**BUREAU OF INDIAN STANDARDS**
**DRAFT FOR COMMENTS ONLY**

**Doc No.: PGD 13 (25114) P-Draft**
**April 2024**

*प्रारंभिक मसौदा*

# स्व - संरेखित रोलर बियरिंग्स

## भाग 1 — एकल पंक्ति विशिष्टता

[IS 6454 *का पहला पुनरीक्षण*]

*Preliminary Draft*

# 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: 09-July-2024 |

## NATIONAL FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft was finalized by the Bearings Sectional Committee and had been approved by the Production and General Engineering Division Council.

This standard was first published in 1972. This revision has been taken up to incorporate feedback gained through experience and other developments taken at international level in this field.

In this revision, the following changes have been made:

a) Clauses on terminology, material specification, 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.

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.

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*Indian Standard*

# SELF ALIGNING ROLLER BEARINGS — SPECIFICATION

(*First Revision*)

## 1 SCOPE

This 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 given below contain provisions which, through reference in this text, constitute provisions 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 standard indicated below:

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

## 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

### 4.1 Single Row Radial Spherical Roller Bearings

The designs shown are for illustrative purposes only; however, the dimensions of single row, radial spherical roller bearings shall be as specified. Details of the inner design are not standardized. Boundary dimensions and designation of single row, radial spherical roller bearings shall be as per Table 1 and Fig. 1.

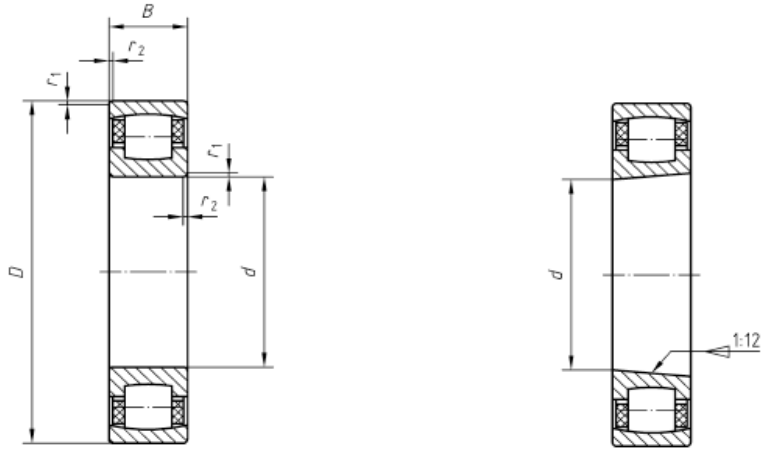
**Table 1 Dimension and Designation**
(*Clause* 4.1)

All Dimensions are in millimetres

| d | D | B | r1s, r2s 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.




Bearing with cylindrical bore 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

## 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, 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 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.

### 12.2 Basic Static Radial Load Rating

**12.2.1** 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.

**12.2.2** IS 3823 shall be followed for arriving at basic static radial load rating for Radial Spherical Roller Bearing.

## 13 WORKMANSHIP AND DELIVERY REQUIREMENT

### 13.1 Visual Inspection

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

### 13.2 Product noise

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

### 13.3 Interchangeability

Complete rolling bearings with the same bearing Designation 1)s, same boundary dimensions shall be interchangeable with regards to fitting and the functioning.

### 13.4 Temperatures

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

**13.4.1** 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.

### 13.5 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.

**13.5.1** For proper storage conditions, the purchaser may consult the manufacturer.

## 14 PACKING

Rolling bearings treated as in 13.5 shall be packed individually and several pieces may be packed together in suitable containers depending on the size. The packing shall be such as to protect the contents from external influences.

## 15 MARKING

**15.1** Packed containers may 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.

### 15.2 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.

## 16 SAMPLING AND CRITERIA FOR ACCEPTANCE

Shall be as given in Annex A.

# ANNEX A

(*Clause* 16)

## SAMPLING AND CRITERIA FOR ACCEPTANCE

### A-1 SCALE OF SAMPLING

#### A-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.

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

**A-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.

#### A-1.4 Number of Tests and Criteria for Conformity

**A-1.4.1** The rolling bearings selected according to A-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.

**A-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 A-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**

(*Clause* A-1.3, A-1.4.1.1 and A-1.4.2)

| **Lot Size** (1) | **Sampling Size** (2) | **Acceptance Number** (3) | **Sub-Sample Size** (4) |
|---|---|---|---|
| Up to 50 | 5 | 0 | 3 |
| 51 to 160 | 8 | 0 | 5 |
| 161 to 300 | 13 | 0 | 5 |
| 301 to 500 | 20 | 0 | 8 |
| 501 to 1 000 | 32 | 1 | 13 |
| 1 001 and above | 60 | 1 | 13 |

**A-1.4.2** If the lot is found satisfactory according to A-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 subjected to hardness test.

**A-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.

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This Indian Standard has been developed from Doc No.: PGD 13 (15471).

**Amendments Issued Since Publication**

| Amendment No. | Date of Issue | Text Affected |
|---|---|---|
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