Doc: PGD 13 (25114) WC
February 2025

भारतीय मानक मसौदा

स्व - संरेखित रोलर बियरिंग्स
भाग 1: एकल पंक्ति — विशिष्टि

(IS 6454 *का पहला पुनरीक्षण*)

Draft Indian Standard

Self - Aligning Roller Bearings
Part 1: Single Row — Specification

(*First revision* of IS 6454)

ICS 21.100.20

Bearings Sectional Committee, PGD 13	Last date for Comment: 29 April 2025

NATIONAL FOREWORD

This Indian Standard (First Revision) will be adopted by Bureau of Indian Standards after the draft is finalized by the Bearings Sectional Committee and approved by the Production and General Engineering Division Council.

This standard was first published in 1972. This first revision has been undertaken to align the standard with the latest technological developments and international practices in this field.

The major changes in this revision are as follows:

a) Clauses on terms and definitions, material of races and rollers and hardness have been added.
b) Clauses on dimensions, tolerances and designation have been modified.
c) Figure 1 has been added; and
d) Table 1 and Table 2 have been added.

This standard is published in two parts. Other part in this series is Part 2 Double row — Specification

In the formulation of this standard, considerable assistance has been derived from DIN 635-1 Rolling bearings, Radial spherical roller bearings - Part 1: Single row with cylindrical or tapered bore (barrel roller bearings) and DIN 635-2 Rolling bearings, Radial spherical roller bearings - Part 2: Double row, with cylindrical or tapered bore, issued by the Deutsches Institut Für Normung (DIN).

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance

with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*).’ The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

SELF - ALIGNING ROLLER BEARINGS

PART 1 — SINGLE ROW SPECIFICATION

(*First Revision*)

1 SCOPE

This Indian Standard specifies requirements for self-aligning roller bearings and their components including through hardened, induction hardened and cased hardened bearings.

This standard does not cover requirements of airframe bearings and instrument precision bearings.

2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed in Annex A.

3 TERMS AND DEFINITIONS

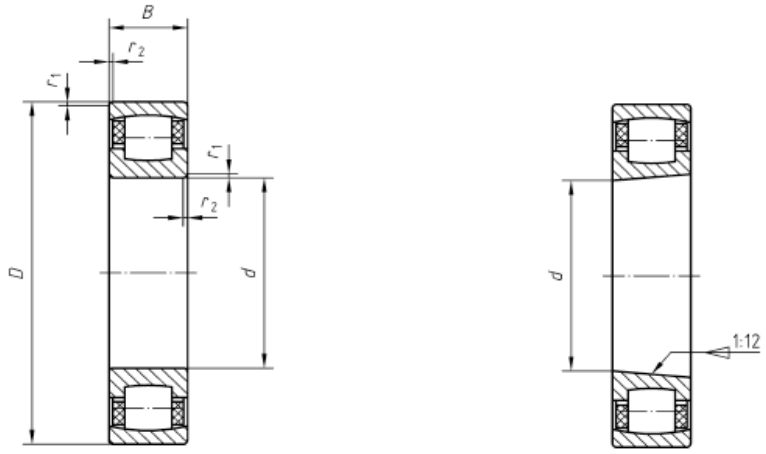
For the purpose of this standard, the terms and definitions given in IS 2399 and the following shall apply:

3.1 Supplier — The party supplying the bearings.

3.2 Purchaser — The party purchasing the bearings. This term shall also apply to person or persons expressly authorized by the purchaser to act on his behalf for inspection of the material.

4 DIMENSION AND DESIGNATIONS

Boundary dimensions and designation of single row, radial spherical roller bearings shall be as per Table 1 and Fig. 1. The designs shown are for illustrative purposes only. However, the dimensions of single row, radial spherical roller bearings shall be as specified in table 1.



a) Bearing with cylindrical bore b) Bearing with 1:12 tapered bore

B = Bearing width
D = Bearing outside diameter
d = Bearing bore diameter
r_{1s}, r_{2s} min = Smallest permissible chamfer dimension

FIG. 1 SINGLE ROW RADIAL SPHERICAL ROLLER BEARING DESIGN

Table 1 Dimension and Designation

(*Clause* 4)

All Dimensions are in millimetres

d	D	B	r_{1s}, r_{2s} min	Designation [1)]	
				Cylindrical	1:12 tapered
20	47	14	1	20204	20204 K
	52	15	1.1	20304	20304 K
25	52	15	1	20205	20205 K
	62	17	1.1	20305	20305 K
30	62	16	1	20206	20206 K
	72	19	1.1	20306	20306 K
35	72	17	1.1	20207	20207 K
	80	21	1.5	20307	20307 K
40	80	18	1.1	20208	20208 K
	90	23	1.5	20308	20308 K
45	85	19	1.1	20209	20209 K
	100	25	1.5	20309	20309 K
50	90	20	1.1	20210	20210 K
	110	27	2	20310	20310 K
55	100	21	1.5	20211	20211 K
	120	29	2	20311	20311 K
60	110	22	1.5	20212	20212 K
	130	31	2.1	20312	20312 K
65	120	23	1.5	20213	20213 K
	140	33	2.1	20313	20313 K
70	125	24	1.5	20214	20214 K
	150	35	2.1	20314	20314 K
75	130	25	1.5	20215	20215 K
	160	37	2.1	20315	20315 K
80	140	26	2	20216	20216 K
	170	39	2.1	20316	20316 K
85	150	28	2	20217	20217 K
	180	41	3	20317	20317 K
90	160	30	2	20218	20218 K
	190	43	3	20318	20318 K
95	170	32	2.1	20219	20219 K

	200	45	3	20319	20319 K
100	180	34	2.1	20220	20220 K
	215	47	3	20320	20320 K
105	190	36	2.1	20221	20221 K
	225	49	3	20321	20321 K
110	200	38	2.1	20222	20222 K
	240	50	3	20322	20322 K
120	215	40	2.1	20224	20224 K
	260	55	3	20324	20324 K
130	230	40	3	20226	20226 K
	280	58	4	20326	20326 K
140	250	42	3	20228	20228 K
	300	62	4	20328	20328 K
150	270	45	3	20230	20230 K
	320	65	4	20330	20330 K
160	290	48	3	20232	20232 K
	340	68	4	20332	20332 K
170	310	52	4	20234	20234 K
	360	72	4	20334	20334 K
180	320	52	4	20236	20236 K
	380	75	4	20336	20336 K
190	340	55	4	20238	20238 K
	400	78	5	20338	20338 K
200	360	58	4	20240	20240 K
	420	80	5	20340	20340 K
220	400	65	4	20244	20244 K
	460	88	5	20344	20344 K
240	440	72	4	20248	20248 K
	500	95	5	20348	20348 K
260	480	80	5	20252	20252 K
280	500	80	5	20256	20256 K

1) Designation given is informative and may vary for different manufacturers.

5 TOLERANCES AND GEOMETRICAL CHARACTERISTICS

Tolerances and geometrical characteristics of the boundary dimensions shall be as specified in IS 5692 and shall be tabulated based on precision class of bearing from tolerance class ‘2’ to tolerance class ‘Normal’.

6 MATERIAL OF RACES AND ROLLERS

6.1 Radial Spherical Roller Bearing has to fulfil the requirements for fatigue strength, wear resistance, hardness, toughness and structural stability. The material used for the races and rolling elements is generally a low alloy, through hardening chromium steel of high purity. For bearings subjected to considerable shock loads and reversed bending stresses, case hardening steel is also used as per agreement between the supplier and the manufacturer.

6.2 Material of races and rollers shall be as specified in IS 17111 or IS 4398 as applicable.

7 CAGE

7.1 Rolling bearing press steel cages are widely used for radial spherical roller bearing. Material of steel cages shall be as specified in IS 4397 or IS 513 (Part 1).

7.2 In some of case radial spherical roller bearing cages are also made with brass and polyamide. Material for such cages may be as agreed between the supplier and the manufacturer.

8 RADIAL INTERNAL CLEARANCE

8.1 Radial internal clearance is 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.

8.2 Radial internal clearance shall be as specified in IS 5935 (Part 1).

9 SURFACE FINISH

9.1 The outer surface, bore and the sides of rolling bearings shall have the maximum values of surface roughness as given in Table 2 when measured in accordance with IS 3073.

9.2 The surface finish of the functional surfaces shall be as per agreement between the purchaser and the supplier.

10 HARDNESS

10.1 The hardness of the inner rings, outer rings and rolling elements shall be minimum 58 HRC.

10.2 For special heat treatment, hardness requirement may be as agreed between the supplier and the purchaser.

10.3 There shall be no impression of the test cone on the load bearing surface.

Table 2 Dimension and Designation
(*Clause* 9.1)

All Dimensions are in millimetres

Nominal Diameter (mm)		**Permissible Mean Surface Roughness (R) (µm)**		
above	up to	Bore	Outside Surface	Sides
18	50	0.6	-	0.6
50	62	0.7	0.25	0.6
62	80	0.7	0.4	0.6
80	120	0.8	0.4	0.6
120	250	0.8	0.6	0.6
250	400	1	0.6	0.6

400	500	1	0.8	0.6
500	800	1.2	0.8	0.6
800	1000	1.2	1.2	0.6
1000	2000	1.4	1.2	0.6
2000	2500	-	1.2	0.6

11 LOAD RATING

11.1 Basic Dynamic Radial Load Rating

11.1.1 The basic dynamic load rating 'C' is that load of constant magnitude and direction which a sufficiently large number of apparently identical bearings can endure for a basic rating life of one million revolutions.

11.1.2 IS 3824 shall be followed for arriving at basic dynamic radial load rating for radial spherical roller bearing.

11.1.3 This standard is not applicable to designs where the rolling elements operate directly on a shaft or housing surface, bearing rings which are integral to housing, for example, planet gear which also acts as bearing raceway unless that surface is equivalent in all respects to the bearing rings quality.

11.2 Basic Static Radial Load Rating

11.2.1 Permanent deformations appear in rolling elements and raceways of rolling bearings under static loads of moderate magnitude and increase gradually with increasing load. Basic static radial load rating is the radial load which corresponds to a calculated contact stress at the center of the most heavily loaded rolling element/raceway contact of 4000 MPa for all radial roller bearing types. For these contact stresses, under static load, a total permanent deformation of rolling element and raceway occurs which is approximately 0.0001 times of the rolling element diameter.

11.2.2 IS 3823 shall be followed for arriving at basic static radial load rating for radial spherical roller bearing.

12 WORKMANSHIP AND DELIVERY REQUIREMENT

12.1 Visual Inspection — The surfaces of the bore, outside diameter, sides, and load carrying areas shall be smooth and shall not show any damaged areas.

12.2 Product Noise — The running noise of the rolling bearings shall be as agreed to between the supplier and the purchaser.

12.3 Interchangeability — Complete rolling bearings with the same bearing designation, same boundary dimensions shall be interchangeable with regards to fitting and the functioning.

12.4 Temperatures — The rolling bearing parts during service shall withstand at least 100°C.

12.4.1 Rolling bearings for service temperatures over 100°C shall be specially heat treated by manufacturer. The supply of these rolling bearings shall be in accordance with agreement between the purchaser and the supplier.

12.5 Protection against Corrosion — The type of protection against corrosion shall be decided by the manufacturer depending on the packing material used. Under proper storage conditions, the anti-corrosive treatment shall be effective for at least 12 months in order to ensure a satisfactory functioning of the rolling bearings, unless otherwise required by the purchaser.

12.5.1 For proper storage conditions, the purchaser may consult the manufacturer.

13 PACKING

Rolling bearings treated as specified in **12.5** for corrosion protection shall be individually packed. Multiple individually packed bearings may be grouped together in suitable containers, depending on their size. The packaging shall be designed to safeguard the contents from external influences, including moisture and contaminants to maintain their corrosion resistance.

14 MARKING

14.1 Packed containers shall be marked with the following:

a) Manufacturer's name or trademark;
b) Designation of the bearing;
c) Coded or direct indication of month and year of manufacture; and
d) Quantity.

14.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the standard mark.

15 SAMPLING AND CRITERIA FOR ACCEPTANCE

Sampling and acceptance criteria shall be as given in Annex B.

ANNEX A

(*Clause* 2)

REFERENCES

IS	*Title*
IS 513 (Part 1) : 2016	Cold reduced carbon steel sheet and strip: Part 1 Cold forming and drawing purpose (*sixth revision*)
IS 2399 : 2024	Rolling bearings — Vocabulary (*third revision*)
IS 3073 : 1967	Assessment of surface roughness
IS 3823 : 2014	Rolling bearings — Static load ratings (*third revision*)
IS 3824 : 2014	Rolling bearings — Dynamic load ratings and rating life (*third revision*)
IS 4397 : 1999	Cold-rolled carbon steel strips for ball and roller bearing cages/retainers
IS 4398 : 1994	Carbon-chromium steel for the manufacture of balls, rollers and bearing races (*second revision*)
IS 4905 : 2015	Random sampling and randomization procedures (*first revision*)
IS 5692 : 2024	Rolling bearings — Radial bearings — Geometrical product specifications (GPS) and tolerance values (*third revision*)
IS 5935 (Part 1) : 2019	Rolling bearings — Internal clearance: Part 1 Radial internal clearance for radial bearings (*second revision*)
IS 17111 : 2019	Heat-treated steels, alloy steels and free-cutting steels — Ball and roller bearing steels

ANNEX B
(*Clause* 15)

SAMPLING AND CRITERIA FOR ACCEPTANCE

B-1 SCALE OF SAMPLING

B-1.1 Lot

In any consignment, all rolling bearings of the same designation and manufactured under similar conditions of production shall be grouped together to constitute a lot.

B-1.2 Rolling bearings from each lot shall be examined to ascertain its conformity to the requirements of the relevant specification.

B-1.3 Unless otherwise agreed to between the supplier and the purchaser the number of ball bearings to be selected at random shall be in accordance with col 1 and col 2 of Table 3. To ensure randomness, selection methods given in IS 4905 shall be followed.

B-1.4 Number of Tests and Criteria for Conformity

B-1.4.1 The rolling bearings selected according to **B-1.3** shall be inspected for dimensions and tolerances, workmanship, surface finish and protection against corrosion. Any bearing failing to meet requirements for any one or more of the above characteristics shall be declared as defective.

B-1.4.1.1 The lot shall be considered conforming to the requirements of the above characteristics, if the number of rolling bearings found defective according to **B-1.3** is less than or equal to the corresponding acceptance number given under col 3 of Table 3.

Table 3 Scale of Sampling and Criteria for Conformity
(*Clauses* B-1.3, B-1.4.1.1 and B-1.4.2)

S.No	Lot Size	Sampling Size	Acceptance Number	Sub-Sample Size
(1)	(2)	(3)	(4)	(5)
i)	Up to 50	5	0	3
ii)	51 to 160	8	0	5
iii)	161 to 300	13	0	5
iv)	301 to 500	20	0	8
v)	501 to 1 000	32	1	13
vi)	1001 and above	60	1	13

B-1.4.2 If the lot is found satisfactory according to **B-1.4.1.1**, a number of rolling bearings corresponding to sub-sample size given under col 4 of Table 3 shall be selected and shall be subjected to hardness test.

B-1.4.2.1 The lot shall be considered satisfactory to the requirements of the specification, if none of the rolling bearings fails to meet the requirement for hardness.