



AEROSPACE STANDARD

AS22227™**REV. C**

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Superseding AS22227B

Bearing, Ball, Annular, Generator, and Motor Generator

RATIONALE

This document has just gone through the 5-year review cycle and it is the desire of the committee to stabilize it.

STABILIZED NOTICE

This document has been declared "Stabilized" by the SAE ACBG Rolling Element Bearing Committee and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

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1. SCOPE AND CLASSIFICATION

1.1 Scope

This standard establishes the requirements for antifriction ball bearings primarily intended for use in aircraft electrical generators and motor-generators.

1.2 Classification

Bearings shall be of the following types:

Type I Bearing, Ball, Annular, primarily for aircraft generators and motor-generators, Standard Light (AS17107)

Type II Bearing, Ball, Annular, primarily for aircraft generators and motor-generators, Wide Cartridge (AS17108)

Type III Bearing, Ball, Annular, primarily for aircraft generators and motor-generators, Thin Extra Light (AS17109)

2. APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AMS-QQ-S-763	Steel Corrosion Resistant, Bars, Wire, Shapes, and Forgings
AMS2303	Steel Cleanliness, Aircraft Quality Martensitic Corrosion-Resistant Steels Magnetic Particle Inspection Procedure
AMS2700	Passivation of Corrosion Resistant Steels
AMS5618	Steel, Corrosion-Resistant, Bars, Wire, and Forgings 17Cr - 0.52Mo (0.95 - 1.20C) (440C) Consumable Electrode Vacuum Melted
AMS5630	Steel, Corrosion-Resistant, Bars, Wire, and Forgings 17Cr - 0.52Mo (0.95 - 1.20C) (440C)
AMS5880	Steel, Corrosion-Resistant, Bars, Wire, and Forgings 17Cr - 0.52Mo (0.95 - 1.20C) (SAE 51440C) for Bearings Applications
AMS6440	Steel, Bars, Forgings, and Tubing 1.45Cr (0.93 - 1.05C) (SAE 52100) For Bearing Applications
AMS6444	Steel, Bars, Forgings, and Tubing 1.45Cr (0.93 - 1.05C) (SAE 52100) Premium Aircraft-Quality, Consumable Electrode Vacuum Melted
AIR4127	Steel: Chemical Composition and Hardenability
AS17107	Bearing, Ball, Annular, Primarily for Aircraft Generators and Motor-Generators, Standard Light, Type I
AS17108	Bearing, Ball, Annular, Primarily for Aircraft Generators and Motor-Generators, Wide Cartridge, Type II
AS17109	Bearing, Ball, Annular, Primarily for Aircraft Generators and Motor-Generators, Thin Extra Light, Type III

2.2 U.S. Government Publications

Available from DLA Document Services, Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6396, <http://quicksearch.dla.mil/>.

MIL-C-11796	Corrosion Preventive Compound, Petrolatum, Hot Application
MIL-DTL-197	Packaging of Bearings, Associated Parts and Sub-Assemblies
MIL-PRF-7808	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base
MIL-PRF-23699	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base, NATO Code Numbers 0-156, 0-152, 0-154, and 0-167
MIL-PRF-27617	Grease, Aircraft and Instrument, Fuel and Oxidizer Resistant
MIL-PRF-81322	Grease, Aircraft, General Purpose Wide Temperature Range, NATO Code G-395
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-1647	Identification Markings for Domestically Manufactured Bearings, Ball, Annular, for Instruments and Precision Components

2.3 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM A240/240M	Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and General Applications
ASTM A313/313M	Standard Specification for Stainless Steel Spring Wire
ASTM A380	Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment and Systems
ASTM A580/580M	Standard Specification for Stainless Steel Wire
ASTM A666	Specification for Annealed or Cold Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar
ASTM A693	Precipitation Hardening Stainless and Heat Resisting Steel Plate Sheet, and Strip
ASTM A967	Chemical Passivation Treatments for Stainless Steel Parts
ASTM D2000	Standard Classification System for Rubber Products in Automotive Applications
ASTM E18	Standard Test Methods for Rockwell Hardness of Metallic Materials
ASTM E45	Standard Test Methods for Determining the Inclusion Content of Steel
ASTM E112	Standard Test Methods for Determining Average Grain Size
ASTM E140	Standard Hardness Conversion Tables for Metals Relationship among Brinell Hardness Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, Scleroscope Hardness, and Leob Hardness
ASTM F2215	Standard Specification for Balls, Bearings, Ferrous and Non-Ferrous for Use in Valves, and Bearing Applications

2.4 ASME Publications

Available from American Society for Quality, 600 North Plankinton Avenue, Milwaukee, WI 53203, Tel: 800-248-1946 (United States or Canada), 001-800-514-1564 (Mexico) or +1-414-272-8575 (all other locations), www.asq.org or ASME, P.O. Box 2900, 22 Law Drive, Fairfield, NJ 07007-2900, Tel: 800-843-2763 (U.S./Canada), 001-800-843-2763 (Mexico), 973-882-1170 (outside North America), www.asme.org.

ASME B46.1	Surface Texture (Surface Roughness, Waviness and Lay)
ASME B89.3.1	Measurement of Out of Roundness
ASQ Z1.4	Sampling Procedures and Tables for Inspection by Attributes

2.5 American Iron and Steel Institute Publications

Available from American Iron and Steel Institute, 25 Massachusetts Avenue, NW, Suite 800, Washington, DC 20001, Tel: 202-452-7100, www.steel.org.

AISI 305	Steel, Stainless (Austentic)
AISI 440C	Steel, Stainless (Martensitic)
AISI 1008	Steel, Ni-Cr-Mo Carbon
AISI 1010	Steel, Ni-Cr-Mo Carbon
AISI 52100	Chrome Alloy Steel

2.6 American Bearing Manufacturers Association Publications

Available from American Bearing Manufacturers Association, 2025 M Street, NW, Suite 800, Washington, DC 20036-3309, Tel: 202-367-1155, www.americanbearings.org.

ABMA 4	Tolerance Definitions and Gauging Practices for Ball and Roller Bearings
ABMA 9	Load Ratings and Fatigue Life for Ball Bearings
ABMA 10	Metal balls for Unground Bearings and Other Uses
ABMA 20	Radial Bearings of Ball, Cylindrical Roller and Spherical Roller Types, Metric Design

2.7 Department of Defense Publications

FAR	Federal Acquisition Regulations
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2.8 Sampling Procedures

Product lot sampling for inspection and acceptance shall be in accordance with ASQ Z1.4 Sampling Procedures and Tables for Inspection by Attributes.

2.9 Order of Precedence

In the event of a conflict between the text of this standard and the reference cited herein, the text of this standard shall take precedence. Nothing in this standard, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

2.10 Definition

2.10.1 BEARING VOID

The volume between the inner and outer rings minus the volume of the balls and retainer.

3. REQUIREMENTS

3.1 AS Part Standards

The individual item requirements specified herein shall be in accordance with the applicable AS Part Standards. In the event of any conflict between the requirements of this standard and the AS sheet, the later shall govern.

3.2 First Article

When specified (see 6.2.1 d), a sample shall be subjected to first article inspection (see 4.4.1).

3.3 Materials

3.3.1 New Materials Versus Reconditioned Component Parts

Bearings purchased as new items under this standard shall not contain parts that have previously been installed in any equipment and operated. There shall be no cracks or fractures of any components. Steels shall have been inspected for relative cleanliness prior to manufacturing. All materials used shall require material certifications.

3.3.2 Ball and Ring Materials

Balls and rings shall be made of chromium-alloy steel, either AISI 52100 (AMS6440 or AMS6444) or AISI 440C (AMS-QQ-S-763, AMS5880, AMS5618, or AMS5630) steel. All rings fabricated of AISI 440C corrosion-resistant steel shall be passivated after completion of all machining or metal removing operations and prior to assembly. The metal shall be homogeneous in structure, free from cracks, pipes, seams, laminations, surface decarburization, excessive inclusion of nonmetallic impurities and other defects which may render it unsuitable for the intended purpose. On microscopic examinations, the metal shall be free from signs of overheating.

3.3.2.1 Material Cleanliness

Chromium-alloy steels used for the production of bearings shall meet the cleanliness requirements of AMS6440 or AMS6444. Stainless steel materials shall meet the cleanliness requirements of AMS5618, AMS5880, and AMS5630.

3.3.3 Grain Size

Shepard grain size shall be six (6) or finer for rings and eight (8) for balls when examined as specified in ASTM E112. Balls and rings shall be dimensionally stable for operation from -67 to +385 °F (-55 to 196 °C).

3.3.4 Dimensional Stability

The balls and rings shall withstand temperature changes and exposures with changes in diameter not exceeding 0.0001 inch per inch of diameter.

3.3.5 Hardness of Rings and Balls

The through hardness of the 52100 (or 440C corrosion-resistant steel) rings and balls shall be 58 to 63 HRC. Chrome steels shall be 58 to 66 HRC as measured in accordance with ASTM E18. The hardness values of any one ring or ball shall not vary by more than three points HRC.

3.3.6 Ball Quality

The minimum quality level of hardness, ball geometry and surface roughness shall be grade 10 as specified in ABMA 10 and in accordance with ASTM F2215.

3.3.7 Retainer

Retainers shall retain the balls within the bearings and shall equally space them circumferentially between the races. They shall be so constructed as not to limit the proper functioning of the bearing to which they are fitted. Retainers shall be of a ball centered design. The retainers shall be formed either with pockets substantially fitting the surface of the balls or with cylindrical type ball pockets, but shall be of such design that the lubricant will be freely admitted. The retainers shall be of materials, workmanship, and finish suitable for the purpose intended. They shall run concentrically with the races. No part of the retainer shall exhibit cracks, burrs, deformities or looseness. Retainers shall be free of burrs and folded over material that might be produced by normal manufacturing processes. They shall not run eccentrically visible to the normal eye.