



Standard Specification for Pressure-Reducing Manifolds for Air or Nitrogen Systems¹

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1. Scope

1.1 This specification covers the design, construction, testing and operating requirements for pressure-reducing manifolds for air or nitrogen systems, referred to herein also as manifolds. The term manifold constitutes the combination of all components and piping between, and including, the inlet and outlet ports (see Fig. 1 and Fig. 2).

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses (metric SI units) are for information only.

2. Referenced Documents

2.1 ASTM Standards:²

F992 Specification for Valve Label Plates

F1508 Specification for Angle Style, Pressure Relief Valves for Steam, Gas, and Liquid Services

F1795 Specification for Pressure-Reducing Valves for Air or Nitrogen Systems

2.2 American Society of Mechanical Engineers (ASME):

B1.1 Unified Screw Threads³

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 Airborne and Structureborne Noise Measurements and Acceptance Criteria of Shipboard Equipment⁴

MS 16142 Boss, Gasket Seal Straight Thread Tube Fitting, Standard Dimensions for⁴

MIL-S-901 Shock Tests, H.I. (High-Impact); Shipboard Machinery, Equipment and Systems, Requirements for⁴

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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 Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5990.

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

MIL-F-1183 Fittings, Pipe, Cast Bronze, Silver-Brazing, General Specification for⁴

2.4 Government Drawings:

Naval Sea Systems Command (NAVSEA):

NAVSEA 803-1385884 Unions, Fittings and Adapters Butt and Socket Welding 6000 PSI, WOG and OXY (IPS)⁴

NAVSEA 803-1385943 Unions, Silver Brazing 3000 PSI, WOG, IPS, for UT Inspection⁴

NAVSEA 803-1385946 Unions, Bronze, Silver Brazing, WOG for UT Inspection, 1500 PSI, WOG⁴

3. Terminology

3.1 Definitions:

3.1.1 *accuracy of regulation*—the amount by which the downstream pressure may vary when the manifold 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-tight*—No visible leakage over a 5-min period using either water submersion or the application of bubble fluid for detection.

3.1.3 *external leakage*—Leakage from the manifold which escapes to atmosphere.

3.1.4 *flow rate demand*—the amount of flow demanded at any given time by the system downstream of the manifold.

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

3.1.6 *hydrostatic shell test pressures*—the hydrostatic test pressures that the inlet and outlet sections of the manifold are required to withstand without damage. Manifold operation is not required during application of shell test pressure, but the manifold must meet all performance requirements after the shell test pressure has been removed.

3.1.7 *inlet operating pressure range*—the range over which the inlet pressure supplied to the manifold can vary under any operational conditions which the manifold can be subjected to in service.

3.1.8 *internal leakage*—leakage from higher pressure to lower pressure portions of the manifold and which does not escape to atmosphere.

3.1.9 *manifold rated pressures*—the inlet and outlet pressure ratings of the manifold. These rated pressures are selected from

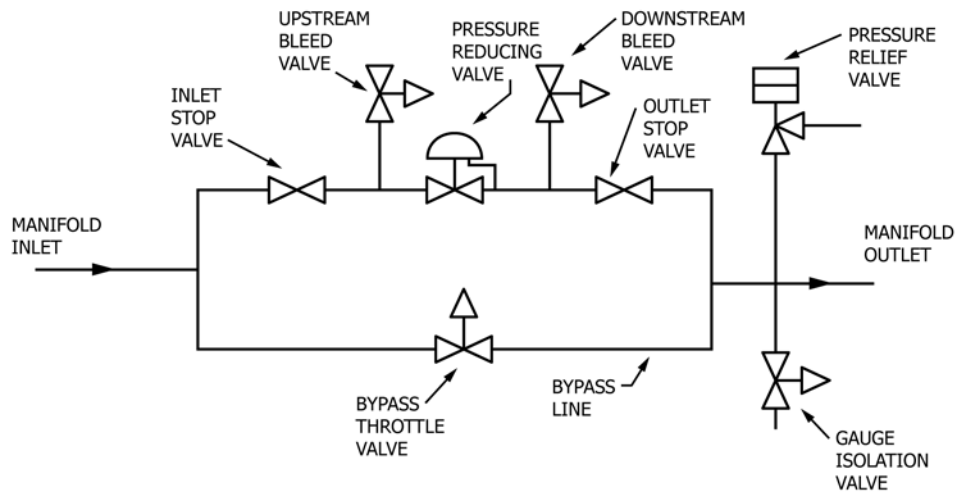


FIG. 1 Manifold Configuration

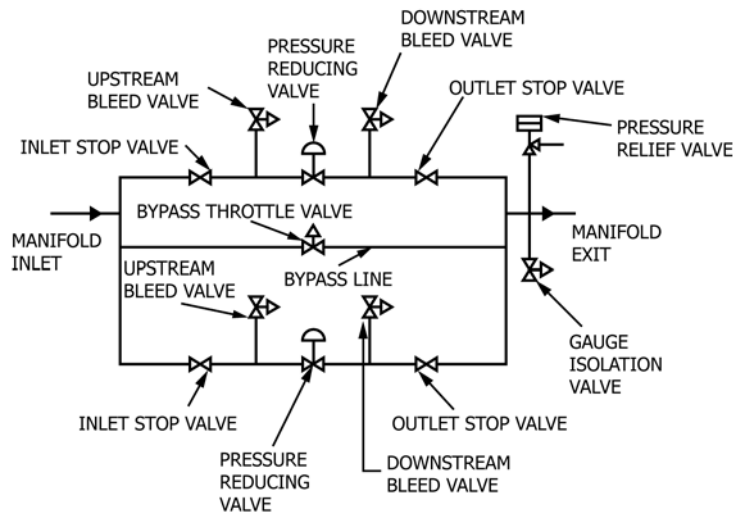


FIG. 2 Manifold Configuration

the applicable pressure ratings (see 4.2) and specified in the ordering information (see Section 5). The inlet pressure rating is applicable from the manifold inlet up to and including the seats of the outlet stop valve and bypass throttle valve. The outlet pressure rating is applicable from the outlet side of the seats of the outlet stop valve to the manifold outlet and the bypass throttle valve to the manifold outlet.

3.1.10 *manual valves*—these are all the manually operated valves in the manifold which include handwheel-operated valves and wrench-operated valves. The handwheel-operated valves are the inlet and outlet stop valves, and the bypass throttle valve. The wrench-operated valves are the upstream and downstream bleed valves and the gage isolation valve. The requirements for any manually operated valves installed in the pressure-reducing valve are covered under 6.5.1.

3.1.11 *maximum flow rate demand*—the maximum amount of flow demanded of the manifold by the downstream system.

3.1.12 *maximum inlet operating pressure*—the highest pressure supplied to the inlet of the manifold in service.

3.1.13 *maximum outlet operating pressure*—the highest pressure at the manifold outlet in service. This is established by the accumulation pressure of the pressure-relief valve.

3.1.14 *maximum set pressure*—the highest set pressure at which the manifold can meet the performance requirements specified.

3.1.15 *minimum flow rate demand*—the minimum flow rate demanded of the manifold by the downstream system.

3.1.16 *minimum inlet operating pressure*—the lowest pressure supplied to the inlet of the manifold in service.

3.1.17 *minimum outlet operating pressure*—the lowest pressure at the manifold outlet in service. This is established by the accuracy of regulation of the pressure-reducing valve.

3.1.18 *minimum set pressure*—the lowest set pressure at which the manifold can meet the performance requirements specified.

3.1.19 *operating pressures*—the pressures within the manifold during service.

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

3.1.21 *pressure-relief valve*—the component of the manifold which protects the manifold and downstream systems against downstream over pressurization.

3.1.22 *set pressure*—the outlet pressure delivered by the manifold 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 manifold (“lock-up” condition), and the manifold is at surrounding ambient temperature.

3.1.23 *set pressure range*—the range of set pressures over which the manifold can be adjusted while meeting the performance requirements specified.

3.1.24 *wide open capacity*—the flow rate when a valve is in a position which presents the least resistance to flow.

4. Classification

4.1 *Configuration*—Manifolds shall be of the following configurations and specified in the ordering information (see 5.1).

Configuration 1-1 One reducer, one relief (see Fig. 1).

Configuration 2-1 Two reducers, one relief (see Fig. 2).

4.2 *Pressure Ratings*—Manifolds shall have inlet-rated pressures and outlet-rated pressures selected from the following categories: 400-, 1500-, 3000-, and 6000-psig (2.8-, 10.3-, 20.7-, and 41.4-MPa gage pressure). The inlet and outlet pressure ratings selected shall be specified in Section 5.

4.3 *End Connections*—Manifolds shall have inlet and outlet end connections selected from those listed in Table 1 and specified in Section 5.

5. Ordering Information

5.1 Ordering documentation for manifolds 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 Size and type of inlet end connection (see 4.3 and 6.4.2),

5.1.3 Size and type of outlet end connection (see 4.3 and 6.4.2),

5.1.4 Size and type of end connections for pressure-reducing valve and pressure-relief valve,

5.1.5 If tail pieces and union nuts are required (when required, their material of construction shall be per Table 1),

5.1.6 Manifold configuration, inlet and outlet pressure ratings (see 4.1 and 4.2),

5.1.7 Manifold inlet operating pressure range,

5.1.8 Type of mounting required: bottom or back mounting (see 6.4.3),

5.1.9 Set pressure and set pressure range, if other than specified (see 7.3),

5.1.10 Flow rate demand range (see 7.1, S1.1.6),

5.1.11 Accuracy of regulation required, if other than specified, or if set pressure is below 10 psig (see 7.2),

5.1.12 Relief valve set pressure and accumulation pressure (if different from Specification F1508),

5.1.13 Ambient atmospheric conditions: temperature range, chemical contaminants, if any,

5.1.14 Quality of inlet air/nitrogen gas: temperature range, moisture content, oil/lubricant contaminants, if any,

5.1.15 Special tools required (see 6.7),

5.1.16 Tamper-proof lead seal if required (see Specification F1795, Section 5),

5.1.17 Supplementary requirements, if any (S1 through S4), and

5.1.18 Maximum vibration frequency, if other than specified (see S1.1.9).

6. Manifold Construction

6.1 Manifolds shall incorporate the design features specified in 6.2 – 6.11.

6.2 *Materials of Construction*—Material requirements for the assemblies in the manifold shall be as specified in the applicable component specifications referenced herein. Materials for all other parts, including the inlet and outlet manifold blocks, shall be 300 series corrosion-resistant steel (SS304, 304L, 316, or 316L) or other materials selected to provide weldability and corrosion resistance without requiring painting, coating, or plating. The inlet and outlet manifold blocks shall be weld repairable. Materials for contacting parts shall be selected to minimize electrolytic corrosion and galling. Metallic materials shall conform to applicable ASTM specifications. Nonmetallic materials shall be compatible with the line medium.

6.3 *General Requirements*—Manifolds shall incorporate the functional elements shown schematically in Fig. 1 or Fig. 2, as applicable, and delineated below:

(1) Inlet and outlet stop valves,

(2) Upstream and downstream bleed valves (for depressurization of all components and fluid cavities.),

(3) Pressure-reducing valve(s),

(4) Pressure-relief valve,

(5) Gauge isolation valve, and

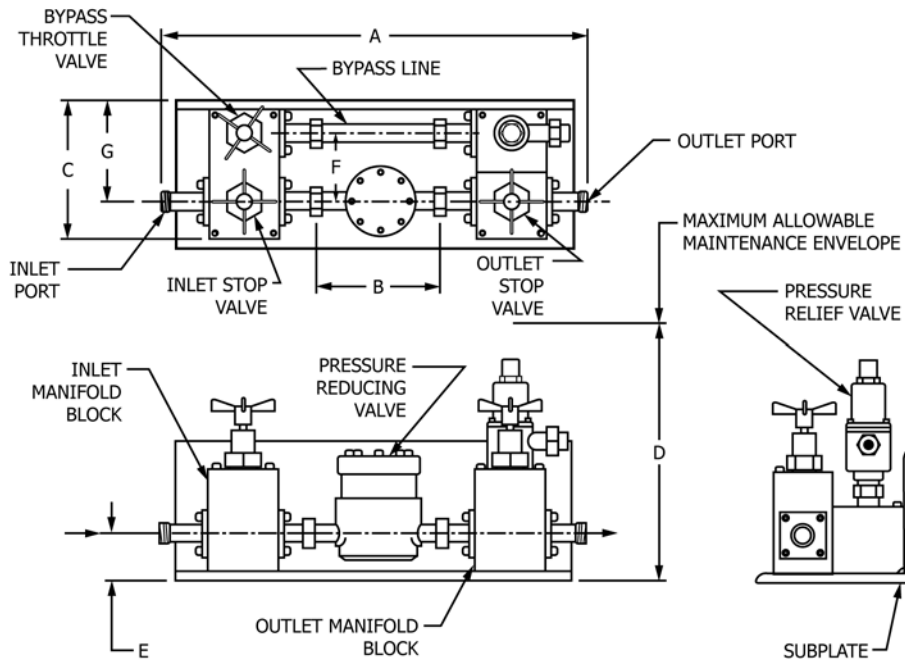
(6) Bypass throttle valve.

All components shall be part of a manifold assembly, as shown in Fig. 3 or Fig. 4, as applicable, which require the inlet

TABLE 1 Manifold Inlet and Outlet End Connections

Type of End Connection	Pressure Rating, lb/in ² (MPa)	Applicable Documents
Union ^A , silver-brazed	400 (2.8)	MIL-F-1183 (O-ring type)
Union ^A , silver-brazed	1500 (10.3)	803-1385946
Union ^A , silver-brazed	3000 (20.5)	803-1385943
Union ^A , butt/socket weld	6000 (41.4)	803-1385884
As specified	As specified	As specified

^A Only the pertinent dimensions listed in the applicable documents applicable to the straight thread portion of the thread piece shall apply. Thread pieces shall be secured to the manifold inlet and outlet blocks using straight threads and a O-ring seal design. For the manifold inlet and outlet connections, unless otherwise specified in Section 5 the tail pieces and the union nuts shall not be furnished—only the thread pieces shall be furnished. If tail pieces and union nuts are required, their materials of construction shall be in accordance with the applicable documents listed above and shall be specified in Section 5.



NOTE 1—Pictorial representations are for illustrative purposes only and do not imply design.

FIG. 3 Components of a Manifold Assembly

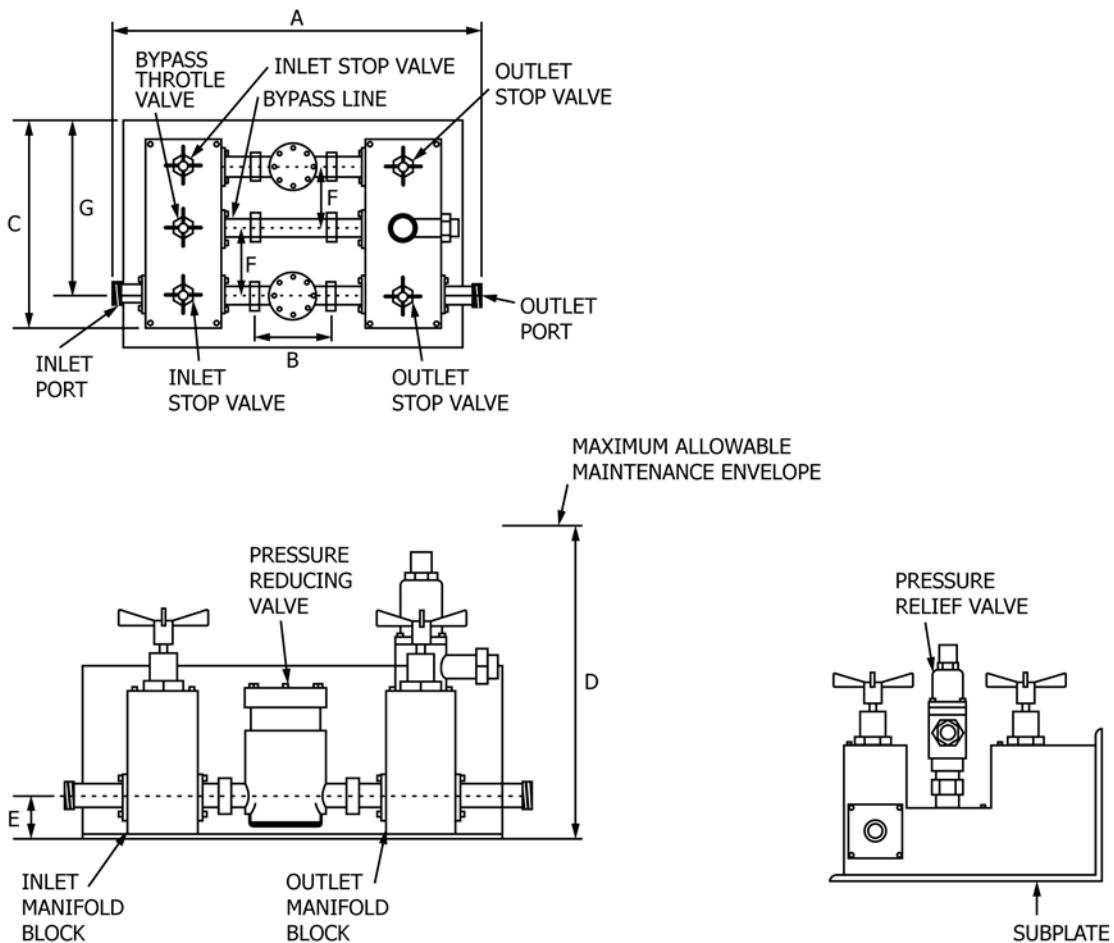


FIG. 4 Components of Manifold Assembly