	4	14	10	23	17	30	25	39	34	52
24	30	5	16	11	24	19	35	29	46	40	58
30	40	6	18	13	29	23	40	34	53	46	66
40	50	6	19	14	31	25	44	37	57	50	71
50	65	7	21	16	36	30	50	45	69	62	88
65	80	8	24	18	40	35	60	54	83	76	108
80	100	9	27	22	48	42	70	64	96	89	124
100	120	10	31	25	56	50	83	75	114	105	145
120	140	10	38	30	68	60	100	90	135	125	175
140	160	15	44	35	80	70	120	110	161	150	210
160	180	15	50	40	92	82	138	126	185	—	—
180	200	17	57	47	105	93	157	144	212	—	—
200	225	18	62	50	115	100	170	155	230	—	—
225	250	20	70	57	130	115	195	175	255	—	—
250	280	23	78	65	145	125	220	200	295	—	—
280	315	27	90	75	165	145	250	230	335	—	—
315	355	32	100	85	185	165	285	260	380	—	—
355	400	35	110	90	205	185	325	295	430	—	—
400	450	38	125	100	230	205	345	315	465	—	—
450	500	40	135	110	255	230	380	345	510	—	—

Table 3 — Double-row self-aligning ball bearings with tapered bore

Clearance values in micrometres

d mm		G_r									
		Group 2		Group N		Group 3		Group 4		Group 5	
>	≤	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
18	24	7	17	13	26	20	33	28	42	37	55
24	30	9	20	15	28	23	39	33	50	44	62
30	40	12	24	19	35	29	46	40	59	52	72
40	50	14	27	22	39	33	52	45	65	58	79
50	65	18	32	27	47	41	61	56	80	73	99
65	80	23	39	35	57	50	75	69	98	91	123
80	100	29	47	42	68	62	90	84	116	109	144
100	120	35	56	50	81	75	108	100	139	130	170
120	140	40	68	60	98	90	130	120	165	155	205
140	160	45	74	65	110	100	150	140	191	180	240
160	180	50	85	75	127	117	173	161	220	—	—
180	200	55	95	85	143	131	195	182	250	—	—
200	225	63	107	95	160	145	215	200	275	—	—
225	250	70	120	107	180	165	245	230	310	—	—
250	280	78	133	120	200	180	275	255	350	—	—
280	315	87	150	135	225	205	310	280	385	—	—
315	355	97	165	150	250	220	340	310	430	—	—
355	400	105	180	160	275	245	375	335	470	—	—
400	450	115	200	170	300	260	400	360	510	—	—
450	500	120	215	180	325	275	425	380	545	—	—

5.3 Cylindrical roller bearings and needle roller bearings

Radial internal clearance values for cylindrical roller bearings and needle roller bearings with cylindrical bore and cylindrical roller bearings with tapered bore are given in Tables 4 and 5 respectively.

For needle roller bearings, the radial internal clearance values specified apply only for bearings which are manufactured and delivered as complete bearing assemblies with inner ring. For needle roller bearings where the inner ring is delivered as a separate item, the radial internal clearance is given by the raceway diameter of the inner ring and the bore diameter of the needle roller complement. In such cases, these diameters should be obtained from the manufacturer of the bearing.