

Metal Ball Valves—Flanged, Threaded, and Welding Ends

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Contents

	Page
1 Scope	1
2 Normative References.....	1
3 Terms and Definitions	2
4 Pressure-temperature Ratings	3
4.1 Valve Rating	3
4.2 Shell Rating	3
4.3 Seat and Seal Rating	3
5 Design	4
5.1 General.....	4
5.2 Flow Passageway	4
5.3 Body	5
5.4 Antistatic Design (Electrical Continuity between Ball-Stem-Body)	7
5.5 Ball-stem Design and Construction	7
5.6 Ball Construction	7
5.7 Packing Glands and Gland Bolting.....	8
5.8 Operation.....	8
5.9 End Flange Face Interruptions	9
5.10 Valve Shell Joints	9
6 Materials	10
6.1 Shell	10
6.2 Trim	10
6.3 Bolting	10
6.4 Stem Seals, Body Seals, and Gaskets.....	10
6.5 Identification Plate(s).....	10
6.6 Threaded Plugs and Auxiliary Components	10
6.7 NACE Requirements	10
7 Inspection, Examination, and Testing	10
7.1 Inspection and Examination	10
7.2 Assembly.....	11
7.3 Pressure Testing.....	11
7.4 Fire Testing	11
7.5 Fugitive Emission Testing	11
8 Marking.....	13
9 Packaging and Shipping Requirements	13
10 Spare Parts	14
Annex A (informative) API Monogram Program Use of the API Monogram by Licensees	15
Annex B (normative) Information to Be Specified by the Purchaser	19
Annex C (informative) Typical Floating and Trunnion Ball Valve Component Nomenclature	20

Contents

	Page
Bibliography	22

Figures

1	Flange Face Interruption Limits	9
2	Typical Fire-resistant Seats	12
C.1	Typical Floating Ball Valve Components (One-piece Body/Unibody Illustrated)—Nomenclature	20
C.2	Typical Trunnion-mounted Ball Valve Components (Split-body Valve Illustrated)—Nomenclature	21

Tables

1	Minimum Seat Pressure-temperature Rating—bar ^a	4
2	Minimum Seat Pressure-Temperature Rating—psig ^a	4
3	Cylinder Diameter for Categorizing Bore Size	5
4	Butt-welding End Diameters	6

Introduction

The purpose of this API standard is to establish additional design, operational, and performance requirements for petroleum refining, petrochemical processing, and chemical processing end users beyond the requirements established by ASME B16.34, *Valves—Flanged, Threaded, and Welding End*.

API 608 is intended to provide similar additional requirements for metal ball valves beyond ASME B16.34 as do the following API standards for other valve types:

- API Standard 594, *Check Valves: Flanged, Lug, Wafer, and Butt-welding*
- API Standard 599, *Metal Plug Valves—Flanged, Threaded, and Welding Ends*
- API Standard 600, *Steel Gate Valves—Flanged and Butt-welding Ends, Bolted Bonnets*
- API Standard 602, *Gate, Globe, and Check Valves for Sizes DN 100 (NPS 4) and Smaller for the Petroleum and Natural Gas Industries*
- API Standard 603, *Corrosion-resistant, Bolted Bonnet Gate Valves—Flanged and Butt-welding Ends*
- API Standard 609, *Butterfly Valves: Double-flanged, Lug- and Wafer-type*
- API Standard 623, *Steel Globe Valves—Flanged and Butt-welding Ends, Bolted Bonnets*

Metal Ball Valves—Flanged, Threaded, and Welding Ends

1 Scope

1.1 This standard specifies the requirements for metal ball valves suitable for petroleum, petrochemical, and industrial applications—corresponding to the nominal pipe sizes in ASME B36.10M—that have:

- flanged ends in sizes DN 15 through DN 600 (NPS $\frac{1}{2}$ through NPS 24);
- butt-welding ends in sizes DN 15 through DN 600 (NPS $\frac{1}{2}$ through NPS 24);
- socket-welding ends in sizes DN 8 through DN 50 (NPS $\frac{1}{4}$ through NPS 2); and
- threaded ends in sizes DN 8 through DN 50 (NPS $\frac{1}{4}$ through NPS 2)

1.2 This standard applies to metal ball valves with pressure classes as follows:

- flanged ends in Classes 150, 300, and 600;
- butt-welding ends in Classes 150, 300, 600, and 800;
- socket-welding ends in Classes 150, 300, 600, and 800;
- threaded ends in Classes 150, 300, 600, and 800.

1.3 This standard establishes requirements for bore sizes described as:

- full bore;
- single reduced bore;
- double reduced bore.

1.4 This standard applies to floating (seat-supported) ball (Figure C.1) and trunnion ball valve designs (Figure C.2). These figures are to be used only for the purpose of establishing standard nomenclature for valve components—other floating and trunnion designs also exist.

1.5 This standard establishes additional requirements for ball valves that are otherwise in full conformance to the requirements of ASME B16.34, Standard Class.

1.6 If product is supplied bearing the API Monogram and is manufactured at a facility licensed by API, the requirements of Annex A shall apply.

1.7 Trunnion ball valves equipped with double piston effect seats are outside of the scope of this standard.

2 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any addenda) applies.

API Standard 598, *Valve Inspection and Testing*

API Standard 602, *Gate, Globe, and Check Valves for Sizes DN 100 (NPS 4) and Smaller for the Petroleum and Natural Gas Industries, Tenth Edition, Includes Errata (September 2016)*.

API Standard 607, *Fire Test for Quarter-turn Valves and Valves Equipped with Nonmetallic Seats*

API Standard 641, *Type Testing of Quarter-turn Valves for Fugitive Emissions*

ASME B1.1, *Unified Inch Screw Threads (UN and UNR Thread Form)*

ASME B1.20.1, *Pipe Threads, General Purpose (Inch)*

ASME B16.5, *Pipe Flanges and Flanged Fittings: NPS 1/2 Through 24 Metric/Inch Standard*

ASME B16.10, *Face-to-Face and End-to-End Dimensions of Valves*

ASME B16.11, *Forged Fittings, Socket-welding and Threaded*

ASME B16.20, *Metallic Gaskets for Pipe Flanges*

ASME B16.25, *Buttwelding Ends*

ASME B16.34, *Valves—Flanged, Threaded, and Welding End*

ASME B18.2.2, *Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)*

ASME B36.10M, *Welded and Seamless Wrought Steel Pipe*

NACE MR 0103, *Petroleum, petrochemical and natural gas industries—Metallic materials resistant to sulfide stress cracking in corrosive petroleum refining environments*

3 Terms and Definitions

For the purposes of this document, the following definitions apply.

3.1

Class

An alphanumeric designation that is used for reference purposes relating to valve pressure-temperature capability, taking into account valve material mechanical properties and valve dimensional characteristics. It comprises the word “Class” followed by a dimensionless whole number. The number following the word “Class” does not represent a measurable value and is not used for calculation purposes except where specified in this standard. The allowable pressure for a valve having a class number depends on the valve material and its application temperature is found in tables of pressure-temperature ratings.

3.2

DN

An alphanumeric designation of size that is common for components used in a piping system, used for reference purposes, comprising the letters “DN” followed by a dimensionless number indirectly related to the physical size of the bore or outside diameter of the end connection as appropriate. The dimensionless number following “DN” does not represent a measurable value and is not used for calculation purposes except where specified in this standard.

3.3

NPS

An alphanumeric designation of size that is common for components used in a piping system, used for reference purposes, comprising the letters “NPS” followed by a dimensionless number indirectly related to the physical size of the bore or outside diameter of the end connection as appropriate. The dimensionless number may be used as a valve size identifier without the prefix “NPS.” The dimensionless size identification number does not represent a measurable value and is not used for calculation purposes.

3.4**shell**

Comprises the body, cover, body insert, body cap, and trunnion that forms a part of the pressure boundary (see Annex C).

3.5**trim**

Internal metal parts of the valve, including ball, stem, trunnion (if it is not part of the pressure boundary), metal seats, and seat retainers (see Annex C).

3.6**UN**

The various constant-pitch series (UN/UNR) with 4, 6, 8, 12, 16, 20, 28, and 32 threads per inch that offer a comprehensive range of diameter-pitch combinations for those purposes where the threads in the coarse-, fine-, and extra-fine-thread series do not meet the particular requirements of the design.

3.7**UNC**

The coarse-thread series (UNC/UNRC) generally used for the bulk production of screws, bolts, and nuts.

3.8**valve-bidirectional**

Type of valve having shutoff capability in both directions.

3.9**valve-unidirectional**

Type of valve designed for sealing only in one direction.

4 Pressure-temperature Ratings**4.1 Valve Rating**

The valve pressure-temperature rating shall be the lesser of the shell rating or the seat and seal rating.

4.2 Shell Rating

The valve shell pressure-temperature rating shall be the rating for the shell material as listed for Standard Class in ASME B16.34.

The valve shell pressure/temperature ratings for intermediate Class 800 valves shall be as shown in Table 2a, Table 2b, Table 2c, Table 2d, Table 2e, and Table 2f of API 602 (2016).

4.3 Seat and Seal Rating**4.3.1 Seat Ratings for PTFE and R-PTFE**

Valves employing polytetrafluoroethylene (PTFE) or modified PTFE seats and valves employing reinforced polytetrafluoroethylene (R-PTFE) or modified R-PTFE seats shall have pressure-temperature ratings equal or higher than the values shown in Table 1 and Table 2.

4.3.2 Seat Ratings—Other Materials

Seat pressure-temperature ratings for seat materials other than PTFE or R-PTFE shall be the manufacturer's standard. Seats made from hard materials such as solid cobalt-chromium alloy, ceramics, or metal seats coated with hard materials such as carbide coatings are also acceptable and shall have seat pressure-temperature

ratings per the manufacturer's standard. The published seat pressure-temperature ratings shall not exceed the manufacturer's published shell ratings.

Table 1—Minimum Seat Pressure-temperature Rating—bar^a

Temperature °C	Temperature °F	PTFE and Modified PTFE Seats			Trunnion	R-PTFE and Modified R-PTFE Seats			Trunnion
		Floating Ball Design				Floating Ball Design			
		DN ≤ 50	50 < DN ≤ 100	DN > 100	DN ≥ 50	DN ≤ 50	50 < DN ≤ 100	DN > 100	DN ≥ 50
−29 to 38	−20 to 100	69.0	51.0	19.7	51.0	75.9	51.0	19.7	51.0
66	150	56.9	42.1	16.2	42.1	63.8	43.1	16.6	43.1
93	200	45.5	33.4	13.1	33.4	52.4	35.5	13.8	35.5
122	250	34.5	24.5	9.7	24.5	39.7	27.6	10.7	27.6
149	300	22.4	15.9	6.2	15.9	29.0	19.0	7.6	19.0
177	350	11.7	6.9	2.8	6.9	17.2	8.6	3.5	8.6
205	400	—	—	—	—	5.5	3.4	1.4	3.4

^a For any given pressure class, the seat pressure-temperature rating shall not exceed the shell ratings in ASME B16.34.

Table 2—Minimum Seat Pressure-Temperature Rating—psig^a

Temperature °C	Temperature °F	PTFE and Modified PTFE Seats			Trunnion	R-PTFE and Modified R-PTFE Seats			Trunnion
		Floating Ball Design				Floating Ball Design			
		NPS ≤ 2	2 < NPS ≤ 4	NPS > 4		NPS ≥ 2	NPS ≤ 2	2 < NPS ≤ 4	
−29 to 38	−20 to 100	1000	740	285	740	1100	740	285	740
66	150	825	610	235	610	925	625	240	625
93	200	660	485	190	485	760	515	200	515
122	250	500	355	140	355	575	400	155	400
149	300	325	230	90	230	420	275	110	275
177	350	170	100	40	100	250	125	50	125
205	400	—	—	—	—	80	50	20	50

^a For any given pressure class, the seat pressure-temperature rating shall not exceed the shell ratings in ASME B16.34.

5 Design

5.1 General

Valves designed and manufactured in accordance with this standard shall meet the requirements of Standard Class valves per ASME B16.34 and additional requirements as specified in this standard.

5.2 Flow Passageway

The flow passageway is the circular opening in the ball and extends outward to both valve end connections, which can be flanged, threaded, socket-welding, or butt-welding types. The bore of this flow passageway is categorized in this standard as full bore, single reduced bore, and double reduced bore. Full bore, single reduced bore, and double reduced bore valves shall have a flow passageway such that a cylinder with the diameters shown in Table 3 can be passed through when the handle or gear operator is moved to the full open position stop.

Table 3—Cylinder Diameter for Categorizing Bore Size

DN	NPS	Full Bore		Single Reduced Bore		Double Reduced Bore	
		mm	in.	mm	in.	mm	in.
8	$\frac{1}{4}$	5	0.2	—	—	—	—
10	$\frac{3}{8}$	8	0.31	5	0.2	—	—
15	$\frac{1}{2}$	11	0.44	8	0.31	—	—
20	$\frac{3}{4}$	17	0.68	12	0.47	8	0.31
25	1	24	0.94	17	0.68	14	0.56
32	$1\frac{1}{4}$	30	1.19	22	0.87	18	0.71
40	$1\frac{1}{2}$	37	1.44	27	1.06	23	0.91
50	2	49	1.94	37	1.44	30	1.19
65	$2\frac{1}{2}$	62	2.44	49	1.94	37	1.44
80	3	75	2.94	56	2.19	49	1.94
100	4	100	3.94	75	2.94	62	2.44
150	6	151	5.94	100	3.94	75	2.94
200	8	202	7.94	151	5.94	100	3.94
250	10	251	9.88	202 ^a	7.94 ^a	151	5.94
300	12	302	11.88	251 ^b	9.88 ^b	202	7.94
350	14	334	13.14	302	11.88	251	9.88
400	16	385	15.15	334	13.14	302	11.88
450	18	436	17.16	385	15.15	334	13.14
500	20	487	19.17	436	17.16	385	15.15
600	24	586	23.07	487	19.17	436	17.16
^a For one-piece (unibody) design the minimum flow passage is 186 mm (7.32 in.).							
^b For one-piece (unibody) design the minimum flow passage is 227 mm (8.94 in.).							

5.3 Body

5.3.1 The wall thicknesses of the valve body (see note) shall be in accordance with the requirements of ASME B16.34 for the applicable Standard Class. ASME wall thicknesses are based on the Standard Class of valve and not the pressure-temperature ratings of 4.1

NOTE Body may comprise multiple components, such as body, body cap, etc.

5.3.2 Face-to-face dimensions of flanged valves shall conform to ASME B16.10 ball valves—long or short pattern.

5.3.3 End-to-end dimensions for threaded, socket-welding, and Class 800 butt-welded valves shall be per the manufacturer's standard.

5.3.4 The dimensions and facing finish of end flanges shall conform to ASME B16.5.

5.3.5 Butt-welding Ends

5.3.5.1 Butt-welding ends for valve sizes greater than NPS 2 shall conform to the requirements of ASME B 16.25 for the bore specified for use without backing rings.

5.3.5.1 阀门尺寸大于 NPS 2 的对焊端应符合 ASME B 16.25 中规定的无垫环使用的要求。

5.3.5.2 Unless otherwise specified by the purchase order, butt-welding ends for NPS 2 and smaller shall be in accordance with ASME B16.25 Figures 2(a) and 3(a) (Welding End Detail for Joint Without Backing Ring) and 5.

3.5.2 除非采购订单另有规定，否则 NP 2 及以下的对接焊接端应符合 ASME 816.25 图 2 (a) 和 3 (a) (无垫环接头的焊接端细节) 的要求，以及

Table 4. The inside and outside surfaces of valve welding ends shall be machine-finished overall. The contour within the envelope is at the option of the manufacturer unless specifically ordered otherwise. Intersections should be slightly rounded. For nominal outside diameters and wall thickness of standard steel pipe, see ASME B36.10 and B36.19.

End-to-end dimensions for butt-welding end valves with either integral or fabricated stub ends shall be in accordance with ASME B16.10 except that Class 800 shall be established by the manufacturer.

Table 4—Butt-welding End Diameters

DN (NPS) ^b	A ^a mm (in.)
15 (1/2)	21.3 (0.840)
20 (3/4)	26.7 (1.050)
25 (1)	33.4 (1.315)
32 (1 1/4)	42.2 (1.660)
40 (1 1/2)	48.3 (1.900)
50 (2)	60.3 (2.375)

^a The tolerance for diameter A (nominal outside diameter of the welding end) shall be ± 0.8 mm (± 0.031 in.) for DN < 40 (NPS < 1 1/2) and $+2.5/-0.8$ mm ($\pm 0.10/-0.031$ in.) for DN ≥ 40 (NPS $\geq 1 1/2$).

^b The tolerance for diameter B (nominal inside diameter of the pipe) shall be ± 0.8 mm (± 0.031 in.).

5.3.5.3 Conversion of a flanged end valve to a butt-welding valve is not permitted except by agreement between the purchaser and manufacturer.

5.3.6 Socket-welding-end preparation, including the internal ends of extended-body valves, shall conform to ASME B16.11. The bottom of the socket shall be square and flat, except in the case where a threaded end valve is converted to a socket-weld end valve. The minimum wall thickness of internal socket-welding ends shall be in accordance with ASME B16.34.

5.3.7 Threaded ends shall have taper pipe threads in accordance with ASME B1.20.1, and the minimum wall thicknesses shall conform to ASME B16.34.

5.3.8 End flanges and bonnet flanges shall be cast or forged integral with the body, except that cast or forged flanges attached by full penetration butt-welding may be used if agreed to by the purchaser. Valves having flanges attached by welding shall meet the requirements of ASME B16.34.

5.3.9 Upstream sealing trunnion-mounted ball valves shall have a test port into the body cavity between seats to allow seat testing as specified in API 598. Test port(s) shall have taper pipe threads in accordance with ASME B1.20.1 unless otherwise specified by the purchase order.

5.3.10 If drain, bypass, or other types of auxiliary connections are specified in the purchase order, they shall comply with the requirements of ASME B16.34.

5.3.11 Valves shall be provided with a means of protection against excessive pressure within the center body cavity between the seats.

5.3.12 When injection points for sealant lubrication or flushing are provided for seats and/or stem, they shall incorporate a check valve and a secondary means of isolation for each injection point. Sealant fittings shall have a design pressure not less than the valve rated pressure and the injection pressure.

5.3.13 The chemical composition of carbon steel welding ends shall meet the following requirements, unless otherwise agreed:

— the carbon content shall not exceed 0.23 % by mass;

— the carbon equivalent, CE, shall not exceed 0.43 as determined by the following formula:

$$CE = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$$

where

<i>C</i>	is weight % carbon
<i>Mn</i>	is weight % manganese
<i>Cr</i>	is weight % chromium
<i>Mo</i>	is weight % molybdenum
<i>V</i>	is weight % vanadium
<i>Ni</i>	is weight % nickel
<i>Cu</i>	is weight % copper

5.4 Antistatic Design (Electrical Continuity between Ball-Stem-Body)

Valves shall incorporate an antistatic feature that ensures electrical continuity between the stem and body of valves $\leq$ DN 50 ($\leq$ NPS 2) and between the ball, stem, and body of valves $>$ DN 50 ($>$ NPS 2). The antistatic feature shall have electrical continuity across the discharge path with a resistance not exceeding 10 ohms from a power source not exceeding 12 volt direct current (Vdc) when type-tested on a new, dry, as-built valve after open-close position cycling of the valve at least five times.

5.5 Ball-stem Design and Construction

5.5.1 The valve shall be designed to ensure that if a failure occurs at the stem-to-ball connection or of the stem itself within the pressure boundary, no portion of the stem is ejected by internal pressure.

5.5.2 The stem shall be of an anti-blowout design and stem seal retaining device shall not be the sole means used for stem retention. The design shall ensure the stem cannot be ejected from the valve by disassembly of gland bolting or actuator mounting hardware.

5.5.3 The torsional strength of both the stem-to-ball connection and the portion of the stem within the pressure boundary (below top of packing) shall exceed the torsional strength of the stem portion above the pressure boundary (above the top of the packing) by at least 10 % at the maximum valve rated temperature.

5.5.4 The stem and the ball-to-stem connection shall be designed such that no permanent deformation occurs, and no failure of any part occurs when a force applied to the lever or gear operator handwheel produces a torque equal to the greater of:

— 20 N m (15 ft-lb) or

— twice the manufacturer's maximum published torque.

The manufacturer's maximum published torque shall be based upon clean, dry air service at the maximum differential pressure rating of the valve.

5.6 Ball Construction

The ball shall have a cylindrical bore and shall be of solid one-piece construction. Other constructions such as "hollow"-type, cored cavity, or sealed cavity may be furnished only if agreed by the purchaser.

5.7 Packing Glands and Gland Bolting

5.7.1 Adjustable packing glands shall be accessible for resealing stem packing without the disassembly of valve parts or operator parts.

5.7.2 Packing glands that are threaded into bodies or covers or onto stems shall not be used for valve sizes greater than DN 80 (NPS 3) unless otherwise specified by purchase order. (See Figure C.1 and Figure C.2 for parts identification.)

5.7.3 Vertically split glands shall not be used.

5.7.4 When used, gland bolts shall pass through holes in the packing gland. The use of open slots is not permitted on any portion of the packing gland.

5.7.5 As a minimum, packing gland bolts shall be designed so that the bolt stress shall not exceed one-third of the ultimate tensile strength of the bolting material when compressing packing material to a compressive stress of 38 MPa (5500 psi) at 38 °C (100 °F).

5.8 Operation

5.8.1 Unless otherwise specified on the purchase order, manually operated valves shall be equipped with lever-type handles.

5.8.2 Gear operators shall be fitted with handwheels and shall be sized to comply with the requirements of 5.8.3.

5.8.3 Unless otherwise specified in the purchase order, the length of the lever handle or the gear ratio, efficiency, and handwheel diameter of gear operators shall be designed so that the required input force to fully open and close the valve shall not exceed 360 N (80 lb) when operating the valve at the manufacturer's maximum published torque as described in 5.5.4.

5.8.4 Valves shall be closed by rotating the closure device (lever or handwheel) in a clockwise direction.

5.8.5 Position stops shall be provided for both fully open and fully closed positions of the valve.

5.8.6 Handwheels on manual gear operators shall be marked to indicate the direction of opening and/or closing.

5.8.7 Lever-type handles shall be parallel to the ball bore so that the lever always indicates the ball bore position. If the purchase order specifies round or oval direct-mounted handwheels, a permanent means of indicating the ball bore position shall be included in the handwheel design.

5.8.8 An indication parallel with the position of ball bore of the valve shall be integral with the valve stem. This indication may be by permanent marking to the top of the stem, keyways, or by the shape of the exposed stem portion.

5.8.9 Levers, handwheels, and other operating mechanisms shall be fitted so that they may be removed and replaced without affecting the integrity of the stem seal(s), body seal(s), or stem retention means.

5.8.10 Lever or manual gear operators shall be designed so that the lever or gear operator cannot be assembled to the valve other than in the correct configuration to indicate open and closed positions.

5.8.11 When specified in the purchase order, valves shall be furnished with a lockable device that accepts a purchaser-supplied padlock that allows the valve to be locked in both the fully open and fully closed positions. The lockable device shall be designed such that a lock with an 8-mm (⁵/₁₆-in.) diameter shank not more than 102 mm (4.0 in.) long can be inserted directly through hole(s) in lockable device and locked. Provision for lockable device is permitted, even when not specified on purchase order.

5.8.12 Position stops integral with packing gland, gland flange, or gland bolting shall not be used.

5.8.13 Direct mounted gear operators, actuators, and extension mounted actuators shall be designed or provided with a means of preventing pressure buildup in the mechanism resulting from stem packing, stem seals, or bonnet seal leakage. Such designs shall also provide self-draining capability to prevent liquid buildup onto gland seals and gland bolting.

5.8.14 Pressed steel handwheels on gear operators are not allowed.

5.8.15 Gear operators, actuators, and extension mounted actuators shall be bolted to the valve and removable without requiring the loosening or removal of the cover bolting, packing gland bolting, or other valve assembly bolting that would expose the valve to leakage while under pressure.

5.9 End Flange Face Interruptions

5.9.1 Ring-shaped radial gaps in the faces of end flanges of flanged ball valves, located in the sealing surface of a centered ASME B16.20 spiral-wound gasket, shall not exceed 0.75 mm (0.030 in.); see dimension “b” in Figure 1. An example of this condition is the radial gap that exists between the outer diameter of a body insert and the inner bore of the body end flange of a valve as shown in Figure C.1.

5.9.2 For ball valves designed with a body insert as shown in Figure C.1, with a gasket seating face outer diameter located within the sealing area of a centered ASME B16.20 spiral-wound gasket, the body insert flange face shall not protrude beyond the valve body end flange face. The body insert flange face shall not be recessed below the body end flange face by more than 0.25 mm (0.010 in.). See dimension “a” in Figure 1.

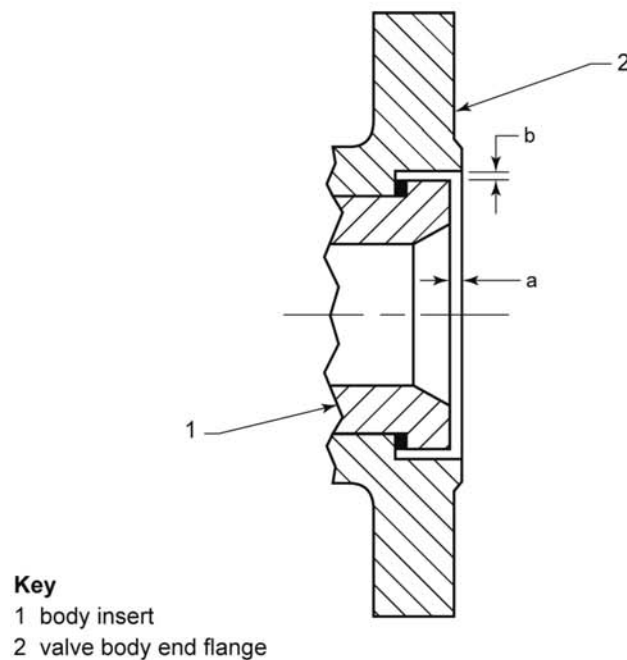


Figure 1—Flange Face Interruption Limits

5.10 Valve Shell Joints

5.10.1 Nut and bolt head bearing surfaces of shell parts assembled by bolting shall be perpendicular to the centerline of tapped or clearance holes for the fasteners within $\pm 1.0^\circ$.

5.10.2 Bolting used for assembly of shell joints shall be studs with nuts, hex head bolts or cap screws. Nuts shall conform to ASME B18.2.2. Bolts and studs shall be threaded in conformance to ASME B1.1 unless the purchase

order specifies metric series bolting. Bolting 25 mm (1.0 in.) or smaller shall have coarse (UNC) threads; bolting larger than 25 mm (1.0 in.) shall be eight thread series (8 UN). Bolt and stud threads shall be Class 2A, and nut threads shall be Class 2B per ASME B1.1.

5.10.3 Each bolted or threaded shell joint calculation shall be in accordance with the requirements of ASME B16.34.

6 Materials

6.1 Shell

The shell shall be of materials specified in ASME B16.34. See Figure C.1 and Figure C.2.

6.2 Trim

The trim shall be of the same nominal chemical composition as the shell and have mechanical and corrosion-resistance properties equivalent to or better than those of the shell. The purchase order may specify trim materials with greater corrosion resistance or higher strength than the shell. See Figure C.1 and Figure C.2.

6.3 Bolting

Body, cover, body joint, and packing gland bolting shall be intermediate strength as specified in ASME B16.5 as a minimum, unless an alternate bolting material is specified by the purchaser. Purchaser may specify higher grades of bolting materials.

6.4 Stem Seals, Body Seals, and Gaskets

Materials for stem seals, body seals, and gaskets shall be suitable for use at the maximum operating temperature and corresponding maximum pressure rating of the valve as stated by the valve manufacturer. Metallic parts of any gasket shall have corrosion resisting properties equal to or superior to shell material.

6.5 Identification Plate(s)

The material of identification plate(s) shall be austenitic stainless steel or nickel alloy. The identification plate(s) shall be attached to the valve body by welding or by pins made from same materials allowed for identification plate.

6.6 Threaded Plugs and Auxiliary Components

Threaded plugs and auxiliary components shall have the same nominal composition as the shell or trim material unless otherwise specified in the purchase order.

6.7 NACE Requirements

When specified in the purchase order, the shell, trim, and bolting materials shall comply with NACE MR 0103.

7 Inspection, Examination, and Testing

7.1 Inspection and Examination

7.1.1 The valve manufacturer shall examine each valve to ensure compliance to this standard.

7.1.2 If inspection is specified in the purchase order, inspection shall be in accordance with API 598. Examination by the manufacturer shall be as specified in API 598.

7.2 Assembly

7.2.1 Light oil or antiseize compound may be applied to facilitate assembly of mating metal components.

7.2.2 Light oil, having a viscosity no greater than kerosene, may be used to assemble O-rings or other seals required to move during valve assembly.

7.2.3 No sealant or grease shall be applied to the ball-seat interface prior to testing.

7.3 Pressure Testing

Each valve shall be pressure tested in accordance with API 598.

7.4 Fire Testing

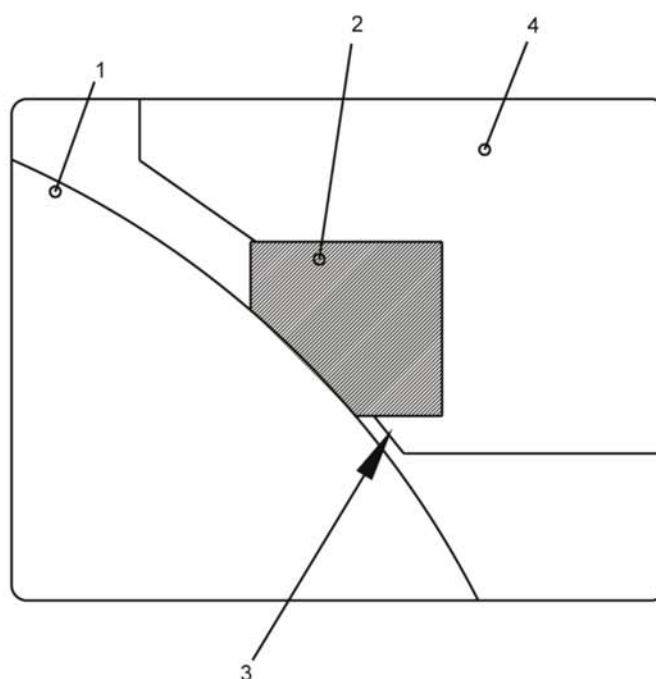
When a fire-tested ball valve is specified in the purchase order, the valve design supplied shall have successfully passed API 607. See Figure 2 for two examples of a fire-resistant seat arrangement using a resilient primary non-fire-resistant seal and a secondary metal back-up seat.

7.5 Fugitive Emission Testing

The valve design shall be qualified by type testing to meet the fugitive emissions requirements of API 641.

Key

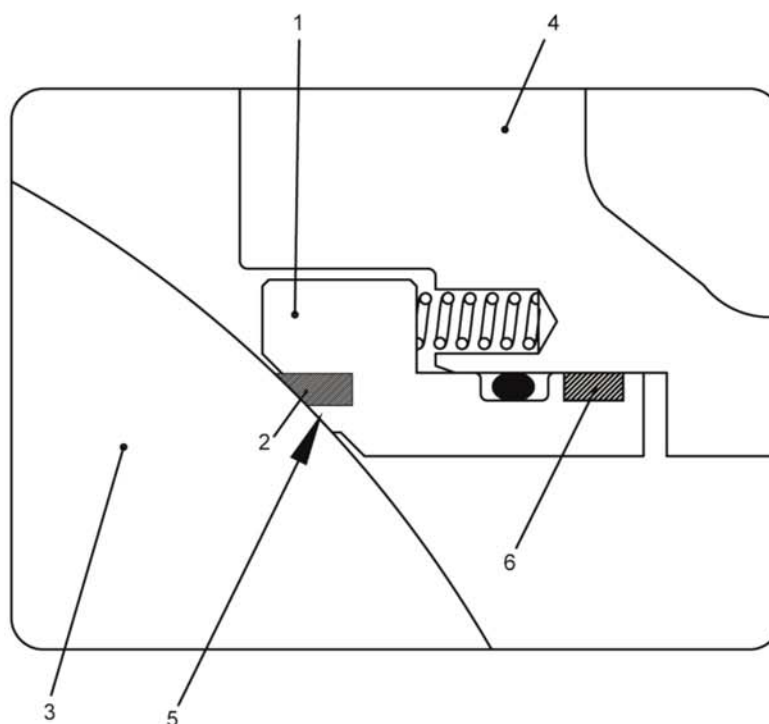
- 1 ball
- 2 seat
- 3 secondary metal sealing
- 4 adapter or body



a) Fire-resistant Seat Arrangement—Floating Ball Valve

Key

- 1 seat holder
- 2 seat
- 3 ball
- 4 adapter or body
- 5 secondary metal seat for fire safety
- 6 graphite back-up ring



b) Fire-resistant Seat Arrangement—Trunnion Ball Valve

Figure 2—Typical Fire-resistant Seats

8 Marking

8.1 The identification plate shall be marked in accordance with ASME B16.34 and shall also be marked API 608 E6 and API 641.

8.2 Body end flanges require marking when end flanges are ring type joint design. The ring joint groove number (such as R24) shall be marked on each end flange outside diameter using low-stress marking. Ring joint groove numbers are as shown in ASME B16.5.

8.3 As a minimum, valve bodies shall be marked with the following information:

- manufacturer's name or trademark;
- body material identification;
- pressure class designation number (e.g. Class 1500);
- nominal size, as either, NPS number (e.g. NPS 2) or the DN followed by the appropriate size number (e.g. DN 50);

8.4 Markings on the body shall consist of letters or symbols cast, stamped, or otherwise integral with the valve, or marked on an identification plate (see 6.5), or both. When stamping is used on valve body, low-stress stamping process shall be used.

8.5 Unidirectional valves shall be marked with the designation "HP" on the high-pressure side of the valve, either by cast or stamped characters or on a permanently attached nameplate (see 6.5). In addition, unidirectional valves shall have a warning label or tag that states, "Unidirectional Valve".

8.6 Bidirectional valves with a "preferred sealing direction" shall be marked with the designation "HP" on the preferred high-pressure side of the valve, either by cast or stamped characters or on a permanently attached nameplate (see 6.5).

Bidirectional valves that do not have a "preferred sealing direction" need no additional marking.

9 Packaging and Shipping Requirements

9.1 Prior to packaging or shipping, each valve shall be drained of test fluid, including draining of the body cavity area between seats and around ball and cavities if "cored balls" are used.

9.2 Valves manufactured with shell materials shown in ASME B16.34 Group 1 shall have lead-free rust preventative coatings on all unmachined exterior body surfaces.

9.3 Machined or threaded surfaces that are not protected from atmospheric corrosion shall be coated with an easily removable, lead-free rust inhibitor.

9.4 Protective end plugs of wood, wood fiber, plastic, or metal shall be securely inserted into the valve end connections of socket-welding and threaded valves or a protective cover over the threaded ends in the case of external threaded ends. The protective end plugs or cover shall be of a design such that the valve cannot be installed with the protective plug or cover in place.

9.5 Protective covers of wood, wood fiber, plastic, or metal shall be securely attached to the valve ends of flanged and butt-welding end valves to protect the gasket surfaces and weld end preparations. The protective end covers shall be of a design such that the valve cannot be installed with the protective cover in place.

9.6 At the time of shipment, the ball shall be in the full open position, unless design precludes this position, such as in the case of a spring-return-to-closed-position actuated ball valve.

9.7 Threaded auxiliary connections shall be fitted with fully tightened solid threaded plugs (see 5.3.9 and 6.6). The thread sealant used to seal the plugs shall be suitable for the full pressure and temperature rating of the valve or as specified in the purchase order.

9.8 Valves shall be packaged to prevent damage during shipment.

9.9 When export packaging is specified in purchase order, valves shall be shipped in wooden boxes or crates and packed to prevent individual valves from moving within the crate or box.

10 Spare Parts

When specified on the purchase order, manufacturer shall submit a complete list of recommended spare parts. This list shall include cross-sectional assembly drawings for identification of recommended spare parts and part numbers.

Annex A

(informative)

API Monogram Program Use of the API Monogram by Licensees

A.1 Scope

The API Monogram® is a registered certification mark owned by the American Petroleum Institute (API) and authorized for licensing by the API Board of Directors. Through the API Monogram Program, API licenses product manufacturers to apply the API Monogram to new products which comply with product specifications and have been manufactured under a quality management system that meets the requirements of API Spec Q1. API maintains a complete, searchable list of all Monogram licensees on the API Composite List website (<http://compositelist.api.org>).

The application of the API Monogram and license number on products constitutes a representation and warranty by the licensee to API and to purchasers of the products that, as of the date indicated, the products were manufactured under a quality management system conforming to the requirements of API Spec Q1 and that the product conforms in every detail with the applicable standard(s) or product specification(s). API Monogram Program licenses are issued only after on-site audits have verified that an organization has implemented and continually maintained a quality management system that meets the requirements of API Spec Q1 and that the resulting products satisfy the requirements of the applicable API product specification(s) and/or standard(s). Although any manufacturer may claim that its products meet API product requirements without monogramming them, only manufacturers with a license from API can apply the API Monogram to their products.

Together with the requirements of the API Monogram license agreement, this annex establishes the requirements for those organizations who wish to voluntarily obtain an API license to provide API monogrammed products that satisfy the requirements of the applicable API product specification(s) and/or standard(s) and API Monogram Program requirements.

For information on becoming an API Monogram Licensee, please contact API, Certification Programs, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001, at Certification@api.org.

A.2 Normative References

For Licensees under the Monogram Program, the latest version of this document shall be used. The requirements identified therein are mandatory.

A.3 Terms and Definitions

For purposes of this annex, the following terms and definitions apply.

A.3.1

API monogramable product

Product that has been newly manufactured by an API Licensee using a fully implemented API Spec Q1 compliant quality management system and that meets all the API-specified requirements of the applicable API product specification(s) and/or standard(s).

A.3.2

API product specification

Prescribed set of rules, conditions, or requirements attributed to a specified product that address the definition of terms; classification of components; delineation of procedures; specified dimensions; manufacturing criteria;

material requirements, performance testing, design of activities; and the measurement of quality and quantity with respect to materials; products, processes, services, and/or practices.

A.3.3

API-specified requirements

Requirements, including performance and Licensee-specified requirements, set forth in API Spec Q1 and the applicable API product specification(s) and/or standard(s).

NOTE Licensee-specified requirements include those activities necessary to satisfy API-specified requirements.

A.3.4

design package

Records and documents required to provide evidence that the applicable product has been designed in accordance with API Spec Q1 and the requirements of the applicable product specification(s) and/or standard(s).

A.3.5

licensee

Organization that has successfully completed the application and audit process, and has been issued a license by API to use the API Monogram Mark.

A.4 Quality Management System Requirements

An organization applying the API Monogram to products shall develop, maintain, and operate at all times a quality management system conforming to API Specification Q1.

A.5 Control of the Application and Removal of the API Monogram

Each licensee shall control the application and removal of the API Monogram in accordance with the following:

- a) Products that do not conform to API-specified requirements shall not bear the API Monogram.
- b) Each licensee shall develop and maintain an API Monogram marking procedure that documents the marking/monogramming requirements specified by this annex and any applicable API product specification(s) and/or standard(s). The marking procedure shall:
 - 1) define the authority responsible for application and removal of the API Monogram and license number;
 - 2) define the method(s) used to apply the Monogram and license number;
 - 3) identify the location on the product where the API Monogram and license number are to be applied;
 - 4) require the application of the date of manufacture of the product in conjunction with the use of the API Monogram and license number;
 - 5) require that the date of manufacture, at a minimum, be two digits representing the month and two digits representing the year (e.g. 05–12 for May 2012) unless otherwise stipulated in the applicable API product specification(s) or standard(s); and
 - 6) define the application of all other required API product specification(s) and/or standard(s) marking requirements.
- c) Only an API licensee shall apply the API Monogram and its designated license number to API monogramable products.

- d) The API Monogram and license number, when issued, are site-specific and subsequently the API Monogram shall only be applied at that site specific licensed facility location.
- e) The API Monogram may be applied at any time appropriate during the production process but shall be removed in accordance with the licensee's API Monogram marking procedure if the product is subsequently found to be out of conformance with any of the requirements of the applicable API product specification(s) and/or standard(s) and API Monogram Program.

For certain manufacturing processes or types of products, alternative API Monogram marking procedures may be acceptable. Requirements for alternative API Monogram marking are detailed in the API Alternative Marking Agreement (AMA), which is available on the API Monogram Program website at: https://www.api.org/~media/Files/Certification/Monogram-APIQR/0_API-Monogram-APIQR/Resources/API-Monogram-Alt-Marking-Agreement_Rev-8_FM-011_Modified-20180601.pdf.

A.6 Design Package Requirements

Each licensee and/or applicant for licensing shall maintain a current design package for all of the applicable products that fall under the scope of each Monogram license. The design package information shall provide objective evidence that the product design meets the requirements of the applicable and most current API product specification(s) and/or standard(s). The design package(s) shall be made available during API audits of the facility.

In specific instances, the exclusion of design activities is allowed under the Monogram Program, as detailed in Advisory # 6, available on the API Monogram Program website at <https://www.api.org/products-and-services/api-monogram-and-apiqr/advisories-updates>.

A.7 Manufacturing Capability

The API Monogram Program is designed to identify facilities that have demonstrated the ability to manufacture equipment that conforms to API specifications and/or standards. API may refuse initial licensing or suspend current licensing based on a facility's level of manufacturing capability. If API determines that additional review is warranted, API may perform additional audits (at the organization's expense) of any primary subcontractors to ensure their compliance with applicable specifications.

Facilities with capabilities that are limited to the processes or activities defined below do not meet the manufacturing capability requirements to produce new products, and therefore, shall not be licensed or be the basis for licensing under the API Monogram Program:

- capabilities that are limited to performing final inspection and testing of the product, except for testing agencies as specified in API Spec 14A and/or API Spec 6AV;
- buying, selling and/or distributing finished products and materials;
- design and development activities;
- tearing-down and/or re-assembling of products/components; and,
- repairing or remanufacturing of existing, used, worn or damaged products.

In all instances where requirements for manufacturing or manufacturing facilities are explicitly identified within the API product specification, those requirements shall take precedence over this advisory.

API solicits information on products that are found to be nonconforming with API-specified requirements, as well as field failures (or malfunctions), which are judged to be caused by either specification and/or standard deficiencies or nonconformities against API-specified requirements. Customers are requested to report to API all problems with API monogrammed products. A nonconformance may be reported using the API Nonconformance Reporting System available at <http://ncr.api.org/ncr.aspx>.

Annex B (normative)

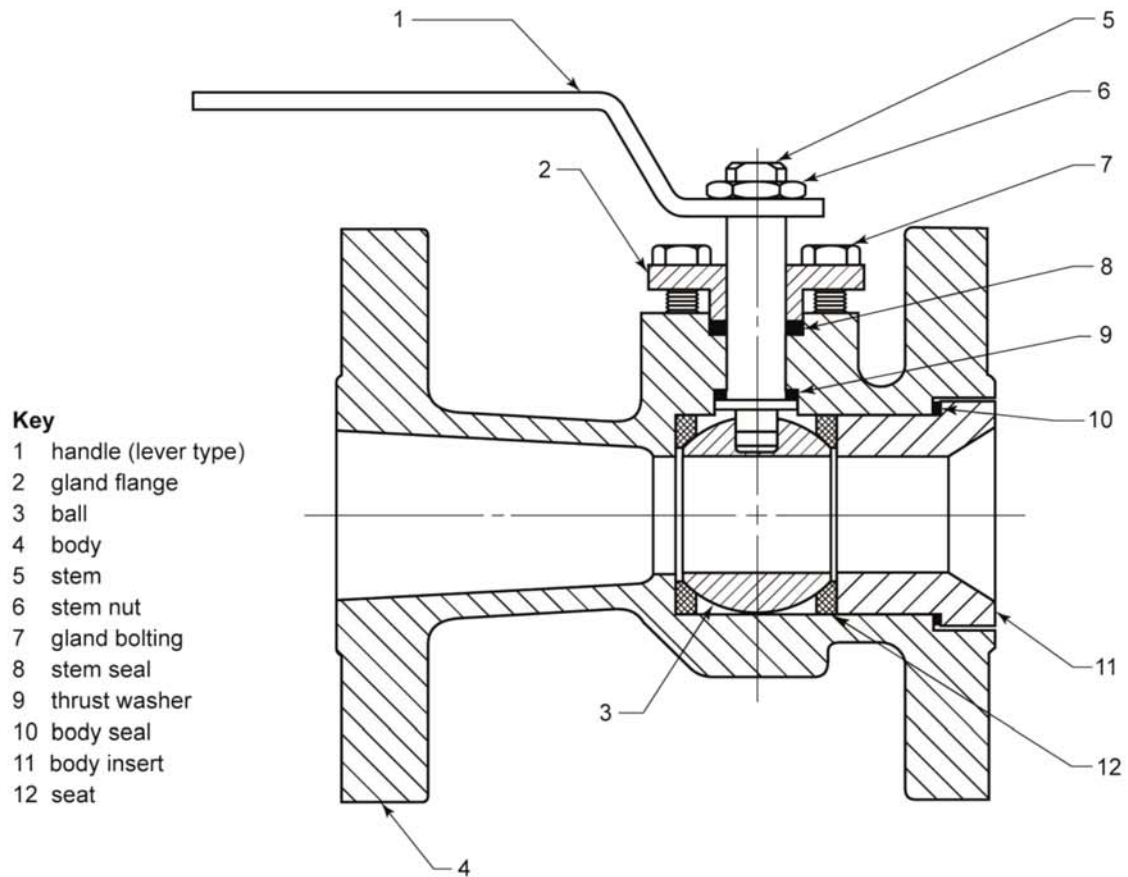
Information to Be Specified by the Purchaser

NOTE Numbers in brackets are references to sections or subsections of this standard.

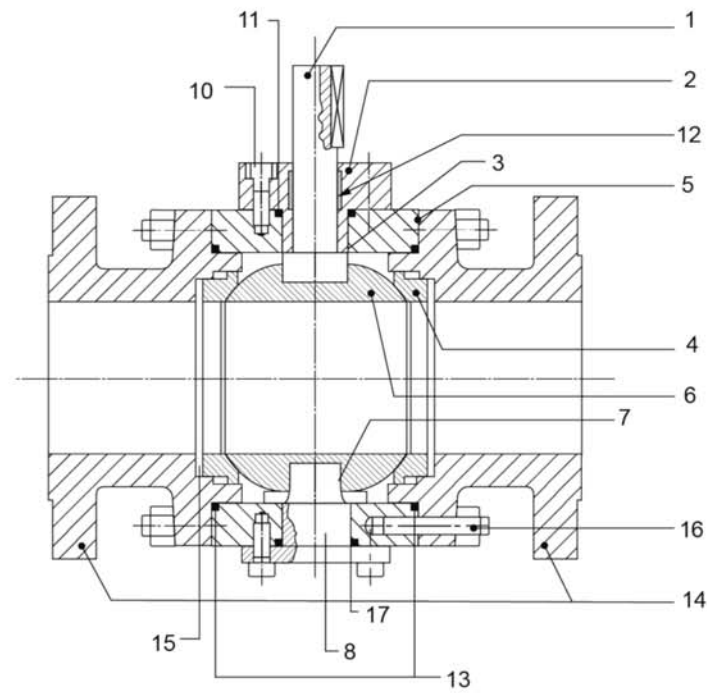
- 1) Supplemental requirements of this standard shall be specifically stated in the purchase order.
- 2) If no supplemental requirements are to be taken, the purchase order just needs to refer to API 608 and to specify the items listed below:
 - a) Nominal valve size [1.1]: _____
 - b) Nominal pressure class [1.2]: _____
 - c) End connection type [1.2]: _____
 - d) Bore size category [1.3]: _____
 - e) Shell material [6.1]: _____
 - f) Trim material [6.2]: _____
 - g) Seat and seal materials [4.3 and 6.4]: _____
 - h) Operator type [5.8.1]: _____
 - i) ASME B16.10 long or short pattern [DN 150 (NPS 6)] and larger Class 150 and 300: _____
- 3) OPTIONAL ITEMS THAT CAN BE SPECIFIED BY PURCHASER
 - a) Lockable device [5.8.11]: _____
 - b) Inspection by purchaser [7.1.2]: _____
 - c) Supplementary examinations [7.1.2]: _____
 - d) Compliance with NACE MR 0103 [6.7]: _____
 - e) Bolting material [6.3]: _____
 - f) Shell joint bolting [5.10.2]: _____
 - g) Special paint or coating: _____
 - h) Export packaging [9.9]: _____
 - i) Auxiliary connections [5.3.10]: _____
 - j) Recommended spare parts [10]: _____
 - k) Prevention of body cavity overpressure [5.3.11]: _____
 - l) API 607 fire-tested design [7.4]: _____
 - m) Butt-welded flanges [5.3.8]: _____
 - n) Butt weld end details [5.3.5]: _____
 - o) Sealant injection fittings [5.3.12]: _____
 - p) Ball construction [5.6]: _____
 - q) Threaded packing glands [5.7.2]: _____
 - r) Required input force [5.8.3]: _____
 - s) Threaded plug material [6.6]: _____
 - t) Thread sealant [9.7]: _____
 - u) Thread style [5.3.9]: _____

Annex C (informative)

Typical Floating and Trunnion Ball Valve Component Nomenclature



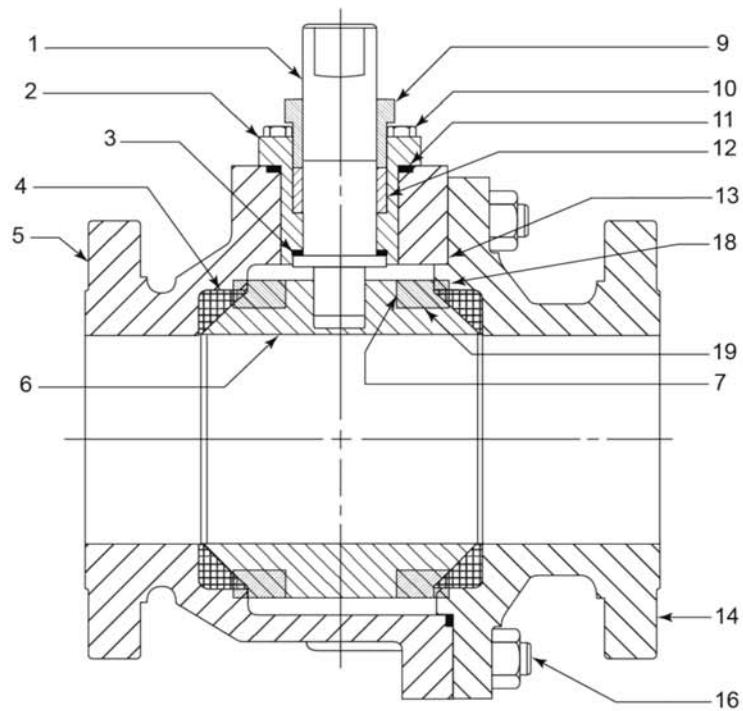
**Figure C.1—Typical Floating Ball Valve Components (One-piece Body/Unibody Illustrated)—
Nomenclature**



a) Example 1

Key

- 1 stem
- 2 cover
- 3 thrust washer
- 4 seat
- 5 body
- 6 ball
- 7 trunnion bearing
- 8 trunnion
- 9 gland
- 10 cover bolting
- 11 cover seal
- 12 stem seal
- 13 body seal
- 14 body cap
- 15 seat spring
- 16 body bolting
- 17 trunnion seal
- 18 trunnion plate
- 19 bearing spacer



b) Example 2

Figure C.2—Typical Trunnion-mounted Ball Valve Components (Split-body Valve Illustrated)—Nomenclature

Bibliography

- [1] ASME B31.3, *Process Piping*
- [2] ASME B31T, *Standard Toughness Requirements for Piping*
- [3] ASTM A193, *Standard Specification for Alloy-steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications*
- [4] ASTM A194, *Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both*
- [5] MSS SP-141, *Multi-turn and Check Valve Modifications*
- [6] MSS SP-134, *Valves for Cryogenic Service, Including Requirements for Body/Bonnet Extensions*
- [7] ISO 14723, *Petroleum and Natural Gas Industries—Pipeline Transportation Systems—Subsea Pipeline Valves*
- [8] ISO 28921-1, *Industrial Valves—Isolating Valves for Low-temperature Applications—Part 1: Design, manufacturing and Production Testing*



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