INTERNATIONAL STANDARD

ISO 5753-1

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Rolling bearings — Internal clearance —

Part 1: Radial internal clearance for radial bearings

Roulements — Jeu interne —

Partie 1: Jeu interne radial pour roulements radiaux

Reference number
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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.

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.

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

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.

Table 4 — Cylindrical roller bearings and needle roller 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.
—	10	0	25	20	45	35	60	50	75	—	—
10	24	0	25	20	45	35	60	50	75	65	90
24	30	0	25	20	45	35	60	50	75	70	95
30	40	5	30	25	50	45	70	60	85	80	105
40	50	5	35	30	60	50	80	70	100	95	125
50	65	10	40	40	70	60	90	80	110	110	140
65	80	10	45	40	75	65	100	90	125	130	165
80	100	15	50	50	85	75	110	105	140	155	190
100	120	15	55	50	90	85	125	125	165	180	220
120	140	15	60	60	105	100	145	145	190	200	245
140	160	20	70	70	120	115	165	165	215	225	275
160	180	25	75	75	125	120	170	170	220	250	300
180	200	35	90	90	145	140	195	195	250	275	330
200	225	45	105	105	165	160	220	220	280	305	365
225	250	45	110	110	175	170	235	235	300	330	395
250	280	55	125	125	195	190	260	260	330	370	440
280	315	55	130	130	205	200	275	275	350	410	485
315	355	65	145	145	225	225	305	305	385	455	535
355	400	100	190	190	280	280	370	370	460	510	600
400	450	110	210	210	310	310	410	410	510	565	665
450	500	110	220	220	330	330	440	440	550	625	735
500	560	120	240	240	360	360	480	480	600	—	—
560	630	140	260	260	380	380	500	500	620	—	—
630	710	145	285	285	425	425	565	565	705	—	—
710	800	150	310	310	470	470	630	630	790	—	—
800	900	180	350	350	520	520	690	690	860	—	—
900	1 000	200	390	390	580	580	770	770	960	—	—
1 000	1 120	220	430	430	640	640	850	850	1 060	—	—
1 120	1 250	230	470	470	710	710	950	950	1 190	—	—
1 250	1 400	270	530	530	790	790	1 050	1 050	1 310	—	—
1 400	1 600	330	610	610	890	890	1 170	1 170	1 450	—	—
1 600	1 800	380	700	700	1 020	1 020	1 340	1 340	1 660	—	—
1 800	2 000	400	760	760	1 120	1 120	1 480	1 480	1 840	—	—

Table 5 — Cylindrical roller bearings with tapered bore

Clearance values in micrometres

d mm		G_r							
		Group 2		**Group N**		**Group 3**		**Group 4**	
>	⩽	min.	max.	min.	max.	min.	max.	min.	max.
—	10	15	40	30	55	40	65	50	75
10	24	15	40	30	55	40	65	50	75
24	30	20	45	35	60	45	70	55	80
30	40	20	45	40	65	55	80	70	95
40	50	25	55	45	75	60	90	75	105
50	65	30	60	50	80	70	100	90	120
65	80	35	70	60	95	85	120	110	145
80	100	40	75	70	105	95	130	120	155
100	120	50	90	90	130	115	155	140	180
120	140	55	100	100	145	130	175	160	205
140	160	60	110	110	160	145	195	180	230
160	180	75	125	125	175	160	210	195	245
180	200	85	140	140	195	180	235	220	275
200	225	95	155	155	215	200	260	245	305
225	250	105	170	170	235	220	285	270	335
250	280	115	185	185	255	240	310	295	365
280	315	130	205	205	280	265	340	325	400
315	355	145	225	225	305	290	370	355	435
355	400	165	255	255	345	330	420	405	495
400	450	185	285	285	385	370	470	455	555
450	500	205	315	315	425	410	520	505	615
500	560	230	350	350	470	455	575	560	680
560	630	260	380	380	500	500	620	620	740
630	710	295	435	435	575	565	705	695	835
710	800	325	485	485	645	630	790	775	935
800	900	370	540	540	710	700	870	860	1 030
900	1 000	410	600	600	790	780	970	960	1 150
1 000	1 120	455	665	665	875	865	1 075	1 065	1 275
1 120	1 250	490	730	730	970	960	1 200	1 200	1 440
1 250	1 400	550	810	810	1 070	1 070	1 330	1 330	1 590
1 400	1 600	640	920	920	1 200	1 200	1 480	1 480	1 760
1 600	1 800	700	1 020	1 020	1 340	1 340	1 660	1 660	1 980
1 800	2 000	760	1 120	1 120	1 480	1 480	1 840	1 840	2 200

5.4 Toroidal roller bearings

Radial internal clearance values for toroidal roller bearings with cylindrical bore and tapered bore are given in Tables 6 and 7 respectively.

Table 6 — Toroidal roller 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.
18	24	15	30	25	40	35	55	50	65	65	85
24	30	15	35	30	50	45	60	60	80	75	95
30	40	20	40	35	55	55	75	70	95	90	120
40	50	25	45	45	65	65	85	85	110	105	140
50	65	30	55	50	80	75	105	100	140	135	175
65	80	40	70	65	100	95	125	120	165	160	210
80	100	50	85	80	120	120	160	155	210	205	260
100	120	60	100	100	145	140	190	185	245	240	310
120	140	75	120	115	170	165	215	215	280	280	350
140	160	85	140	135	195	195	250	250	325	320	400
160	180	95	155	150	220	215	280	280	365	360	450
180	200	105	175	170	240	235	310	305	395	390	495
200	225	115	190	185	265	260	340	335	435	430	545
225	250	125	205	200	285	280	370	365	480	475	605
250	280	135	225	220	310	305	410	405	520	515	655
280	315	150	240	235	330	330	435	430	570	570	715
315	355	160	260	255	360	360	485	480	620	620	790
355	400	175	280	280	395	395	530	525	675	675	850
400	450	190	310	305	435	435	580	575	745	745	930
450	500	205	335	335	475	475	635	630	815	810	1 015
500	560	220	360	360	520	510	690	680	890	890	1 110
560	630	240	400	390	570	560	760	750	980	970	1 220
630	710	260	440	430	620	610	840	830	1 080	1 070	1 340
710	800	300	500	490	680	680	920	920	1 200	1 200	1 480
800	900	320	540	530	760	750	1 020	1 010	1 330	1 320	1 660
900	1 000	370	600	590	830	830	1 120	1 120	1 460	1 460	1 830
1 000	1 120	410	660	660	930	930	1 260	1 260	1 640	1 640	2 040
1 120	1 250	450	720	720	1 020	1 020	1 380	1 380	1 800	1 800	2 240
1 250	1 400	490	800	800	1 130	1 130	1 510	1 510	1 970	1 970	2 460
1 400	1 600	570	890	890	1 250	1 250	1 680	1 680	2 200	2 200	2 740
1 600	1 800	650	1 010	1 010	1 390	1 390	1 870	1 870	2 430	2 430	3 000

Table 7 — Toroidal roller 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	15	35	30	45	40	55	55	70	65	85
24	30	20	40	35	55	50	65	65	85	80	100
30	40	25	50	45	65	60	80	80	100	100	125
40	50	30	55	50	75	70	95	90	120	115	145
50	65	40	65	60	90	85	115	110	150	145	185
65	80	50	80	75	110	105	140	135	180	175	220
80	100	60	100	95	135	130	175	170	220	215	275
100	120	75	115	115	155	155	205	200	255	255	325
120	140	90	135	135	180	180	235	230	295	290	365
140	160	100	155	155	215	210	270	265	340	335	415
160	180	115	175	170	240	235	305	300	385	380	470
180	200	130	195	190	260	260	330	325	420	415	520
200	225	140	215	210	290	285	365	360	460	460	575
225	250	160	235	235	315	315	405	400	515	510	635
250	280	170	260	255	345	340	445	440	560	555	695
280	315	195	285	280	380	375	485	480	620	615	765
315	355	220	320	315	420	415	545	540	680	675	850
355	400	250	350	350	475	470	600	595	755	755	920
400	450	280	385	380	525	525	655	650	835	835	1 005
450	500	305	435	435	575	575	735	730	915	910	1 115
500	560	330	480	470	640	630	810	800	1 010	1 000	1 230
560	630	380	530	530	710	700	890	880	1 110	1 110	1 350
630	710	420	590	590	780	770	990	980	1 230	1 230	1 490
710	800	480	680	670	860	860	1 100	1 100	1 380	1 380	1 660
800	900	520	740	730	960	950	1 220	1 210	1 530	1 520	1 860
900	1 000	580	820	810	1 040	1 040	1 340	1 340	1 670	1 670	2 050
1 000	1 120	640	900	890	1 170	1 160	1 500	1 490	1 880	1 870	2 280
1 120	1 250	700	980	970	1 280	1 270	1 640	1 630	2 060	2 050	2 500
1 250	1 400	770	1 080	1 080	1 410	1 410	1 790	1 780	2 250	2 250	2 740
1 400	1 600	870	1 200	1 200	1 550	1 550	1 990	1 990	2 500	2 500	3 050
1 600	1 800	950	1 320	1320	1 690	1 690	2 180	2 180	2 730	2 730	3 310

5.5 Double-row self-aligning roller bearings

Radial internal clearance values for double-row self-aligning roller bearings with cylindrical bore and tapered bore are given in Tables 8 and 9 respectively.

Table 8 — Double-row self-aligning roller 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.
14	18	10	20	20	35	35	45	45	60	60	75
18	24	10	20	20	35	35	45	45	60	60	75
24	30	15	25	25	40	40	55	55	75	75	95
30	40	15	30	30	45	45	60	60	80	80	100
40	50	20	35	35	55	55	75	75	100	100	125
50	65	20	40	40	65	65	90	90	120	120	150
65	80	30	50	50	80	80	110	110	145	145	180
80	100	35	60	60	100	100	135	135	180	180	225
100	120	40	75	75	120	120	160	160	210	210	260
120	140	50	95	95	145	145	190	190	240	240	300
140	160	60	110	110	170	170	220	220	280	280	350
160	180	65	120	120	180	180	240	240	310	310	390
180	200	70	130	130	200	200	260	260	340	340	430
200	225	80	140	140	220	220	290	290	380	380	470
225	250	90	150	150	240	240	320	320	420	420	520
250	280	100	170	170	260	260	350	350	460	460	570
280	315	110	190	190	280	280	370	370	500	500	630
315	355	120	200	200	310	310	410	410	550	550	690
355	400	130	220	220	340	340	450	450	600	600	750
400	450	140	240	240	370	370	500	500	660	660	820
450	500	140	260	260	410	410	550	550	720	720	900
500	560	150	280	280	440	440	600	600	780	780	1 000
560	630	170	310	310	480	480	650	650	850	850	1 100
630	710	190	350	350	530	530	700	700	920	920	1 190
710	800	210	390	390	580	580	770	770	1 010	1 010	1 300
800	900	230	430	430	650	650	860	860	1 120	1 120	1 440
900	1 000	260	480	480	710	710	930	930	1 220	1 220	1 570

Table 9 — Double-row self-aligning roller 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	15	25	25	35	35	45	45	60	60	75
24	30	20	30	30	40	40	55	55	75	75	95
30	40	25	35	35	50	50	65	65	85	85	105
40	50	30	45	45	60	60	80	80	100	100	130
50	65	40	55	55	75	75	95	95	120	120	160
65	80	50	70	70	95	95	120	120	150	150	200
80	100	55	80	80	110	110	140	140	180	180	230
100	120	65	100	100	135	135	170	170	220	220	280
120	140	80	120	120	160	160	200	200	260	260	330
140	160	90	130	130	180	180	230	230	300	300	380
160	180	100	140	140	200	200	260	260	340	340	430
180	200	110	160	160	220	220	290	290	370	370	470
200	225	120	180	180	250	250	320	320	410	410	520
225	250	140	200	200	270	270	350	350	450	450	570
250	280	150	220	220	300	300	390	390	490	490	620
280	315	170	240	240	330	330	430	430	540	540	680
315	355	190	270	270	360	360	470	470	590	590	740
355	400	210	300	300	400	400	520	520	650	650	820
400	450	230	330	330	440	440	570	570	720	720	910
450	500	260	370	370	490	490	630	630	790	790	1 000
500	560	290	410	410	540	540	680	680	870	870	1 100
560	630	320	460	460	600	600	760	760	980	980	1 230
630	710	350	510	510	670	670	850	850	1 090	1 090	1 360
710	800	390	570	570	750	750	960	960	1 220	1 220	1 500
800	900	440	640	640	840	840	1 070	1 070	1 370	1 370	1 690
900	1 000	490	710	710	930	930	1 190	1 190	1 520	1 520	1 860

Bibliography

[1] ISO 1132-2, *Rolling bearings — Tolerances — Part 2: Measuring and gauging principles and methods*

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Price based on 12 pages