



Designation: F 1370 – 92

An American National Standard

Standard Specification for Pressure-Reducing Valves for Water Systems, Shipboard¹

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

1. Scope

1.1 This specification covers self-contained, globe style, pressure-reducing valves for use in water systems of shipboard installations. These valves are limited to discharge pressure settings of 200 psig (1379 kPa) and below.

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

1.3 The following precautionary caveat pertains only to the tests portion, Section 8, of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

- A 125 Specification for Steel Springs, Helical, Heat Treated²
- A 193 Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service³
- A 194 Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service³
- A 231 Specification for Chromium-Vanadium Alloy Steel Spring Wire⁴
- A 276 Specification for Stainless and Heat-Resisting Steel Bars and Shapes²
- A 313 Specification for Stainless and Heat-Resisting Steel Spring Wire⁴
- A 689 Specification for Carbon and Alloy Steel Bars for Springs²
- B 21 Specification for Naval Brass, Rod, Bar, and Shapes⁵
- B 26 Specification for Aluminum-Alloy Sand Castings⁶

- B 61 Specification for Steam or Valve Bronze Castings⁵
- B 62 Specification for Composition Bronze or Ounce Metal Castings⁵
- B 148 Specification for Aluminum-Bronze Sand Castings⁵
- B 150 Specification for Aluminum Bronze Rod, Bar, and Shapes⁵
- B 637 Specification for Precipitation Hardening Nickel Alloy Bars, Forgings, and Forging Stock for High-Temperature Service⁷
- B 689 Specification for Electroplated Engineering Nickel Coatings⁸
- F 467 Specification for Nonferrous Nuts for General Use⁹
- F 468 Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use⁹
- F 593 Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs⁹
- F 594 Specification for Stainless Steel Nuts⁹
- 2.2 *ANSI Standards:*¹⁰
 - ANSI B1.1 Unified Screw Threads
 - ANSI B1.12 Class 5 Interference, Fit Thread
- 2.3 *ISA Standards:*¹¹
 - S75.01 Flow Equations for Sizing Control Valves
 - S75.02 Control Valve Capacity Test Procedure
- 2.4 *Federal Specifications:*¹²
 - QQ-B-637 Brass, Naval: Rod, Wire, Shapes, Forgings, and Flat Products with Finished Edges (Bar, Flat Wire, and Strip)
 - QQ-C-390 Copper Alloy Casting (Including Cast Bar)
 - QQ-C-465 Copper-Aluminum Alloys (Aluminum Bronze) (Copper Alloy Numbers 606, 6014, 630, 632M, and 642); Rod, Flat Products with Finished Edges (Flat Wire, Strip, and Bar) Shapes, and Forgings
 - QQ-N-281 Nickel-Copper Alloy Bar, Rod, Plate, Sheet, Strip, Wire, Forgings, and Structural and Special Shaped Sections

¹ This specification is under the jurisdiction of ASTM Committee F-25 on Ships and Marine Technology and is the direct responsibility of Subcommittee F25.13 on Piping Systems.

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² *Annual Book of ASTM Standards*, Vol 01.05.

³ *Annual Book of ASTM Standards*, Vol 01.01.

⁴ *Annual Book of ASTM Standards*, Vol 01.03.

⁵ *Annual Book of ASTM Standards*, Vol 02.01.

⁶ *Annual Book of ASTM Standards*, Vol 02.02.

⁷ *Annual Book of ASTM Standards*, Vol 02.04.

⁸ *Annual Book of ASTM Standards*, Vol 02.05.

⁹ *Annual Book of ASTM Standards*, Vol 15.08.

¹⁰ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

¹¹ Available from Instrumentation, Systems, and Automation Society, 67 Alexander Dr., Research Triangle Park, NC 27709.

¹² Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

QQ-N-286 Nickel-Copper-Aluminum Alloy, Wrought (UNS N05500)

QQ-N-288 Nickel-Copper Alloy and Nickel-Copper-Silicon Alloy, Castings

QQ-S-763 Steel Bars, Wire, Shapes, and Forgings, Corrosion Resisting

QQ-S-766 Steel Corrosion Resisting Plate, Sheet and Strip

QQ-W-390 Wire, Nickel-Chromium-Iron Alloy

TT-P-645 Primer Paint, Zinc Chromate, Alkyd Type

2.5 Military Standards and Specifications:¹²

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

DOD-P-15328 Primer (Wash), Pretreatment (Formula No. 117 for Metals) (Metric)

MIL-F-20042 Flanges, Pipe and Bulkhead, Bronze (Silver Brazing)

MIL-C-20159 Copper-Nickel Alloy Casting (UNS No. C96200 and C96400)

MIL-F-24227 Fittings and Flanges, Cast Bronze, Silver Brazing Suitable for Ultrasonic Inspection

MIL-B-24480 Bronze, Nickel-Aluminum (UNS No. C95800) Castings for Seawater Service

MIL-S-81733 Sealing and Coating Compound, Corrosion Inhibitive

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-798 Non-destructive Testing, Welding, Quality Control, Material Control and Identification, and Hi-shock Test Requirements for Piping System Components for Naval Shipboard Use

2.6 Other Publications:¹²

Naval Sea Systems Command (NAVSEA)

2.7 Drawings:¹²

803-1385946 Union Bronze, Silver Brazing WOG for UT Inspection

803-1385947 Flanges, Bronze, 700 PSI WOG for UT Inspection

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:* Descriptions of Terms Specific to This Standard:

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

3.1.2 *design pressure and temperature*—the maximum pressure and temperature the valve should be subjected to under any condition; these are the pressure and temperature upon which the strength of the pressure-containing envelope is based.

3.1.3 *hydrostatic proof test pressure*—the maximum test pressure that the valve is required to withstand without damage; valve operation is not required during application of this test pressure, but the valve must meet all performance requirements after the pressure has been removed.

3.1.4 *lockup pressure*—the outlet pressure delivered by a pressure-reducing valve when the flow is reduced to zero; lockup pressure is always greater than set pressure, and in actual practice it may vary with the specific valve design, tolerances, method of sensing downstream pressure, and piping configurations.

3.1.5 *nominal pressure*—the approximate maximum pressure to which the valve will be subjected in service under normal conditions.

3.1.6 *set pressure*—the downstream pressure that the valve is set to maintain under a given set of operating conditions (that is, inlet pressure and flow); the valve should ideally be set at downstream pressure approximately equal to the midpoint of the set pressure limits (defined in 3.1.7).

3.1.7 *set pressure limits (set pressure adjustable range)*—the range of set pressure over which the valve can be adjusted while meeting the specified performance requirements.

4. Classification

4.1 Valves shall be of the following types and pressure ratings, as specified (see Section 5 and 6.1.21).

4.1.1 *Type I*—Pressurized spring chamber, and

4.1.2 *Type II*—Unpressurized spring chamber.

4.2 *Pressure Ratings*—Valves shall have nominal inlet pressure ratings of 150 or 250 psig (1034 or 1724 kPa), or as specified (see 6.1.21).

5. Ordering Information

5.1 Ordering documentation for valves in accordance with 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 specification code (see 6.1.21),

5.1.3 Quantity of valves,

5.1.4 Set pressure required,

5.1.5 Set pressure limits, if not listed in 7.1.4,

5.1.6 Face-to-face dimensions for valves, if not listed in Table 1,

5.1.7 Regulation accuracy required, if other than as given in 7.1.5,

5.1.8 When a choke feature is required (see 6.1.2),

5.1.9 When tailpieces and nuts are required (see 6.1.15),

5.1.10 Capacity requirement of valves, if not listed in Table 2 (see 7.1.6), and

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

6. Valve Construction and Coding

6.1 Valves shall incorporate the design features specified in 6.1.1 through 6.1.21.

6.1.1 *Materials of Construction*—Materials shall be as specified in Table 3. All materials shall be selected to prevent corrosion, galling, seizing, excessive wear, or erosion where applicable. Cadmium plating is prohibited.

TABLE 1 Face-to-Face Dimensions, in. (mm), $\pm 1/16$ (1.59)

Size, in. (mm)	Flanged End		Union End	Flanged End		Union End	
	150 psig (1034 kPa)	250 psig (1724 kPa)	150 and 250 psig (1034 and 1724 kPa)	400 psig (2758 kPa)	700 psig (4826 kPa)	400 psig (2758 kPa)	700 psig (4826 kPa)
0.25 (6.35)	7 $\frac{1}{4}$	7 $\frac{7}{8}$	7 $\frac{7}{32}$			7 $\frac{7}{8}$	7 $\frac{7}{32}$
0.37 (9.40)	7 $\frac{1}{4}$ (184)	7 $\frac{7}{8}$ (200)	7 $\frac{9}{32}$ (185)			7 $\frac{9}{32}$ (185)	7 $\frac{9}{32}$ (185)
0.50 (12.7)	7 $\frac{1}{4}$ (184)	7 $\frac{7}{8}$ (200)	7 $\frac{9}{32}$ (185)	6 $\frac{1}{2}$ (165)	6 $\frac{1}{2}$ (165)	7 $\frac{9}{32}$ (185)	7 $\frac{9}{32}$ (185)
0.75 (19.05)	7 $\frac{3}{8}$ (187)	7 $\frac{7}{8}$ (200)	7 $\frac{1}{2}$ (191)	7 $\frac{1}{2}$ (191)	7 $\frac{1}{2}$ (191)	8 (203)	8 (203)
1.00 (25.4)	7 $\frac{3}{8}$ (187)	8 (203)	7 $\frac{1}{2}$ (191)	8 $\frac{1}{2}$ (216)	8 $\frac{1}{2}$ (216)	8 $\frac{3}{4}$ (222)	8 $\frac{3}{4}$ (222)
1.25 (31.75)	7 $\frac{15}{16}$ (202)	8 $\frac{11}{16}$ (221)	8 $\frac{9}{32}$ (207)	9 (229)	9 (229)	9 $\frac{1}{2}$ (241)	9 $\frac{1}{2}$ (241)
1.50 (38.1)	8 $\frac{3}{4}$ (222)	9 $\frac{1}{2}$ (241)	8 $\frac{31}{32}$ (228)	9 $\frac{1}{2}$ (241)	9 $\frac{1}{2}$ (241)	10 (254)	10 (254)
2.00 (50.8)	10 (254)	10 $\frac{3}{4}$ (273)	10 $\frac{7}{32}$ (260)	11 $\frac{1}{2}$ (292)	11 $\frac{1}{2}$ (292)	11 $\frac{1}{8}$ (302)	11 $\frac{1}{8}$ (302)
2.50 (63.5)	10 $\frac{7}{8}$ (276)	11 $\frac{3}{4}$ (298)		13 (330)	13 (330)		
3.00 (76.2)	11 $\frac{5}{8}$ (295)	12 $\frac{1}{2}$ (318)		14 (356)	14 (356)		
3.50 (88.9)	11 $\frac{5}{8}$ (295)	12 $\frac{5}{8}$ (321)					
4.00 (101.6)	13 $\frac{1}{2}$ (343)	14 $\frac{1}{2}$ (368)		16 (406)	17 (432)		

TABLE 2 Minimum Required Valve C_v for Types I and II, 150 and 250 psig (1034 and 1724 kPa) Rated Valves with 5 to 30 psig (34 to 207 kPa), 25 to 60 psig (172 to 414 kPa), and 50 to 100 psig (345 to 689 kPa) Set Pressure Adjustable Ranges

Size, in. (mm)	5 to 30 psig (34 to 207 kPa) Set Pressure Adjustable Range			25 to 60 (172 to 414 kPa) psig Set Pressure Adjustable Range			50 to 100 psig (345 to 689 kPa) Set Pressure Adjustable Range		
	Set Pressure, psig (kPa)								
	10 (69)	20 (138)	30 (207)	30 (207)	45 (310)	60 (414)	60 (414)	80 (552)	100 (689)
0.25 (6.35)	0.7	0.9	1.0	0.6	0.7	0.9	0.5	0.6	0.7
0.37 (9.40)	1.4	1.8	2.0	1.2	1.4	1.8	1.0	1.2	1.4
0.50 (12.70)	2.5	3	3.5	2	2.5	3	1.5	2.0	2.5
0.75 (19.05)	3	3.5	4	2.5	3	3.5	2.0	2.5	3.0
1.00 (25.40)	4	5	6	3	4	5	2.6	3.3	4.0
1.25 (31.75)	5.5	7.5	9	5	7	8.5	3.5	4.5	5.5
1.50 (38.10)	7	10	12	6.5	9.5	11.5	5.0	6.0	7.0
2.00 (50.80)	15	20	25	12	17	22	11	13	15
2.50 (63.50)	30	35	40	25	30	35	24	27	30
3.00 (76.20)	45	50	55	40	45	50	35	40	45
3.50 (88.90)	55	60	65	50	55	60	45	50	55
4.00 (101.60)	70	75	80	65	70	75	60	65	70

6.1.2 *General Requirements*—Valves shall be self-contained, spring-loaded, direct-operated, pressure-reducing valves incorporating a balanced valve element. Reduced pressure (not to exceed 200 psig (1379 kPa)) shall be sensed by a diaphragm and compared with a reference spring load. Any force imbalance shall be transmitted directly to and positively reposition a single-seated valve element to limit the set point error within the limits specified in 7.1.5. Type I valves shall be valves in which the spring chamber in combination with the body and bottom cap forms a pressure-containing envelope capable of withstanding the full hydrostatic proof test. These valves shall be specified for special applications in which it is necessary to contain the line media in the event of a failure that subjects the spring chamber to full inlet pressure. The spring chamber assembly need not be leakproof; however, it shall contain line media at hydrostatic proof test pressure without structural failure and shall limit external leakage to a small seepage (in drip form) past the adjusting screw threads and spring chamber joint. Type I valves shall also incorporate a choke feature on the poppet to limit capacity in the event of a diaphragm failure, where specified (see Section 5). Type II valves shall be valves in which the spring chamber does not form part of the pressure-containing envelope.

6.1.3 *Pressure Envelope Rating*—The nominal inlet (see 3.1.5), design (see 3.1.2), and hydrostatic proof test (see 3.1.3)

pressures for the pressure-containing envelope (body, spring housing, and bottom cap) shall be as specified in Table 4. The design temperature (see 3.1.2) is also given in Table 4.

6.1.4 *Body Passages*—Body passages shall produce gradual changes in flow direction so as to reduce any effects of concentrated impingement and 90° turns. In portions of the valve subject to velocity increases and flow direction changes, such as immediately downstream of the seat, the 90° impingement against the walls at close range shall be avoided. The body cavity downstream of the seat shall present a high angle (70 to 90°) of incidence to the issuing jet. At points at which direct impingement at close range does occur and cannot be eliminated, the section thickness shall be increased substantially to provide adequate material to withstand the additional erosive effect.

6.1.5 *Diaphragm Construction*—The main diaphragm shall be clamped between flanges on the body and spring chamber to ensure a leaktight flange seal. The flange faces shall have sufficient width, and all edges in contact with the diaphragm shall be properly chamfered or rounded to prevent cutting or tearing of the diaphragm. The valve and diaphragm shall withstand a pressure differential across the diaphragm of twice the highest set pressure or 200 psig (1379 kPa), whichever is greater, for Type I valves. For Type II valves, this pressure differential shall be as follows: For valves of sizes up to 2 in.