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An American National Standard

Standard Specification for Special Requirements for Valves Used in Gaseous Oxygen Service[1]

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ε[1] NOTE—Keywords were added editorially in September 2016.

1. Scope

1.1 This specification covers the special requirements for valves used in gaseous oxygen service. It is intended that this specification be invoked as an additional requirement in conjunction with primary valve specifications.

1.2 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.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

G63 Guide for Evaluating Nonmetallic Materials for Oxygen Service

G88 Guide for Designing Systems for Oxygen Service

G93 Practice for Cleaning Methods and Cleanliness Levels for Material and Equipment Used in Oxygen-Enriched Environments

G94 Guide for Evaluating Metals for Oxygen Service

2.2 *ANSI Standard:*[3]

ANSI B1.1 Unified Screw Threads

2.3 *ASME Standard:*[4]

ASME Boiler and Pressure Vessel Code

2.4 *Military Standards and Specifications:*[5]

MIL-STD-1330 Standard Practice for Precision Cleaning and Testing of Shipboard Oxygen, Helium, Helium-Oxygen, Nitrogen, and Hydrogen Systems

MIL-V-5027 Valves, Check, Oxygen, High Pressure

MIL-STD-278 Fabrication, Welding and Inspection; Casting Inspection and Repair for Machinery, Piping and Process Vessels in Ships of the United States Navy

MIL-STD-271 Non-destructive Testing Requirements for Metals

MIL-P-46122 Plastic Molding and Extrusion Material, Polyvinylidene Fluoride Polymer and Copolymer

3. Ordering Information

3.1 Ordering documentation for valves under this specification shall include the following information, as required, to describe the equipment adequately.

3.1.1 ASTM designation and year of issue.

3.1.2 Primary valve specification (see 1.1).

3.1.3 End preparations, if different than specified in 4.4.

3.1.4 Supplementary requirements, if any (see S1 through S4).

4. Valve Design and Construction

4.1 Valves shall incorporate the features specified in 4.2 – 4.6.

4.2 *Materials of Construction*—Material requirements shall be as follows:

4.2.1 The pressure containing/retaining envelope (including any bolting, union nuts, or other fastening devices establishing the integrity of the pressure containing/retaining envelope), bellows (where applicable), and end nipples, shall be nickel-copper (70-30). Internal trim which is in contact with the line media shall be nickel-copper (70-30), bronze, nickel-aluminum-bronze, Inconel Alloy 600, brass, or other materials which are compatible with oxygen service.

4.2.2 Non-metallic seat, seat insert, or seals. These materials shall be selected from TFE, Reinforced TFE, CTFE, plastic in accordance with MIL-P-46122, Polyamide (Vespel), or PEEK. The materials for O-rings and gaskets shall be compatible for oxygen service.

4.2.3 *Lubricants*—Materials for lubricants shall be halocarbon (25-5S), Dupont (Krytox 240 AC, 240 AZ), Braycote 601, or other lubricants compatible with oxygen service.

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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.

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

[4] Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, http://www.asme.org.

[5] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

4.2.4 Guidance on the selection of materials for oxygen service can be found in Guides G63 and G94. Guidance on designing systems for oxygen service can be found in Guide G88.

4.3 *General Requirements:*

4.3.1 *Fire Prevention*—Valves shall be constructed to minimize the possibility of initiating ignition in gaseous oxygen service. This shall be accomplished by the following:

4.3.1.1 Materials for parts in contact with oxygen shall have the highest spontaneous ignition temperatures and the lowest impact sensitivities compatible with construction and performance limitations.

4.3.1.2 Surfaces in contact with oxygen shall be smooth with well-rounded edges and without sharp or thin sectioned protrusions (that is, all parts shall have a high ratio of volume-to-surface area). Sharp exterior corners are prohibited, and interior corners shall have fillets to prevent the retention or entrapment of machining chips, burrs, or foreign material.

4.3.1.3 Nonmetallic materials (O-rings, gaskets, etc.) other than the seating insert, if applicable, shall be well removed from the main flow path.

4.3.2 *Fire Containment*—Valves shall be constructed to minimize oxygen escape in the event of an internal or external fire. This shall be accomplished by the following:

4.3.2.1 *Pressure-Boundary Sealing*—Joints for the pressure-boundary seals shall provide an effective barrier to leakage in the event of damage or consumption of the non-metallic sealing elements by providing long, close fitting metal-to-metal leakage or flame paths.

4.3.2.2 *Internal Seating*—The seat design shall be such that in the event that the non-metallic seat is damaged, destroyed, or carried away, there will be a secondary metal-to-metal seat to minimize through seat leakage. The construction and location of the nonmetallic seals and seating inserts shall minimize the possibility of ignition under a pressure surge.

4.3.2.3 *Pressure Surge*—Valves shall be designed to prevent pressure surge, which could cause auto-ignition.

4.4 *Design Features:*

4.4.1 Manual valves shall be of the packless design, with the stem sealed by a bellows.

4.4.2 *Threads*—Threads shall conform to ANSI B1.1. Use of threads in contact with oxygen shall be minimized. Any threads wetted by oxygen shall be of rolled construction or shall be completely chamfered and deburred to prevent the possibility of sharp edges or machining burrs in contact with oxygen.

4.4.3 *Cleaning*—Prior to assembly and testing, valves shall be degreased and cleaned in accordance with Practice G93, and thereafter maintained clean for oxygen service.

4.5 *End Preparation*—Unless otherwise specified (see Section 3), end preparation for the valves shall be as follows:

4.5.1 Valves shall be supplied with inline extension nipples welded directly to the valve body or fabricated as an integral part of the valve body. Nipples shall be of the same basic material as the body. The length and schedule of these nipples shall be as specified in Table 1.

4.6 *Welding and Nondestructive Testing*—Welding and nondestructive testing shall be in accordance with ASME Boiler and Pressure Vessel Code, Sections VIII and IX.

5. Marking

5.1 *Identification Plates*—A metallic corrosion-resisting identification plate shall be securely attached to the valve and shall indicate “Valve specially made for oxygen service”.

5.2 In addition, each valve shall be marked in accordance with their applicable primary valve specification requirements.

6. Quality Assurance System

6.1 The manufacturer shall establish and maintain a quality assurance system that will ensure all the requirements of this specification are satisfied.

6.2 A written description of the quality assurance system the manufacturer will use shall be available for review and acceptance by the inspection authority.

6.3 The purchaser reserves the right to witness any tests and inspect the valves in the manufacturer’s plant to the extent specified on the purchase order.

7. Keywords

7.1 gaseous; oxygen; valve

TABLE 1 Length and Schedule of Extension Nipples

Size of Valve	Pipe Schedule	Minimum Length of Extension, inches (Valve Center to End)
¼ NPS to 1 NPS (13.5 mm to 33.7 mm)	80	7.00 (178 mm)
1-½ NPS to 2-½ NPS (48.3 mm to 73.0 mm)	160	12.0 (305 mm)