



ANSI/AFBMA  
Std. 12.1 - 1992  
(Revision of ANSI/AFBMA  
Std. 12.1 - 1985)

## **AMERICAN NATIONAL STANDARD**

### **AFBMA STANDARD**

## **INSTRUMENT BALL BEARINGS**

### **METRIC DESIGN**

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## FOREWORD

(This foreword is not a part of American National Standard ANSI/AFBMA Std. 12.1-1991, Instrument Ball Bearings - Metric Design.)

This Standard is a revision of ANSI/AFBMA Standard 12.1-1985 and covers some of the metric design instrument ball bearings presently in production in the U.S.A. The revision primarily addresses changes in the classification procedures for selective assembly and incorporated the current U.S.A. practice of using the  $f_{cm}$  factor in calculating dynamic load ratings.

The Standard covers the characteristics that define the requirements of precision and super-precision instrument ball bearings. It establishes their boundary dimensions, tolerances, internal clearances, and classification for selective assembly. The recommended practices for gauging, frictional torque determination, load rating determination, and operational life prediction and yield rate limitation are provided. All components covered by this Standard are designed to S.I. (metric) dimensions and are presented in Part 1 of the tables provided. The equivalent U.S. Customary (inch) dimensions shown in Part 2 of the Tables are provided for the convenience of those using that system.

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., 11 West 42nd Street - 13th Floor, New York, New York, NY 10036.

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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Hydraulic Institute  
National Machine Tool Builders Association  
Society of Tribologists and Lubrication Engineers  
U.S. Department of Defense, DISC  
U.S. Department of the Navy

AFBMA Standards  
for  
Ball and Roller Bearings  
and Balls

- 1 — Terminology
- 4 — Tolerance Definitions and Gauging 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 Locking 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
- 19.1 — Tapered Roller Bearings, Radial, Metric Design
- 20 — Radial Bearings of Ball Cylindrical Roller and Spherical Roller Types, Metric Design
- 21.1 — Thrust Needle Roller and Cage Assemblies and Thrust Washers, Metric Design
- 21.2 — Thrust Needle Roller and Cage Assemblies and Thrust Washers, Inch Design
- 22.2 — Spherical Plain Bearings, Joint Type, Inch Design
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- 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
- 25.2 — Rolling Bearings, Linear Motion, Recirculating Ball, Sleeve Type, Inch Series

An AFBMA Standard is intended as a guide to aid the manufacturer, the consumer and the general public. The existence of an AFBMA Standard does not in any respect preclude anyone, whether he has approved the Standard or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standard. AFBMA Standards are subject to revision or withdrawal at any time and users who refer to an AFBMA Standard should satisfy themselves that they have the latest information from the Association.

# INSTRUMENT BALL BEARINGS INCH DESIGN

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## **Instrument Ball Bearings Metric Design**

### **1. SCOPE**

**1.1** This standard covers the characteristics that define metric design instrument ball bearings, their boundary dimensions, tolerances, internal clearances, classification for selective assembly, and recommended practices for gaging, friction torque determination, load rating, operational life prediction and yield rate limitation.

**1.2** The standard applies only to the size ranges covered by Paragraph 4, Boundary Dimensions.

### **2. CHARACTERISTICS**

**2.1** Instrument ball bearings comprise bearings with functional requirements for use in any unit that can, in a general sense, be characterized as an instrument.

**2.2** Instrument ball bearings must be particularly free from foreign matter and are typically applied to meet one or more of the following characteristics:

- a. Positional accuracy.
- b. Low friction torque.
- c. Smoothness of operation.
- d. Yield rate limitation.

Due to the many specialized requirements that exist in instrument applications, specifications for these characteristics should be established only after full agreement between the manufacturer and the user.

**2.3** Instrument precision ball bearings meet tolerances specified in Classes ABEC 5P, ABEC 7P, ABEC 9P, ABEC 5T and ABEC 7T and may reflect specific requirements against one or more of the characteristics of Paragraph 2.2 above.

**2.4** Instrument semi-precision ball bearings meet tolerances specified in Class ABEC 3P.