



ANSI/AFBMA  
Std. 13-1987  
(Revision of ANSI/AFBMA  
Std. 13-1970)

## AMERICAN NATIONAL STANDARD

### AFBMA STANDARD

# ROLLING BEARING VIBRATION AND NOISE

## (METHODS OF MEASURING)

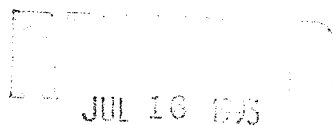
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Approved September 2, 1987

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## FOREWORD

(This Foreword is not part of ANSI/AFBMA Standard 13-1987, Rolling Bearing Vibration and Noise (Methods of Measuring))

This standard was originally developed by the Annular Bearing Engineers Committee (ABEC) and the Roller Bearing Engineers Committee (RBEC) of The Anti-Friction Bearing Manufacturers Association, Inc., (AFBMA), in response to increasing demands from industry and government services for standards to cover the measurement of noise and vibration in rolling contact (ball and roller) bearings.

As a result of the studies and deliberations of these committees of the AFBMA, members of which had frequent association and contact with equipment builders and users who have need for quiet running bearings, this standard was presented to Sectional Committee B3 of The American National Standards Institute for their review and approval in September 1969. After approval of that committee in December 1969, this standard was approved by The American National Standards Institute on November 20, 1970. This standard was reapproved in 1977 and in 1986.

In response to growing interest for standards for measuring noise and vibration of instrument ball bearings, Section III to the Standard was added in 1987. This section provides the concepts which should be part on any specified test methods for instrument ball bearing noise and vibration.

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 the Standard was submitted are as follows:

S. R. Ahlman, Chairman

G. T. Satterfield, Secretary

American Society of Agricultural Engineers  
American Society of Lubrication Engineers  
Anti-Friction Bearing Manufacturers Association  
Hydraulic Institute  
National Machine Tool Builders Association  
Society of Automotive 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 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
- 19.1 — Tapered Roller Bearings — Radial, Metric Design
- 20 — Radial Bearings of Ball, Cylindrical Roller and Spherical Roller Types, Metric Design
- 21 — Metric Thrust Needle Roller and Cage Assemblies and Thrust Washers
- 21.2 — Thrust Bearings of Ball, Cylindrical Roller, Tapered Roller and Needle Roller Types, Inch Design
- 22 — Spherical Plain Bearings, Joint Type

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.

# AMERICAN NATIONAL STANDARD AFBMA STANDARD ROLLING BEARING VIBRATION AND NOISE

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# AMERICAN NATIONAL STANDARD AFBMA STANDARD ROLLING BEARING VIBRATION AND NOISE

## 1. GENERAL

### 1.1 Scope

**1.1.1 Purpose.** Under certain operating conditions, vibration in rotating rolling bearings can be of importance as an operating characteristic of such bearings. For this reason, the measurement of vibration emitted by a rolling bearing under specified test conditions is utilized for study and qualification as one facet of quality assurance.

This standard on rolling bearing noise and vibration serves to define and specify, for purposes of bearing quality assurance, the physical quantities measured and the test conditions utilized in measurement of vibration and noise generated by rolling bearings. Based on the standard, parties to the acceptance inspection of rolling bearings may, by agreement, establish acceptance specifications and grades of rolling bearings with which to control bearing vibration and noise.

**1.1.2 Limitations of Standard.** Rolling bearing vibration and noise are complex physical phenomena. The knowledge of vibration and noise of bearings under a given set of test conditions does not necessarily afford a means of judging the vibratory behavior of the bearing to be expected under different conditions, nor does it suffice for a prediction of the vibration of assemblies of which the bearing forms a part. No simple set of values characterizing vibration and noise of a bearing is adequate for the evaluation of the vibratory performance in all possible applications.

The field of application for standards on bearing vibration and noise is, therefore, not universal. It encompasses the applications where usefulness of these standards as a basis for bearing

selection and specification has been proven by sufficient experimental evidence.

In the current edition of this standard, only selected methods for the measurement of the (structure-borne) *vibration* of certain types of ball bearings have been specified. Other vibration measurement methods, as well as methods for the measurement of rolling bearing (air-borne) *noise*, may be specified in later editions.

**1.1.3. Coverage.** The standard covers two product types:

- (a) Non-instrument ball bearings (Section 2)
- (b) Instrument ball bearings (Section 3).

Section 2 provides, in Subsection 2.1, a general description of the principles used for the selection of test methods for *non-instrument* ball bearings. Subsection 2.2 describes one selected test method, in sufficient detail to permit correlation of test results obtained with different instruments meeting Subsection 2.2 specifications.

Section 3 provides concepts of the method for vibration testing *instrument* ball bearings. The current edition of this standard does *not include* detailed methods sufficient to permit correlation of test results obtained with different instruments adhering to Section 3 concepts.

### 1.2 Definitions

**1.2.1 Description of Bearing Vibration and Noise.** In a running rolling bearing some relative motions of the parts are inherent and functionally required. These are designated primary motions. Thus, co-axial rotation of inner or outer rings with reference to their associated opposite ring members, pivoting of rings in self-aligning bearings around a common center point, and axial translation of the ring members along the common axis of rotation in bearings that permit axial free-