



Standard Specification for Mechanical Seals for Shipboard Pump Applications¹

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1. Scope

1.1 This specification covers mechanical end-face seals for centrifugal and positive displacement pumps for shipboard use.

1.2 The following types of seals are not included in this specification: lip seals, oil seals, circumferential seals, or labyrinth seals.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard. A companion hard metric standard is in the process of preparation.

1.4 Special requirements for U.S. Navy Shipboard Pump Applications are included in Supplement S1.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

- A108 Specification for Steel Bar, Carbon and Alloy, Cold-Finished
- A182/A182M Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
- A240/A240M Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
- A276 Specification for Stainless Steel Bars and Shapes

- A313/A313M Specification for Stainless Steel Spring Wire
- A351/A351M Specification for Castings, Austenitic, for Pressure-Containing Parts
- A436 Specification for Austenitic Gray Iron Castings
- A494/A494M Specification for Castings, Nickel and Nickel Alloy
- A564/A564M Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes
- A579/A579M Specification for Superstrength Alloy Steel Forgings
- A693 Specification for Precipitation-Hardening Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
- A744/A744M Specification for Castings, Iron-Chromium-Nickel, Corrosion Resistant, for Severe Service
- B62 Specification for Composition Bronze or Ounce Metal Castings
- B127 Specification for Nickel-Copper Alloy Plate, Sheet, and Strip
- B164 Specification for Nickel-Copper Alloy Rod, Bar, and Wire
- B166 Specification for Nickel-Chromium-Aluminum Alloy, Nickel-Chromium-Iron Alloys, Nickel-Chromium-Cobalt-Molybdenum Alloy, Nickel-Iron-Chromium-Tungsten Alloy, and Nickel-Chromium-Molybdenum-Copper Alloy Rod, Bar, and Wire
- B168 Specification for Nickel-Chromium-Aluminum Alloys (UNS N06699), Nickel-Chromium-Iron Alloys (UNS N06600, N06601, N06603, N06690, N06693, N06025, N06045, and N06696), Nickel-Chromium-Cobalt-Molybdenum Alloy (UNS N06617), Nickel-Iron-Chromium-Tungsten Alloy (UNS N06674), and
- B271 Specification for Copper-Base Alloy Centrifugal Castings
- B333 Specification for Nickel-Molybdenum Alloy Plate, Sheet, and Strip
- B335 Specification for Nickel-Molybdenum Alloy Rod
- B338 Specification for Seamless and Welded Titanium and Titanium Alloy Tubes for Condensers and Heat Exchangers
- B348 Specification for Titanium and Titanium Alloy Bars and Billets

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

B367 Specification for Titanium and Titanium Alloy Castings

B443 Specification for Nickel-Chromium-Molybdenum-Columbium Alloy and Nickel-Chromium-Molybdenum-Silicon Alloy Plate, Sheet, and Strip

B446 Specification for Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625), Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219), and Nickel-Chromium-Molybdenum-Tungsten Alloy (UNS N06650) Rod and Bar

B472 Specification for Nickel Alloy Billets and Bars for Reforging

B473 Specification for UNS N08020, UNS N08024, and UNS N08026 Nickel Alloy Bar and Wire

B505/B505M Specification for Copper Alloy Continuous Castings

B584 Specification for Copper Alloy Sand Castings for General Applications

B637 Specification for Precipitation-Hardening and Cold Worked Nickel Alloy Bars, Forgings, and Forging Stock for Moderate or High Temperature Service

B670 Specification for Precipitation-Hardening Nickel Alloy (UNS N07718) Plate, Sheet, and Strip for High-Temperature Service

D1141 Practice for Preparation of Substitute Ocean Water

D1418 Practice for Rubber and Rubber Latexes—Nomenclature

D3294 Specification for Polytetrafluoroethylene (PTFE) Resin Molded Sheet and Molded Basic Shapes

D3951 Practice for Commercial Packaging

2.2 *ASQ Standards:*³

ASQC Z1.4 American Society of Quality, Quality Conformance Inspection

2.3 *ANSI Standards:*⁴

ANSI Y14.1 Drawing Sheet Size and Format

ANSI Y14.2 Line Convention and Lettering

ANSI Y14.3 Multi and Sectional View Drawings

ANSI Y14.5 Dimensioning and Tolerancing for Engineering Drawings

ANSI Y14.6 Screw Thread Representation

ANSI Y14.26.3 Computer-Aided Preparation of Production Definition Data, Terms and Definitions

2.4 *Military Standards:*⁵

MIL-S-901 Shock Tests, H.I. (High Impact); Shipboard Machinery, Equipment & Systems, Requirements for

MIL-P-16789 Packaging of Pumps, Including Prime Movers and Associated Repair Parts

MIL-STD-167-1 Environmental Vibration Testing

2.5 *ISO Standard:*⁶

ISO 9001 Quality Systems—Model for Quality Assurance in Design/Development, Production, Installation, and Service

2.6 *SAE Standards:*⁶

AMS 7259 Rings, Sealing, Fluorocarbon (FKM) Rubber High-Temperature—Fluid Resistant Low Compression Set 85 to 95

AMS 7276 Rings, Sealing, Fluorocarbon (FKM) Rubber High-Temperature—Fluid Resistant Low Compression Set 70 to 80

AMS 3216 Fluorocarbon (FKM) Rubber, High-Temperature—Fluid Resistant, Low Compression, Set 70 to 80

AMS 3218 Fluorocarbon (FKM) Rubber, High-Temperature—Fluid Resistant, Low Compression, Set 85 to 95

J1926-1 Standard Dimensions for Gasket Seal Straight Thread Tube Fitting

2.7 *Other Document:*

DS56I Metals and Alloys in the Unified Numbering System²

3. Terminology

3.1 *Definitions*—Refer to **Annex A1** for terminology relating to mechanical seals.

4. Classification of Seal Arrangements

4.1 For this specification, mechanical seals shall be classified by type, grade, and class. The categories are divided by application arrangement in the equipment in which it is installed:

- 4.1.1 Type A—Inside Single Mounted Seals
- 4.1.2 Type B—Outside Single Mounted Seals
- 4.1.3 Type C—Double Seals
- 4.1.4 Type D—Tandem Seals
- 4.1.5 Type E—Gas Seals
- 4.1.6 Type F—Special Arrangements/Applications Vacuum or Gas Seal
- 4.1.7 Grade 1—Basic End Face Seal
- 4.1.8 Grade 2—Cartridge Seal
- 4.1.9 Grade 3—Split Seal
- 4.1.10 Class 0—Nonsplit Seal Assembly
- 4.1.11 Class 1—Partial Split Seal Assembly, Solid Gland
- 4.1.12 Class 2—Partial Split Seal Assembly, Split Gland
- 4.1.13 Class 3—Fully Split Seal Assembly, Solid Gland
- 4.1.14 Class 4—Fully Split Seal Assembly, Split Gland

4.2 **Figs. 1-6** give general orientation information for various types of seals. The specific design of seal shown is not limited to that particular application.

5. Ordering Information

5.1 The purchaser (buyer) shall provide the manufacturer with all of the pertinent application data shown in **Figs. 7-9**. If special operating conditions exist that are not shown in the checklist, they shall also be described.

³ Available from American Society for Quality (ASQ), 600 N. Plankinton Ave., Milwaukee, WI 53203, <http://www.asq.org>.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁵ Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, <http://quicksearch.dla.mil>.

⁶ Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096, <http://www.sae.org>.