Designation: F1792 – 97 (Reapproved 2021)

An American National Standard

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

This standard is issued under the fixed designation F1792; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

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.

1.3 *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]

G63 Guide for Evaluating Nonmetallic Materials for Oxygen Service

G88 Guide for Designing Systems for Oxygen Service

G93 Guide for Cleanliness Levels and Cleaning Methods for Materials and Equipment Used in Oxygen-Enriched Environments

G94 Guide for Evaluating Metals for Oxygen Service

2.2 *ASME Standards:*[3]

ASME B1.1 Unified Inch Screw Threads (UN, UNR, and UNJ Thread Forms)

ASME Boiler and Pressure Vessel Code

2.3 *Military Standards and Specifications:*[4]

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

[1] This specification is under the jurisdiction of ASTM Committee F25 on Ships and Marine Technology and is the direct responsibility of Subcommittee F25.11 on Machinery and Piping Systems.

Current edition approved Jan. 1, 2021. Published January 2021. Originally approved in 1997. Last previous edition approved in 2016 as F1792 – 97 (2016)ε1. DOI: 10.1520/F1792-97R21.

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

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

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.

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 ASME 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 Guide 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)

SUPPLEMENTARY REQUIREMENTS

One or more of the following Supplementary Requirements S1, S2, S3, or S4 shall be applied only when specified by the purchaser in the inquiry, contract, or order. Details of those supplementary requirements shall be agreed upon in writing by the manufacturer and purchaser. Supplementary requirements shall in no way negate any requirement of the specification itself.

S1. Supplemental Tests

S1.1 Supplemental tests shall be conducted at a laboratory satisfactory to the customer and shall consist of the examinations and tests selected from those specified in S1.2 through S1.4.

S1.2 *Examination Prior to Testing*—The valve(s) shall be examined visually to determine conformance with the ordering data, dimensions, and workmanship without disassembly.

S1.3 *Nonmetallic Materials Compatibility Test*—Materials shall be subjected to the ozone-resistance and oxygen-bomb tests as specified in MIL-V-5027, with test pressure applicable to the valve under test. No charring or deterioration is allowed.

S1.4 *Nondestructive Testing*—Nondestructive testing shall be in accordance with MIL-STD-271.

S2. Cleaning, Drying, Packaging, and Marking Requirements

S2.1 Valves shall be cleaned, dried, packaged, and marked in accordance with MIL-STD-1330. Packaging operations shall be accomplished in an area that will prevent valve contamination by hydrocarbons.

S3. Quality Assurance

S3.1 *Scope of Work*—The written description of the quality assurance system shall include the scope and locations of the work to which the system is applicable.

S3.2 *Authority and Responsibility*—The authority and responsibility of those in charge of the quality assurance system shall be clearly established.

S3.3 *Organization*—An organizational chart showing the relationship between management and the engineering, purchasing, manufacturing, construction, inspection, and quality control groups is required. The purpose of this chart is to identify and associate the various organizational groups with the particular functions for which they are responsible. These requirements are not intended to encroach on the manufacturer's right to establish, and from time to time to alter, whatever form of organization the manufacturer considers appropriate for its work. Persons performing quality control functions shall have a sufficiently well-defined responsibility and the authority and the organizational freedom to identify quality control problems and to initiate, recommend, and provide solutions.

S3.4 *Review of Quality Assurance System*—The manufacturer shall ensure and demonstrate the continuous effectiveness of the quality assurance system.

S3.5 *Drawings, Design Calculations, and Specification Control*—The manufacturer's quality assurance system shall include provisions to ensure that the latest applicable drawings, design calculations, specifications, and instructions, including all authorized changes, are used for manufacture, examination, inspection, and testing.

S3.6 *Purchase Control*—The manufacturer shall ensure that all purchased material and services conform to specified requirements and that all purchase orders give full details of the material and services ordered.

S3.7 *Material Control*—The manufacturer shall include a system for material control that ensures the material received is properly identified and that any required documentation is present, identified to the material, and verifies compliance to the specified requirements. The material control system shall ensure that only the intended material is used in manufacture. The manufacturer shall maintain control of material during the manufacturing process by a system that identified inspection status of material throughout all stages of manufacture.

S3.8 *Manufacturing Control*—The manufacturer shall ensure that manufacturing operations are carried out under controlled conditions utilizing documented work instructions. The manufacturer shall provide for inspection, where appropriate, for each operation that affects quality or shall arrange an appropriate monitoring operation.

S3.9 *Quality Control Plan*—The manufacturer's quality control plan shall describe the fabrication operations, including examinations and inspections.

S3.10 *Welding*—The quality control system shall include provisions for ensuring that welding conforms to specified requirements. Welders shall be qualified to the appropriate standards and the qualification records shall be made available to the inspection authority if required.

S3.11 *Nondestructive Examination*—Provisions shall be made to utilize non-destructive examination, as necessary, to ensure that material and components comply with the specified requirements. Non-destructive examinations shall be authorized by their employer or qualified by a recognized national body, or both, and their authorizations/qualification records shall be made available to the inspection authority if required.

S3.12 *Non-Conforming Items*—The manufacturer shall establish procedures for controlling items not in conformance with the specified requirements.

S3.13 *Heat Treatment*—The manufacturer shall provide controls to ensure that all required heat treatments have been applied. Means should be provided by which heat treatment requirements can be verified.

S3.14 *Inspection Status*—The manufacturer shall maintain a system for identifying the inspection status of material during all stages of manufacture and shall be able to distinguish between inspected and non-inspected material.

S3.15 *Calibration of Measurement and Test Equipment*—The manufacturer shall provide, control, calibrate, and maintain inspection, measuring and test equipment to be used in verifying conformance to the specified requirements. Such calibration shall be traceable to a national standard and calibration records shall be maintained.