



Designation: F 2246 – 03

Standard Specification for Bearing, Roller, Needle: Thick Outer Ring With Rollers and Cage¹

This standard is issued under the fixed designation F 2246; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers needle roller bearings having thick outer rings, with rollers and cages.

1.2 The bearings being specified are intended to be used with hardened shafts (HRC58-65; see Test Methods E 18). For use with unhardened shafts, bearings should be used in conjunction with inner bearing ring as specified in MS51962 shown as bearing assemblies in MS500072.

1.3 The use of recycled materials that meet the requirements of the applicable material specification without jeopardizing the intended use of the item is encouraged.

1.4 Bearings designed to this specification are intended for use in applications requiring high radial load with minimal angular shaft misalignment.

1.5 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are provided for information only.

NOTE 1—This specification contains many of the requirements of MS 51961, which was originally developed and maintained by the Defense Supply Center Richmond.

2. Referenced Documents

2.1 ASTM Standards:

E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials²

2.2 ANSI Standard:³

ANSI B46.1 Surface Texture (Surface Roughness, Waviness, and Lay)

2.3 SAE Standards:⁴

SAE J-404 Chemical Compositions of SAE Alloy Steels
SAE AMS-STD-66 Steel: Chemical Composition and Hard-
enability

2.4 Military Standards:⁵

MIL-STD-130 Identification Marking of U.S. Military Property

MS500072 Bearing, Roller, Needle: Assembly (Thick Outer Race)

MS51962 Ring Bearing, Inner: For Needle Roller Bearing with Thick Outer Ring

2.5 American Bearing Manufacturers Association Standard:⁶

ABMA 18.1 Needle Roller Bearings Radial, Inch Design

2.6 International Organization for Standardization Standards:⁷

ISO 492 Rolling Bearings—Radial Bearings—Tolerances

ISO 3096 Rolling Bearings—Needle Rollers—Dimensions and Tolerances

ISO 5593 Rolling Bearings—Vocabulary

3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification, refer to ISO 5593, Rolling Bearings—Vocabulary.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *average life (L_{50})*—for a radial roller bearing, the number of revolutions that 50 % of a group of bearings will complete or exceed before the first evidence of fatigue develops.

3.2.1.1 *Discussion*—The average life is approximately five times the rating life.

3.2.2 *basic dynamic load rating (C_r)*—for a radial roller bearing, that calculated, constant radial load that a group of apparently identical bearings with stationary outer rings can theoretically endure for a rating life of one million revolutions of the inner ring.

3.2.2.1 *Discussion*—Since applied loading as great as the basic dynamic load rating tends to cause local plastic deformation of the rolling surfaces, it is not anticipated that such heavy loading would normally be applied.

¹ This specification is under the jurisdiction of ASTM Committee F34 on Rolling Element Bearings and is the direct responsibility of Subcommittee F34.06 on Aerospace.

Current edition approved May 10, 2003. Published June 2003.

² *Annual Book of ASTM Standards*, Vol 03.01.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

⁴ Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001.

⁵ Available from USA Information Systems, 1092 Laskin Rd. Ste. 208, Virginia Beach, VA 23451.

⁶ Available from Techstreet, 1327 Jones Drive, Ann Arbor, MI 48105.

⁷ Available from ANSI Washington, D.C. Headquarters, 1819 L Street, NW, 6th Floor, Washington, DC, 20036

3.2.3 *basic static load rating (C_{or})*—for a radial roller bearing, that uniformly distributed static radial load which produces a maximum contact stress at the center of the most heavily loaded rolling element contact of 580 000 psi (4000 Mpa).

3.2.3.1 *Discussion*—For this contact stress, a total permanent deformation of roller element plus raceway occurs, which is approximately 0.0001 of the roller diameter.

3.2.4 *rating life (L_{10})*—for a radial roller bearing, the number of revolutions that 90 % of a group of bearings will complete or exceed before the first evidence of fatigue develops.

4. Ordering Information

4.1 When ordering parts in accordance with this specification, specify the following:

- 4.1.1 ASTM designation number, including year of issue,
- 4.1.2 Dash number (see Table 1),
- 4.1.3 Dimensions of roller bearings, including:
 - 4.1.3.1 Bore diameter, in. (mm),
 - 4.1.3.2 Outside diameter, in. (mm),
 - 4.1.3.3 Width, in. (mm), and
 - 4.1.3.4 Radius, in. (mm),
- 4.1.4 Load rating, including basic static load rating, lb (N) and basic dynamic load rating, lb (N), and
- 4.1.5 Approximate limiting speed, rpm.

5. Materials and Manufacture

5.1 *Rollers*—Rollers shall be manufactured of steel, alloy, grade E50100, E51100 or E52100 in accordance with SAE AMS-STD-66 or SAE J-404.

5.2 *Rings*—Rings shall be manufactured of steel, alloy or carbon, carburizing grade 4620, 4720, 8620, 8720, or 1010-1020 in accordance with SAE AMS-STD-66 or SAE 51100 or SAE 52100 in accordance with SAE J-404.

5.3 *Cages*—Cages shall be manufactured of steel, brass, or bronze, or other material in accordance with manufacturer’s standards.

6. Other Requirements

6.1 *Heat Treatment:*

6.1.1 *Rollers*—Rollers shall be through hardened to Rockwell HRC58-66 in accordance with Test Methods E 18.

6.1.2 *Rings:*

6.1.2.1 Steel 4620, 4720, 8620, 8720, and 1010-1020 shall be case hardened to Rockwell HRC58-65, in accordance with Test Methods E 18. Case depth shall be 0.025 in. (0.64 mm) minimum.

6.1.2.2 Steel SAE 51100 and SAE 52100 shall be through hardened to Rockwell HRC58-65, in accordance with Test Methods E 18.

6.2 *Protective Coating:*

6.2.1 Bearings shall be furnished without plating.

6.2.2 Manufacturer shall coat bearings with rust preventive film.

6.3 *Lubrication*—Bearings shall be furnished without lubrication.

7. Dimensions, Mass, and Permissible Variations

7.1 Products manufactured in accordance with this specification shall meet the requirements shown in Table 1.

7.2 Bearings are intended to be installed on shafts where maximum taper does not exceed 0.0005 in. per inch (0.0005 mm per mm) of bearing width.

7.3 Bearing bore should be checked using a “go” plug gage that is 0.0001 in. (0.0025 mm) less than the minimum diameter under the needle rollers column of Table 1, and “no go” plug gage that is 0.0001 in. (0.0025 mm) larger than the maximum diameter under the needle rollers column of Table 1. The “no go” gage may enter 25 % of the roller length.

7.4 One end of the bearing must clear the maximum housing fillet radius shown in the radius column of Table 1. A minimum chamfer of 1/32 in. (0.79 mm) on the opposite end may be used in lieu of radius clearance. When ends are not identical, the marking (see Section 13) shall be applied to the end with the largest surface.

7.5 The needle roller diameter variation in each bearing shall fall within the limitations prescribed within ISO 3096 for Grade 5.

7.6 The run-out for each bearing outside diameter and raceway inside diameter shall be within the limitations prescribed in ISO 492 for the Normal Class.

7.7 Oil grooves and between one and four oil holes shall be included in accordance with manufacturer’s standard practice.

8. Workmanship, Finish and Appearance

8.1 *Surface Finish:*

8.1.1 *Needle Rollers*—Needle rollers shall have a maximum surface roughness, in accordance with ANSI B46.1, of 8 μ in. R_a (0.20 μ m R_a).

8.1.2 *Rings*—The raceway surface (bore) of the outer ring shall have a maximum surface roughness, in accordance with ANSI B46.1, of 20 μ in. R_a (0.51 μ m R_a).

9. Rating Life of Roller Bearing

9.1 Use the following equation to calculate rating life of roller bearing, L_{10} , in millions of revolutions, at loads other than the basic dynamic load ratings:

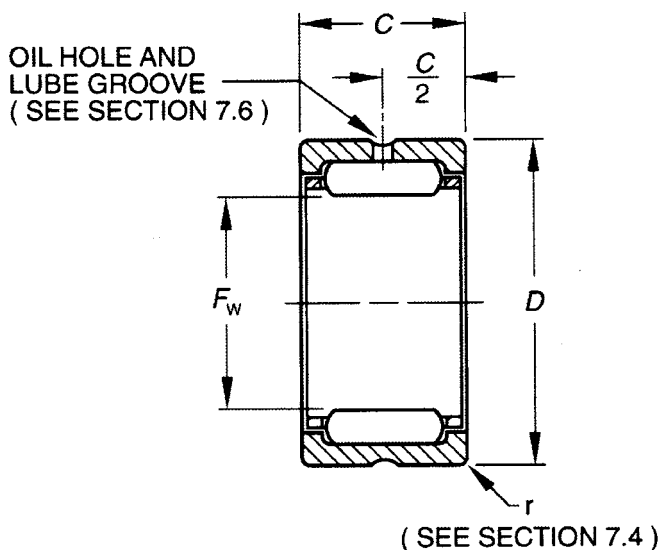


FIG. 1 Schematic Drawing—Roller Bearing