Designation: F1793 – 97 (Reapproved 2021)

An American National Standard

Standard Specification for Automatic Shut-Off Valves (Also Known as Excess Flow Valves, EFV) for Air or Nitrogen Service[1]

This standard is issued under the fixed designation F1793; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification covers self-contained automatic shut-off valves (also known as excess flow valves) for air or nitrogen service. They are intended to be installed as safety devices to quickly and automatically shut off flow under certain excess flow conditions caused by a downstream failure or casualty, such as a hose rupture.

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]

F992 Specification for Valve Label Plates

2.2 *ASME Standards:*[3]

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

ASME B1.20.1 Pipe Threads, General Purpose, Inch

ASME B16.11 Forged Fittings, Socket-Welding and Threaded

ASME B16.25 Buttwelding Ends

ASME B16.34 Valves — Flanged, Threaded, and Welding End

2.3 *Military Standards and Specifications:*[4]

MIL-STD-167-1 Mechanical Vibrations of Shipboard Equipment (Type I—Environmental and Type II—Internally Excited)

MIL-STD-740-1 Airborne Sound Measurements and Acceptance Criteria of Shipboard Equipment

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

MIL-F-1183 Fitting, Pipe, Cast Bronze, Silver-Brazing, General Specification for

2.4 *Government Drawings:*[4]

Naval Sea Systems Command (NAVSEA)

NAVSEA 803-1385884 Unions, Fittings and Adapters Butt and Socket Welding 6000 PSI, WOG, NPS

NAVSEA 803-1385943 Unions, Silver Brazing 3000 PSI, WOG, NPS, for UT Inspection

NAVSEA 803-1385946 Unions, Bronze Silver Brazing, WOG for UT Inspection

3. Terminology

3.1 *Definitions:*

3.1.1 *automatic shut-off valve, n*—automatic shut-off valves covered by this specification trip shut in response to the pressure differential across the valve.

3.1.2 *bubble-tight, n*—no visible leakage over a 3-min period using either water submersion or the application of bubble fluid for detection.

3.1.3 *external leakage, n*—leakage from the automatic shut-off valve that escapes to atmosphere.

3.1.4 *hydrostatic shell test pressure, n*—the hydrostatic shell test pressure that the automatic shut-off valve is required to withstand without damage. Automatic shut-off valve operation is not required during application of shell test pressure, but it must meet all performance requirements after the shell test pressure has been removed.

[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 F1793 – 97 (2016)ε1. DOI: 10.1520/F1793-97R21.

[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.

3.1.5 *pressure ratings, n*—the pressure ratings of the automatic shut-off valves shall be as defined in the documents listed in Table 1. The pressure ratings (also called pressure-temperature ratings) establish the maximum allowable working (service) pressures of a component (valve, end connections, and so forth) at various temperatures.

3.1.6 *seat tightness, n*—the ability of the automatic shut-off valve to prevent leakage from the valve-inlet to the valve-outlet.

3.1.7 *set point, n*—a combination of inlet pressure and flow, at which the valve trips shut.

3.1.8 *set-point accuracy, n*—the band of accuracy of the automatic shut-off valve expressed as a range of flow rates at a given inlet pressure, established by the following two points:

3.1.8.1 A combination of inlet pressure-flow, at or below which the automatic shut-off valve will not trip shut (valve will remain open) regardless of influences such as spring relaxation, mechanical shock or vibration, and so forth.

3.1.8.2 A combination of inlet pressure-flow, at or above which the automatic shut-off valve will trip shut (valve will not remain open) regardless of influences tending to resist closure such as breakloose friction, corrosion, or sludge, and so forth.

3.1.9 *set-point range, n*—the range of set points over which the automatic shut-off valve can be adjusted. Expressed as a range of flow rates at a given inlet pressure.

4. Classification

4.1 Automatic shut-off valves shall be of the following types, styles, sizes, pressure ratings, and end connections:

4.1.1 *Types:*

4.1.1.1 *Type I*—Valves that can be adjusted or repaired without removing the valve from pipe line.

4.1.1.2 *Type II*—Valves that cannot be adjusted or repaired without removing the valve from pipe line.

4.1.2 *Styles:*

TABLE 1 Pressure Ratings for Automatic Shut-Off Valves

Type of End Connection	Pressure Rating	Applicable Documents for Dimensional Details of End Connections
Butt-welded	ASME B16.34 Class 150, 300, 400, 600, 900, 1500, 2500, or 4500	ASME B16.25
Socket-welded	ASME B16.34 Class 150, 300, 400, 600, 900, 1500, 2500, or 4500	ASME B16.11
Threaded (tapered pipe thread)	ASME B16.34 Class 150, 300, 400, 600, 900, 1500, or 2500	ASME B1.20.1 and ASME B16.11
Union-end,[A] Silver-brazed	MIL-F-1183 (O-ring type) 400 lb/in.^{2} (2.758 MPa)	MIL-F-1183 (O-ring type) 400 lb/in.^{2} (2.758 MPa)
Union-end,[A] Silver-brazed	803-1385946 1500 lb/in.^{2} (10.342 MPa)	803-1385946 1500 lb/in.^{2} (10.342 MPa)
Union-end,[A] Silver-brazed	803-1385943 3000 lb/in.^{2} (20.684 MPa)	803-1385943 3000 lb/in.^{2} (20.684 MPa)
Union-end,[A] Butt/socket weld	803-1385884 6000 lb/in.^{2} (41.369 MPa)	803-1385884 6000 lb/in.^{2} (41.369 MPa)
Other, as specified	As specified	As specified

[A] For Union inlet and outlet end connections, only the pertinent dimensions listed in the applicable documents (Military Specification or NAVSEA Requirements) shall apply. The valve shall be supplied with the thread-pieces only, without the tail-pieces and union-nuts.

4.1.2.1 *Style 1—Automatic Reset Construction*—These valves are designed to limit the flow of air or nitrogen upon closure to a small predetermined level. These valves reset automatically once the service line downstream is made air or nitrogen-tight and pressure is equalized across the valve.

4.1.2.2 *Style 2—Manual Reset Construction*—These valves are designed to stop the flow of air or nitrogen upon closure. These valves must be manually reset.

4.1.3 *Sizes*—Automatic shut-off valves shall be of the following NPS sizes: ¼ (13.5 mm), ⅜ (17.2 mm), ½ (21.3 mm), ¾ (26.9 mm), 1 (33.7 mm), 1¼ (42.4 mm), 1½ (48.3 mm), and 2 (60.3 mm). Unless otherwise specified in 5.0, the valve inlet size shall be the same as the outlet size.

4.1.4 *Pressure Ratings*—Automatic shut-off valves shall have pressure rating(s) selected (see 3.1.5) from Table 1. The pressure rating(s) selected shall be specified in Section 5. The inlet and outlet pressure ratings of the automatic shut-off valve shall be the same for any given valve.

4.1.5 *End Connections*—Automatic shut-off valves shall have end connections selected from those listed in Table 1 and specified in Section 5.

5. Ordering Information

5.1 Ordering documentation for automatic shut-off valves under this specification shall include the following information, as required, to describe the equipment adequately:

5.1.1 ASTM designation and year of issue,

5.1.2 Valve type (see 4.1.1),

5.1.3 Valve style (see 4.1.2),

5.1.4 Valve size (see 4.1.3),

5.1.5 Valve pressure rating (see 4.1.4),

5.1.6 End connections (see 4.1.5),

5.1.7 Valve inlet operating pressure,

5.1.8 Set point (see 3.1.7 and 7.2),

5.1.9 Tamper-proof set point adjustment, if required (see 6.3.2),

5.1.10 Supplementary requirements, if any (see S1 through S4), and

5.1.11 Maximum vibration frequency and displacement amplitude, if other than specified (see S1.2).

6. Valve Construction

6.1 Valves shall incorporate the features specified in 6.2 – 6.16.

6.2 *Materials of Construction*—Material requirements for the automatic shut-off valve shall be as follows: The pressure-containing envelope shall be 300 series corrosion-resistant steel (304, 304L, 316, or 316L). Internal parts including springs, poppets, retainers, etc. shall be 300 series corrosion-resistant steel, nickel-aluminum-bronze, nickel-copper (70-30), or bronze. Other materials for both the pressure-containing envelope and internal parts may be selected to assure compatibility with the line medium, weldability, and to provide corrosion resistance without requiring painting, coating, or plating. Materials for contacting parts shall be selected to minimize electrolytic corrosion and galling.

6.3 *General Requirements:*

6.3.1 Automatic shut-off valves shall be self-contained, requiring no external power source for operation. The automatic shut-off valve shall be capable of meeting all requirements of this specification and provide extended reliable operation.

6.3.2 Automatic shut-off valves shall incorporate a provision for manually resetting. This shall constitute an isolatable bleed-by which is operable with the valve in the pipeline under pressure and which functions by equalizing pressure across the poppet. Style 1 valves shall in addition, incorporate a provision which automatically resets the valve, and which constitutes a small non-isolatable bleed-by.

6.4 *Threads*—Threads shall be as specified in ASME B1.1. Where necessary, provisions shall be incorporated to prevent the accidental loosening of threaded parts. The design shall be such that standard wrenches can be used on all external bolting. Lock-wire shall not be used. Any exposed threads shall be protected by plastic caps for shipping.

6.5 *Interchangeability*—The automatic shut-off valve, including all associated piece parts, shall have part number identity, and shall be replaceable from stock or the manufacturer on a nonselective and random basis. Parts having the same manufacturer's part number shall be directly interchangeable with each other with respect to installation (physical) and performance (function). Physically interchangeable assemblies, components, and parts are those which are capable of being readily installed, removed or replaced without alteration, misalignment, or damage to parts being installed or to adjoining parts. Fabrication operations such as cutting, filing, drilling, reaming, hammering, bending, prying, or forcing shall not be required.

6.6 *Nonmetallic Element Interchangeability*—Nonmetallic elements, including but not limited to, seat rings, poppet seat inserts, cushions, and O-rings shall be treated as separately identified and readily replaceable parts.

6.7 *Maintainability*—Maintenance shall require standard tools to the maximum extent possible. Any special tools required for maintenance shall be identified, and shall be supplied as part of the valve.

6.8 *Reversibility*—Seating inserts, if applicable, shall not be physically reversible unless they are also functionally reversible to preclude incorrect assembly.

6.9 *Adjustments*—There shall be no adjustments required in the automatic shut-off valve during or after assembly other than the set point.

6.10 *Pressure Envelope*—The valve shall be designed to pass a hydrostatic shell test at a pressure of at least 1.5 times the 100°F (38°C) pressure rating of the valve without damage.

6.11 *Body Construction*—All pressure lines, including the reset bleed line, shall be internally ported. The bonnet and bottom cap (where applicable) shall be attached to the body by bolting, threading, or threaded-union connections.

6.12 *Set-Point Adjustment*—Set point shall be adjustable through the range specified in 7.4. Type I valves shall be adjustable with the valve in the line under pressure. Type II valves may be removed from the line for adjustment. The set point shall incorporate right-hand threads so that a clockwise rotation increases the set point. Means shall be used to prevent an accidental or inadvertent change in set point. The option of a tamper-proof set-point adjustment (lead seal, and so forth) shall be available and shall be specified as in Section 5.

6.13 *Port Configuration*—The automatic shut-off valve shall have in-line inlet and outlet ports.

6.14 *Springs*—Spring incorporated in the automatic shut-off valve shall not be compressed solid during operation. Spring ends shall be squared and ground. Engagement or disengagement of parts against spring compression shall not be permitted.

6.15 *Guiding*—The valve poppet shall be guided to prevent binding or seizing, and to ensure proper seating under all operating conditions. Proper alignment of all internal operating parts shall be maintained with interchangeable parts and under all tolerance stack-up conditions.

6.16 *Accessibility*—Type I automatic shut-off valve shall be accessible for adjustment or service, without removing the automatic shut-off valve from the line.

7. Performance Requirements

7.1 Automatic shut-off valves shall meet the requirements of 7.2 – 7.8.

7.2 *Set Point*—The required set point as defined in 3.1.7, shall be as specified (see Section 5).

7.3 *Set-Point Accuracy*—The set-point accuracy, as defined in 3.1.8, shall be plus or minus 10 % of the set point.

7.4 *Range of Set-Point Adjustment*—Automatic shut-off valves shall be capable of meeting all performance requirements when set at any point within plus or minus 25 % of the nominal specified set point.

7.5 *Trip Differential Pressure*—The pressure differential at which the automatic shut-off valve trips shut shall not exceed the values specified in Table 2.

7.6 *Reset Pressure*—Once shut, the automatic shut-off valve shall remain shut until the pressure across the valve is equalized.

7.7 *Seat Tightness*—Once shut, and with the manually operated isolatable bleed-by closed, the automatic shut-off valve shall meet the following seat tightness requirements. Where necessary, leakage measurement shall start after temperature stabilization.

7.7.1 *Style 1 Valves*—Flow leakage shall not be less than 2 % and no greater than 5 % of the set-point flow.

TABLE 2 Maximum Allowable Trip Differential Pressures

Maximum Inlet Operating Pressure, psi (MPa)	Maximum Allowable Trip Differential Pressure, psi (kPa)
400 (2.758)	15 (103)
1500 (10.342)	40 (276)
3000 (20.684)	60 (414)
6000 (41.369)	75 (517)

7.7.2 *Style 2 Valves*—Flow leakage shall not exceed 60 standard cubic inches per hour (SCIH), per inch of valve size.

7.8 *External Leakage*—The automatic shut-off valve external leakage shall be bubble-tight at its operating pressure conditions over a 3-min period.

8. Tests Required

8.1 Each automatic shut-off valve must pass the tests outlined in 8.2 – 8.6.

8.2 *Visual Examination*—The automatic shut-off valve shall be examined visually to determine conformance with the ordering data, interface dimensions, and workmanship without disassembly.

8.3 *Hydrostatic Shell Test*—The automatic shut-off valve shall be hydrostatically tested using water by applying a test pressure equal to the 1.5 times the 100°F (38°C) pressure rating to the valve inlet and outlet to check its structural integrity. Pressure shall be applied for three minutes. Air or nitrogen may be used in lieu of water, providing appropriate safety precautions are taken to minimize the risk associated with the use of a compressible fluid. There shall be no external leakage, permanent distortion, or structural failure.

8.4 *Seal Tightness Test (Style 2 Valves Only)*—The automatic shut-off valve shall be tested with air or nitrogen gas with an inlet test pressure equal to the 1.1 times the 100°F (38°C) pressure rating. The leakage requirements of 7.7 shall be met.

8.5 *External Leakage Test*—Air or nitrogen at a test pressure equal to the 100°F (38°C) pressure rating of the valve shall be applied to the inlet and outlet of the automatic shut-off valve. External leakage shall be checked using bubble fluid, or by submerging the valve under water. There shall be no visible external leakage over a 3-min period.

8.6 *Set-Point Test*—Apply air or nitrogen at the nominal pressure rating to the valve inlet. Instrumentation shall include a pressure gage at the valve inlet, and a flow-measuring device. With the inlet pressure maintained at the nominal rating, establish flow at less than 90 % of the specified set point. Slowly increase flow until the valve trips shut. The valve shall not close at less than 90 % of the set-point flow, and shall close at no greater than 110 % of the set-point flow.

9. Marking

9.1 *Body Markings*—Valve bodies shall have the manufacturer's name or trademark, and flow arrow or "inlet" and "outlet" cast, forged or stamped with round bottom dies on them.

9.2 *Identification Plate*—An identification plate of corrosion-resistant metal in accordance with Specification F992; types I, II, III, or IV shall be permanently attached to the automatic shut-off valve and shall include the following information (some or all information may instead be stamped or etched directly on the outside surface of the automatic shut-off valve):

9.2.1 Manufacturer's name.
9.2.2 ASTM designation and year of issue.
9.2.3 Rated pressure.
9.2.4 Set point and range of adjustment.
9.2.5 Manufacturer's model/part number.

10. Quality Assurance System

10.1 The manufacturer shall establish and maintain a quality assurance system that will ensure all the requirements of this specification are satisfied. This system shall also ensure that all valves will perform in a similar manner to those representative valves subjected to original testing for determination of the operating and flow characteristics.

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

10.3 The purchaser reserves the right to witness the production tests and inspect the valves in the manufacturer's plant to the extent specified on the purchase order.

11. Keywords

11.1 air; excessive flow valve (EFV); nitrogen; valve

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 S1.5.

S1.2 *Shock Test*—The automatic shut-off valve shall be subjected to and meet the high-impact shock tests for grade A, class I as specified in MIL-S-901 pressurized with water, air, or nitrogen. The inlet port shall be pressurized to the maximum inlet operating pressure. There shall be no structural damage to the automatic shut-off valve. There shall be no degradation to the performance capability of the automatic shut-off valve. Tripping shut of the automatic shut-off valve is permissible.

S1.3 *Vibration Test*—The automatic shut-off valve shall be vibration tested in accordance with type I of MIL-STD-167-1 pressurized with water, air, or nitrogen. The inlet port shall be pressurized to the maximum inlet operating pressure. At frequencies up to and including 33 Hz (unless otherwise