

INCH- POUND
MIL-V-2961D(SH)
3 April 1990
SUPERSEDING
MIL-V-2961C(SHIPS)
24 May 1968
(See 6.12)

MILITARY SPECIFICATION

VALVES, GLOBE, PRESSURE REDUCING, GAS SERVICE

This specification is approved for use by the Naval Sea Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers self-contained globe (in-line and offset) pressure reducing valves for gas (air or nitrogen) service intended for shipboard and marine environment use (see 6.1). Guidance in the selection and installation of these valves is contained in MIL-HDBK-227.

1.2 Classification. Pressure reducing valves shall be of the following types, classes, body type, and pressure rating, as specified (see 6.2):

- Type I - Direct spring loaded
- Type II - Gas dome loaded
- Type III - Gas dome loaded, pilot referenced
- Type IV - Internal pilot operated

- Class 1 - Balanced main poppet
- Class 2 - Unbalanced main poppet

- Body A - In-line
- Body B - Offset

Valves shall have nominal inlet pressure ratings of 200, 400, 600, 1500, 3000, 3300, and 6000 pounds per square inch (lb/in²) (see 6.8.5).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

FEDERAL

- QQ-B-637 - Brass, Naval: Rod, Wire, Shapes, Forgings, and Flat Products with Finished Edges (Bar, Flat Wire, and Strip).
- QQ-C-465 - Copper-Aluminum Alloys (Aluminum Bronze) (Copper Alloy Numbers 606, 614, 630, 632M, and 642); Rod, Flat Products with Finished Edges (Flat Wire, Strip, and Bar), Shapes, and Forgings.
- QQ-N-288 - Nickel-Copper Alloy and Nickel-Copper-Silicon Alloy Castings.
- QQ-S-763 - Steel Bars, Wire, Shapes, and Forgings, Corrosion Resisting.
- PPP-F-320 - Fiberboard; Corrugated and Solid, Sheet Stock (Container Grade), and Cut Shapes.

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- MIL-V-3 - Valves, Fittings, and Flanges (Except for Systems Indicated Herein); Packaging of.
- MIL-S-901 - Shock Tests, H.I. (High-Impact); Shipboard Machinery, Equipment and Systems, Requirements For.
- MIL-F-1183 - Fittings, Pipe, Cast Bronze, Silver-Brazing, General Specification for.
- MIL-S-1222 - Studs, Bolts, Hex Cap Screws, Socket Head Cap Screws and Nuts.
- MIL-P-15024 - Plates, Tags and Bands For Identification of Equipment.
- MIL-R-17131 - Rods and Powders, Welding, Surfacing.
- MIL-L-19140 - Lumber and Plywood, Fire-Retardant Treated.
- MIL-B-24480 - Bronze, Nickel-Aluminum (UNS No. C95800) Castings for Seawater Service.
- DOD-F-24669 - Forgings and Forging Stock, Steel Bars, Billets and Blooms, General Specification for. (Metric)
- DOD-F-24669/6 - Forgings and Forging Stock, Steel Bars and Billets, Corrosion Resisting; for Reforging. (Metric)

STANDARDS

FEDERAL

- FED-STD-H28 - Screw Thread Standards for Federal Services.
- FED-STD-H28/2 - Screw Thread Standards for Federal Services, Section 2, Unified Inch Screw Threads-UN and UNR Thread Forms.

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- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-167-1 - Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited).
- MIL-STD-248 - Welding and Brazing Procedure and Performance Qualification.
- MIL-STD-278 - Welding and Casting Standard.
- MIL-STD-438 - Schedule of Piping, Valves, Fittings, and Associated Piping Components for Submarines Service.
- MIL-STD-740-1 - Airborne Sound Measurements and Acceptance Criteria of Shipboard Equipment.
- MIL-STD-740-2 - Structureborne Vibratory Acceleration Measurements and Acceptance Criteria of Shipboard Equipment.
- MIL-STD-777 - Schedule of Piping, Valves, Fittings, and Associated Piping Components for Naval Surface Ships.
- MIL-STD-1520 - Corrective Action and Disposition System for Nonconforming Material.
- MS16142 - Boss, Gasket Seal Straight Thread Tube Fitting, Standard Dimensions for.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

DRAWINGS

MILITARY

- 810-1385884 - Unions, Fittings and Adapters, Butt and Socket Welding, 6000 PSI, WOG and OXY (IPS).
- 810-1385943 - Silver Brazing, 3000 PSI, WOG, IPS for UT Inspection.
- 810-1385946 - Unions, Bronze, Silver Brazing, WOG or UT Inspection.

(Application for copies should be addressed to the Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

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AMERICAN IRON AND STEEL INSTITUTE (AISI)
Steel Products Manual

(Application for copies should be addressed to the American Iron and Steel Institute, 350 Fifth Avenue, New York, NY 10001.)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
ANSI/ASME-B46.1 - Surface Texture (Surface Roughness, Waviness,
and Lay). (DoD adopted)

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- A 564 - Standard Specification for Hot-Rolled, and Cold-Finished Age-Hardening Stainless and Heat-Resisting Steel Bars and Shapes.
- B 21 - Standard Specification for Naval Brass Rod, Bar, and Shapes. (DoD adopted)
- B 61 - Standard Specification for Steam or Valve Bronze Castings. (DoD adopted)
- B 148 - Standard Specification for Aluminum-Bronze Sand Castings.
- B 150 - Standard Specification for Aluminum Bronze Rod, Bar, and Shapes. (DoD adopted)
- B 151 - Standard Specification for Copper-Nickel-Zinc Alloy (Nickel Silver) and Copper-Nickel Rod and Bar. (DoD adopted)
- B 171 - Standard Specification for Copper-Alloy Plate and Sheet for Pressure Vessels, Condensers, and Heat Exchangers.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

INSTRUMENT SOCIETY OF AMERICA (ISA)
S75.01 Flow Equations for Sizing Control Valves

(Application for copies should be addressed to the Instrument Society of America, 67 Alexander Drive P.O. Box 1227, Research Triangle Park, NC 27709.)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

- AMS-5362 - Steel Castings, Investment, Corrosion and Heat Resistant 19Cr - 12Ni - 1.0 (Cb + Ta) Solution Heat Treated. (DoD adopted)
- AMS-5363 - Steel Castings, Sand and Centrifugal, Corrosion and Heat Resistant 18.5Cr - 10.5Ni - 0.90 (Cb + Ta) Solution Heat Treated.

(Application for copies should be addressed to the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

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2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 6.4) in accordance with 4.3.

3.2 Materials. Materials shall be in accordance with 3.2.1 through 3.2.6. All materials shall be selected to prevent galling, seizing, or excessive wear between moving parts. However, this specification is not intended to be restrictive provided proposed alternative materials will give equal or better marine service than the materials specified. Proposed alternative materials shall be subject to approval by the contracting activity. Components for which specific materials are not specified shall be materials appropriate for the service intended. Particular attention shall be given to avoid sensitization of materials during hard facing, stress relieving, or welding. Use of cadmium plated parts and fasteners, including washers, is prohibited.

3.2.1 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 which 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 permitted under this specification unless otherwise specifically specified.

3.2.2 Body, gas dome or spring housing, and bottom cap. The body, gas dome or spring housing, and bottom cap shall be one of the following materials:

- (a) 18-8 corrosion resistant steel - AISI Steel Products Manual 303, 304, or 316; steel castings, sand and centrifugal, corrosion and heat resistant - AMS 5363; steel castings, investment, corrosion and heat resistant - AMS 5362; and steel, corrosion-resisting, bars and billets DOD-F-24669 and DOD-F-24669/6.
- (b) Aluminum bronze - grade 9BHT of ASTM B 148, alloy 2 of ASTM B 150, MIL-B-24480, or QQ-C-465. When castings are used, the body shall be cast as a solid billet. Coring shall not be permitted.
- (c) Valve bronze - ASTM B 61.
- (d) Naval brass - alloy B of ASTM B 21, or copper alloy numbers 462, 464, 482, and 485 of QQ-B-637 unless prohibited by MIL-STD-438 or MIL-STD-777 limitations on body materials for new designs.
- (e) Copper-nickel-zinc alloy (nickel silver) or copper-nickel rod and bar, copper alloys UNS numbers C70600 and C71500 of ASTM B 151. Copper alloy condenser tube plates, copper alloy UNS numbers C36500, C36600, C36700, C36800, C46400, C46500, C46600, C46700, C61300, C61400, and C71500 of ASTM B 171.

3.2.3 Springs. Springs shall be made of phosphor-bronze, monel, corrosion resisting steel, or other suitable corrosion-resistant material.

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3.2.4 Nonmetallic seating inserts, diaphragms, gaskets, O-rings, and similar parts. Nonmetallic parts shall be compatible with ship's air containing high moisture (100 percent humidity), entrained salt spray, and, on ships with conventional air compressors, 2190 TEP lubricating oil (see 6.2).

3.2.5 Valve poppets, seat rings, guide posts, and bushings. Internal trim shall be manufactured from corrosion-resistant alloy, DOD-F-24669 and DOD-F-24669/6 type 303, 303Se, 304, 316, 321, 347, or ASTM A 564 stainless steel; hardfacing material MIL-R-17131 (RCOCR-A or COCH-W), bronze; or nickel aluminum bronze. The guiding surfaces on the stem (guide posts) and the guide bushings shall have a minimum hardness differential of 50 Brinell hardness numbers. This requirement shall not apply if either the guide posts or bushings have a hardness in excess of 350 Brinell or are made of nongalling grade material (such as 303Se) and hardfacing material MIL-R-17131 (RCOCR-A or COCR-W). The finish on the guide post and bushings shall be not greater than 32 roughness height rating (RHR) in accordance with ASME B46.1.

3.2.6 Bolting and other metallic parts not subject to line media. These parts shall be made from materials which provide inherent corrosion resistance in a marine atmosphere without requiring painting, coating, or plating. Selection of corrosion-resistant materials from MIL-S-1222 is recommended.

3.3 Construction. Construction of the valves shall be as specified in 3.3.1 through 3.3.9 (see 6.3).

3.3.1 Concept. Internal trim shall be readily replaceable without requiring removal of the valve body from the line. Design emphasis shall be placed on simplicity, maintainability, ruggedness, and reliability, as defined in 3.3.1.1 through 3.3.1.4.

3.3.1.1 Simplicity. Valves shall have the fewest separate parts and fewest dynamic seals consistent with satisfactory performance. The valve shall require no adjustments during or after assembly, other than the set point adjustment (see 3.3.8).

3.3.1.2 Maintainability. Easy disassembly and reassembly with standard tools (see 3.6) shall be provided, and, as far as practical, the incorrect reassembly of parts shall be prevented. Positioning and alignment of parts in assembly shall employ positive means so that correct reassembly is repeatedly assured (see 3.3.5).

3.3.1.3 Ruggedness. To the maximum extent practical, valves shall tolerate and not be easily subject to damage, malfunction, or leakage resulting from foreign particle and other line media contamination or from mishandling. Therefore, valves shall not incorporate or rely upon excessively fine clearances or finishes. Valves shall tolerate occasional particulate contamination up to 40 microns in size.

3.3.1.4 Reliability. Valves shall operate satisfactorily for extended periods of time with minimum need for maintenance, lubrication, or adjustment, when subjected to the conditions normally associated with shipboard service. Valves shall not require maintenance or lubrication at intervals shorter than 1 year under continuous use in shipboard applications.

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3.3.1.5 Welding. Welding shall be in accordance with MIL-STD-248 and MIL-STD-278.

3.3.2 Pressure envelope. The nominal inlet (see 6.8.5), design (see 6.8.6), hydrostatic proof (see 6.8.7), and burst (see 6.8.8) pressures for the pressure containing envelope (body, gas dome or spring housing, and bottom cap) shall be as specified in table I. Design temperature (see 6.8.6) shall also be as specified in table I.

TABLE I. Design and test pressures.

Nominal inlet pressure rating (lb/in ²)	Design pressure (lb/in ²)	Design temp. (°F)	Hydrostatic proof press. (lb/in ²)	Hydrostatic burst press. (lb/in ²)
200	240	165 max	300	400
400	480	165 max	600	800
600	720	165 max	900	1200
1500	1800	165 max	2250	3000
3000	3600	165 max	4500	6000
3300	3960	165 max	4950	6600
6000	7200	165 max	9000	12000
As required	Nominal inlet press. x 1.2	165 max	Nominal inlet press. x 1.5	Nominal inlet press. x 2.0

3.3.3 Seat construction. A gasket or O-ring sealed seat ring shall be provided which is either threaded in or retained by cage type construction. The poppet or plug guiding surfaces (bushings and posts) shall have the proper hardness (see 3.2.5), finish, concentricity, parallelism, clearances, length, and rigidity to prevent binding or seizing and to ensure proper seating under all operating conditions. These alignment requirements shall be maintained with interchangeable parts and under any tolerance stackup condition. A nonmetallic seating feature shall be incorporated in either the poppet or seat, and shall be readily replaceable on all sizes. A precision dimensioned gland or cavity shall be provided in either the body or seat ring to ensure proper and controlled retention of the sealing element.

3.3.4 Body construction. Valves shall be basic globe configuration with in-line or offset inlet and outlet ports. Pressure lines, including the reduced pressure sensing (impulse) line, gas dome loading line, and poppet balance line, where applicable, shall be internally ported in the valve body. Direct high velocity impingement of the flow issuing from the throttling orifice onto the sensing element shall be prevented. The bonnet or spring housing and bottom cap shall be attached to the body with bolted flanges or threaded union connection. Bearing surfaces of nuts and bolts and their respective mating surfaces on the valve shall be machine finished.

3.3.5 Interchangeability. Parts having the same manufacturer's part number shall be directly interchangeable with each other with respect to installation and performance without requiring selection or fitting. In no case shall parts for a given valve be physically interchangeable or reversible unless such parts are also interchangeable or reversible with regard to function, performance, and strength (see 6.8.9).

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3.3.6 Springs. Springs shall not be compressed solid during any operation of the valve. Spring ends shall be squared and ground.

3.3.7 Threads. Threads shall conform to FED-STD-H28 and FED-STD-H28/2. Accidental loosening of threaded parts shall be prevented. External bolting shall be compatible with standard tools (wrenches).

3.3.8 Set point adjustment. The set point shall be adjustable through a range of at least 10 percent of the specified set pressure (see 6.2 and 6.8.1). The adjusting or loading device shall be safeguarded against accidental change in the set point. The option of a tamper-proof factory setting shall be available (see 6.2). The adjusting screw shall have a right hand thread so that clockwise rotation increases the set pressure. The valve shall be adjustable while under pressure.

3.3.9 End connections. Both the inlet and outlet connections shall be suitable for the maximum inlet pressure and shall be selected as shown in table II. Union thread pieces shall be cast or forged integral with the valve body or secured to the body with a straight thread and O-ring seal, with straight threads conforming to MS16142.

TABLE II. End connections.

Pressure rating (lb/in ²)	Applicable document
400	MIL-F-1183 SIL-BRZ
1500	810-1385946 SIL-BRZ
3000	810-1385943 SIL-BRZ
6000	810-1385884 Weld end

The materials for the union end nut and tailpieces shall be as specified (see 6.2). The materials for the union threadpieces and union nuts shall be selected by the manufacturer from the materials specified herein to prevent galling. The following materials, in addition to those listed in the documents in table II, may be used for the union threadpieces and union nuts:

- (a) QQ-N-288, composition B
- (b) CRES, QQ-S-763, composition 303Se or 416Se

The use of silver brazed tailpieces is prohibited for selected pressures and gases. See MIL-STD-438 and MIL-STD-777 for specifics.

3.4 Performance. Valves shall perform as specified in 3.4.1 through 3.4.9 (see 6.3).

3.4.1 Springs. When removed from the sample valve and compressed fully (solid), the springs shall not have an excessive permanent set (see 4.7.2).

3.4.2 Hydrostatic burst. The valve pressure containing envelope (body, bonnet, dome, spring housing, bottom cap) shall withstand an internal hydrostatic burst pressure of two times the nominal inlet pressure (see 4.7.3 and 6.8.8).

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3.4.3 Hydrostatic proof. The valve pressure containing envelope shall withstand an internal hydrostatic pressure of 1-1/2 times the nominal inlet pressure (see 4.7.4 and 6.8.7).

3.4.4 Seat tightness. With nominal inlet pressure applied at the inlet and downstream pressure at lock up, the leakage rate from the inlet to outlet portion of the valve shall not exceed 15 standard cubic inches per hour (SCIH) per inch of seat diameter (see 4.7.5).

3.4.5 Set pressure limits (see 6.8.3). Set pressure shall be adjustable within the range or limits in 3.4.6 (see 4.7.6).

3.4.6 Accuracy of regulation (see 6.8.2). The valve shall meet accuracy of regulation requirements within the limits shown on figure 1 (see 4.7.7) or as otherwise specified (see 6.2).

3.4.7 Capacity requirements. Actual flow capacity in standard cubic feet per minute (SCFM) shall be based on the minimum inlet pressure and highest reduced pressure setting under which the valve will be required to operate (see 6.2). The valve shall meet the specified capacity requirement, and shall operate without instability, hunting, and chattering, and within noise and vibration requirements. The valve shall also meet capacity requirements under all specified ambient operating conditions and within the requirements of 3.4.6 (see 4.7.8).

3.4.8 Noise and vibration.

3.4.8.1 Noise. When specified (see 6.2), airborne and structureborne noise levels of the valve shall be as specified (see 4.7.9.1).

3.4.8.2 Vibration. The valve shall be in accordance with the requirements of 3.4.6, and 3.4.7 during environmental (type I) vibration in accordance with MIL-STD-167-1. There shall be no valve resonance frequencies below 33 hertz (Hz) (see 4.7.9.2).

3.4.9 Shock test. The valve shall retain its set performance capability and suffer no structural damage or permanent deformation after shock testing in accordance with MIL-S-901 (see 4.7.10).

3.5 Marking.

3.5.1 Body markings. Valve bodies shall have the nominal inlet pressure rating, manufacturer's name or trademark, and flow direction arrow or the words "inlet" and "outlet" either cast or forged, stamped with round bottom dies, or laser etched on the valve body.

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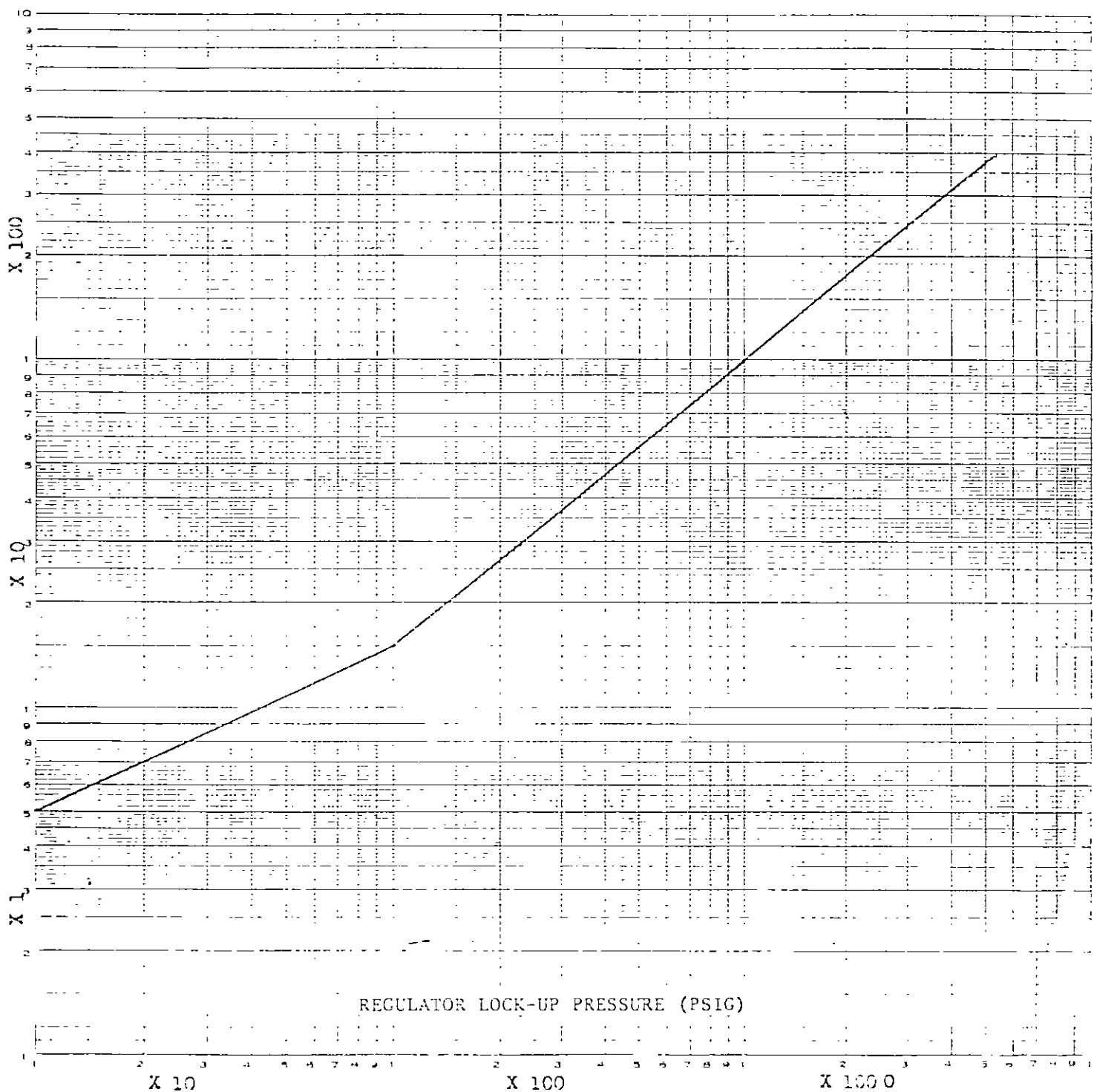


FIGURE 1. Accuracy of regulation.

3.5.2 Identification plates. An identification plate in accordance with MIL-P-15024 and attaching device of corrosion-resisting steel, brass, or anodized aluminum shall be securely attached to the valve and shall list the following data or provide a space therefore:

- (a) Manufacturer's name or trademark.
- (b) Pin number (see 6.9).
- (c) Flow capacity rating of valve in SCFM at a given set of upstream and downstream pressure conditions or expressed as a flow coefficient (C_v).
- (d) Nominal inlet pressure rating.
- (e) Range of adjustable outlet pressures.
- (f) Manufacturer's drawing number.
- (g) Manufacturer's model and part number.
- (h) Applicable manual number.
- (i) Space for nine-digit CID number.

3.6 Special tools. Special tools shall not be required to install or service the valves. Special tools are defined as those tools not listed in the Federal Supply Catalog (copies of this catalog may be consulted in the office of the Defense Contract Administration Services Management Area (DCASMA)).

3.7 Workmanship. Components shall be free from defects which affect their appearance or which may affect their operation. Castings shall be clean, sound, smoothly cored (where permitted), true to form, uniform in texture, and free from cold shunts, porosity, blow holes, and other injurious defects. Castings shall not be plugged, brazed, or burned, nor otherwise repaired without prior approval of NAVSEA. Castings or bored billets shall be thoroughly cleaned, both inside and outside, with all fins, burrs, residue and roughness removed. Machined surfaces shall not exceed 125 RHR. Welding and brazing shall be in accordance with 3.3.1.5.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program (see 6.3). The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of the manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

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4.1.2 Test equipment and inspection facilities. The contractor shall ensure that test and inspection facilities having sufficient accuracy, safety, quality, and quantity are established and maintained in a safe condition to permit performance of required tests and inspections.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- (a) First article inspection (see 4.3).
- (b) Quality conformance inspection (see 4.4).

4.3 First article inspection. First article inspection shall be performed at a laboratory acceptable to the Government (see 6.3) on sample valves produced with equipment and procedures normally used in production. First article inspection shall consist of the examination and tests specified in table III.

TABLE III. First article inspection.

Inspection	Requirements	Test method
Visual and dimensional	3.3.1.2, 3.3.3, 3.3.4, 3.3.5, 3.3.8, 3.3.9, 3.5, 3.6, 3.7	4.7.1
Tool (wrench) demonstration <u>1/</u>	3.3.7	4.7.1
Spring test	3.4.1	4.7.2
Hydrostatic burst test	3.4.2	4.7.3
Hydrostatic proof test	3.4.3	4.7.4
Seat tightness test	3.4.4	4.7.5
Set pressure test	3.4.5	4.7.6
Accuracy of regulation test	3.4.6	4.7.7
Capacity requirement test	3.4.7	4.7.8
Noise, vibration, and shock test		
MIL-STD-167-1	3.4.8	4.7.9
MIL-STD-740-1, -2	3.4.8	4.7.9
MIL-S-901	3.4.9	4.7.10

1/ The visual and dimensional inspection shall be required where specified in the test methods and at any point in the testing procedure where there exists a reasonable cause to examine a failure. The tool demonstration (see 3.3.7) may be accomplished at any opportune time. The interchangeability of spare parts (see 3.3.5) may be demonstrated in the tool demonstration.

4.3.1 First article sample size. The number of valves to be subjected to first article inspection shall be two for each type, class, body, pressure rating, flow capacity, and reduced pressure range for which acceptance is desired.

4.3.2 Failures. Failure of any test shall be cause for failure of the first article inspection.

4.3.3 Order of tests. The order of tests shall be as shown in table III.

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4.4 Quality conformance inspection. Quality conformance inspection shall consist of examination and tests as specified in table IV.

TABLE IV. Quality conformance inspection.

Inspection	Requirements	Test method
Visual and dimensional examination	3.3.1 through 3.3.9 and 3.7	4.7.1
Hydrostatic proof test	3.4.3	4.7.4
Seat tightness test	3.4.4	4.7.5

4.4.1 Inspection lot. Valves of the same material, type, class, size, body design, and temperature rating ordered for delivery at the same time shall be considered a lot for purpose of sampling.

4.4.2 Sampling for quality conformance inspection.

4.4.2.1 Sampling for visual and dimensional examination. A random sample shall be selected from each lot in accordance with inspection level II of MIL-STD-105 for the visual and dimensional examination of 4.7.1 and table V.

TABLE V. Classification of defects.

<u>Major</u>	
101	Type, class, flow, size, capacity, material, pressure rating, range of discharge pressures, or temperature rating not as specified, or body configuration not a globe type.
102	End preparation not as required, or improperly machined.
103	Threads or bolting requirements not as specified.
104	Seat ring not properly retained.
105	Pressure envelope leaks.
106	Body passages conducive to fluid impingement on unreinforced areas.
107	Dimensional or structural change after hydrostatic test.
108	Dimensional errors, out of manufacturing tolerances.
109	Dirt, chips, sand, or residue from manufacturing processes present in valve.
110	Valve internal elements not concentric, parallel, square, or are out of round, galled, etc. Parallel disc/seat contact and free valve movement not evident.
111	Spring exhibits a "set" above tolerance or can be fully compressed under operation or adjustment. Spring ends not square or ground. Plating (where utilized) not adequate.
112	Parts having the same manufacturer's number not interchangeable without causing out of tolerance dimensional changes in assembly stack-up dimensions.

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TABLE V. Classification of defects - Continued.

<u>Minor</u>	
201	Identification markings missing or illegible on valve.
202	Packaging/markings not as specified.
203	Tools (wrenches) not compatible with valve bolting.
204	Valve body must be removed from pipeline for repair.
205	Weight in excess by 10 percent or more of original estimate on submitted drawings.

4.4.2.2 Sampling for remaining quality conformance tests. A random sample shall be selected from each lot in accordance with table VI for the remaining tests specified in 4.4 and table IV.

TABLE VI. Sampling for quality conformance, hydrostatic test, and seat tightness.

Allowable number Lot size	Number of samples	Allowable number of rejects
2 to 8	5	0
9 to 15	7	0
16 to 25	10	0
41 to 65	25	0
66 to 110 or over	35	1

4.4.3 Quality conformance tests. The sample items selected in accordance with 4.4.2.2 shall be subjected to the quality conformance tests shown in table IV (see 6.3). Any sample which fails any quality conformance test shall be rejected.

4.5 Rejected lots.

4.5.1 Rejection and reinspection. Reworked lots shall be submitted for reinspection and acceptance in accordance with inspection level II of MIL-STD-105.

4.5.2 Nonconforming inspection lots. Disposition of inspection lots found unacceptable shall be in accordance with MIL-STD-1520.

4.5.3 Disposition of sample units. Sample units which have been subjected to quality conformance tests (see 4.4) and approved may be delivered on the contract or purchase order, in an assembled, ready-for-service condition.

4.6 Inspection conditions. Unless otherwise specified (see 6.2), all inspections shall be performed in accordance with the test conditions specified in 4.7 and elsewhere herein.

4.6.1 Test temperature. Unless otherwise specified (see 6.2), inspection and tests shall be accomplished at ambient room temperature.

4.6.2 Test fluid. Unless otherwise specified (see 6.2), tests shall be conducted using clean fresh water. Sea water used as a test fluid shall have an approximate salinity of 35 parts per thousand.

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4.7 Methods of inspection.

4.7.1 Visual and dimensional examinations. Each sample selected in accordance with 4.4.2.1 shall be weighed and visually and dimensionally examined to determine conformance with this specification and detailed engineering drawings. Major and minor defects shall be classified as shown in table V. Any sample failing to conform to the visual and dimensional examination shall be rejected.

4.7.2 Spring test. The spring from a disassembled sample valve shall be visually and dimensionally examined as follows:

- (a) The free spring length shall be measured and an allowance of 0.010 inch per inch of free spring length calculated. Fractional inches of free spring length shall be extrapolated and added to the calculation.
- (b) The spring shall be fully (solidly) compressed and released.
- (c) Ten minutes after release the spring shall be remeasured.
- (d) The spring shall not exhibit a permanent set in excess of the allowance calculated in step (a).

4.7.3 Hydrostatic burst test. One of the two sample valves (see 4.3 and 6.8.8) shall have its pressure envelope tested to the appropriate burst pressure in table I. Failure of the pressure envelope shall be that point at which the test pump cannot keep up with the leakage rate whether the deformation is permanent or temporary, or where there is an obvious structural failure, such as a split, crack, or rupture in the envelope. Once tested to the burst pressure, the tested valve envelope shall be disposed of in a manner precluding its subsequent repair or use even at lower pressure. A visual and dimensional examination shall be performed on valves that have not failed obviously as described above. An obvious failure below the burst pressure or a failure of the visual and dimensional examination shall constitute failure of this test.

4.7.4 Hydrostatic proof test. The hydrostatic proof test pressure shall be 1.5 times the nominal inlet pressure. Table I contains a listing of appropriate hydrostatic test pressures. The test shall be performed on the other sample valve. The valve shall be pressurized for 2 minutes, depressurized and pressurized again for 2 minutes. There shall be no leakage. At the completion of the test, the valve shall be visually and dimensionally examined in accordance with the visual and dimensional requirements of table III. Any leakage or a failure of the visual and dimensional examination shall constitute failure.

4.7.5 Seat tightness test. The seat leakage rate after lockup shall be verified by measuring the pressure buildup in a known volume over a given period of time. The volume and time for this test shall be such that a pressure buildup of not more than 1 or 2 percent is required to indicate excessive leakage.

4.7.6 Set pressure limits. The set point limits shall be demonstrated in a manner or procedure similar to the seat tightness test specified in 4.7.5, at both the minimum and maximum limits of the set pressure range.

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4.7.7 Accuracy of regulation. The valve shall be tested for accuracy of regulation, that is the amount the downstream regulated pressure can deviate from the set pressure at lockup and when the flow through the valve is increased to the rated capacity. An inlet pressure equal to the nominal rating shall be applied and flow varied from lockup to full flow and back to lockup. The pressure variation shall be within the limits of figure 1.

4.7.8 Capacity requirements. The valve shall be tested to the requirements of 3.4.7. Testing and test calculations shall be in accordance with ISA S75.01 or other similar procedure proposed by the contractor and concurred in by the contracting activity.

4.7.9 Noise and vibration.

4.7.9.1 Noise. The valve shall be tested for airborne and structureborne noise in accordance with MIL-STD-740-1 and MIL-STD-740-2. The valve shall be tested under the following operating conditions; maximum flow, maximum capacity, highest reduced pressure, mid-range pressure reduction, and lowest reduced pressure.

4.7.9.2 Vibration. The valve shall be tested for susceptibility to environmental vibration in accordance with MIL-STD-167-1 (see 3.4.8.2). Testing shall be accomplished with the nominal inlet pressure applied to the inlet port with the valve adjusted to the midpoint of the set pressure range.

4.7.10 Shock test. The valve shall be subjected to the high-impact mechanical shock requirements for grade A, class 1 of MIL-S-901 to determine its resistance to high impact mechanical shock. The shock test shall be performed with the nominal working pressure applied to the inlet port. During impact an instantaneous reversible pressure excursion is allowable. After shock the valve shall be tested in accordance with table IV and given a visual and dimensional check (see 6.3).

4.8 Inspection of packaging. Sample packs, and the inspection of the preservation, packing, and marking for shipment, stowage and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition. For the extent of applicability of the packaging requirements of referenced documents listed in section 2, see 6.7.)

5.1 General.

5.1.1 Navy shipboard stowage fire-retardant requirements.

- (a) Treated lumber and plywood. Unless otherwise specified (see 6.2), all lumber and plywood including laminated veneer material used in shipping containers and pallet construction, members, blocking, bracing, and reinforcing shall be fire-retardant treated material conforming to MIL-L-19140 as follows:

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- (g) Whether nonmetallic parts must be compatible with 2190 TEP (see 3.2.4).
- (h) Adjustable range of set pressures required and option of factory set tamper proof adjustment (see 3.3.8).
- (i) Material for union end nut and tailpiece (see 3.3.9).
- (j) Accuracy of regulation if other than required by figure 1 (see 3.4.6).
- (k) Flow capacity required (see 3.4.7).
- (l) When noise requirements must be met (see 3.4.8.1). Also specify "equipment grade" and "equipment type" (see MIL-STD-740-1 and MIL-STD-740-2).
- (m) If test conditions are other than specified (see 4.6, 4.6.1, and 4.6.2).
- (n) When fire-retardant materials are not required (see 5.1.1(a)).
- (o) Preservation, packing, and marking requirements (see 5.2).

6.3 Consideration of data requirements. The following data requirements should be considered when this specification is applied on a contract. The applicable Data Item Descriptions (DID's) should be reviewed in conjunction with the specific acquisition to ensure that only essential data are requested/provided and that the DID's are tailored to reflect the requirements of the specific acquisition. To ensure correct contractual application of the data requirements, a Contract Data Requirements Lists (DD Form 1423) must be prepared to obtain the data, except where DOD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

<u>Reference paragraph</u>	<u>DID number</u>	<u>DID title</u>	<u>Suggested tailoring</u>
3.3	DI-DRPR-80651	Engineering drawings	Level 2 and 3
3.4	DI-MISC-80678	Certification data/ report	----
4.1.1	DI-R-4803	Inspection system program plan	----
4.3	DI-T-4902	First article inspection report	----
4.4.3	UDI-T-23473	Report, test/inspection	----
4.7.10	UDI-T-23753	Reports, equipment shock test	----

The above DID's were those cleared as of the date of this specification. The current issue of DOD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be researched to ensure that only current, cleared DID's are cited on the DD Form 1423.

6.4 First article. When first article inspection is required, the contracting officer should provide specific guidance to offerors whether the item(s) should be a preproduction sample, a first article sample, a first production item, a sample selected from the first _____ production items, a standard production item from the contractor's current inventory (see 3.1), and the number of items to be tested as specified in 4.3. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first

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article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.5 Technical manuals. The requirement for technical manuals should be considered when this specification is applied on a contract. If technical manuals are required, military specifications and standards that have been cleared and listed in DOD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL) must be listed on a separate Contract Data Requirements List (DD Form 1423), which is included as an exhibit to the contract. The technical manuals must be acquired under separate contract line item in the contract.

6.6 Spare parts. When ordering spare parts or repair parts for the equipment covered by this specification, the contract should state that such spare parts and repair parts shall meet the same requirements and quality assurance provisions as the parts used in the manufacture of the equipment. Packaging for such parts should also be specified.

6.7 Sub-contracted material and parts. The packaging requirements of referenced documents listed in section 2 do not apply when material and parts are acquired by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

6.8 Definitions.

6.8.1 Set pressure. The downstream pressure which the valve is set to maintain under a given set of operating conditions (that is, inlet pressure and flow). Normally the valve is set under conditions which will result in the highest downstream pressure (usually minimum inlet and lockup). Therefore, the delivered pressure would drop off or "droop" below the set pressure under all other operating conditions.

6.8.2 Accuracy of regulation. The maximum permissible band over which the downstream pressure may vary when the valve is set at any pressure within the required range of adjustment and is subjected to any combination of inlet pressure, flow demand, and ambient temperature variations, within the specified limits.

6.8.3 Set pressure limits. The range of set pressure over which the valve can be adjusted while meeting the performance requirements specified.

6.8.4 Lock-up pressure. The outlet pressure delivered by a reducing valve when the flow is reduced to a point where it is equal to or less than the allowable leakage.

6.8.5 Nominal pressure. The approximate maximum pressure which the valve will be subjected to in service under normal conditions.

6.8.6 Design pressure and temperature. The maximum pressure and temperature the valve should be subjected to under any condition. This is the pressure and temperature upon which the strength of the pressure containing envelope is based.

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6.8.7 Proof pressure. The maximum test pressure that the valve is required to withstand without damage. Valve operation is not required during application of the proof pressure, but after the pressure has been removed, the valve must meet all performance requirements.

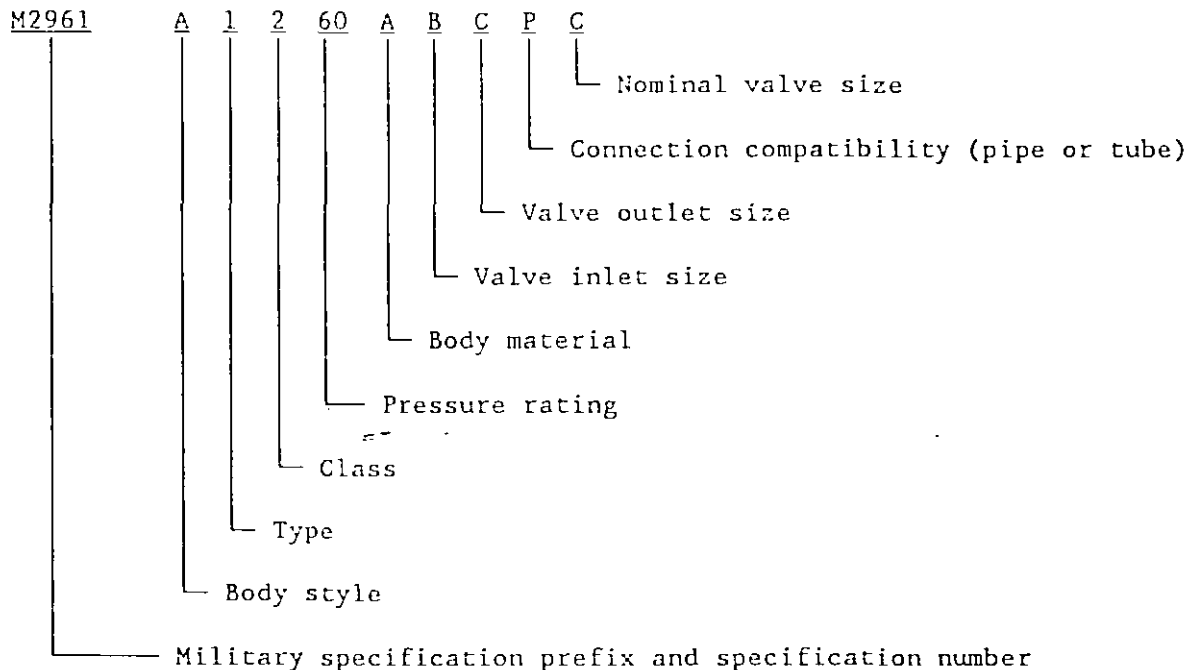
6.8.8 Burst pressure. The maximum test pressure that a valve is required to withstand without complete or dangerous structural failure. The valve is not required to operate either during or following the application of burst pressure. Normally a burst test is not required under this specification, unless a new design has been submitted. If a burst test is specified, two first article samples are required.

6.8.9 Interchangeability. Physical interchangeability in accordance with the following: interchangeable assemblies, components, and parts are those which are capable of being readily removed or replaced without alteration, misalignment, or damage to parts being installed or to adjoining parts. Interchangeable assemblies, components and parts also require no fabrication operations such as cutting, filing, drilling, reaming, hammering, bending, prying, or forcing.

6.8.10 Sensitization. The changing of the structural or mechanical properties of a material.

6.8.11 Standard air conditions. Temperature equals 68°F, pressure equals 14.7 lb/in², and relative humidity equals 36 percent.

6.9 Part or Identifying Number (PIN). The PIN to be used for pressure reducing valves acquired to this specification are created as follows:



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PIN codes. The following codes may be used to create and interpret PIN numbers.

Body style

- A - In-line
- B - Offset

Type

- 1 - Direct spring loaded
- 2 - Gas dome loaded
- 3 - Gas dome loaded, pilot referenced
- 4 - Internal pilot operated

Class

- 1 - Balanced main poppet
- 2 - Unbalanced main poppet

Pressure rating

- 02 - 200 lb/in²
- 04 - 400 lb/in²
- 06 - 600 lb/in²
- 15 - 1500 lb/in²
- 30 - 3000 lb/in²
- 33 - 3300 lb/in²
- 60 - 6000 lb/in²

Body material

- A - 18-8 corrosion resistant steel
- B - Aluminum bronze
- C - Valve bronze
- D - Naval brass
- E - Copper-nickel-zinc or copper-nickel

End connections and nominal valve size

- A - 0.25 inch
- B - 0.375 inch
- C - 0.50 inch
- D - 0.75 inch
- E - 1 inch
- F - 1.25 inches
- G - 1.5 inches

- P - end connections compatible with pipe
- T - end connections compatible with tube

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PIN number example.

M2961A130CCDP - Pressure reducing valve in accordance with MIL-V-2961 having an in-line body, direct spring loaded, balanced main poppet, 3000 lb/in² rating, valve bronze body material, 0.5 inch inlet and 0.75 outlet connections compatible with pipe, 0.5 inch nominal valve size.

6.10 Acceptable quality levels (AQL).

6.10.1 Visual and dimensional examination. The AQL for the visual and dimensional examination specified in 4.4.2.1 will be 0.20 percent defective for major defects and 0.40 percent defective for minor defects.

6.10.2 Remaining quality conformance tests. The AQL for the remaining quality conformance tests specified in 4.4.2.2 will be 0.20 percent defective.

6.10.3 Rejected lots. The AQL for the reinspection of rejected lots as specified in 4.5.1 will be 0.40 percent defective.

6.11 Subject term (key word) listing.

Air systems
Dome
In-line
Nitrogen systems
Offset
Pilot
Poppet
Spring

6.12 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Review activity:
DLA - DCSC-SS

Preparing activity:
Navy - SH
(Project 4820-N029)

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APPENDIX

ENGINEERING DRAWINGS TECHNICAL CONTENT REQUIREMENTS

10. SCOPE

10.1 Scope. This appendix covers the technical requirements that should be included on drawings when required by the contract or order. This appendix is mandatory only when data item description DI-DRPR-80651 is cited on the DD Form 1423.

20. APPLICABLE DOCUMENTS

20.1 Government documents.

20.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

SPECIFICATION

MILITARY

DOD-D-1000 - Drawings, Engineering and Associated Lists.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

30. DRAWINGS

30.1 Drawings. Drawings as specified in 30.1.1 and 30.1.2 shall be prepared in accordance with DOD-D-1000.

30.1.1 Preliminary drawings. Preliminary drawings shall show the following:

- (a) An accurately scaled sectional assembly of the valve.
- (b) Bill of materials listing specification, grade, condition, and any other data required to fully identify the properties of the materials proposed.
- (c) Complete details of all replaceable internal trim sufficient to permit manufacture, by ship or tender, of repair parts.
- (d) Dimensions and concentricity, parallelism, squareness, and roundness requirements necessary to evaluate the guiding alignment and running clearance limits of the main valve.
- (e) Finishes and hardnesses of the main valve dynamic guiding and sealing surfaces.
- (f) Installation dimensions.
- (g) End connection detail and clearance dimensions required for disassembly.

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- (h) Required assembly torques or other equivalent assembly instructions for all threaded parts (except adjustments).
- (i) Table of spring data.
- (j) Estimated weight of complete valve assemblies for each combination of type, pressure, and size. For union end valves an estimate of nut and tailpiece weight shall be stated separately.
- (k) Reference to any previous shock and vibration approval and test report numbers. Reference to previous burst test, if any, should be given.
- (l) Material descriptions where different from previously submitted preliminary drawings.

30.1.2 Final drawings. In addition to the requirements of 30.1 and 30.1.1, the following data shall be shown on final drawings:

- (a) Ship identification.
- (b) Applicable assembly drawing numbers.
- (c) Applicable manual number.
- (d) CID (APL) number.
- (e) Application description.
- (f) Valve description.
- (g) The set pressure and adjustable range of valve.
- (h) Required accuracy of regulation over specified range of operating conditions.
- (i) Rated accuracy of regulation over specified range of operating conditions.
- (j) Required maximum capacity under specified conditions.
- (k) Rated maximum capacity under specified conditions.
- (l) Fail open capacity (for purposes of relief valve sizing).