

ANSI/ABMA 16.1

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ANSI/AFBMA
Std. 16.1-1988

**AMERICAN NATIONAL STANDARD
AFBMA STANDARD**

**AIRFRAME BALL, ROLLER AND
NEEDLE ROLLER BEARINGS
METRIC DESIGN**

Sponsor

The Anti-Friction Bearing
Manufacturers Association, Inc.

November 17, 1988
American National Standards Institute, Inc.

American National Standard

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FOREWORD

(This foreword is not a part of ANSI/AFBMA Standard 16.1-1987, Airframe Ball, Roller and Needle Roller Bearings, Metric Design.)

This American National Standard consolidates the boundary dimensions, tolerances and radial internal clearances for metric design airframe bearings which have been standardized for general use in the USA.

The dimensions, tolerances and clearances stated in this standard are based on metric units and are found in Part 1 of the various tables. A soft conversion to U.S. customary (inch-pound) units is provided in Part 2 of the various tables for the convenience of the user.

Suggestions for the improvement of this Standard gained through experience with its use will be welcomed. These should be sent to the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

The officers of Accredited Standards Committee B3 of the American National Standards Institute and the organizations represented at the time this Standard was submitted are as follows:

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 American Society of Lubrication Engineers
 Anti-Friction Bearing Manufacturers Association
 Hydraulic Institute
 National Machine Tool Builders Association
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AFBMA Standards for Ball and Roller Bearings and Balls

- 1 — Terminology
- 4 — Tolerance Definitions and Gaging Practices
- 7 — Shaft and Housing Fits for Metric Radial Ball and Roller Bearings
(Except Tapered Roller Bearings) Conforming to Basic Boundary Plans
- 8.1 — Ball and Roller Bearing Mounting Accessories, Metric Design
- 8.2 — Ball and Roller Bearing Mounting Accessories, Inch Design
- 9 — Load Ratings and Fatigue Life for Ball Bearings
- 10 — Metal Balls
- 11 — Load Ratings and Fatigue Life for Roller Bearings
- 12.1 — Instrument Ball Bearings, Metric Design
- 12.2 — Instrument Ball Bearings, Inch Design
- 13 — Rolling Bearing Vibration and Noise
- 14 — Housings for Bearings With Spherical Outside Surfaces
- 15 — Ball Bearings With Spherical Outside Surfaces and Extended Inner Ring
Width (Includes Eccentric Looking Collars)
- 16.1 — Airframe Ball, Roller and Needle Roller Bearings, Metric Design
- 16.2 — Airframe Ball, Roller and Needle Roller Bearings, Inch Design
- 17 — Needle Rollers, Metric Design
- 18.1 — Needle Roller Bearings Radial, Metric Design
- 18.2 — Needle Roller Bearings Radial, Inch Design
- 19 — Tapered Roller Bearings Radial, Inch Design
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- 20 — Metric Ball and Roller Bearings (Except Tapered Roller Bearings)
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- 21.1 — Thrust Needle Roller and Cage Assemblies and Thrust Washers,
Metric Design
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- 22.2 — Spherical Plain Bearings, Joint Type, Inch Design
- 23.2 — Thrust Bearings of Tapered Roller Type, Inch Design
- 24.1 — Thrust Bearings of Ball, Cylindrical Roller and Spherical Roller Types,
Metric Design
- 24.2 — Thrust Bearings of Ball and Cylindrical Roller Types, Inch Design

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AIRFRAME BALL, ROLLER AND NEEDLE ROLLER BEARINGS METRIC DESIGN

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Double Row - Torque Tube				
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Track Roller - Yoke Type		5.5	6.4	7.4
Track Roller - Stud Type		5.6	6.5	7.5
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Single Row, Rigid	Dia. 0	5.7	6.6	7.6
Single Row, Rigid	Dia. 2	5.8	6.6	7.6
Single Row, Rigid	Dia. 8/9	5.9	6.6	7.6
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AIRFRAME BALL, ROLLER AND NEEDLE ROLLER BEARINGS METRIC DESIGN

1. SCOPE AND FIELD OF APPLICATION

1.1 This Standard specifies characteristics, boundary dimensions, tolerances and radial internal clearances of rolling bearings, other than tapered roller bearings, used in airframes. For the purposes of this Standard, an airframe is defined as the general structure of an aircraft and includes its control surfaces, all flaps and doors and their respective mechanisms. Inch equivalents for metric series bearings are included in this Standard to assist the user.

1.2 The fact that a bearing is not included in this Standard does not exclude the possibility that it may be used to advantage in airframe applications.

2. REFERENCES

ANSI/AFBMA Standard 1-1984—Terminology for Anti-Friction Ball and Roller Bearings and Parts.

ANSI/AFBMA Standard 4-1984—Tolerance Definitions and Gaging Practices for Ball and Roller Bearings.

ISO 1002-1983—Rolling bearings—Airframe bearings—Characteristics, boundary dimensions, tolerances, static load ratings.

3. CHARACTERISTICS

3.1 Airframe bearings are designed for high load oscillating motion or slow intermittent rotation and to provide high capacity with minimum weight and size.

3.2 Load ratings for airframe bearings are unique to the airframe industry, and do not follow normal bearing load rating standards. The basic rating utilized is the Limit Load, which is the maximum static radial or thrust load which can be applied to a bearing without impairing the subsequent functioning of the bearing in airframe applications. Load ratings for the bearings listed in this Standard may be found in the manufacturers' catalogs or appropriate Defense Standards (DS).

3.3 The bearings included in this Standard are usually full complement bearings (no cage and full complement of rolling elements) with basically cylindrical bore and outside surface and are sealed or shielded. The bearings are normally supplied adequately charged with suitable grease, and the external surfaces of the bearings may be protected by the same grease.

The bearing design usually provides for one or more of the following:

- Extended inner ring and bore dimensions for mounting on standard bolts.
- Prelubrication and protection by integral closures.
- Ability to accommodate considerable misalignment.
- Special configuration for use in airframe applications.
- External corrosion resistance. (Bores are not plated.)

3.4 For airframe bearings which have been standardized in ISO 1002, the boundary dimensions, tolerances and clearances have been used in this Standard. The bearings are identified by the diameter series used in ISO 1002.

4. SYMBOLS AND NOMENCLATURE

- d = bearing bore diameter, nominal
- Δd_{mp} = single plane mean bore diameter deviation
- Δd_s = deviation of a single bore diameter
- d_1 = stud diameter
- d_2 = cotter pin hole diameter
- d_a = clamping face diameter
- D = bearing outside diameter, nominal
- ΔD_{mp} = single plane mean outside diameter deviation
- ΔD_s = deviation of a single outside diameter
- C = outer ring width, nominal
- ΔC_s = deviation of a single width of the outer ring
- V_{Cs} = outer ring width variation
- C_1 = nominal width of track contact (cylindrical)
- C_{1s} = single width of track contact (cylindrical)
- C_2 = stud washer standoff
- B = inner ring width, nominal
- ΔB_s = deviation of a single width of the inner ring
- V_{Bs} = inner ring width variation
- B_2 = stud length

- B_4 = location of cotter pin hole
 r = outer ring radial and axial chamfer dimension
 r_s = outer ring single chamfer dimension
 r_i = inner ring radial and axial chamfer dimension
 r_{is} = inner ring single chamfer dimension
 K_{ia} = radial runout of assembled bearing inner ring
 K_{ea} = radial runout of assembled bearing outer ring
 θ = angular displacement permissible between inner and outer ring axes of a self-aligning bearing
 γ = grease fitting displacement from shank centerline to grease fitting centerline
 G = stud thread
 G_1 = length of stud thread
 L = lubrication hole diameter or groove width

5. BOUNDARY DIMENSIONS

The boundary dimensions shown in Tables 5.1 through 5.13 represent actual airframe bearing usage. The number of ball and roller bearings tabulated has been held to the practical minimum in order to promote standardization and economic production yet provide a sufficient number of alternative types to satisfy present and future airframe bearing user needs.

6. TOLERANCES

The tolerances applicable to the airframe bearings listed in Tables 5.1 through 5.13 are shown in Tables 6.1 through 6.7.

Where plating is specified, tolerances are applicable after plating.

7. RADIAL INTERNAL CLEARANCE

The radial internal clearances for the airframe bearings listed in Tables 5.1 through 5.13 are shown in Tables 7.1 through 7.7.