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An American National Standard

Standard Specification for Pressure-Reducing Valves for Air or Nitrogen Systems[1]

This standard is issued under the fixed designation F 1795; 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 design, construction, testing, and operating requirements for self-contained pressure-reducing valves for air or nitrogen systems.

1.2 The values stated in this specification in inch-pounds units are to be regarded as the standard. The SI equivalent shown in parentheses are provided for information only.

2. Referenced Documents

2.1 *ASTM Standards:*

F 992 Specification for Valve Label Plates[2]

F 1685 Pressure-Reducing Manifolds for Air or Nitrogen Systems[2]

2.2 *American National Standards Institute (ANSI):*

B1.1 United Screw Threads (UN and UNR Thread Form)[3]

B1.20.1 Pipe Threads, General Purpose (Inch)[3]

B16.11 Forged Steel Fittings, Socket-Welding and Threaded[3]

B16.25 Buttwelding Ends[3]

B16.34 Valves—Flanged, Threaded, and Welded End[3]

2.3 *Military Standards and Specifications:*

MIL-STD-167-1 Mechanical Vibrations of Shipboard Equipment (Type I—Environmental and Type II—Internally Excited)[4]

MIL-STD-740-1 Airborne Sound Measurements and Acceptance Criteria of Shipboard Equipment[4]

MIL-S-901 Shock Tests, H.I. (High-Impact); Shipboard Machinery, Equipment and Systems, Requirements for[4]

MIL-F-1183 Fittings, Pipe, Cast Bronze, Silver-Brazing, General Specifications for[4]

2.4 *Government Drawings:*

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 *accuracy of regulation*—the amount by which the downstream pressure may vary when the pressure-reducing valve is set at any pressure within the required set pressure range and is subjected to any combination of inlet pressure, flow demand, and ambient temperature variations within the specified limits.

3.1.2 *bubble-sight*—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*—leakage from the pressure-reducing valve which escapes to atmosphere.

3.1.4 *fail-open flow capacity*—the ability of the pressure-reducing valve to pass flow under any given set of pressure conditions when, as a result of mechanical failure, it has assumed a position of least resistance to flow.

3.1.5 *flow capacity*—the ability of the pressure-reducing valve to pass flow under any given set of pressure conditions.

3.1.6 *flow rate demand*—the amount of flow demanded by the system at any given time downstream of the pressure-reducing valve.

3.1.7 *flow rate demand range*—the range over which the flow demand can vary.

3.1.8 *hydrostatic shell test pressure(s)*—The hydrostatic test pressures that the inlet and outlet of the pressure-reducing valve is required to withstand without damage. Pressure-reducing valve operation is not required during application of shell test pressure, but the pressure-reducing valve must meet all performance requirements after the shell test pressure has been removed.

3.1.9 *inlet operating pressure range*—the range over which the inlet pressure supplied to the pressure-reducing valve can vary under any operational conditions which the pressure-reducing valve can be subjected to in service.

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[2] *Annual Book of ASTM Standards*, Vol 01.07.

[3] Available from American National Standards Institute, 25 W. 43rd St., 4th Floor, New York, NY 10036.

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

3.1.10 *operating pressure(s)*—the pressures within the pressure-reducing valve during service.

3.1.11 *pressure ratings*—the pressure ratings of the pressure-reducing valve 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. For a pressure-reducing valve, the pressure ratings may not be identical for the valve inlet and outlet.

3.1.12 *pressure-reducing valve*—a component which accomplishes automatic regulation of the downstream pressure. In this component, the upstream pressure is reduced to the desired downstream pressure.

3.1.13 *pressure reversal*—a condition in which pressure exists at the outlet of a pressure-reducing valve when the loading element is deactivated (set spring adjustment backed off fully or dome charge vented off completely) and inlet pressure is vented off.

3.1.14 *seat-tightness*—the ability of the pressure-reducing valve to prevent leakage from the valve inlet to the valve outlet.

3.1.15 *self-contained pressure-reducing valve*—a pressure-reducing valve that does not use an external power source, such as compressed air, electricity, or hydraulic fluid for operation, but instead uses the line fluid for operation.

3.1.16 *set pressure*—the outlet pressure delivered by the pressure-reducing valve at the time the pressure setting is made. For the purposes of this specification, it will be assumed that the setting is made when there is no flow demand on the pressure-reducing valve ("lock-up" condition), and the pressure-reducing valve is at surrounding ambient temperature.

TABLE 1 Pressure Ratings for Pressure-Reducing Valve

Type of End Connection	Pressure Rating	Applicable Documents for Dimensional Details of End Connections
Butt-welded	ANSI B16.34 Class 150, 300, 400, 600, 900, 1500, 2500, or 4500	ANSI B16.25
Socket-welded	ANSI B16.34 Class 150, 300, 400, 600, 900, 1500, 2500, or 4500	ANSI B16.11
Threaded (tapered pipe thread)	ANSI B16.34 Class 150, 300, 400, 600, 900, 1500, or 2500	ANSI B1.20.1 and ANSI 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} (20.64 MPa)	803-1385943 3000 lb/in.^{2} (20.64 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 tall pieces and union nuts.

3.1.17 *set pressure range*—the range of set pressures (set pressure limits) over which the pressure-reducing valve can be adjusted while meeting the performance requirements specified.

3.1.18 *soft-seating insert*—the insert, incorporated in either the poppet or the seat of the pressure-reducing valve, which ensures bubble-tight seat tightness under all operating conditions.

3.1.19 *valve poppet*—the part of the pressure-reducing valve trim which established a rate of flow by moving toward or away from the valve seat.

4. Classification

4.1 Pressure-reducing valves shall be of the following types, sizes, pressure ratings, and end connections, as specified in Section 5.

4.1.1 *Types*—Pressure-reducing valves shall be either Type I (inlet outlet end connections of the same pressure rating) or Type II (outlet end connection pressure rating lower than the inlet end connection rating) and specified in Section 5.

4.1.2 *Sizes*—Pressure-reducing valve sizes shall be ⅛ NPS (10.2 mm), ¼ NPS (13.5 mm), ⅜ NPS (17.2 mm), ½ NPS (21.3 mm), ¾ NPS (26.9 mm), 1 NPS (33.7 mm), 1¼ NPS (42.4 mm), 1½ NPS (48.3 mm), and 2 NPS (60.3 mm).

4.1.3 *Pressure Ratings*—Pressure-reducing valves shall have pressure rating(s) selected (see 3.1) from Table 1. The pressure rating(s) selected shall be specified in Section 5.

4.1.4 *End Connections*—Pressure-reducing 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 pressure-reducing 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 inlet and outlet sizes (see 4.1.2),

5.1.4 Pressure rating(s) (see 4.1.3),

5.1.5 Type of end connections (see 4.1.4),

5.1.6 Inlet operating pressure range.

5.1.7 Set pressure and set pressure range, if other than specified (see 7.1.3).

5.1.8 Flow rate demand range (see 7.1.1, S1.1.2).

5.1.9 Accuracy of regulation required, if set pressure is below 10 psig (see 7.1.2).

5.1.10 Tamper-proof set-point adjustment, if required (see 6.1.9),

5.1.11 Supplementary requirements, if any (S1 through S4).

5.1.12 Maximum vibration frequency and displacement amplitude, if other than specified (see S1.1.4).

6. Valve Construction

6.1 Valves shall incorporate the design features specified in 6.1.1-6.1.19.

6.1.1 *General Requirements*—Pressure-reducing valves shall be self-contained, requiring no external power source for operation. The pressure-reducing valve shall be capable of

meeting all requirements of this specification and provide extended reliable operation when protected by a 5-µm nominal/18-µm absolute filter installed upstream and when subjected to conditions specified in Section 5.

6.1.2 *Materials of Construction*—Material requirements for the pressure-reducing valve shall be as follows: The pressure containing envelope (body, gas dome, or spring housing) shall be 300 series corrosion-resistant steel (304, 304L, 316, or 316L). Internal parts including springs, poppets, seal rings, and retainers 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.

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

6.1.4 *Port Configuration*—The pressure-reducing valve shall have in-line inlet and outlet ports.

6.1.5 *Pressure Lines*—All pressure lines in the pressure-reducing valve shall be internally ported.

6.1.6 *Soft-Seating Insert*—A field replaceable soft-seating insert shall be incorporated in the pressure-reducing valve. Soft-seating inserts shall be protected from direct flow impingement, excessive loading and extrusion, or any other effect jeopardizing their useful life. Soft-seating inserts shall be of the simplest practical configuration to facilitate emergency replacement manufacture where necessary.

6.1.7 *Joints*—The bonnet or spring housing and bottom cap shall be attached to the body by bolting, a threaded connection, or a threaded union connection.

6.1.8 *Springs*—Any spring incorporated in the pressure-reducing 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.

6.1.9 *Set Point Adjustment*—For mechanical spring-loaded pressure-reducing valves, the set point shall be adjustable under pressure and shall incorporate right-hand threads so that a clockwise rotation increases the set pressure. Means shall be used to prevent an accidental or inadvertent change in set pressure. The option of a tamper-proof set point adjustment (lead seal, and so forth) shall be available and provided if specified in Section 5. For gas-dome loaded pressure-reducing valves, set point adjustment shall be in accordance with 6.1.10.

6.1.10 *Gas Dome*—For gas-dome loaded pressure-reducing valves, the set point shall be adjustable under pressure and shall maintain its charge without adjustment or recharge more frequently than once a year to remain within its specified performance envelope. Upstream pressure shall be used to establish dome load. Dome loading shall be accomplished by two valves installed in series, with a bleed-off valve in-between. If these valves are metal seated, they shall not seat directly into the structure of the dome so that damage or wear to the seating surfaces would not require repair or replacement of the dome. Only a single dome penetration is allowed. The valves shall be operable by a standard-size hex wrench or other suitable means. There shall be no external leakage past the threads during dome bleeding. Flow from the bleed-off valve shall be ported in such a way that it does not impinge directly on the person making the adjustment, cause excessive noise, or potentially lead to ice formation within the dome loading circuit.

6.1.11 *Threads*—Threads shall be as specified in ANSI 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.

6.1.12 *Accessability*—All internal parts of the pressure-reducing valve shall be accessible for adjustment or service, without removing the pressure-reducing valve from the line.

6.1.13 *Interchangeability*—The pressure-reducing 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 that are capable of being readily installed, removed, or replaced without alternation, 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.

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

6.1.15 *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.

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

6.1.17 *Adjustments*—There shall be no adjustments required in the pressure-reducing valve during or after assembly other than the set point.

6.1.18 *Pressure Reversal*—The pressure-reducing valve shall not be damaged when subjected to a maximum pressure reversal (maximum set pressure exists at the outlet).

6.1.19 *Guiding*—The valve poppet shall be guided to prevent binding or seizing and 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.

7. Performance Requirements

7.1 Pressure-reducing valves shall meet the performance requirements of 7.1.1-7.1.5.

7.1.1 *Flow Rate Demand Range*—The maximum and minimum flow rate demand required shall be specified (see Section

5) in standard cubic feet per minute [at 60°F (16°C) and 14.7 psia (101 kPa)]. The pressure-reducing valve shall meet the specified maximum and minimum flow rate demand requirements, or any intermediate flow rate demand requirement, and shall operate without hunting or chattering under all specified conditions.

7.1.2 *Accuracy of Regulation*—The pressure-reducing valve shall maintain set pressure within the accuracy of regulation limits specified in Table 2 under all flow rate demand and inlet operating pressure conditions specified.

7.1.3 *Set Pressure Range*—The set pressure range shall be as follows: Where the pressure-reducing valve is mechanically spring loaded, the set pressure shall be adjustable through a range of at least ±5 % of the set pressure, or ±2 psi (13.8 kPa), whichever is greater. Where the pressure-reducing valve is gas dome loaded, the set point shall be adjustable through a range of at least ±25 % of the set pressure or 10 psi (68.9 kPa), whichever is greater.

7.1.4 *Seat Tightness*—The pressure-reducing valve shall meet the seat tightness requirements of 8.1.3. Where necessary, leakage measurement shall start after temperature stabilization.

7.1.5 *External Leakage*—Pressure-reducing valve external leakage shall be bubble tight at operating pressure conditions over a 3-min period.

8. Tests Required

8.1 Each pressure-reducing valve must pass the tests outlined in 8.1.1-8.1.4.

8.1.1 *Visual Examination*—The pressure-reducing valve shall be examined visually to determine conformance with the ordering data, interface dimensions, and workmanship without disassembly.

8.1.2 *Hydrostatic Shell Test*—The pressure-reducing valve shall be hydrostatically tested with water by applying test pressure(s) not less than 1.5 times the 100°F (38°C) pressure rating(s) to the inlet and outlet ports to check structural integrity. Test pressure(s) shall be applied for 3 min. 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.

TABLE 2 Required Accuracy of Regulation

Set Pressure, psig	Accuracy of Regulation (Percent of Set Pressure)
0–9 (0–69 kPa)	As specified in Section 5
10–25 (70–172 kPa)	(−30 ± 5 %)
26–50 (173–345 kPa)	(−20 ± 5 %)
51–100 (346–689 kPa)	(−16 ± 2 %)
101–250 (690–1725 kPa)	(−12 ± 2 %)
251–750 (1726–5170 kPa)	(−10 ± 2 %)
751–1000 (5171–6895 kPa)	(−9 ± 1 %)
Above 1000 (above 6896 kPa)	(−7 ± 1 %)

8.1.3 *Seal Tightness Test*—The pressure-reducing valve shall be tested for seat tightness with air or nitrogen gas at an inlet test pressure not less than the maximum inlet operating pressure. The valve shall be isolated downstream using a dead-ended volume not exceeding ten diameters of downstream pipe and monitored with bubble fluid to assure tightness. There shall be no detectable rise in the outlet pressure over a 3-min period after pressure-reducing valve temperature stabilizes.

8.1.4 *External Leakage Test*—Air or nitrogen gas shall be applied to the inlet of the pressure-reducing valve at the rated pressure. External leakage shall be checked using bubble fluid or by submerging the pressure-reducing valve in water. There shall be no visible external leakage over a 3-min period.

9. Marking

9.1 *Identification Plate*—An identification plate of corrosion-resistant metal in accordance with Specification F 992, Types I, II, III, or IV shall be permanently attached to the pressure-reducing valve and shall include the following information (some or all information may instead be stamped or etched directly on the outside surface of the pressure-reducing valve):

9.1.1 Manufacturer's name,

9.1.2 ASTM designation and year of issue,

9.1.3 Valve size, type, and pressure rating(s),

9.1.4 Nominal operating conditions (inlet pressure, set pressure, and flow capacity),

9.1.5 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 pressure-reducing 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 pressure-reducing valves in the manufacturer's plant to the extent specified on the purchase order.

SUPPLEMENTARY REQUIREMENTS

One or more of the following supplementary requirements S1, S2, 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 Qualification tests shall be conducted at a facility satisfactory to the customer and shall consist of the examinations and tests selected from those specified in S1.1.1 through S1.1.7 and delineated in the ordering data. The tests may be conducted on representative valve sizes and pressure classes to qualify all sizes and pressure classes of valves, provided the valves are of the same type and design. Evidence of prior approval of these tests is acceptable.

S1.1.1 *Pressure Reversal Test*—The pressure-reducing valve shall be tested to determine the susceptibility to damage when subjected to pressure reversal as specified in 6.1.18. It shall be set up with maximum inlet operating pressure and maximum set pressure. A separate means shall be included to insure that there is no loss of downstream pressure during this test. The reference load shall then be removed from the set-point mechanism (if the pressure-reducing valve is spring loaded, all spring compression shall be backed off, if it is gas dome loaded, all dome charge shall be released). The inlet pressure shall then be released and this condition (no load on the pressure-reducing valve set point mechanism, zero pressure applied to the inlet side of the pressure-reducing valve seat, and maximum set pressure applied to the outlet side of the pressure-reducing valve seat) shall be maintained for a period of not less than 1 h. There shall be no leakage from the outlet to the inlet of the pressure-reducing valve. There shall be no evidence of damage to the pressure-reducing valve and no degradation to its performance capability.

S1.1.2 *Accuracy of Regulation Test*—The pressure-reducing valve shall be tested for accuracy of regulation at each inlet pressure/set pressure combination shown in Table S1.1. At Condition D, flow shall be varied over the full range of flow rate demand as specified in Section 5. For Conditions A, B, and C, full flow range testing is not required. During each sequence (changing from Condition A to Condition B and changing from Condition C to Condition D), no alteration shall be made to the set pressure adjustment, or any other portion of the pressure-reducing valve, and the accuracy of regulation shall be maintained as required by Table 2. There shall be no instability or other evidence of unsatisfactory operation of pressure-reducing valve during these tests. Flow in each condition shall be maintained long enough to demonstrate that the above requirements are met.

TABLE S1.1 Pressure Combinations for Accuracy of Regulation Tests

Condition	Inlet Pressure	Set Pressure
A	maximum	minimum
B	minimum	minimum
C	maximum	maximum
D	minimum	maximum

S1.1.3 *Shock Test*—The pressure-reducing 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 air or nitrogen gas. The inlet port shall be pressurized to the maximum inlet operating pressure and the outlet port pressurized to the maximum outlet operating pressure. There shall be no structural damage to the pressure-reducing valve or any components. There shall be no degradation to the performance capability of the pressure-reducing valve. Momentary loss in pressure is permissible.

S1.1.4 *Vibration Test*—The pressure-reducing valve shall be vibration tested in accordance with Type 1 of MIL-STD-167-1 pressurized with air or nitrogen gas. The inlet port shall be pressurized to the maximum inlet operating pressure and the outlet port pressurized to the maximum outlet operating pressure. At frequencies up to and including 33 Hz (unless otherwise specified in Section 5), there shall be no resonance in the range of frequency tested. There shall be no structural damage or degradation to the performance capability of the pressure-reducing valve.

S1.1.5 *Noise Test*—The pressure-reducing valve shall be tested for airborne noise in accordance with MIL-STD-740-1. The noise (sound pressure level) shall not exceed 85 db observed at 1-m distance from the pressure-reducing valve.

S1.1.6 *Posttest Examination*—The pressure-reducing valve shall be disassembled and examined for any evidence of excessive wear, degradation, or impending damage or breakage.

S1.1.7 *Spring Deflection Test*—The springs used in the pressure-reducing valves shall not exhibit a permanent set when compressed 20 % beyond their design limits. A spring deflection test shall be conducted to verify compliance to this requirement.

S2. Technical Data and Certification Requirements

S2.1 *Drawings*—Assembly drawings or catalog sheets of the pressure-reducing valve that clearly depict design and shall be provided. The following information shall also be included as part of the drawings or catalog sheets:

S2.1.1 Bill of material listing specification, grade, condition, and any other data required to identify fully the properties of the materials proposed. This shall include identifications, material and size designations, shore hardness and any other data necessary to identify fully the parts.

S2.1.2 In cases in which standard commercial or military parts are or can be used, these shall be appropriately identified.

S2.1.3 Outline dimensions, disassembly space, location, and size of end connections.

S2.1.4 Estimated weight and center of gravity (vertical, longitudinal, and transverse).

S2.1.5 Recommended assembly torques or equivalent procedures for making up all joints and threaded assemblies.

S2.1.6 The following valve performance information shall be included:

S2.1.6.1 Set pressure and adjustable range.

S2.1.6.2 Specified operating conditions—range of inlet pressures and required range of capacity.

S2.1.6.3 Fail-open capacity (for purposes of pressure-relief valve sizing) of the pressure-reducing valve.

S2.2 *Technical Manuals*—Technical manuals shall provide a description, installation procedures, operation and maintenance instructions, and illustrated parts breakdown for the pressure-reducing valve, organized as follows:

S2.2.1 *Chapter 1*—General Information and Safety Precautions.

S2.2.2 *Chapter 2*—Operation.

S2.2.3 *Chapter 3*—Functional Description.

S2.2.4 *Chapter 4*—Scheduled Maintenance.

S2.2.5 *Chapter 5*—Troubleshooting.

S2.2.6 *Chapter 6*—Corrective Maintenance.

S2.2.7 *Chapter 7*—Parts List.

S2.2.8 *Chapter 8*—Installation.

S2.2.9 In addition, the following shall be included as part of the technical manual content:

(a) The assembly drawings for the pressure-reducing valve, supplemented by additional illustrations where necessary to illustrate operation and maintenance adequately. These additional illustrations may consist of blowouts, partial or full sections, and may eliminate extraneous lines and details to clarify the interaction of parts.

(b) Table listing wrench sizes and assembly torques or other equivalent procedures) for making up all joints and threaded assemblies.

(c) Detailed disassembly and reassembly and procedures. In addition to a section providing procedures for the complete disassembly and reassembly of the pressure-reducing valve, maintenance and troubleshooting sections shall contain, or refer to, only the limited disassembly and reassembly required to accomplish each particular operation. This is intended to reduce the possibility of unnecessary disassembly and unnecessary disturbance of adjustments when performing specific or limited maintenance or troubleshooting operations.

S2.3 *Certification*—Certification shall be provided indicating that the valve meets all requirements of the purchase order.

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 organization 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 which identifies 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 using 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 examination 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 use nondestructive examination, as necessary, to ensure that material and components comply with the specified requirements. Nondestructive examinations shall be authorized by their employer and/or qualified by a recognized national body, and their authorizations/qualification records shall be made available to the inspection authority if required.

S3.12 *Nonconforming 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 treatment 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.

S3.16 *Records Maintenance*—The manufacturer shall have a system for the maintenance of inspection records, radiographs, and manufacturer's data reports that describe the achievement of the required quality and the effective operation of the quality system.

S3.17 *Sample Forms*—The forms used in the quality control system and any detailed procedures for their use shall be available for review. The written description of the quality assurance system shall make reference to these forms.

S3.18 *Inspection Authority*—The manufacture shall make available to the inspection authority at the manufacturer's plant a current copy of the written description of the quality assurance system. The manufacturer's quality assurance system shall provide for the inspection authority at the manufacturer's plant to have access to all drawings, calculations, specifications, procedures, process sheets, repair procedures, records, test results, and any other documents as necessary for the inspection authority to perform its duties in accordance with this supplementary requirement. The manufacturer may provide for such access by furnishing the inspection authority with originals or copies of such documents.

S4. Special Material, Design, and Performance Requirements

S4.1 *Recovered Materials*—Unless otherwise specified herein, all equipment, material, and articles incorporated in the products covered by this specification shall be new and may be fabricated using materials produced from recovered materials to the maximum extent practicable without jeopardizing the intended use. The term "recovered materials" means materials that have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification unless otherwise specified.

S4.2 Pipe threads shall not be used in the pressure-reducing valve.

S4.3 *Envelope Dimensions*—Pressure-reducing valve envelope dimensions (see X1.5) shall be as specified in Fig. 1 and Table S4.1.

S4.4 *Nonmetallic Valve Internal Parts*—Nonmetallic internal parts shall be compatible with any residual materials (100 % humidity, entrained salt spray, and 2190 TEP lubricating oil used in air compressors) in the line media.

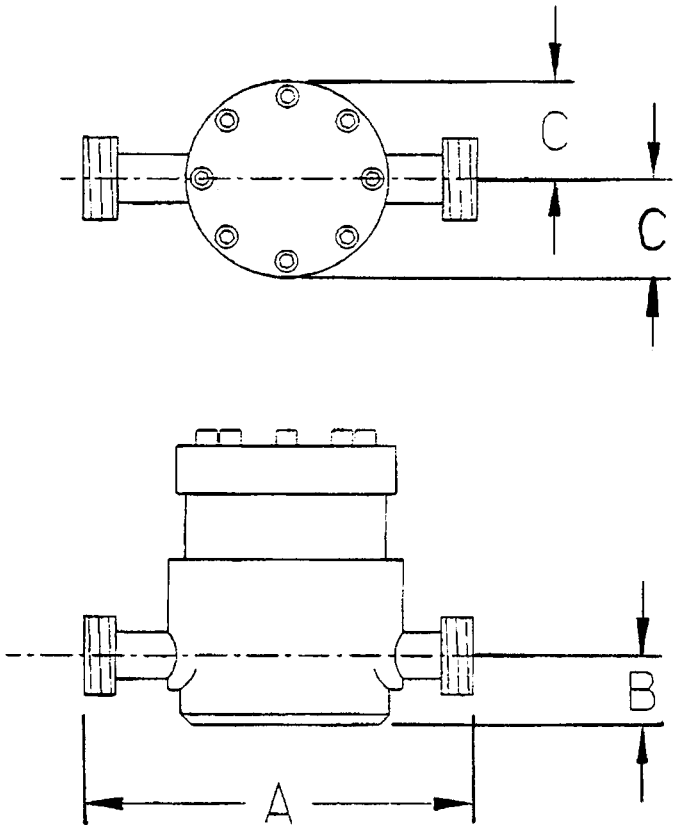

FIG. 1 Pressure–Reducing Valve Envelope Dimensions

TABLE S4.1 Envelope Dimensions

Valve Size	A (in.)	A (mm)	B (in.) (Max)	B (mm) (Max)	C (in.) (Max)	C (mm) (Max)
¼ NPS (13.5 mm)	6¼ ± 3/16	158 ± 5	3½	89	3	76
⅜ NPS (17.2 mm)	7 ± 3/16	178 ± 5	4¼	108	4	102
½ NPS (21.3 mm)	8 ± ¼	203 ± 6	5	127	4½	114
¾ NPS (26.9 mm)	9 ± ¼	229 ± 6	5¾	146	5	127
1 NPS (33.7 mm)	10 ± ¼	254 ± 6	6½	165	5¾	146

APPENDIX

(Nonmandatory Information)

X1. GUIDELINES FOR SELECTION OF PRESSURE-REDUCING VALVES

X1.1 *Scope*—This appendix provides general guidelines for the selection of pressure-reducing valves, and therefore, its use does not in any way relieve the user of the final responsibility in the selection and installation of pressure-reducing valves.

X1.2 *Mode of Operation*—Pressure-reducing valves for air or nitrogen service are commonly designed to operate in one of three basic modes:

X1.2.1 *Direct Spring Loaded*—Set point established by a mechanical spring; generally practical at only small-to-moderate combinations of flow demand and set pressure.

X1.2.2 *Gas Dome Loaded*— Set point established by a fixed gas charge loaded into the dome from the valve inlet at the time the valve is set; generally advantageous for high combinations of flow demand and set pressure.

X1.2.3 *Gas Dome Loaded, Pilot Referenced*—Set point established by a charge of gas in the dome which is maintained constant at all times by a spring-loaded pilot valve installed on or adjacent to the dome and which operates by sensing the pressure in the dome and either venting the dome, or charging the dome, using gas drawn from the valve inlet, as necessary. This arrangement, also known as a compensator, compensates for temperature change, valve stroke, leakage, or any other condition which would otherwise cause a change in dome pressure and thus set point.

X1.3 *Fail-Open Capacity*—It is critical to establish accurately and define clearly the fail-open capacity of a pressure-reducing valve. This parameter establishes the requirements for the pressure-relief valve that protects the system downstream of the pressure-reducing valve from overpressure in the event of pressure-reducing valve failure.

X1.4 *Valve Types*—Pressure-reducing valves covered by this specification are defined by type as follows:

X1.4.1 *Type 1*—Valves that have inlet and outlet connections that are identical.

X1.4.2 *Type 2*—Valves that have inlet and outlet connections that are not identical. These valves can facilitate any configuration, increase in size, or decrease in rating downstream of the regulator as a result of the pressure reduction in the flow path accomplished by the pressure-reducing valve.

X1.5 Pressure-reducing valves intended for use in manifolds per the applicable ASTM specification on manifolds (Specification F 1685), should be Type I, with union end connections in accordance with Table 1 and envelope dimensions in accordance with Fig. 1 and Table S4.1.