Designation: F1370 – 92 (Reapproved 2019)$^{\varepsilon 1}$

An American National Standard

Standard Specification for Pressure-Reducing Valves for Water Systems, Shipboard[1]

This standard is issued under the fixed designation F1370; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

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

ε^1 NOTE—A Keywords section was added editorially in August 2019.

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 standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A125 Specification for Steel Springs, Helical, Heat-Treated
A193/A193M Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications
A194/A194M Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
A231/A231M Specification for Chromium-Vanadium Alloy Steel Spring Wire
A276 Specification for Stainless Steel Bars and Shapes
A313/A313M Specification for Stainless Steel Spring Wire
A689 Specification for Carbon and Alloy Steel Bars for Springs
B21/B21M Specification for Naval Brass Rod, Bar, and Shapes
B26/B26M Specification for Aluminum-Alloy Sand Castings
B61 Specification for Steam or Valve Bronze Castings
B62 Specification for Composition Bronze or Ounce Metal Castings
B148 Specification for Aluminum-Bronze Sand Castings
B150/B150M Specification for Aluminum Bronze Rod, Bar, and Shapes
B637 Specification for Precipitation-Hardening and Cold Worked Nickel Alloy Bars, Forgings, and Forging Stock for Moderate or High Temperature Service
B689 Specification for Electroplated Engineering Nickel Coatings
F467 Specification for Nonferrous Nuts for General Use
F468 Specification for Nonferrous Bolts, Hex Cap Screws, Socket Head Cap Screws, and Studs for General Use
F593 Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
F594 Specification for Stainless Steel Nuts

2.2 *ASME Standards:*[3]

ASME B1.1 Unified Inch Screw Threads, UN and UNR Thread Form
ASME B1.12 Class 5 Interfence-Fit Thread

2.3 *ISA Standards:*[4]

ISA S75.01 Flow Equations for Sizing Control Valves
ISA S75.02 Control Valve Capacity Test Procedure

[1] This specification is under the jurisdiction of ASTM Committee F25 on Ships and Marine Technology and is the direct responsibility of Subcommittee F25.11 on Machinery and Piping Systems.

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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, Two Park Ave., New York, NY 10016-5990, http://www.asme.org.

[4] Available from International Society of Automation (ISA), 67 T.W. Alexander Drive, PO Box 12277, Research Triangle Park, NC 27709, https://www.isa.org.

2.4 *Federal Specifications:*[5]

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

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

QQ-N-288 Nickel-Copper Alloy and Nickel-CopperSilicon 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:*[5]

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:*[5]

Naval Sea Systems Command (NAVSEA)

2.7 *Drawings:*[5]

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:*

3.1.1 *accuracy of regulation, n*—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, n*—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, n*—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, n*—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, n*—the approximate maximum pressure to which the valve will be subjected in service under normal conditions.

3.1.6 *set pressure, n*—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), n*—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] Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, http://quicksearch.dla.mil.

TABLE 1 Face-to-Face Dimensions, in. (mm), ±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)	7¼	7⅞	7 7⁄32			7⅞	7 7⁄32
0.37 (9.40)	7¼ (184)	7⅞ (200)	7 9⁄32 (185)			7 9⁄32 (185)	7 9⁄32 (185)
0.50 (12.7)	7¼ (184)	7⅞ (200)	7 9⁄32 (185)	6½ (165)	6½ (165)	7 9⁄32 (185)	7 9⁄32 (185)
0.75 (19.05)	7⅜ (187)	7⅞ (200)	7½ (191)	7½ (191)	7½ (191)	8 (203)	8 (203)
1.00 (25.4)	7⅜ (187)	8 (203)	7½ (191)	8½ (216)	8½ (216)	8¾ (222)	8¾ (222)
1.25 (31.75)	7 15⁄16 (202)	8 11⁄16 (221)	8 5⁄32 (207)	9 (229)	9 (229)	9½ (241)	9½ (241)
1.50 (38.1)	8¾ (222)	9½ (241)	8 31⁄32 (228)	9½ (241)	9½ (241)	10 (254)	10 (254)
2.00 (50.8)	10 (254)	10¾ (273)	10 7⁄32 (260)	11½ (292)	11½ (292)	11⅞ (302)	11⅞ (302)
2.50 (63.5)	10⅞ (276)	11¾ (298)		13 (330)	13 (330)		
3.00 (76.2)	11⅝ (295)	12½ (318)		14 (356)	14 (356)		
3.50 (88.9)	11⅝ (295)	12⅝ (321)					
4.00 (101.6)	13½ (343)	14½ (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

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.

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,

TABLE 3 List of Materials

Name of Parts	Material
Body and bottom cap[A]	Valve bronze, Specification B61, QQ-C-390, Alloy C92200. Copper-nickel, MIL-C-20159, Alloy C96400. Gun metal, QQ-C-390, Alloy C90300. Nickel-aluminum-bronze in accordance with MIL-B-24480.
Spring chamber (Type I valves)	Same as for body and bottom cap.
Spring chamber (Type II valves)	Same as for body and bottom cap plus: Brass, QQ-B-637. Aluminum, Specification B26/B26M.
Stem[B]	Nickel-copper alloy, QQ-N-281, or QQ-N-288. Nickel-copper-aluminum alloy, QQ-N-286.
Guide bushings[B]	Nickel-copper-silicon alloy, QQ-N-288, Comp D; or Nickel-copper-aluminum QQ-N-286.
Seat ring	Nickel-copper alloy, QQ-N-281, or Nickel-copper-silicon alloy QQ-N-288, Comp D.
Springs not subject to line media	300 series stainless steel in accordance with Specification A313/A313M; QQ-S-763, QQ-W-390; Nickel-copper alloy, QQ-N-281; Nickel-copper-aluminum, QQ-N-286; Nickel plated steel in accordance with Specifications A125, A231/A231M, or A689 plated to Specification B689, Type 1, Class (x) 125. Specification B637 (UNS N07500).
Metallic parts subject to line media	Nickel-copper alloy, QQ-N-281, QQ-N-286, or QQ-N-288. Copper-nickel, MIL-C-20159, Alloy C71500. Valve bronze, Specification B61, QQ-C-390, Alloy C92200. Aluminum-bronze (cast: QQ-C-390, Alloy C95800; forged: QQ-C-465, Specification B150/B150M, Alloy C63200). Specification B148, UNS C95800, Specification B150/B150M, UNS C63200.
Metallic parts not subject to line media	Same as above, plus: CRES (300 and 400 series), QQ-S-763, QQ-S-766, Specification A276. Naval Brass, QQ-B-637, Specification B21/B21M. Nickel plated steel in accordance with Specification A125, plated to Specification B689, Type 1, Class (x) 125. Bronze, Specification B62.
Diaphragm	Synthetic fabric reinforced nitrile or fluorocarbon rubber or other materials when specified (see Section 5).
Nonmetallic seals	
Disc insert[C] and static seals	Nitrile or fluorocarbon rubber or other materials when specified (see Section 5).
Dynamic seals	Nitrile or fluorocarbon rubber or other materials when specified (see Section 5).
Bolting	QQ-N-281, QQ-N-286, Specifications F467, F468. Specifications F593, F594, A193/A193M, and A194/A194M (stainless steel 300 series).

[A] When threaded parts made of nickel-copper alloys, such as seat ring, guide bushings, and so forth are screwed into a bronze body, the threads on these parts as well as the mating threads in the body shall be given a corrosion-inhibitive coating (polysulfate chromate elastomer) in accordance with MIL-S-81733 to minimize the galvanic and crevice corrosion of threads.
[B] The guiding surfaces on the stem (guide posts) and the guide bushings shall have a minimum hardness differential of 50 Brinell hardness numbers. The softer of the two guiding surfaces shall have a minimum hardness of 200 Brinell.
[C] Hardness of the disc insert is to be Shore 75 ± 5.

TABLE 4 Design and Test Pressures

Nominal Inlet Pressure Rating, psig (kPa)	Design Pressures, psig (kPa)	Hydrostatic Proof Test Pressure, psig (kPa)	Design Temperature, °F (°C)
150 (1034)	150 (1034)	225 (1551)	165 (74)
250 (1724)	250 (1724)	375 (2586)	165 (74)
400 (2758)	400 (2758)	600 (4137)	165 (74)
700 (4826)	700 (4826)	1050 (7239)	165 (74)

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. (50.8 mm), it shall be twice the highest set pressure or 375 psig (2586 kPa), whichever is greater; for valves of sizes over 2 in. (50.8 mm), it shall be twice the highest set pressure or 300 psig (2068 kPa), whichever is greater. There shall be no damage or degradation to the performance capabilities of either the valve internals or the diaphragm. However, in no case shall the diaphragm be required to withstand a pressure differential greater than the nominal inlet pressure rating of the valve.

6.1.6 *Valving Element Construction*—The stem shall be of one-piece construction and be top and bottom guided. The valve disc shall be retained on the stem with a threaded retainer using a prevailing torque–locking feature. The disc shall incorporate a resilient seating insert that shall be readily replaceable on all sizes. Guide bushings shall be provided in the body and bottom cap and shall have a minimum thickness of 0.060 in. (1.52 mm). Concentricity, parallelism, squareness, and roundness requirements for all surfaces that establish main valve alignment shall ensure parallel disc/seat contact and free valve movement without sticking or binding in the assembled valve. The valve shall be designed so that these alignment requirements are maintained with interchangeable parts and under any additive tolerance (stackup) condition without requiring machining after assembly of the body and bottom cap. The bottom cap/body joint shall ensure, by positive means, proper alignment of the lower guide bushing to ensure repeated correct reassembly. The bottom cap shall be located by body guiding, that is, a close tolerance fit between machined diameters on the body and bottom cap rather than depending on studs or bolts for location. Where the bottom cap/body joint is of flanged construction, proper parallel alignment of the lower guide bushing shall be ensured by metal-to-metal takeup of at least a portion of the flange faces, which shall be machined true. The finish of the guiding surfaces shall have a roughness height rating (RHR) of 32 or better. The guiding surfaces shall not be used as sealing surfaces.

6.1.7 *Valving Element Balance*—The valve element shall be completely pressure balanced when in the seated position. The dynamic seal shall be accomplished by use of either a diaphragm or a fully retained U-cup or O-ring. Where a U-cup or O-ring is used, the surface moving against the seal shall have a finish of RHR 16 or better and shall not be used for guiding the stem.

6.1.8 *Seat Ring*—A replaceable threaded seat ring (or a piston chamber for valves with the cage construction design) shall be provided so that it can be replaced with hand tools (see 6.1.18) and does not require machining after assembly. The seat ring shall shoulder against the body to provide a positive pressure-tight joint in which the threads are not used to seal. Where a nonmetallic sealing element is used, 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.

6.1.9 *Bolting Requirements*—The spring chamber/body flange and bottom cap/body flange (if applicable) shall be secured by one of the following methods:

(1) Bolts threaded the entire length and fitted with a nut on each end. Threads on bolts and nuts shall have a Class 2 fit in accordance with ASME B1.1.

(2) Tap-end studs with a Class 5 interference fit at the tap end and a Class 2 fit at the nut end. The fit shall be in accordance with ASME B1.12.

(3) Hexagonal head bolts or cap screws.

The bearing surfaces of nuts and bolts and their respective mating surfaces on the valve shall be cast or forged smooth and true or be finish-machined. The bottom cap/body joint may have either a flanged construction, in accordance with the above, or a threaded construction. A properly retained gasket or O-ring shall be provided to seal against external leakage.

6.1.10 *Spring Construction*—Springs shall not be fully compressed under any normal operation or adjustment of the valve. Spring ends shall be squared and ground.

6.1.11 *Set Pressure Adjustment*—The set pressure (see 3.1.6) shall be adjustable with the valve under pressure. The set pressure shall be increased by the clockwise rotation of the adjusting device. The adjusting device shall be provided with a locknut and cap or other suitable means to guard against an accidental change in set point. Set pressure shall be adjustable through a range of not less than 75 to 125 % of the mid-range set pressure with the installed spring without replacing any internal parts (see Section 5).

6.1.12 *Threads*—Threads shall conform to ASME B1.1. Provisions shall be incorporated, where necessary, to prevent the accidental loosening of threaded parts. Bolting shall generally have a Class 2 fit, in accordance with ASME B1.1. The material, hardness, finish, and clearances of mating threaded parts shall prevent galling of the threads. Pipe threads shall not be used for main connections, but they may be used for low-stressed internal parts, such as attachment of a pitot tube. When required in Table 3, threads shall be coated.

TABLE 5 End Connections

Nominal Pressure Rating, psig (kPa)	Union End	Flanged End
150 (1034)	MIL-F-1183	MIL-F-20042
250 (1724)	MIL-F-1183	MIL-F-20042
400 (2758)	MIL-F-24227	MIL-F-20042
700 (4826)	803-1385946	803-1385947

6.1.13 *Interchangeability*—Parts having the same manufacturer's parts numbers 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.

6.1.14 *Accessibility*—Adjustment and repair of the valve shall be possible without removal from the line.

6.1.15 *End Connections*—Valve ends shall be in accordance with the applicable documents listed in Table 5. The valve end connection type shall be as specified (see Section 5 and 6.1.21). Unless otherwise specified in the ordering information (see Section 5), valves with union-ends shall be supplied with the male threadpieces only, without the tailpieces and the union nuts. Flanges and union-end thread pieces shall be cast or forged integral with the valve body. Inlet and outlet connections shall be of the same size and pressure rating.

6.1.16 *Face-to-Face Dimensions*—Face-to-face dimensions for valves shall be in accordance with Table 1. Face-to-face dimensions for valves not covered in Table 1 shall be as specified (see Section 5). For union-end valves, the face-to-face dimension is defined as the distance between the parallel faces of the threaded ends of the valve body.

6.1.17 *Body Configuration*—Valves shall have globe configuration with in-line inlet and outlet ports. Pressure lines, including the reduced pressure sensing line, shall be internally ported in the body.

6.1.18 *Special Tools*—Special tools shall not be required for installing or removing the valve from the pipe line. Special tools may be furnished for servicing valve internals if it can be demonstrated that use of the special tool saves labor or time. Special tools are defined as those tools not listed in the Federal Supply Catalog.[5]

6.1.19 *Painting*—Except for the case of aluminum alloys, painting of the external surfaces of nonferrous metal castings, pipings, or other parts is not required. Parts made of aluminum alloys shall be given one coat of pretreatment in accordance with DOD-P-15328, Formula 117, and one coat of primer in accordance with TT-P-645, Formula 84.

6.1.20 *Welding and Brazing*—Welding and brazing shall be performed in accordance with MIL-STD-248 and MIL-STD-278.

6.1.21 *Valve Specification Coding*—Basic valve design features shall be specified and recorded using the valve coding system shown in Fig. 1. The valve specification code contains

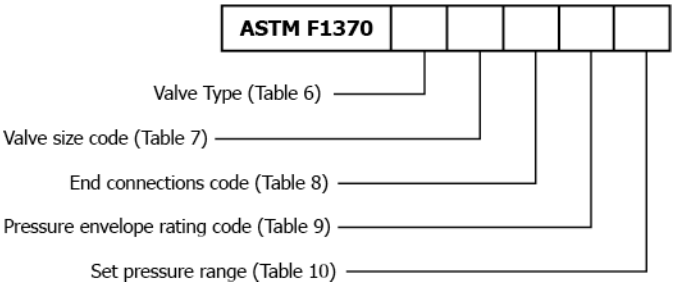

FIG. 1 Valve Coding System

six fields of information, which describe the construction features of the valve. These six fields are each further assigned their respective codes in accordance with Tables 6-10.

7. Performance Requirements

7.1 All valves shall meet the following requirements:

7.1.1 *Springs*—Springs shall not exhibit a set in excess of the calculated allowable set (see S1.1.3).

7.1.2 *Hydrostatic Proof Test*—The pressure-containing envelope shall withstand internal hydrostatic pressure of 1.5 times the design pressure (see Table 4 and S1.1.4).

7.1.3 *Seat Tightness*—The pressure increase after lockup (see 3.1.4) on the downstream (or regulated outlet) side of the valve shall not exceed 10 % of the set pressure or 2.5 psi (17.24 kPa), whichever is greater, over a 15-min period (see S1.1.5).

7.1.4 *Set Pressure Limits*—Unless otherwise specified (see Section 5), the set pressure (see 3.1.7 and Table 10) shall be adjustable within the standard set pressure ranges of 5 to 30, 25 to 60, and 50 to 100 psig (34 to 207, 172 to 414, and 345 to 689 kPa). If required, more than one spring may be used to accomplish this.

7.1.5 *Accuracy of Regulation*—Unless otherwise specified (see Section 5), the valve shall provide an accuracy of regulation (see 3.1.1) in accordance with the following:

7.1.5.1 The downstream regulated pressure shall not deviate beyond the values listed in Table 11 when the flow through the valve is increased from zero to the rated capacity.

7.1.5.2 The downstream regulated pressure deviation from the set pressure shall not exceed 0.5 psi (3.45 kPa) for every 10-psi (69-kPa) change in upstream pressure when the upstream pressure is changed at the same flow rate condition.

7.1.6 *Capacity Requirements*—The minimum required valve flow coefficients (C_v) for Type I and II valves, based on the accuracy of regulation specified in 7.1.5, shall be in accordance with Table 2. The minimum required capacity for valves not listed in Table 2 shall be as specified (see Section 5). Valves shall meet the specified capacity required, or any intermediate capacity requirement, while maintaining the regulated pressure within the accuracy limits specified in 7.1.5, without instability and within the vibration requirements of 7.1.7.

7.1.6.1 *Capacity Calculation*—Calculation of the valve flow (C_v) shall be performed from test data (test calculations shall be in accordance with ISA S75.01 and tests in accordance with ISA S75.02) based on the following equations for turbulent flow:

TABLE 6 Valve Type Code

Valve Type	Code
Type 1	1
Type 2	2

TABLE 7 Valve Size Code

Size, NPS	Code	Size, NPS	Code	Size, NPS	Code
0.25	A	1.00	E	2.50	J
0.37	B	1.25	F	3.00	K
0.50	C	1.50	G	3.50	L
0.75	D	2.00	H	4.00	M

TABLE 8 End Connection Code

Type of End Connection	Code
Union ends (NPS 2 and under)	U
Flanged ends	F

TABLE 9 Valve Body Pressure Rating Code

Nominal Pressure Rating, psig (kPa)	Code
150 (1034)	1
250 (1724)	2
400 (2758)	4
700 (4826)	7

TABLE 10 Set Pressure Range Code

Set Pressure Range, psig (kPa)	Code
5 to 30 (34 to 207)	A
25 to 60 (172 to 414)	B
50 to 100 (345 to 689)	C
As specified	X

TABLE 11 Accuracy of Regulation

Set Pressure, psig (kPa)	Allowable Variation in Downstream Pressure, psi (kPa)
0 to 10 (0 to 69)	2.5 (17.24)
20 (138)	4.5 (31.03)
30 (207)	6.0 (41.37)
45 (310)	7.75 (53.43)
60 (414)	11.75 (81.01)
80 (552)	14.5 (99.97)
100 (689)	12.5 (86.19)
150 (1034)	18.5 (127.55)
200 (1379)	25.5 (175.82)

$$C_v = \frac{\text{flow}}{F_p\sqrt{\text{inlet pressure} - \text{minimum delivered flow pressure}}} \quad (1)$$

where:

F_p = piping geometry factor (F_p = 1.0 when pipe reducers are not used),
flow = US gal/min of water at 60°F (16°C),
inlet pressure = psig, and
minimum delivered flow pressure = the set pressure, minus allowable pressure deviation permitted, psig.