



Standard Specification for Hand-Operated, Globe-Style Valves for Gas (Except Oxygen Gas) and Hydraulic Systems¹

This standard is issued under the fixed designation F 1794; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers the design, construction, testing, and operating requirements for hand-operated, quick-change cartridge trim, in-line body and angle-body, globe-style valves for use in gas (except oxygen gas) and hydraulic systems. These valves may be used for on-off, and/or throttling applications.

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

2. Referenced Documents

2.1 ASTM Standards:²

F 992 Specification for Valve Label Plates

2.2 American National Standards Institute (ANSI):³

B1.1 Unified Screw Threads (UN and UNR Thread Form)

B1.20.1 Pipe Threads, General Purpose (Inch)

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

B16.25 Buttwelding Ends

B16.34 Valves—Flanged, Threaded, and Welded End

2.3 Military Standards and Specifications:⁴

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

MIL-STD-740-1 Airborne Noise Measurements and Acceptance Criteria of Shipboard Equipment

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

2.4 Government Drawings:

Naval Sea Systems Command (NAVSEA):

NAVSEA 803-1385884 Unions, Fittings and Adapters Butt and Socket Welding 6000 PSI, WOG, NPS

NAVSEA 803-1385943 Unions, Silver Brazing 3000 PSI, WOG, NPS, for UT Inspection

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

3. Terminology

3.1 Definitions:

3.1.1 *bubble-tight*—no visible leakage over a 3-min period using either water submersion or the application of bubble fluid for detection.

3.1.2 *external leakage*—leakage from the valve that escapes to atmosphere.

3.1.3 *flow capacity*—the ability of a valve to pass flow under any given set of pressure conditions. The flow capacity of a valve is directly related to its Flow Coefficient (C_v). The Flow coefficient is the quantity of water passing through a valve, expressed in gallons/minute (litres/minute), when 1 psi (6.895 kPa) pressure drop at 60°F (16°C) is applied across the valve.

3.1.4 *globe-style valves*—a basic control valve type that gets its name from the globular shape of its body with an internal bridgewall construction. It normally uses a basic rising stem/plug for the closure member.

3.1.5 *hydrostatic shell test pressures*—the hydrostatic test pressures that the valve is required to withstand without damage. Valve operation is not required during application of shell test pressure, but the valve must meet all performance requirements after the shell test pressure has been removed.

3.1.6 *internal leakage*—leakage from higher pressure to lower pressure portions of the valve.

3.1.7 *operating pressures*—the pressures within the valve during service.

3.1.8 *pressure ratings*—the pressure ratings of the valve shall be as defined in the documents listed in Table 1. The pressure ratings (also called pressure-temperature ratings)

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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 National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

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

TABLE 1 End Connections and Pressure Ratings for Valves

Type of End Connection	Pressure Rating	Applicable Documents for Dimensional Details of End Connections
Butt-welded	ANSI B16.34 Class 150, 300, 400, 600, 900, 1500, 2500, or 4500	ANSI B16.25
Socket-welded	ANSI B16.34 Class 150, 300, 400, 600, 900, 1500, 2500, or 4500	ANSI B16.11
Threaded (tapered pipe thread)	ANSI B16.34 Class 150, 300, 400, 600, 900, 1500, or 2500	ANSI B1.20.1 and ANSI B16.11
Union-end, ^A	MIL-F-1183 (O-ring type)	MIL-F-1183 (O-ring type)
Silver-brazed	400 lb/in. ² (2.758 MPa)	400 lb/in. ² (2.758 MPa)
Union-end, ^A	803-1385946 1500 lb/in. ²	803-1385946 1500 lb/in. ²
Silver-brazed	(10.342 MPa)	(10.342 MPa)
Union-end, ^A	803-1385943 3000 lb/in. ²	803-1385943 3000 lb/in. ²
Silver-brazed	(20.684 MPa)	(20.684 MPa)
Union-end, ^A	803-1385884 6000 lb/in. ²	803-1385884 6000 lb/in. ²
Butt/socket weld	(41.369 MPa)	(41.369 MPa)
Other, as specified	As specified	As specified

^A For union inlet and outlet end connections, only the pertinent dimensions listed in the applicable documents (Military Specification or NAVSEA Requirements) shall apply. The valve shall be supplied with the thread-pieces only, without the tail-pieces and union-nuts.

establish the maximum allowable working (service) pressures of a component (valve, end connections, and so forth) at various temperatures.

3.1.9 *quick-change cartridge trim*—a construction that facilitates rapid and reliable seat-ring/seat removal and replacement by retaining the seat-ring/seat in the valve cartridge, as opposed to a seat-ring which is threaded, welded, brazed, or made integral with the valve body.

3.1.10 *seat tightness*—the ability of a valve to prevent internal leakage from the valve-inlet to the valve-outlet.

4. Classification

4.1 Valves shall be of the following types, styles, sizes, pressure ratings, and end connections, as specified in Section 5.

4.1.1 *Types*—Valves shall have either Type I (angle body construction) or Type II (inline body construction).

4.1.2 *Styles*—Valves shall be either Style I (shut-off valves) or Style 2 (throttling valves).

4.1.3 *Sizes*—Valve sizes shall be ½ NPS (10.2 mm), ¾ NPS (13.5 mm), 1 NPS (26.9 mm), 1½ NPS (38.3 mm), 2 NPS (50.8 mm), 2½ NPS (63.5 mm), 3 NPS (76.2 mm), 4 NPS (101.6 mm), 6 NPS (152.4 mm), 8 NPS (203.2 mm), 10 NPS (254.0 mm), 12 NPS (304.8 mm), 14 NPS (355.6 mm), 16 NPS (406.4 mm), 18 NPS (457.2 mm), 20 NPS (508.0 mm), 24 NPS (609.6 mm), 30 NPS (762.0 mm), 36 NPS (914.4 mm), 42 NPS (1066.8 mm), 48 NPS (1219.2 mm), 60 NPS (1524.0 mm), 72 NPS (1828.8 mm), 84 NPS (2133.6 mm), 96 NPS (2438.4 mm), 108 NPS (2743.2 mm), 120 NPS (3048.0 mm), 144 NPS (3657.6 mm), 168 NPS (4267.2 mm), 192 NPS (4876.8 mm), 216 NPS (5486.4 mm), 240 NPS (6096.0 mm), 288 NPS (7315.2 mm), 336 NPS (8534.4 mm), 384 NPS (9753.6 mm), 432 NPS (10972.8 mm), 480 NPS (12192.0 mm), 528 NPS (13411.2 mm), 576 NPS (14630.4 mm), 624 NPS (15849.6 mm), 672 NPS (17068.8 mm), 720 NPS (18307.2 mm), 768 NPS (19545.6 mm), 816 NPS (20784.0 mm), 864 NPS (22220.8 mm), 912 NPS (23697.6 mm), 960 NPS (25113.6 mm), 1008 NPS (26530.4 mm), 1056 NPS (27947.2 mm), 1104 NPS (29364.0 mm), 1152 NPS (30780.8 mm), 1200 NPS (32197.6 mm), 1248 NPS (33614.4 mm), 1296 NPS (35041.6 mm), 1344 NPS (36468.8 mm), 1392 NPS (37896.0 mm), 1440 NPS (39323.2 mm), 1488 NPS (40750.4 mm), 1536 NPS (42177.6 mm), 1584 NPS (43624.8 mm), 1632 NPS (45091.2 mm), 1680 NPS (46547.2 mm), 1728 NPS (48003.2 mm), 1776 NPS (49459.2 mm), 1824 NPS (50915.2 mm), 1872 NPS (52371.2 mm), 1920 NPS (53827.2 mm), 1968 NPS (55283.2 mm), 2016 NPS (56739.2 mm), 2064 NPS (58195.2 mm), 2112 NPS (59651.2 mm), 2160 NPS (61107.2 mm), 2208 NPS (62563.2 mm), 2256 NPS (64019.2 mm), 2304 NPS (65475.2 mm), 2352 NPS (66931.2 mm), 2400 NPS (68387.2 mm), 2448 NPS (69843.2 mm), 2496 NPS (71299.2 mm), 2544 NPS (72755.2 mm), 2592 NPS (74211.2 mm), 2640 NPS (75667.2 mm), 2688 NPS (77123.2 mm), 2736 NPS (78579.2 mm), 2784 NPS (80035.2 mm), 2832 NPS (81491.2 mm), 2880 NPS (82947.2 mm), 2928 NPS (84403.2 mm), 2976 NPS (85859.2 mm), 3024 NPS (87315.2 mm), 3072 NPS (88771.2 mm), 3120 NPS (90227.2 mm), 3168 NPS (91683.2 mm), 3216 NPS (93139.2 mm), 3264 NPS (94595.2 mm), 3312 NPS (96051.2 mm), 3360 NPS (97507.2 mm), 3408 NPS (98963.2 mm), 3456 NPS (100419.2 mm), 3504 NPS (101875.2 mm), 3552 NPS (103331.2 mm), 3600 NPS (104787.2 mm), 3648 NPS (106243.2 mm), 3696 NPS (107699.2 mm), 3744 NPS (109155.2 mm), 3792 NPS (110611.2 mm), 3840 NPS (112067.2 mm), 3888 NPS (113523.2 mm), 3936 NPS (114979.2 mm), 3984 NPS (116435.2 mm), 4032 NPS (117891.2 mm), 4080 NPS (119347.2 mm), 4128 NPS (120803.2 mm), 4176 NPS (122259.2 mm), 4224 NPS (123715.2 mm), 4272 NPS (125171.2 mm), 4320 NPS (126627.2 mm), 4368 NPS (128083.2 mm), 4416 NPS (129539.2 mm), 4464 NPS (130995.2 mm), 4512 NPS (132451.2 mm), 4560 NPS (133907.2 mm), 4608 NPS (135363.2 mm), 4656 NPS (136819.2 mm), 4704 NPS (138275.2 mm), 4752 NPS (139731.2 mm), 4800 NPS (141187.2 mm), 4848 NPS (142643.2 mm), 4896 NPS (144099.2 mm), 4944 NPS (145555.2 mm), 4992 NPS (147011.2 mm), 5040 NPS (148467.2 mm), 5088 NPS (149923.2 mm), 5136 NPS (151379.2 mm), 5184 NPS (152835.2 mm), 5232 NPS (154291.2 mm), 5280 NPS (155747.2 mm), 5328 NPS (157203.2 mm), 5376 NPS (158659.2 mm), 5424 NPS (160115.2 mm), 5472 NPS (161571.2 mm), 5520 NPS (163027.2 mm), 5568 NPS (164483.2 mm), 5616 NPS (165939.2 mm), 5664 NPS (167395.2 mm), 5712 NPS (168851.2 mm), 5760 NPS (170307.2 mm), 5808 NPS (171763.2 mm), 5856 NPS (173219.2 mm), 5904 NPS (174675.2 mm), 5952 NPS (176131.2 mm), 6000 NPS (177587.2 mm), 6048 NPS (179043.2 mm), 6096 NPS (180499.2 mm), 6144 NPS (181955.2 mm), 6192 NPS (183411.2 mm), 6240 NPS (184867.2 mm), 6288 NPS (186323.2 mm), 6336 NPS (187779.2 mm), 6384 NPS (189235.2 mm), 6432 NPS (190691.2 mm), 6480 NPS (192147.2 mm), 6528 NPS (193603.2 mm), 6576 NPS (195059.2 mm), 6624 NPS (196515.2 mm), 6672 NPS (197971.2 mm), 6720 NPS (199427.2 mm), 6768 NPS (200883.2 mm), 6816 NPS (202339.2 mm), 6864 NPS (203795.2 mm), 6912 NPS (205251.2 mm), 6960 NPS (206707.2 mm), 7008 NPS (208163.2 mm), 7056 NPS (209619.2 mm), 7104 NPS (211075.2 mm), 7152 NPS (212531.2 mm), 7200 NPS (213987.2 mm), 7248 NPS (215443.2 mm), 7296 NPS (216899.2 mm), 7344 NPS (218355.2 mm), 7392 NPS (219811.2 mm), 7440 NPS (221267.2 mm), 7488 NPS (222723.2 mm), 7536 NPS (224179.2 mm), 7584 NPS (225635.2 mm), 7632 NPS (227091.2 mm), 7680 NPS (228547.2 mm), 7728 NPS (229999.2 mm), 7776 NPS (231455.2 mm), 7824 NPS (232911.2 mm), 7872 NPS (234367.2 mm), 7920 NPS (235823.2 mm), 7968 NPS (237279.2 mm), 8016 NPS (238735.2 mm), 8064 NPS (240191.2 mm), 8112 NPS (241647.2 mm), 8160 NPS (243103.2 mm), 8208 NPS (244559.2 mm), 8256 NPS (246015.2 mm), 8304 NPS (247471.2 mm), 8352 NPS (248927.2 mm), 8400 NPS (250383.2 mm), 8448 NPS (251839.2 mm), 8496 NPS (253295.2 mm), 8544 NPS (254751.2 mm), 8592 NPS (256207.2 mm), 8640 NPS (257663.2 mm), 8688 NPS (259119.2 mm), 8736 NPS (260575.2 mm), 8784 NPS (262031.2 mm), 8832 NPS (263487.2 mm), 8880 NPS (264943.2 mm), 8928 NPS (266399.2 mm), 8976 NPS (267855.2 mm), 9024 NPS (269311.2 mm), 9072 NPS (270767.2 mm), 9120 NPS (272223.2 mm), 9168 NPS (273679.2 mm), 9216 NPS (275135.2 mm), 9264 NPS (276591.2 mm), 9312 NPS (278047.2 mm), 9360 NPS (279503.2 mm), 9408 NPS (280959.2 mm), 9456 NPS (282415.2 mm), 9504 NPS (283871.2 mm), 9552 NPS (285327.2 mm), 9600 NPS (286783.2 mm), 9648 NPS (288239.2 mm), 9696 NPS (289695.2 mm), 9744 NPS (291151.2 mm), 9792 NPS (292607.2 mm), 9840 NPS (294063.2 mm), 9888 NPS (295519.2 mm), 9936 NPS (296975.2 mm), 9984 NPS (298431.2 mm), 10032 NPS (299887.2 mm), 10080 NPS (301343.2 mm), 10128 NPS (302799.2 mm), 10176 NPS (304255.2 mm), 10224 NPS (305711.2 mm), 10272 NPS (307167.2 mm), 10320 NPS (308623.2 mm), 10368 NPS (310079.2 mm), 10416 NPS (311535.2 mm), 10464 NPS (312991.2 mm), 10512 NPS (314447.2 mm), 10560 NPS (315903.2 mm), 10608 NPS (317359.2 mm), 10656 NPS (318815.2 mm), 10704 NPS (320271.2 mm), 10752 NPS (321727.2 mm), 10800 NPS (323183.2 mm), 10848 NPS (324639.2 mm), 10896 NPS (326095.2 mm), 10944 NPS (327551.2 mm), 10992 NPS (329007.2 mm), 11040 NPS (330463.2 mm), 11088 NPS (331919.2 mm), 11136 NPS (333375.2 mm), 11184 NPS (334831.2 mm), 11232 NPS (336287.2 mm), 11280 NPS (337743.2 mm), 11328 NPS (339199.2 mm), 11376 NPS (340655.2 mm), 11424 NPS (342111.2 mm), 11472 NPS (343567.2 mm), 11520 NPS (345023.2 mm), 11568 NPS (346479.2 mm), 11616 NPS (347935.2 mm), 11664 NPS (349391.2 mm), 11712 NPS (350847.2 mm), 11760 NPS (352303.2 mm), 11808 NPS (353759.2 mm), 11856 NPS (355215.2 mm), 11904 NPS (356671.2 mm), 11952 NPS (358127.2 mm), 12000 NPS (359583.2 mm), 12048 NPS (361039.2 mm), 12096 NPS (362495.2 mm), 12144 NPS (363951.2 mm), 12192 NPS (365407.2 mm), 12240 NPS (366863.2 mm), 12288 NPS (368319.2 mm), 12336 NPS (369775.2 mm), 12384 NPS (371231.2 mm), 12432 NPS (372687.2 mm), 12480 NPS (374143.2 mm), 12528 NPS (375599.2 mm), 12576 NPS (377055.2 mm), 12624 NPS (378511.2 mm), 12672 NPS (379967.2 mm), 12720 NPS (381423.2 mm), 12768 NPS (382879.2 mm), 12816 NPS (384335.2 mm), 12864 NPS (385791.2 mm), 12912 NPS (387247.2 mm), 12960 NPS (388703.2 mm), 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18768 NPS (564879.2 mm), 18816 NPS (566335.2 mm), 18864 NPS (567791.2 mm), 18912 NPS (569247.2 mm), 18960 NPS (570703.2 mm), 19008 NPS (572159.2 mm), 19056 NPS (573615.2 mm), 19104 NPS (575071.2 mm), 19152 NPS (576527.2 mm), 19200 NPS (577983.2 mm), 19248 NPS (579439.2 mm), 19296 NPS (580895.2 mm), 19344 NPS (582351.2 mm), 19392 NPS (583807.2 mm), 19440 NPS (585263.2 mm), 19488 NPS (586719.2 mm), 19536 NPS (588175.2 mm), 19584 NPS (589631.2 mm), 19632 NPS (591087.2 mm), 19680 NPS (592543.2 mm), 19728 NPS (593999.2 mm), 19776 NPS (595455.2 mm), 19824 NPS (596911.2 mm), 19872 NPS (598367.2 mm), 19920 NPS (599823.2 mm), 19968 NPS (601279.2 mm), 20016 NPS (602735.2 mm), 20064 NPS (604191.2 mm), 20112 NPS (605647.2 mm), 20160 NPS (607103.2 mm), 20208 NPS (608559.2 mm), 20256 NPS (610015.2 mm), 20304 NPS (611471.2 mm), 20352 NPS (612927.2 mm), 20400 NPS (614383.2 mm), 20448 NPS (615839.2 mm), 20496 NPS (617295.2 mm), 20544 NPS (618751.2 mm), 20592 NPS (620207.2 mm), 20640 NPS (621663.2 mm), 20688 NPS (623119.2 mm), 20736 NPS (624575.2 mm), 20784 NPS (626031.2 mm), 20832 NPS (627487.2 mm), 20880 NPS (628943.2 mm), 20928 NPS (630399.2 mm), 20976 NPS (631855.2 mm), 21024 NPS (633311.2 mm), 21072 NPS (634767.2 mm), 21120 NPS (636223.2 mm), 21168 NPS (637679.2 mm), 21216 NPS (639135.2 mm), 21264 NPS (640591.2 mm), 21312 NPS (642047.2 mm), 21360 NPS (643503.2 mm), 21408 NPS (644959.2 mm), 21456 NPS (646415.2 mm), 21504 NPS (647871.2 mm), 21552 NPS (649327.2 mm), 21600 NPS (650783.2 mm), 21648 NPS (652239.2 mm), 21696 NPS (653695.2 mm), 21744 NPS (655151.2 mm), 21792 NPS (656607.2 mm), 21840 NPS (658063.2 mm), 21888 NPS (659519.2 mm), 21936 NPS (660975.2 mm), 21984 NPS (662431.2 mm), 22032 NPS (663887.2 mm), 22080 NPS (665343.2 mm), 22128 NPS (666799.2 mm), 22176 NPS (668255.2 mm), 22224 NPS (669711.2 mm), 22272 NPS (671167.2 mm), 22320 NPS (672623.2 mm), 22368 NPS (674079.2 mm), 22416 NPS (675535.2 mm), 22464 NPS (676991.2 mm), 22512 NPS (678447.2 mm), 22560 NPS (679903.2 mm), 22608 NPS (681359.2 mm), 22656 NPS (682815.2 mm), 22704 NPS (684271.2 mm), 22752 NPS (685727.2 mm), 22800 NPS (687183.2 mm), 22848 NPS (688639.2 mm), 22896 NPS (690095.2 mm), 22944 NPS (691551.2 mm), 22992 NPS (693007.2 mm), 23040 NPS (694463.2 mm), 23088 NPS (695919.2 mm), 23136 NPS (697375.2 mm), 23184 NPS (698831.2 mm), 23232 NPS (700287.2 mm), 23280 NPS (701743.2 mm), 23328 NPS (703199.2 mm), 23376 NPS (704655.2 mm), 23424 NPS (706111.2 mm), 23472 NPS (707567.2 mm), 23520 NPS (709023.2 mm), 23568 NPS (710479.2 mm), 23616 NPS (711935.2 mm), 23664 NPS (713391.2 mm), 23712 NPS (714847.2 mm), 23760 NPS (716303.2 mm), 23808 NPS (717759.2 mm), 23856 NPS (719215.2 mm), 23904 NPS (720671.2 mm), 23952 NPS (722127.2 mm), 24000 NPS (723583.2 mm), 24048 NPS (725039.2 mm), 24096 NPS (726495.2 mm), 24144 NPS (727951.2 mm), 24192 NPS (729407.2 mm), 24240 NPS (730863.2 mm), 24288 NPS (732319.2 mm), 24336 NPS (733775.2 mm), 24384 NPS (735231.2 mm), 24432 NPS (736687.2 mm), 24480 NPS (738143.2 mm), 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26448 NPS (797839.2 mm), 26496 NPS (799295.2 mm), 26544 NPS (800751.2 mm), 26592 NPS (802207.2 mm), 26640 NPS (803663.2 mm), 26688 NPS (805119.2 mm), 26736 NPS (806575.2 mm), 26784 NPS (808031.2 mm), 26832 NPS (809487.2 mm), 26880 NPS (810943.2 mm), 26928 NPS (812399.2 mm), 26976 NPS (813855.2 mm), 27024 NPS (815311.2 mm), 27072 NPS (816767.2 mm), 27120 NPS (818223.2 mm), 27168 NPS (819679.2 mm), 27216 NPS (821135.2 mm), 27264 NPS

Physically interchangeable assemblies, components, and parts are those which are capable of being readily installed, removed, or replaced without alteration, misalignment, or damage to parts being installed or to adjoining parts. Fabrication operations such as cutting, filing, drilling, reaming, hammering, bending, prying, or forcing shall not be required.

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

6.1.9 Maintainability—Valve maintenance shall require standard tools to the maximum extent possible. Any special tools required for maintenance shall be identified, and shall be supplied with the valve.

6.1.10 Reversibility—Seat inserts shall not be physically reversible unless they are also functionally reversible to preclude incorrect assembly.

6.1.11 Adjustments—There shall be no adjustments required in the valve during or after assembly.

6.1.12 Bidirectional Operation and Bubbletight Shut-Off—The valve shall be capable of operation and bubbletight shut-off with a differential pressure equal to the rated pressure applied across the valve in either direction of flow.

6.1.13 Guiding—The valve poppet shall be guided to prevent binding or seizing, and to ensure proper seating, under all operating conditions. Proper alignment of all internal operating parts shall be maintained with interchangeable parts and under all tolerance stack-up conditions.

6.1.14 Valve Operating Force—The maximum permissible total tangential force required on the handwheel/handle for operating or seating/unseating the valve shall not exceed 50 lb (222 N), when the valve is subjected to a differential pressure equal to the rated pressure applied across the valve in either direction of flow.

6.1.15 Pressurization Rate—To prevent the possibility of auto-ignition, the valve shall be capable of being operated to limit the rate of downstream pressure buildup in a depressurized volume (with the rated pressure upstream) to 200 psi (1380 kPa) per second. Downstream volumes for this pressurization rate shall be taken as 10 pipe diameters.

6.1.16 Operation—The valve shall close by a clockwise rotation of handwheel/handle when viewed from directly over the handwheel/handle.

6.1.17 Envelope Dimensions—For union-end valves only, the overall envelope dimensions shall be as shown in Fig. 1 (angle body construction) or Fig. 2 (inline body construction), as applicable, and Table 2.

7. Performance

7.1 Valves shall meet the performance requirements of 7.1.1-7.1.3.

7.1.1 Flow Capacity—The flow capacity of the valve, expressed in terms of C_v , shall be equal or greater than the values shown in Table 3.

7.1.2 Seat Tightness—Valve shall be bubbletight at 1.1 times the 100°F (38°C) pressure rating in both directions when closed with a handwheel/handle force not exceeding that specified in 6.1.14 (or the manufacturer's published recommendations, when less).

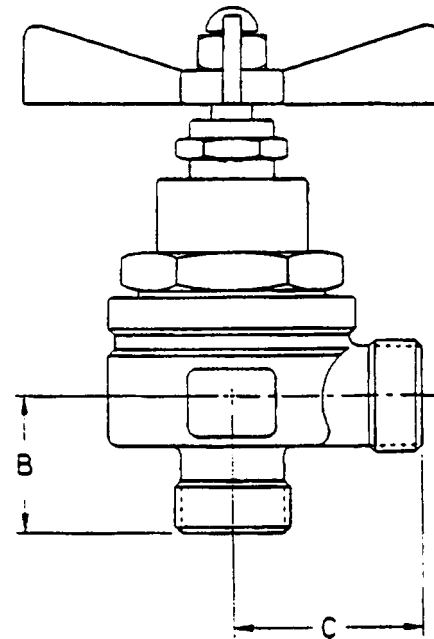


FIG. 1 Angle Body

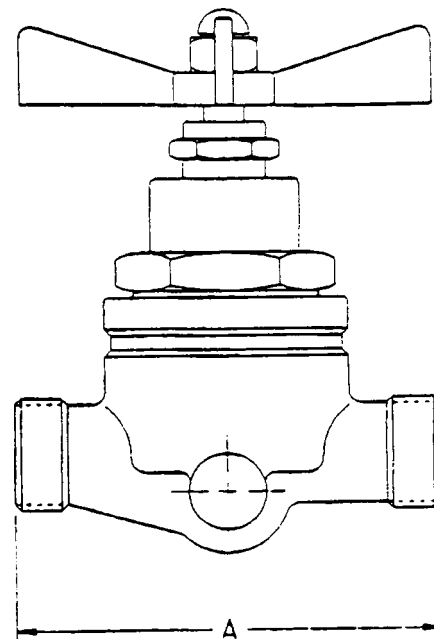


FIG. 2 Inline Body

7.1.3 External Leakage—Valve external leakage shall be bubbletight at its 100°F (38°C) pressure rating.

8. Tests Required

8.1 Each valve shall pass the tests outlined in 8.1.1-8.1.4.

8.1.1 Visual Examination—The valve shall be examined visually to determine conformance with the ordering data and workmanship without disassembly.

8.1.2 Hydrostatic Shell Test—The valve shall be hydrostatically tested with water by applying test pressures equal to 1.5 times the 100°F (38°C) pressure rating to the inlet and outlet ports (with the valve in the open position) to check the

**TABLE 2 Envelope Dimensions (for Union-End Valves Only)**

Valve Size, NPS	Envelope Dimensions, ± 0.015 in. (± 0.38 mm)		
	Dim. A	Dim. B	Dim. C
$\frac{1}{8}$ (10.2 mm)	2.750 (69.85)	$1\frac{1}{8}$ (28.59)	$1\frac{3}{8}$ (34.92)
$\frac{1}{4}$ (13.5 mm)	3.375 (85.73)	$1\frac{1}{2}$ (38.10)	$1\frac{1}{2}$ (42.86)
$\frac{3}{8}$ (17.2 mm)	4.000 (101.60)	$1\frac{5}{8}$ (41.28)	2 (50.40)
$\frac{1}{2}$ (21.3 mm)	4.250 (107.95)	$1\frac{3}{4}$ (44.45)	$2\frac{1}{8}$ (53.98)
$\frac{3}{4}$ (26.9 mm)	4.625 (117.75)	$2\frac{3}{8}$ (60.33)	$2\frac{9}{16}$ (59.05)
1 (33.7 mm)	5.250 (133.35)	$2\frac{3}{4}$ (69.85)	$2\frac{3}{8}$ (66.65)
$1\frac{1}{4}$ (42.4 mm)	6.500 (228.60)	3 (76.20)	$3\frac{1}{4}$ (82.55)
$1\frac{1}{2}$ (48.3 mm)	9.000 (241.30)	4 (101.60)	4 (101.60)
2 (60.3 mm)	9.500 (241.30)	4.500 (114.30)	4.500 (114.30)

TABLE 3 Flow Coefficient (C_v)

Valve Size NPS	Flow Capacity, C_v , gpm	Flow Capacity, C_v , litres/m
$\frac{1}{8}$ (10.2 mm)	0.5	1.89
$\frac{1}{4}$ (13.5 mm)	1.1	4.16
$\frac{3}{8}$ (17.2 mm)	2.3	8.71
$\frac{1}{2}$ (21.3 mm)	3.1	11.73
$\frac{3}{4}$ (26.9 mm)	5.0	18.93
1 (33.7 mm)	8.9	33.69
$1\frac{1}{4}$ (42.4 mm)	13.8	52.24
$1\frac{1}{2}$ (48.3 mm)	22.0	83.28
2 (60.3 mm)	36.0	136.27

structural integrity of the valve. Pressure shall be applied for three minutes. Air or nitrogen may be used in lieu of water, providing appropriate safety precautions are taken to minimize the risk associated with the use of a compressible fluid. There shall be no external leakage, permanent distortion, or structural failure.

8.1.3 Seat Tightness Test—The valve shall be seated with an applied handwheel/handle force not exceeding that specified in 6.1.14 (or the manufacturer's published recommendations, when less). Air or nitrogen at 1.1 times the 100°F (38°C) pressure rating of the valve shall be used for seat tightness test, using bubble fluid or immersing the outlet, or a line from the outlet, under water. The valve shall show no visible evidence of leakage over a 3-min period. The valve shall be tested in both directions of flow to assure bidirectional seat tightness. For

valves used for helium or helium mixture service, the testing medium shall be helium or helium/nitrogen mixture.

8.1.4 External Leakage Test—With the valve in the partially open position, air or nitrogen shall be applied at a test pressure equal to the 100°F (38°C) pressure rating of the valve to the inlet port, and the outlet port blanked off. External leakage shall be checked using bubble fluid, or by submerging the valve in water. There shall be no visible external leakage over a 3-min period. For valves used for helium or helium mixture service, the testing medium shall be helium or helium/nitrogen mixture.

9. Marking

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

- 9.1.1 Manufacturer's name,
- 9.1.2 ASTM designation and year of issue,
- 9.1.3 Manufacturer's model/part number,
- 9.1.4 Size, and
- 9.1.5 Pressure rating.

9.2 Body Markings—Valve body shall be marked per ANSI B16.34.

10. Quality Assurance System

10.1 The manufacturer shall establish and maintain a quality assurance system that will ensure all the requirements of this specification are satisfied. This system shall also ensure that all valves will perform in a similar manner to those representative valves subjected to original testing for determination of the operating and flow characteristics.

10.2 A written description of the quality assurance system the manufacturer will use shall be available for review and acceptance by the inspection authority.

10.3 The purchaser reserves the right to witness the production tests and inspect the valves in the manufacturer's plant to the extent specified on the purchase order.

SUPPLEMENTARY REQUIREMENTS

One or more of the following supplementary requirements S1, S2, S3, or S4 shall be applied only when specified by the purchaser in the inquiry, contract, or order. Details of those supplementary requirements shall be agreed upon in writing by the manufacturer and purchaser. Supplementary requirements shall in no way negate any requirement of the specification itself.

S1. Supplemental Tests

S1.1 Supplemental tests shall be conducted at a laboratory satisfactory to the customer and shall consist of the examination and tests selected from those specified in S1.1.1 through S1.1.6.

S1.1.1 *Operational Test*—The valve shall be attached to an air or nitrogen source at the rated pressure with flow through the valve over the seat. A needle valve shall be installed downstream to limit flow during cycling tests. The valve shall be cycled as follows:

(a) Cycle 50 times and then seat valve with the maximum seating force as specified per manufacturer's recommended published data. One cycle shall consist of one complete opening and closing.

(b) Allow valve to remain pressurized for 1 h in the seated condition.

(c) Repeat (a) and (b) above until valve has undergone 2500 cycles.

(d) After each 50 cycles, stem and seat leakage shall be checked.

(e) Seating, unseating, and running torques shall be noted during this test. Maximum valves should be within those listed in manufacturer's published data.

No lubrication shall be applied to the stem seal either before or during these tests.

S1.1.2 *Pressurization Rate Test*—With a test pressure equal to the 100°F (38°C) pressure rating applied upstream, and a depressurized downstream volume as specified in 6.1.15, the valve shall be operated to demonstrate its ability to meet the pressurization rate specified in 6.1.15.

S1.1.3 *Shock Test*—The valve shall be subjected to and meet the high-impact shock tests for Grade A, Class I as specified in MIL-S-901, pressurized with water, air, or nitrogen. The valve inlet shall be pressurized to a test pressure of the 100°F (38°C) pressure rating. There shall be no structural damage to the valve. There shall be no degradation to the performance capability of the valve.

S1.1.4 *Vibration Test*—The valve shall be vibration tested in accordance with Type I of MIL-STD-167-1 pressurized with air or nitrogen. The valve inlet shall be pressurized to the 100°F (38°C) pressure rating. At frequencies up to and including 33 Hz (unless otherwise specified in the ordering information, Section 5), there shall be no resonance in the range of frequency tested. There shall be no structural damage or degradation to the performance capability of the valve.

S1.1.5 *Noise Test*—The valve shall be tested for airborne noise in accordance with MIL-STD-740-1. The noise (sound pressure level) shall not exceed 85 db, unless otherwise specified in 5.0, observed at one-metre distance from the valve.

S1.1.6 *Post-Test Examination*—After completion of each or all of the tests specified in S1.1.1 through S1.1.5, the valve shall be disassembled and examined for any evidence of excessive wear, degradation, or impending damage or breakage.

S2. Technical Data Requirements

S2.1 *Drawings*—Assembly drawings or catalog sheets of the valve which clearly depict design shall be provided. The

following information shall also be included as part of the drawings or catalog sheets:

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

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

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

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

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

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

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

S2.2.2 *Chapter 2*—Operation.

S2.2.3 *Chapter 3*—Functional Description.

S2.2.4 *Chapter 4*—Scheduled Maintenance.

S2.2.5 *Chapter 5*—Troubleshooting.

S2.2.6 *Chapter 6*—Corrective Maintenance.

S2.2.7 *Chapter 7*—Parts List.

S2.2.8 *Chapter 8*—Installation.

S2.3 In addition, the following shall be included as part of the technical manual content:

S2.3.1 The assembly drawings for the valve, supplemented by additional illustrations where necessary to adequately illustrate operation and maintenance. These additional illustrations may consist of blowouts, partial or full sections, and may eliminate extraneous lines and details to clarify the interaction of parts.

S2.3.2 Table listing wrench sizes and assembly torques (or other equivalent procedures) for making up all joints and threaded assemblies.

S2.3.3 Detailed disassembly and reassembly procedures. In addition to a section providing procedures for the complete disassembly and reassembly of the valve, maintenance, and troubleshooting sections shall contain, or refer to, only the limited disassembly and reassembly required to accomplish each particular operation. This is intended to reduce the possibility of unnecessary disassembly and unnecessary disturbance of adjustments when performing specific or limited maintenance or troubleshooting operations.

S3. Quality Assurance

S3.1 *Scope of Work*—The written description of the quality assurance system shall include the scope and locations of the work to which the system is applicable.

S3.2 *Authority and Responsibility*—The authority and responsibility of those in charge of the quality assurance system shall be clearly established.

S3.3 *Organization*—An organizational chart showing the relationship between management and the engineering, purchasing, manufacturing, construction, inspection, and quality

control groups is required. The purpose of this chart is to identify and associate the various organizational groups with the particular functions for which they are responsible. These requirements are not intended to encroach on the manufacturer's right to establish, and from time to time to alter, whatever form of organization the manufacturer considers appropriate for its work. Persons performing quality control functions shall have a sufficiently well-defined responsibility and the authority and the organizational freedom to identify quality control problems and to initiate, recommend, and provide solutions.

S3.4 Review of Quality Assurance System—The manufacturer shall ensure and demonstrate the continuous effectiveness of the quality assurance system.

S3.5 Drawings, Design Calculations, and Specification Control—The manufacturer's quality assurance system shall include provisions to ensure that the latest applicable drawings, design calculations, specifications, and instructions, including all authorized changes, are used for manufacture, examination, inspection, and testing.

S3.6 Purchase Control—The manufacturer shall ensure that all purchased material and services conform to specified requirements and that all purchase orders give full details of the material and services ordered.

S3.7 Material Control—The manufacturer shall include a system for material control that ensures the material received is properly identified and that any required documentation is present, identified to the material, and verifies compliance to the specified requirements. The material control system shall ensure that only the intended material is used in manufacture. The manufacturer shall maintain control of material during the manufacturing process by a system which identified inspection status of material throughout all stages of manufacture.

S3.8 Manufacturing Control—The manufacturer shall ensure that manufacturing operations are carried out under controlled conditions utilizing documented work instructions. The manufacturer shall provide for inspection, where appropriate, for each operation that affects quality or shall arrange an appropriate monitoring operation.

S3.9 Quality Control Plan—The manufacturer's quality control plan shall describe the fabrication operations, including examinations and inspections.

S3.10 Welding—The quality control system shall include provisions for ensuring that welding conforms to specified requirements. Welders shall be qualified to the appropriate standards and the qualification records shall be made available to the inspection authority if required.

S3.11 Nondestructive Examination—Provisions shall be made to utilize non-destructive examination, as necessary, to ensure that material and components comply with the specified requirements. Nondestructive examinations shall be authorized by their employer and/or qualified by a recognized national body, and their authorizations/qualification records shall be made available to the inspection authority if required.

S3.12 Nonconforming Items—The manufacturer shall establish procedures for controlling items not in conformance with the specified requirements.

S3.13 Heat Treatment—The manufacturer shall provide controls to ensure that all required heat treatments have been applied. Means should be provided by which heat treatment requirements can be verified.

S3.14 Inspection Status—The manufacturer shall maintain a system for identifying the inspection status of material during all stages of manufacture and shall be able to distinguish between inspected and noninspected material.

S3.15 Calibration of Measurement and Test Equipment—The manufacturer shall provide, control, calibrate, and maintain inspection, measuring, and test equipment to be used in verifying conformance to the specified requirements. Such calibration shall be traceable to a national standard and calibration records shall be maintained.

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

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

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

S4. Special Material, Design, and Performance Considerations

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

S4.2 Pipe threads shall not be used in the construction of the valve.

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