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ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 1224

ROLLING BEARINGS

INSTRUMENT PRECISION BEARINGS

1st EDITION

January 1971

For each individual country the only valid standard is the national standard of that country.

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BRIEF HISTORY

The ISO Recommendation R 1224, *Rolling bearings – Instrument precision bearings*, was drawn up by Technical Committee ISO/TC 4, *Rolling bearings,* the Secretariat of which is held by the Sveriges Standardiserings-kommission (SIS).

Work on this question led to the adoption of Draft ISO Recommendation No. 414, which included Draft ISO Recommendation No. 560 and which was circulated to all the ISO Member Bodies for enquiry in October 1968. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Austria	India	Spain
Belgium	Israel	Sweden
Czechoslovakia	Italy	Switzerland
France	Netherlands	Turkey
Germany	Poland	U.A.R.
Greece	Romania	United Kingdom
Hungary	South Africa, Rep. of	U.S.A.

The following Member Body opposed the approval of the Draft :

Japan

This Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided to accept it as an ISO RECOMMENDATION.

ISO Recommendation R 1224 January 1971

ROLLING BEARINGS

INSTRUMENT PRECISION BEARINGS

1. SCOPE

This ISO Recommendation establishes the characteristics that define instrument precision rolling bearings, their types, boundary dimensions, tolerances and internal clearances, classifications used for selective assembly, torque definitions and test conditions, and limitations of yield rates.

2. CHARACTERISTICS

Instrument precision rolling bearings comprise bearings with critical functional requirements for use in any unit that can, in a general sense, be characterized as an instrument. Satisfactory performance of these bearings necessitates that they be produced to tolerances of the same order as ISO 4 Tolerance classe 5 or better, including specific limits for diameter variation of bore and outside diameter. In addition, these bearings must be particularly free from foreign matter and meet one or more specific requirements in the following categories :

(*a*) low torque or uniform torque or both, either at starting or in rotation (this requirement does not apply to bearings with contact type seals);

(*b*) smooth running or vibration limitations;

(*c*) limitations of bearing yield rates.

Due to the many specialized requirements that exist in instrument applications, specification of these categories should be established only after full agreement between producer and user.

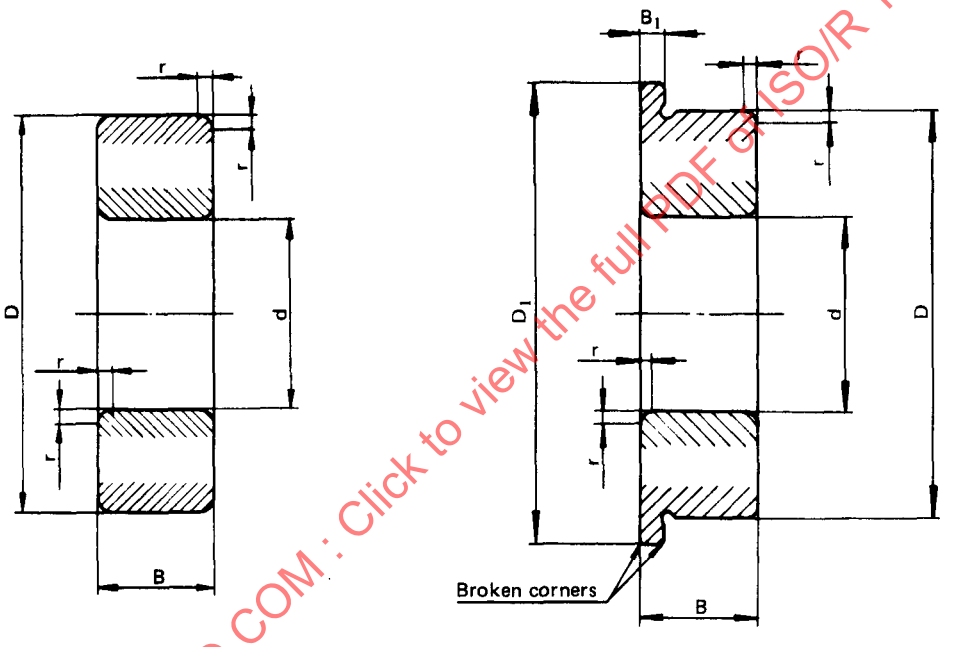
3. BEARING TYPES

3.1 Single row, non-filling slot ball bearings, type BC, meet the majority of requirements and may be flanged or unflanged, open, single or double shielded or sealed.

3.2 Angular contact ball bearings, self-contained types BN, BA and BT and separable inner ring types BNT and BAS, may be required for specific applications.

4. BOUNDARY DIMENSIONS : METRIC AND INCH SERIES

4.1 Symbols



d = bearing bore diameter, nominal

D = bearing outside diameter, nominal

B = bearing width (inner and outer ring width), nominal

D_1 = flange outside diameter, nominal

B_1 = flange width, nominal

r = nominal chamfer dimension, except where r_1 is applicable

r_1 = nominal chamfer dimensions of the narrow ring face of angular contact bearings

r_{min} = low limit of chamfer dimension, except where $r_{1\,min}$ is applicable

$r_{1\,min}$ = low limit of chamfer dimension of the narrow ring face of angular contact bearings

4.2 Metric series bearings

TABLE 1

Dimensions in millimetres

d	D	B	r	r_1	Flanged bearings		No shields or seals (N) Shields or seals (S)	Unflanged bearings Dimension series
					D_1	B_1		
1	3	1	0.15	0.1	3.8	0.3	N	18
1	3	1.5	0.15	0.1	3.8	0.45	S	38
1	4	1.6	0.2	0.1	5	0.5	N	19
1	4	2.3	0.2	0.1	5	0.6	S	39
1.5	4	1.2	0.2	0.1	5	0.4	N	18
1.5	4	2	0.2	0.1	5	0.6	S	38
1.5	5	2	0.3	0.15	6.5	0.6	N	19
1.5	5	2.6	0.3	0.15	6.5	0.8	S	39
2	5	1.5	0.2	0.1	6.1	0.5	N	18
2	5	2.3	0.2	0.1	6.1	0.6	S	38
2	6	2.3	0.3	0.15	7.5	0.6	N	19
2	6	3	0.3	0.15	7.5	0.8	S	39
2.5	6	1.8	0.3	0.15	7.1	0.5	N	18
2.5	6	2.6	0.3	0.15	7.1	0.8	S	38
2.5	7	2.5	0.3	0.15	8.5	0.7	N	19
2.5	7	3.5	0.3	0.15	8.5	0.9	S	39
3	7	2	0.3	0.15	8.1	0.5	N	18
3	7	3	0.3	0.15	8.1	0.8	S	38
3	8	3	0.3	0.15	9.5	0.7	N	19
3	8	4	0.3	0.15	9.5	0.9	S	39
3	10	4	0.3	0.15	11.5	1	N, S	02
4	9	2.5	0.3	0.15	10.3	0.6	N	18
4	9	4	0.3	0.15	10.3	1	S	38
4	11	4	0.3	0.15	12.5	1	N, S	19
4	13	5	0.4	0.2	15	1	N, S	02
4	16	5	0.5	0.3	–	–	N, S	03
5	11	3	0.3	0.15	12.5	0.8	N	18
5	11	5	0.3	0.15	12.5	1	S	38
5	13	4	0.3	0.15	15	1	N, S	19
5	16	5	0.5	0.3	18	1	N, S	02
5	19	6	0.5	0.3	–	–	N, S	03
6	13	3.5	0.3	0.15	15	1	N	18
6	13	5	0.3	0.15	15	1.1	S	28
6	15	5	0.3	0.15	17	1.2	N, S	19
6	19	6	0.5	0.3	22	1.5	N, S	02
7	14	3.5	0.3	0.15	–	–	N	18
7	14	5	0.3	0.15	–	–	S	28
7	17	5	0.3	0.15	19	1.2	N, S	19
7	22	7	0.5	0.3	–	–	N, S	02
8	19	6	0.3	0.15	22	1.5	N, S	19
8	22	7	0.5	0.3	–	–	N, S	10
8	24	8	0.5	0.3	–	–	N	02
9	20	6	0.5	0.3	–	–	N, S	19
9	26	8	1	0.5	–	–	N, S	02

4.3 Inch series bearings

TABLE 2

Dimensions in inches

d	D	B	r_{min}	$r_{1\ min}$	Flanged bearings		No shields or seals (N) Shields or seals (S)
					D_1	B_1	
0.0250	0.1000	0.0312	0.003	0.003	–	–	N
0.0400	0.1250	0.0469	0.003	0.003	–	–	N
0.0469	0.1562	0.0625	0.003	0.003	0.203	0.013	N
0.0469	0.1562	0.0937	0.003	0.003	0.203	0.031	S
0.0550	0.1875	0.0781	0.003	0.003	0.234	0.023	N
0.0550	0.1875	0.1094	0.003	0.003	0.234	0.031	S
0.0781	0.2500	0.0937	0.003	0.003	0.296	0.023	N
0.0781	0.2500	0.1406	0.003	0.003	0.296	0.031	S
0.0937	0.1875	0.0625	0.003	0.003	0.234	0.018	N
0.0937	0.1875	0.0937	0.003	0.003	0.234	0.031	S
0.0937	0.3125	0.1094	0.005	0.003	0.359	0.023	N
0.0937	0.3125	0.1406	0.005	0.003	0.359	0.031	S
0.1250	0.2500	0.0937	0.003	0.003	0.296	0.023	N
0.1250	0.2500	0.1094	0.003	0.003	0.296	0.031	S
0.1250	0.3125	0.1094	0.003	0.003	0.359	0.023	N
0.1250	0.3125	0.1406	0.003	0.003	0.359	0.031	S
0.1250	0.3750	0.1094	0.005	0.003	0.422	0.023	N
0.1250	0.3750	0.1406	0.005	0.003	0.422	0.031	S
0.1250	0.3750	0.1562	0.012	0.006	0.440	0.030	N, S
0.1250	0.5000	0.1719	0.012	0.006	–	–	N, S
0.1562	0.3125	0.1094	0.003	0.003	0.359	0.023	N
0.1562	0.3125	0.1250	0.003	0.003	0.359	0.036	S
0.1875	0.3125	0.1094	0.003	0.003	0.359	0.023	N
0.1875	0.3125	0.1250	0.003	0.003	0.359	0.036	S
0.1875	0.3750	0.1250	0.003	0.003	0.422	0.023	N
0.1875	0.3750	0.1250	0.003	0.003	0.422	0.031	S
0.1875	0.5000	0.1562	0.012	0.006	–	–	N
0.1875	0.5000	0.1960	0.012	0.006	0.565	0.042	N*, S
0.2187	0.3125	0.1094	0.003	0.003	–	–	N
0.2500	0.3750	0.1250	0.003	0.003	0.422	0.023	N
0.2500	0.3750	0.1250	0.003	0.003	0.422	0.036	S
0.2500	0.5000	0.1250	0.005	0.003	0.547	0.023	N
0.2500	0.5000	0.1875	0.005	0.003	0.547	0.045	S
0.2500	0.6250	0.1960	0.012	0.006	0.690	0.042	N, S
0.2500	0.7500	0.2188	0.016	0.008	–	–	N
0.2500	0.7500	0.2812	0.016	0.008	–	–	S
0.3125	0.5000	0.1562	0.005	0.003	0.547	0.031	N, S
0.3750	0.6250	0.1562	0.010	0.005	0.690	0.042	N
0.3750	0.6250	0.1960	0.010	0.005	0.690	0.042	S
0.3750	0.8750	0.2188	0.016	0.008	–	–	N
0.3750	0.8750	0.2812	0.016	0.008	0.969	0.062	N*, S

* Unshielded bearings furnished in flange type only.

5. TOLERANCES AND RADIAL INTERNAL CLEARANCE

5.1 Tolerances

5.1.1 *Tolerance class 5A – Inner rings*

TABLE 3

Bore diameter d nominal		Cylindrical bore diameter d			Width B			Radial run-out	Side run-out with bore	Groove run-out with side
over	incl.	Deviations		Variation	Deviations		Variation			
		high	low	max.	high	low	max.	max.	max.	max.
millimetres		Values in micrometres								
0.6*	10	0	− 5	3	0	− 25	5	3.5	7	7
inches		Values in 0.0001 inch								
0.024*	0.394	0	− 2	1.2	0	− 10	2	1.5	3	3

* This diameter is included in the group.

5.1.2 *Tolerance class 5A – Outer rings*

TABLE 4 a

Outside diameter D nominal		Outside diameter									Width B		
		Open bearings			Shielded and sealed bearings								
		D			D_m		D						
		Deviations		Variation	Deviations				Variation		Deviations		Variation
over	incl.	high	low	max.	high	low	high	low	max.		high	low	max.
millimetres		Values in micrometres											
2.5*	18	0	– 5	3	0	– 5	+ 1	– 6	5		0	– 25	5
(18)	30	0	– 6	3	0	– 6	+ 1	– 7	5		0	– 25	5
inches		Values in 0.0001 inch											
0.099*	0.709	0	– 2	1.2	0	– 2	+ 0.4	– 2.4	2		0	– 10	2
(0.709)	1.181	0	– 2.4	1.2	0	– 2.4	+ 0.4	– 3	2		0	– 10	2

* This diameter is included in the group.

TABLE 4 b

Outside diameter D nominal		Radial run-out	Outside surface run-out with side	Groove run-out with side	Flange width		Flange diameter	
					Deviations		Deviations	
over	incl.	max.	max.	max.	high	low	high	low
millimetres		Values in micrometres						
2.5*	18	5	8	8	0	– 50	0	– 25
(18)	30	6	8	8	0	– 50	0	– 25
inches		Values in 0.0001 inch						
0.099*	0.709	2	3	3	0	– 20	0	– 10
(0.709)	1.181	2.4	3	3	0	– 20	0	– 10

* This diameter is included in the group.

5.1.3 *Tolerance class 4A – Inner rings*

TABLE 5

Bore diameter d nominal		Cylindrical bore diameter d			Width B			Radial run-out	Side run-out with bore	Groove run-out with side
over	incl.	Deviations		Variation	Deviations		Variation			
		high	low	max.	high	low	max.	max.	max.	max.
millimetres		Values in micrometres								
0.6*	10	0	− 5	2.5	0	− 25	2.5	2.5	3	3
inches		Values in 0.0001 inch								
0.024*	0.394	0	− 2	1	0	− 10	1	1	1.2	1.2

* This diameter is included in the group.

5.1.4 *Tolerance class 4A – Outer rings*

TABLE 6 a

Outside diameter D nominal		Outside diameter								Width B		
		Open bearings			Shielded and sealed bearings							
		D			D_m		D					
		Deviations		Variation	Deviations				Variation	Deviations		Variation
over	incl.	high	low	max.	high	low	high	low	max.	high	low	max.
millimetres		Values in micrometres										
2.5*	18	0	− 5	2.5	0	− 5	+ 1	− 6	5	0	− 25	2.5
(18)	30	0	− 5	2.5	0	− 5	+ 1	− 6	5	0	− 25	2.5
inches		Values in 0.0001 inch										
0.099*	0.709	0	− 2	1	0	− 2	+ 0.4	− 2.4	2	0	− 10	1
(0.709)	1.181	0	− 2	1	0	− 2	+ 0.4	− 2.4	2	0	− 10	1

* This diameter is included in the group.

TABLE 6 b

Outside diameter D nominal		Radial run-out	Outside surface run-out with side	Groove run-out with side	Flange width		Flange diameter	
					Deviations		Deviations	
over	incl.	max.	max.	max.	high	low	high	low
millimetres		Values in micrometres						
2.5*	18	3.5	4	5	0	− 50	0	− 25
(18)	30	4	4	5	0	− 50	0	− 25
inches		Values in 0.0001 inch						
0.099*	0.709	1.5	1.5	2	0	− 20	0	− 10
(0.709)	1.181	1.5	1.5	2	0	− 20	0	− 10

* This diameter is included in the group.