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Design, Installation, Maintenance, and Application of Ball Slewing Ring Bearings

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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FOREWORD

The uniqueness of large-diameter ball bearings is evidenced by the fact that most of the existing standards available to the public are applicable only to small diameter "standard" or "off-the shelf" bearings and are not meant to be applied to slewing ring bearings (SRB). To date, some conventions but few standards have been established for this product.

In the late 1970s, a letter was circulated to slewing ring bearing (SRB) manufacturers suggesting that a committee of manufacturers' representatives be formed. The idea was generally accepted, but it was agreed that the manufacturers should also gain the sponsorship of a professional or trade organization. Since several of the slewing ring bearing manufacturers were members of the then Anti-Friction Bearing Manufacturers Association (AFBMA), now American Bearing Manufacturers Association (ABMA), that organization was petitioned. The AFBMA agreed to sponsor the committee in 1984.

Over the next several years, interest and membership within the SRB Committee declined, and AFBMA withdrew its sponsorship of the committee. The committee was disbanded by AFBMA in 1987.

In late 1987 a member from the disbanded AFBMA SRB Committee requested that The American Society of Mechanical Engineers (ASME) assume the responsibility of developing a standard to cover large-diameter slewing ring bearings and reconstitute the SRB Committee. On September 29, 1988, the ASME Council on Codes and Standards approved the scope for a standardization project on slewing ring bearings. The recruitment of members for the newly established ASME Committee on Slewing Ring Bearings began in 1989, and the first meeting of the SRB Committee was held on December 6, 1989. The Slewing Ring Bearing Committee was disbanded on April 12, 2002 due to lack of interest from the industry. Work on the draft was discontinued.

In 2010 ASME re-evaluated industry interest for the formation of a new Slewing Ring Bearing Standards Committee. A new Committee was formed to develop and maintain standards relating to the design, manufacture, application, quality assurance, installation, and maintenance of slewing ring bearings. The committee, which consisted of bearing manufacturers, equipment manufacturers, consultants, and equipment end-users, held its first meeting on June 28, 2010. Originally, the standard was envisioned to cover both ball and rolling-element slewing ring bearings. However, subsequent lack of participation from those members with rolling-element SRB design expertise led to a decision to publish the initial standard addressing ball-bearing SRBs only. Recruitment for new members with additional expertise in the design of rolling-element SRBs is ongoing, and the next edition is expected to cover these bearings.

This Standard was approved by the American National Standards Institute on July 27, 2018.

ASME SRB COMMITTEE
Slewing Ring Bearings

(The following is the roster of the Committee at the time of approval of this Standard.)

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Secretary, SRB Standards Committee
The American Society of Mechanical Engineers
Two Park Avenue
New York, NY 10016-5990
http://go.asme.org/Inquiry

Proposing Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Interpretations. Upon request, the SRB Standards Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the SRB Standards Committee.

Requests for interpretation should preferably be submitted through the online Interpretation Submittal Form. The form is accessible at http://go.asme.org/InterpretationRequest. Upon submittal of the form, the Inquirer will receive an automatic e-mail confirming receipt.

If the Inquirer is unable to use the online form, he/she may mail the request to the Secretary of the SRB Standards Committee at the above address. The request for an interpretation should be clear and unambiguous. It is further recommended that the Inquirer submit his/her request in the following format:

Subject:	Cite the applicable paragraph number(s) and the topic of the inquiry in one or two words.
Edition:	Cite the applicable edition of the Standard for which the interpretation is being requested.
Question:	Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. Please provide a condensed and precise question, composed in such a way that a “yes” or “no” reply is acceptable.
Proposed Reply(ies):	Provide a proposed reply(ies) in the form of “Yes” or “No,” with explanation as needed. If entering replies to more than one question, please number the questions and replies.
Background Information:	Provide the Committee with any background information that will assist the Committee in understanding the inquiry. The Inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in the format described above may be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

Moreover, ASME does not act as a consultant for specific engineering problems or for the general application or understanding of the Standard requirements. If, based on the inquiry information submitted, it is the opinion of the Committee that the Inquirer should seek assistance, the inquiry will be returned with the recommendation that such assistance be obtained.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not "approve," "certify," "rate," or "endorse" any item, construction, proprietary device, or activity.

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DESIGN, INSTALLATION, MAINTENANCE, AND APPLICATION OF BALL SLEWING RING BEARINGS

1 SCOPE, PURPOSE, AND REFERENCES

1.1 Scope

This Standard applies to the design, application, installation, inspection requirements, and maintenance of slewing ring bearings (SRBs) using balls that do not require dynamic capacity-life ratings. These also may be called slewing rings. This is inclusive of four-point contact single-row and double-row ball bearings. Such bearings are used in, but not limited to, equipment such as hydraulic shovels, excavators, aerial platforms (manlifts), cranes, wind-power generators, building maintenance units (BMUs), and other equipment where one part of the structure must rotate with respect to another in an oscillating or indexing manner.

1.2 Purpose

The purpose of this Standard is to define standard methods to evaluate variables and establish practices for satisfactory performance in ball SRBs in oscillating or indexing applications. This will allow effective communication and exchange of data among the user, installer, and SRB manufacturer such that all parties understand each other's requirements and have a common point of reference.

Certain parameters are standardized to reduce the potential for confusion between the SRB manufacturer and the user. Acceptance criteria and guidelines are provided for SRB design, material, inspection requirements, and application.

1.3 References

The following publications are referenced in this Standard. Unless otherwise specified, the latest edition shall apply.

ABMA 10A, Metal Balls for Unground Bearings and Other Uses
Publisher: American Bearing Manufacturers Association (ABMA), 330 North Wabash Avenue, Suite 300, Chicago, IL 60611 (www.americanbearings.org)

ISO 3290-1, Rolling bearings — Balls — Part 1: Steel balls
Publisher: International Organization for Standardization (ISO), Chemin de Blandonnet 8, Case Postale 401, 1214 Vernier, Geneva, Switzerland (www.iso.org)

2 DEFINITIONS

2.1 Bearing Definitions

angular contact bearing: a rolling-element bearing with a nominal contact angle between 0 deg and 90 deg.

axial load: a force acting in a direction parallel with the bearing axis.

ball: a spherical rolling element.

ball grade: a specific combination of dimensional, form, surface roughness, and sorting tolerances for balls as defined in ABMA 10A or ISO 3290-1.

ball path: the area where the rolling elements (balls) ride between the races.

ball-path diameter: the diameter that corresponds to the centerline of the balls as shown in Figure 2.1-1.

bearing preload: the absence of internal clearances; can be described as either radial or axial.

bending moment: effect of an applied force at a distance from the axis of rotation.

conformance: ratio of ball-path radius to ball diameter.

contact angle: the angle between a plane perpendicular to the bearing axis and a line passing through the contact point and the center of the rolling elements (see Figure 2.1-1).

contact point: the point of contact between a ball and one raceway.

dynamic load: a load (constant or varying) acting on a bearing when its races rotate in relation to each other.

face: a surface of a race perpendicular to the axis of the race.

fixed quadrant slewing action: oscillating or intermittent slewing action that occurs 50% or more of the time in one 90-deg quadrant.

four-point contact ball bearing: a single-row angular contact ball bearing in which, when under purely radial load, each loaded ball makes contact with each of the two raceways at two points; under pure axial load, each loaded ball makes contact with each of the two raceways at one point.

inner race: a bearing race incorporating the rolling element raceway(s) on its outer diameter.

integral seal: a bearing sealing device that is an integral part of an assembled bearing.