Pipeline Valves

API Specification 6D, Twenty-second Edition
January 2002

ISO 14313: 1999, MOD, Petroleum and Natural Gas Industries—Pipeline Transportation Systems—Pipeline Valves

EFFECTIVE DATE: JULY 1, 2002

PROPOSED NATIONAL ADOPTION

INCLUDES ANNEX F, NOVEMBER 1, 2002

American
Petroleum
Institute

**Helping You
Get The Job
Done Right.**SM

Petroleum and natural gas industries—
Pipeline transportation systems—Pipeline valves

1 Scope

This International Standard specifies requirements and gives recommendations for the design, manufacturing, testing and documentation of ball, check, gate and plug valves for application in pipeline systems meeting the requirements of ISO 13623 for the petroleum and natural gas industries.

Valves for pressure ratings exceeding PN 420 (Class 2500) are not covered by this International Standard.

Annex A of this International Standard provides guidelines to assist the purchaser with valve type selection and specification of specific requirements when ordering valves.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

NOTE Non-International Standards may be replaced, by agreement, with other recognized and equivalent national or industry standards.

ISO 7-1, *Pipe threads where pressure-tight joints are made on the threads—Part 1: Dimensions, tolerances and designation*.

ISO 148, *Steel — Charpy impact test (V-notch).*

ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads—Part 1: Dimensions, tolerances and designation.*

ISO 228-2, *Pipe threads where pressure-tight joints are not made on the threads—Part 2: Verification by means of limit gauges*.

ISO 5208, *Industrial valves—Pressure testing of valves.*

ISO 7005-1, *Metallic flanges—Part 1: Steel flanges*.

ISO 10474, *Steel and steel products—Inspection documents.*

ISO 10497, *Testing of valves—Fire type-testing requirements.*

ISO 13623, *Petroleum and natural gas industries—Pipeline transportation systems.*

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 ½ through NPS 24.*

ASME B16.10, *Face-to-face and end-to-end dimensions of valves.*

ASME B16.25:1997, *Buttwelding ends.*

ASME B16.34:1996, *Valves—Flanged, threaded, and welding end.*

ASME B16.47, *Larger diameter steel flanges—NPS 26 through NPS 60.*

ASME B31.4:1992, *Liquid transportation systems for hydrocarbons, liquid petroleum gas, anhydrous ammonia, and alcohols.*

ASME B31.8:1995, *Gas transmission and distribution piping systems.*

ASME Boiler and Pressure Vessel Code:1998, Section V, *Non destructive examination.*

ASME Boiler and Pressure Vessel Code:1998, Section VIII, Division 1, *Rules for construction of pressure vessels.*

ASME Boiler and Pressure Vessel Code:1998, Section VIII, Division 2, *Alternative rules for construction of pressure vessels.*

ASME Boiler and Pressure Vessel Code, Section IX, *Qualification standard for welding and brazing procedures, welders, brazers, and welding and brazing operators.*

(American Society of Mechanical Engineers, 345 East 47th Street, New York 10017-2392, USA)

ASNT SNT-TC-1A, *Recommended Practice No. SNT-TC-1A.*

(American Society of Non-Destructive Testing, P.O. Box 28518, 1711 Arlingate Lane, Columbus, Ohio 43228-0518, USA)

ASTM A 193/A 193M, *Standard specification for alloy-steel and stainless steel bolting materials for high-temperature service.*

ASTM A 320/A 320M, *Standard specification for alloy steel bolting materials for low-temperature service.*

ASTM A 370, *Standard test methods and definitions for mechanical testing of steel products.*

ASTM A 388/A 388M, *Standard practice for ultrasonic examination of heavy steel forgings.*

ASTM A 435/A 435M, *Standard specification for straight-beam ultrasonic examination of steel plates.*

ASTM A 577/A 577M, *Standard specification for ultrasonic angle-beam examination of steel plates.*

ASTM A 609/A 609M:1997, *Standard practice for castings, carbon, low-alloy, and martensitic stainless steel, ultrasonic examination thereof.*

(American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428-2959, USA)

AWS QC1, *Standard for AWS certification of welding inspectors.*

(The American Welding Society, 550 NW LeJeune Road, Miami, Florida 33126, USA)

EN 287-1, *Approval testing of welders—Fusion welding—Part 1: Steels.*

EN 288-3, *Specification and approval of welding procedures for metallic materials—Part 3: Welding procedure tests for the arc welding of steels.*

EN 473:1993, *Qualification and certification of NDT personnel—General principles*.

(CEN, European Committee for Standardization, Central Secretariat, Rue de Stassart 36, B-1050, Brussels, Belgium)

MSS SP-44, *Steel pipeline flanges*.

(Manufacturers Standardization Society of the Valve & Fittings Industry Inc., 127 Park Street N.E., Vienna, Virginia 22180, USA)

NACE MR 0175, *Sulfide stress cracking resistant metallic materials for oilfield equipment.*

NACE TM 0177, *Laboratory testing of metals for resistance to specific forms of environmental cracking in H_2S environments.*

NACE TM 0284, *Evaluation of pipeline and pressure vessel steels for resistance to hydrogen-induced cracking.*

(National Association of Corrosion Engineers, P.O. Box 218340, Houston, Texas 77218, USA)

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply:

3.1
ANSI rating class
numerical pressure design class defined in ASME B16.5 and used for reference purposes

NOTE The ANSI rating class is designated by the word "Class" followed by a number.

3.2
bi-directional valve
valve designed for blocking the fluid in both downstream and upstream directions

3.3
bleed
drain or vent

3.4
block valve
gate, plug or ball valve that blocks flow into the downstream conduit when in the closed position

NOTE Valves are either single- or double-seated, bi-directional or uni-directional.

3.5
breakaway thrust
breakaway torque
thrust or torque required for opening a valve with maximum pressure differential

3.6
by agreement
agreed between manufacturer and purchaser

3.7
double-block-and-bleed (DBB) valve
valve with two seating surfaces which, in the closed position, blocks flow from both valve ends when the cavity between the seating surfaces is vented through a bleed connection provided on the body cavity

3.8
drive train
all parts of a valve drive between the operator and the obturator, including the obturator but excluding the operator

3.9
flow coefficient
K_V
volumetric flow rate, in cubic metres per hour, of water at a temperature between 5°C (40°F) and 40°C (104°F) passing through a valve and resulting in a pressure loss of 1 bar (14,7 psi)

NOTE K_V relates to the flow coefficient C_V in US gallons per minute at 15,6°C (60°F) resulting in a 1 psi pressure drop as follows:

$$K_V = \frac{C_V}{1{,}156}$$

3.10
full-opening valve
valve with an unobstructed opening capable of allowing a sphere or other internal device for the same nominal size as the valve to pass

3.11
handwheel
wheel consisting of a rim connected to a hub, for example, by spokes, and used to operate manually a valve requiring multiple turns

3.12
locking device
part or an arrangement of parts for securing a valve in the open and/or closed position

3.13
manual actuator
manual operator
wrench (lever) or handwheel with or without a gearbox

3.14
maximum pressure differential (MPD)
maximum difference between the upstream and downstream pressure across the obturator at which the obturator may be operated

3.15
nominal pipe size (NPS)
numerical inches designation of size which is common to components in piping systems of any one size

NOTE The nominal pipe size is designated by the letters NPS followed by a number.

3.16
nominal pressure (PN) class
numerical pressure design class as defined in ISO 7005-1 and used for reference purposes

NOTE The nominal pressure (PN) class is designated by the abbreviation PN followed by a number.

3.17
nominal size (DN)
numerical metric designation of size which is common to components in piping systems of any one size

NOTE Nominal size is designated by the letters DN followed by a number.

3.18
obturator
closure member
part of a valve, such as a ball, clapper, disc, gate or plug, which is positioned in the flow stream to permit or block flow

3.19
operator
device (or assembly) for opening or closing a valve

3.20
position indicator
device to show the position of the valve obturator

3.21
powered actuator
powered operator
electric, hydraulic or pneumatic device bolted or otherwise attached to the valve for powered opening and closing of the valve

3.22
pressure class
numerical pressure design class expressed in accordance with either the nominal pressure (PN) class or the ANSI rating class

NOTE In this International Standard, the pressure class is stated by the PN class followed by the ANSI rating class between brackets.

3.23
pressure-containing parts
parts, such as bodies, bonnets, glands, stems, gaskets and bolting, designed to contain the pipeline fluid

3.24
pressure-controlling parts
parts, such as seat and obturator, intended to block or permit the flow of fluids

3.25
process-wetted parts
parts exposed directly to the pipeline fluid

3.26
reduced-opening valve
valve with the opening through the obturator smaller than at the end connection(s)

3.27
seating surfaces
contact surfaces of the obturator and seat which ensure valve sealing

3.28
stem
part that connects the obturator to the operator and which may consist of one or more components

3.29
stem extension assembly
assembly consisting of the stem extension and the stem extension housing

3.30
support ribs or legs
metal structure which provides a stable footing when the valve is set on a fixed base

3.31
through-conduit valve
valve with an unobstructed and continuous cylindrical opening

3.32
twin-seat, both seats bi-directional, valve
valve with two seats, each sealing in both directions

3.33
twin-seat, one seat uni-directional and one seat bi-directional, valve
valve with two seats, one sealing in one direction and the other in either direction

3.34
uni-directional valve
valve designed for blocking the flow in one direction only

3.35
venturi plug valve
valve with a substantially reduced opening through the plug and a smooth transition from each full-opening end to the reduced opening

4 Symbols and abbreviations

4.1 Symbols

C_v Flow coefficient in imperial units

K_v Flow coefficient in metric units

4.2 Abbreviations

BM	Base metal
CE	Carbon equivalent
DBB	Double-block-and-bleed
DN	Nominal size
HAZ	Heat-affected zone
HR	Rockwell hardness
HV	Vickers hardness
MPD	Maximum pressure differential
MT	Magnetic-particle testing
NDE	Non-destructive examination
NPS	Nominal pipe size
PN	Nominal pressure
PQR	Procedure qualification record
PT	Penetrant testing
PWHT	Post-weld heat treatment
SMYS	Specified minimum yield strength
WM	Weld metal
WPS	Weld procedure specification
WQR	Welder qualification record

5 Valve types and configurations

5.1 Valve types

5.1.1 Gate valves

Typical configurations for gate valves with flanged and welding ends are shown, for illustration purposes only, in Figures 1 and 2.

Gate valves shall have an obturator which moves in a plane perpendicular to the direction of flow. The gate can be constructed of one piece for slab-gate valves or of two or more pieces for expanding-gate valves.

Gate valves shall be provided with a back seat or secondary stem sealing feature in addition to the primary stem seal.

5.1.2 Lubricated and non-lubricated plug valves

Typical configurations for plug valves with flanged and welding ends are shown, for illustration purposes only, in Figure 3.

Plug valves shall have a cylindrical or conical obturator which rotates about an axis perpendicular to the direction of flow.

5.1.3 Ball valves

Typical configurations for ball valves with flanged or welding ends are shown, for illustration purposes only, in Figures 4, 5 and 6.

Ball valves shall have a spherical obturator which rotates on an axis perpendicular to the direction of flow.

5.1.4 Check valves

Typical configurations for check valves are shown, for illustration purposes only, in Figures 7 to 11. Check valves may also be of the wafer type.

Check valves shall have an obturator which responds automatically to block fluid in one direction.

5.2 Valve configurations

5.2.1 Full-opening valves

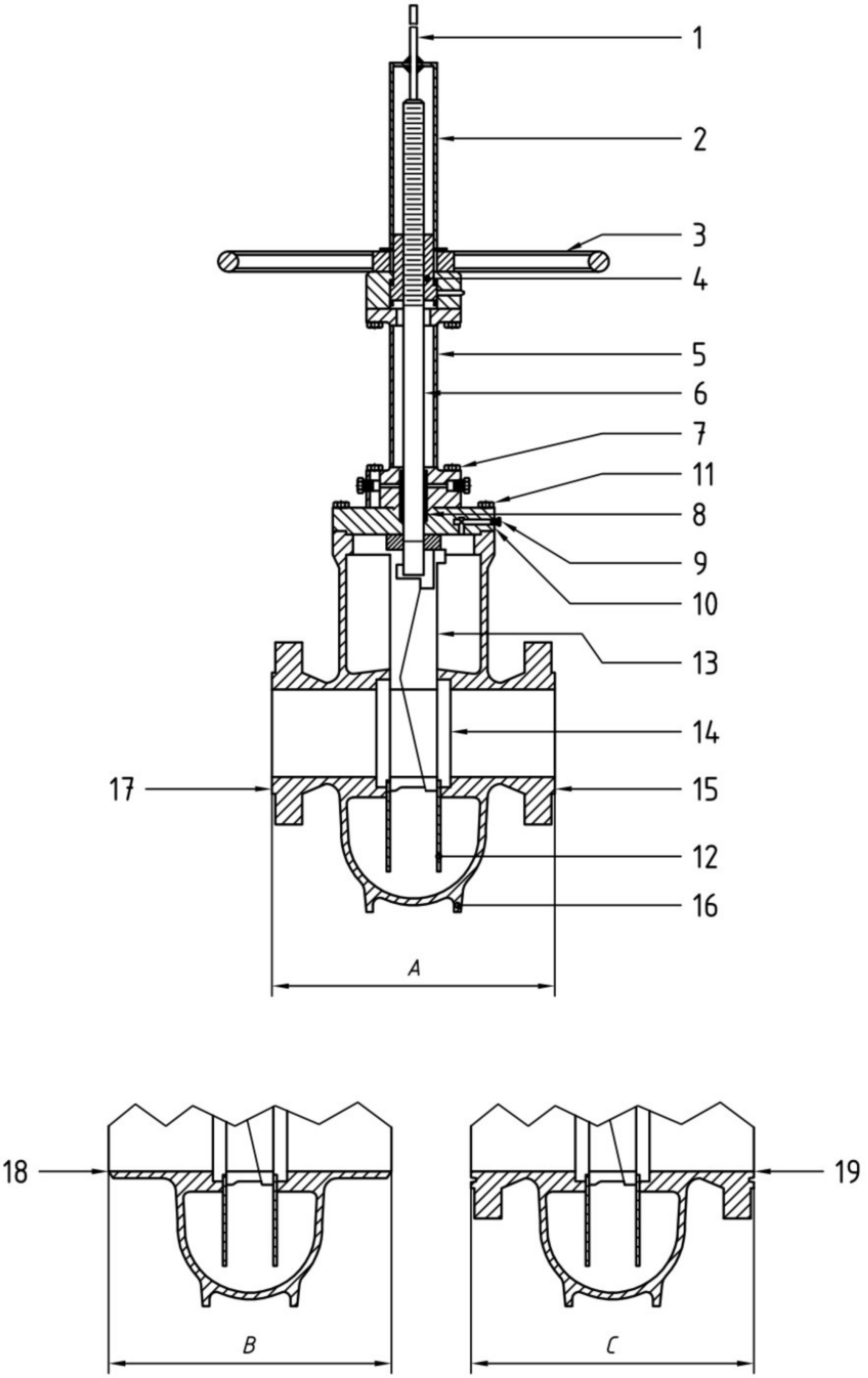
Full-opening valves shall be unobstructed in the fully opened position and have an internal bore as specified in Table 1. There is no restriction on the upper limit of valve bore sizes.

Full-opening through-conduit valves shall have a circular bore in the obturator that will allow a sphere with a nominal size not less than that specified in Table 1 to pass.

Welding-end valves may require a smaller bore at the welding end to mate with the pipe.

5.2.2 Reduced-opening valves

The internal bore of reduced-opening valves shall be less than the internal bore specified in Table 1.

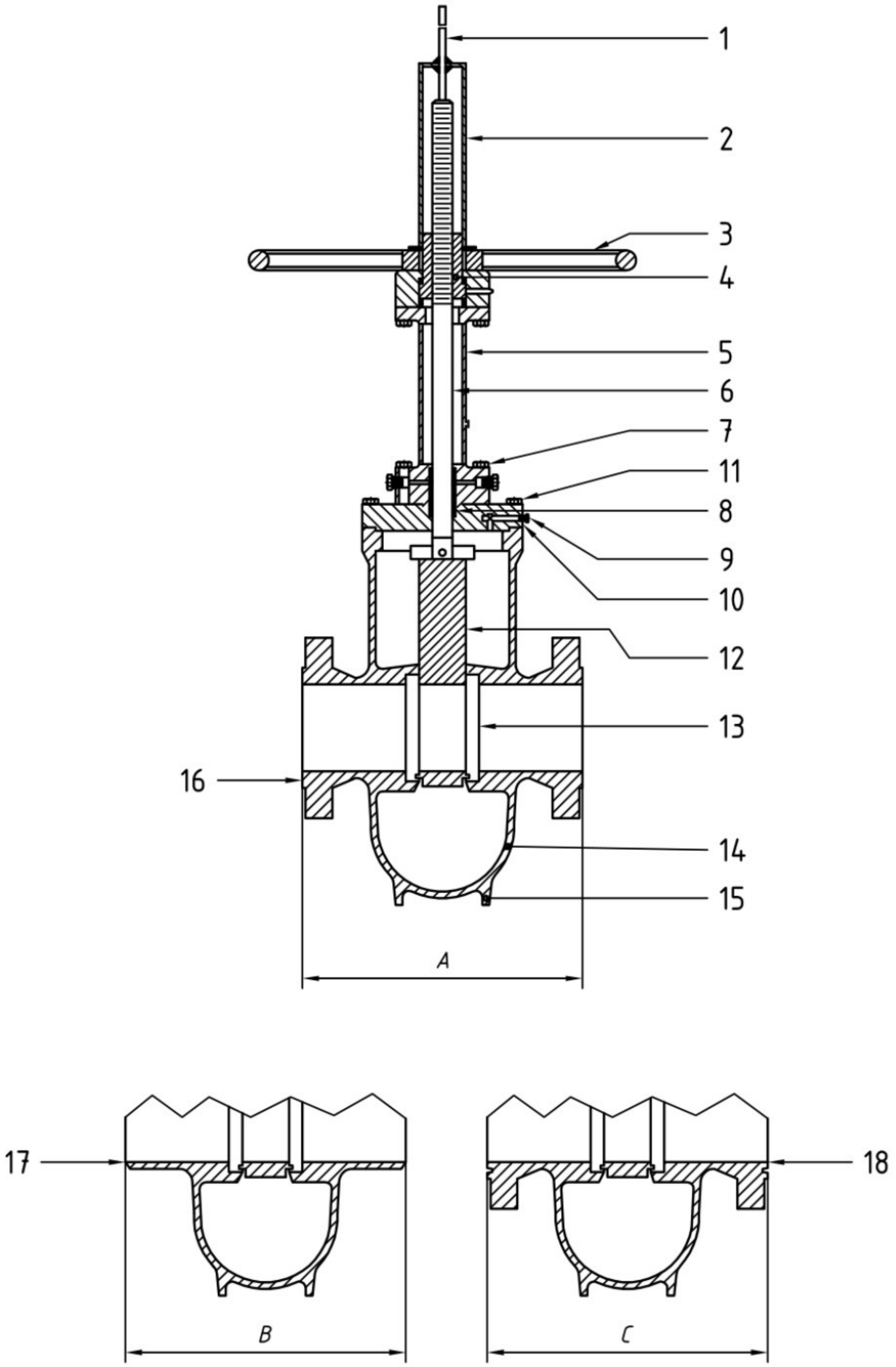


Key

1 Stem indicator
2 Stem enclosure
3 Handwheel
4 Yoke nut
5 Yoke
6 Stem
7 Yoke bolting
8 Stem packing
9 Relief valve
10 Bonnet
11 Bonnet bolting
12 Gate guide
13 Gate assembly
14 Seat ring
15 Body
16 Support ribs or legs
17 Raised face
18 Welding end
19 Ring joint

A Raised-face face-to-face dimension
B Welding-end end-to-end dimension
C Ring-joint end-to-end dimension

Figure 1—Expanding-gate/rising-stem gate valve

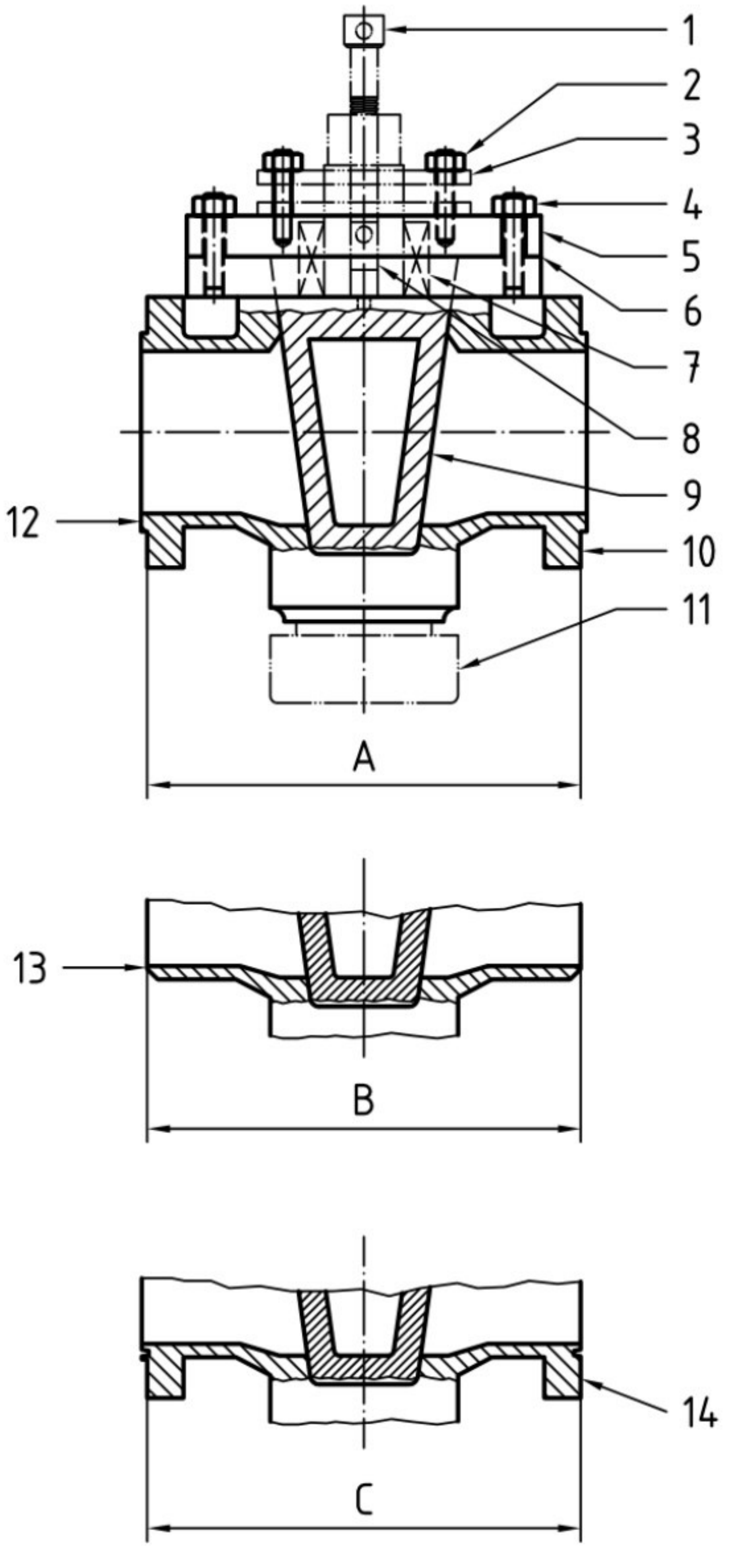


Key

1 Stem indicator
2 Stem enclosure
3 Handwheel
4 Yoke nut
5 Yoke
6 Stem
7 Yoke bolting
8 Stem packing
9 Relief valve
10 Bonnet
11 Bonnet bolting
12 Gate
13 Seat ring
14 Body
15 Support ribs or legs
16 Raised face
17 Welding end
18 Ring joint

A Raised-face face-to-face dimension
B Welding-end end-to-end dimension
C Ring-joint end-to-end dimension

Figure 2—Slab-gate/through-conduit rising-stem gate valve

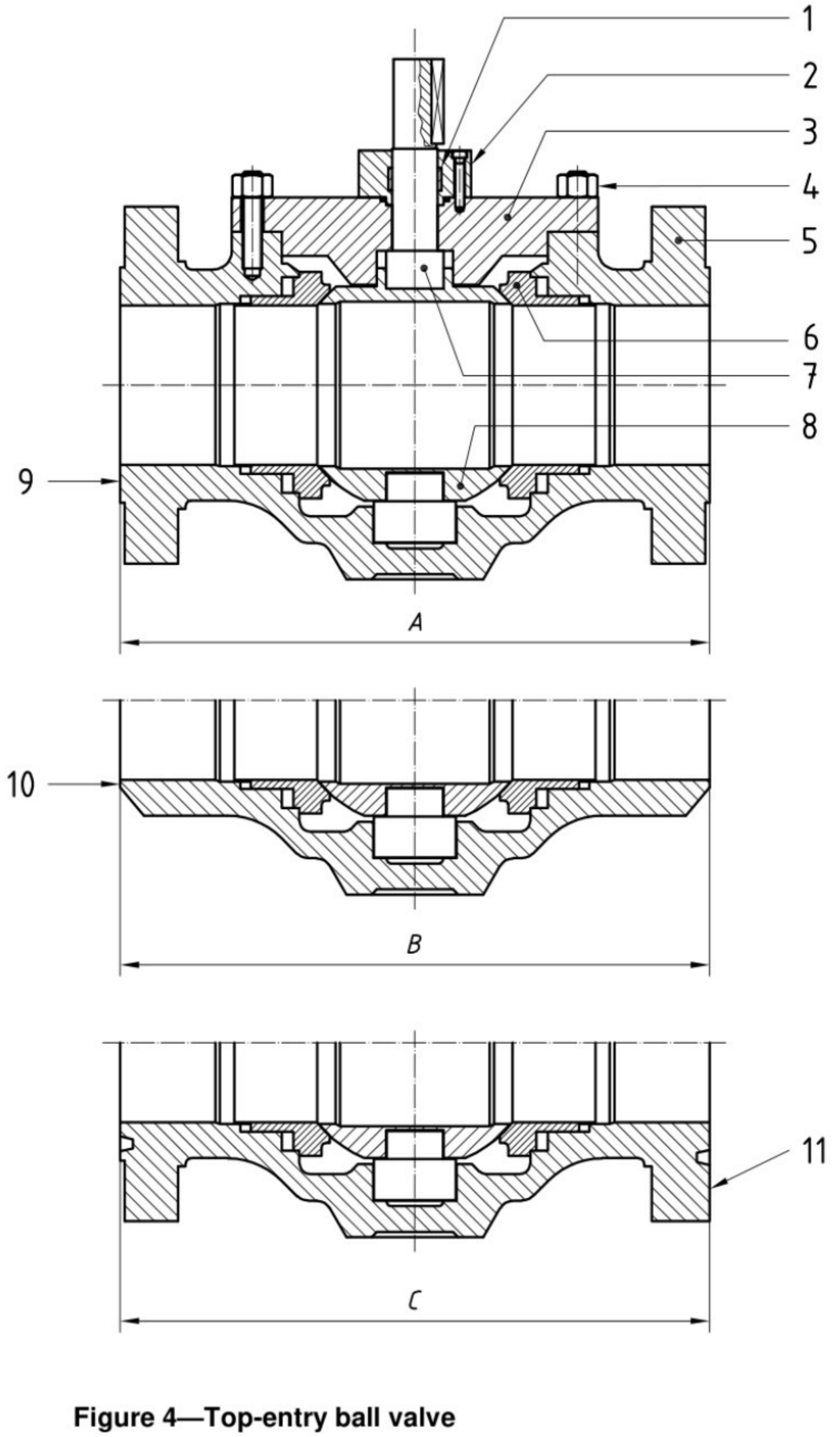


Key

1 Lubricator screw
2 Gland studs and nuts
3 Gland
4 Cover studs and nuts
5 Cover
6 Cover gasket
7 Stem packing
8 Lubricant check valve
9 Plug
10 Body
11 Stop collar
12 Raised face
13 Welding end
14 Ring joint

A Raised-face face-to-face dimension
B Welding-end end-to-end dimension
C Ring-joint end-to-end dimension

Figure 3—Plug valve

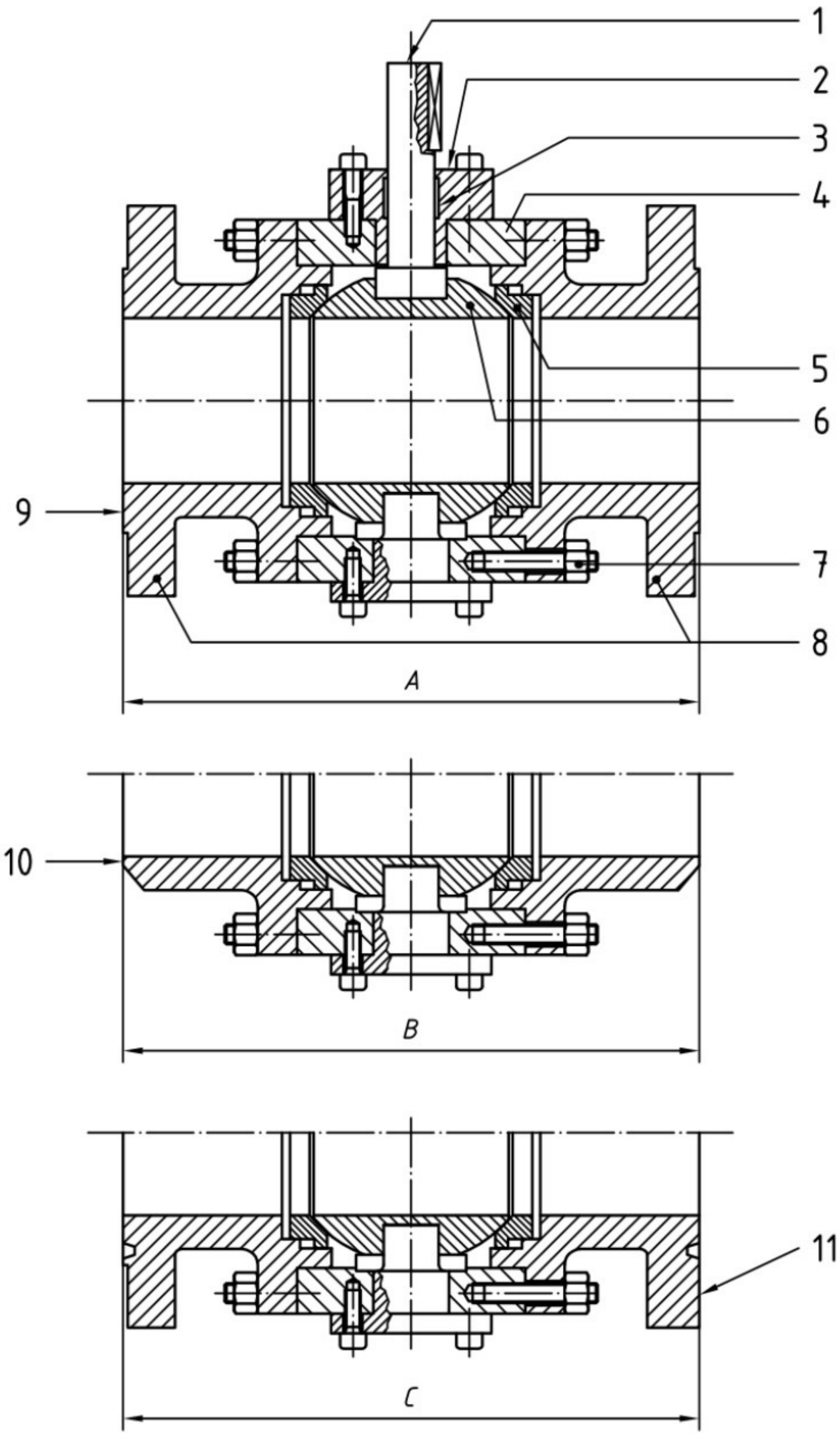


Key

1 Stem seal
2 Bonnet cover
3 Bonnet
4 Body bolting
5 Body
6 Seat ring
7 Stem
8 Ball
9 Raised face
10 Welding end
11 Ring joint

A Raised-face face-to-face dimension
B Welding-end end-to-end dimension
C Ring-joint end-to-end dimension

Figure 4—Top-entry ball valve

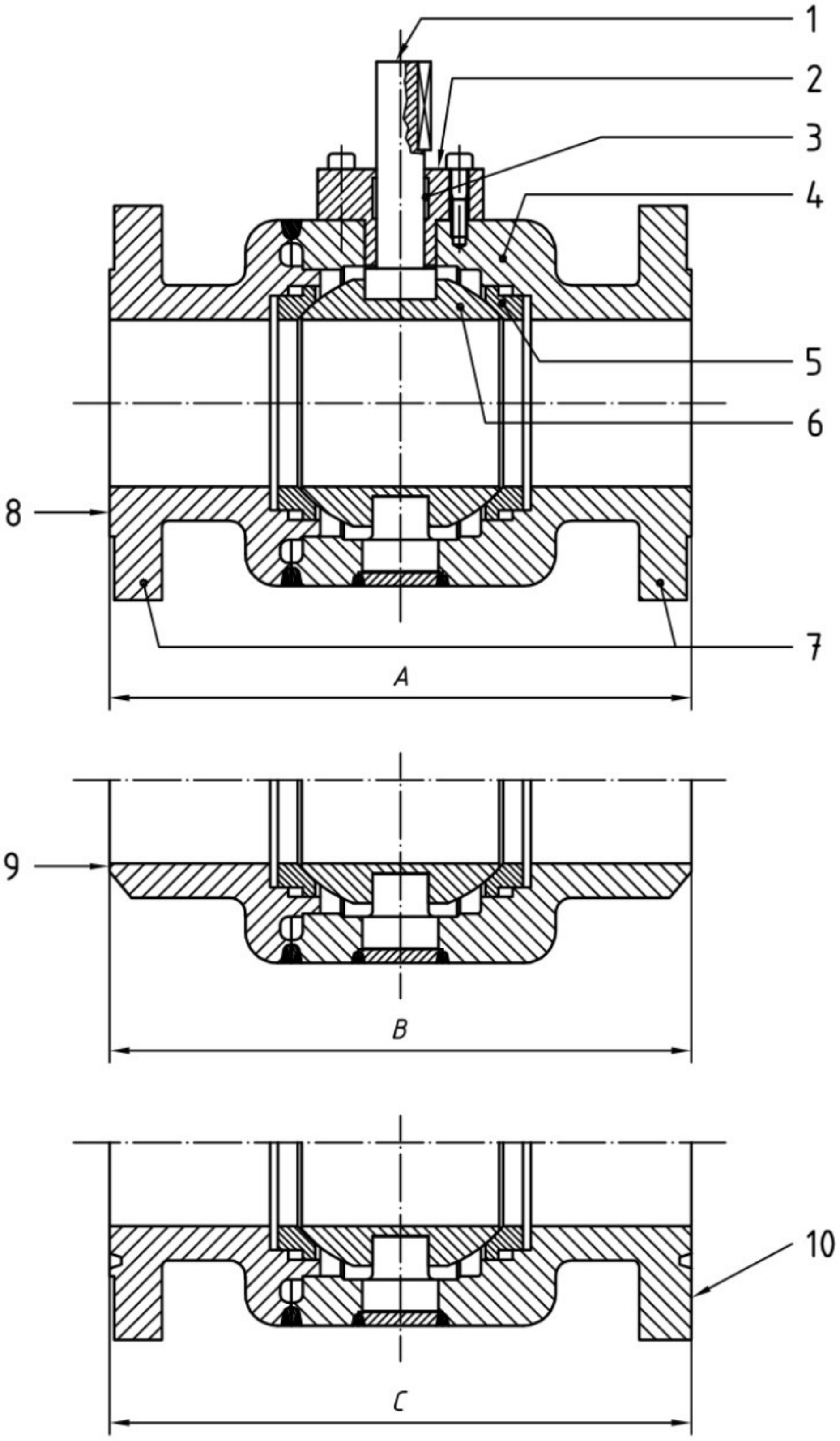


Key

1 Stem
2 Body cover
3 Stem seal
4 Body
5 Seat ring
6 Ball
7 Body bolting
8 Closure
9 Raised face
10 Welding end
11 Ring joint

A Raised-face face-to-face dimension
B Welding-end end-to-end dimension
C Ring-joint end-to-end dimension

Figure 5—Three-piece ball valve

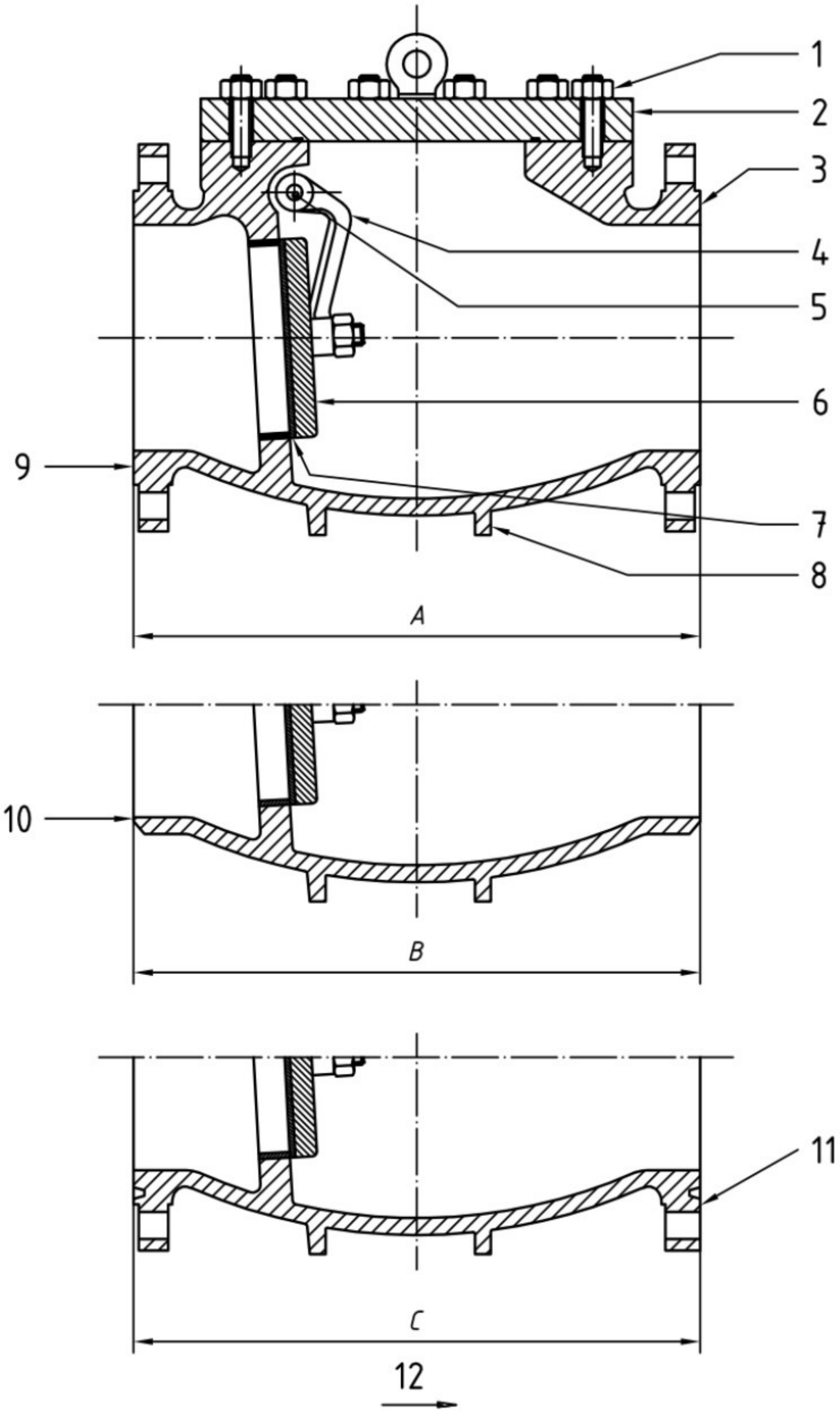


Key

1 Stem
2 Body cover
3 Stem seal
4 Body
5 Seat ring
6 Ball
7 Closure
8 Raised face
9 Welding end
10 Ring joint

A Raised-face face-to-face dimension
B Welding-end end-to-end dimension
C Ring-joint end-to-end dimension

Figure 6—Welded-body ball valve

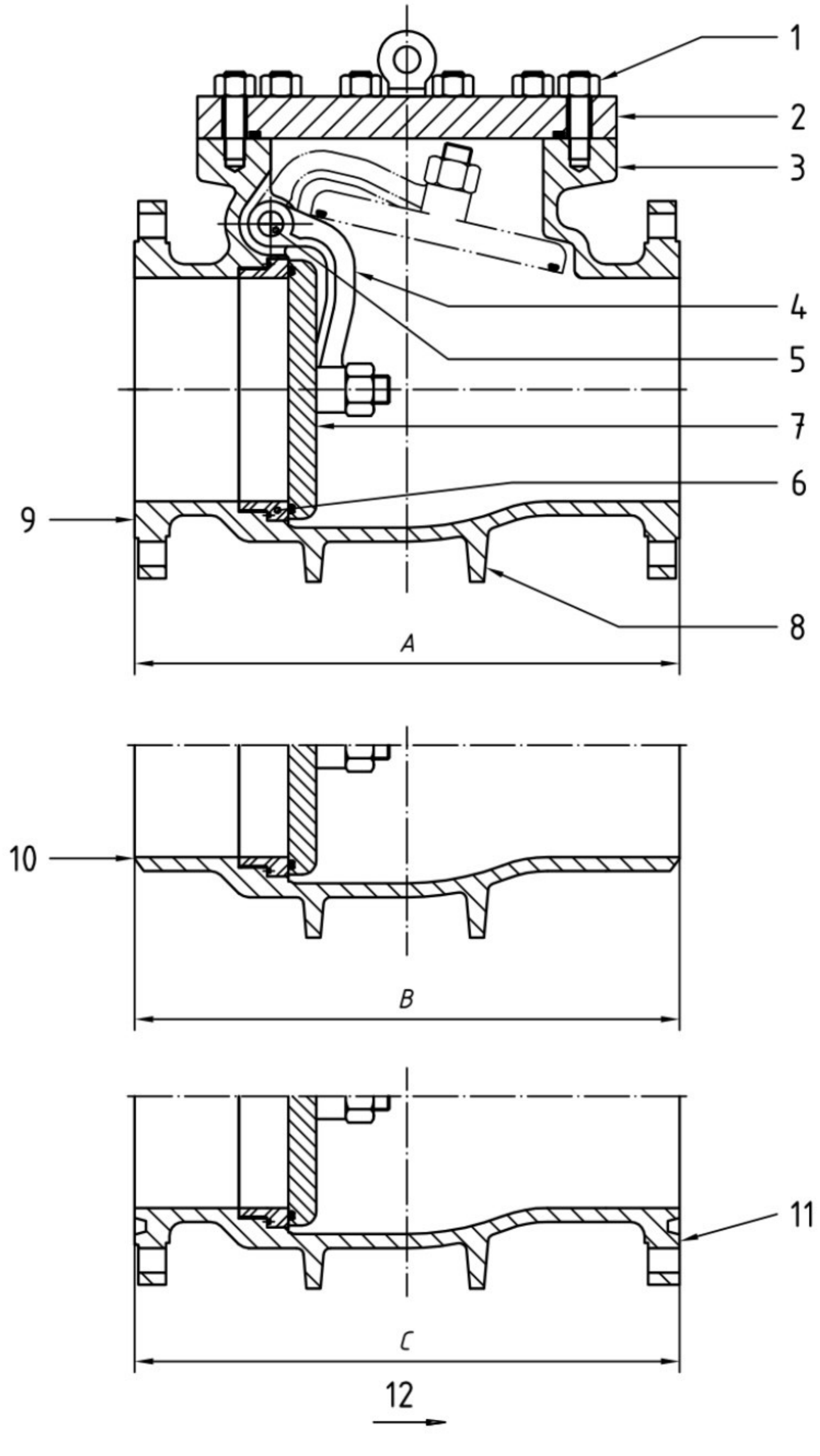


Key

1 Cover bolting
2 Cover
3 Body
4 Clapper disc arm
5 Shaft
6 Clapper disc
7 Seat ring
8 Support ribs or legs
9 Raised face
10 Welding end
11 Ring joint
12 Direction of flow

A Raised-face face-to-face dimension
B Welding-end end-to-end dimension
C Ring-joint end-to-end dimension

Figure 7—Reduced-opening swing check valve



Key

1 Cover bolting
2 Cover
3 Body
4 Clapper disc arm
5 Shaft
6 Seat ring
7 Clapper disc
8 Support ribs or legs
9 Raised face
10 Welding end
11 Ring joint
12 Direction of flow

A Raised-face face-to-face dimension
B Welding-end end-to-end dimension
C Ring-joint end-to-end dimension

Figure 8—Full-opening swing check valve

Key

1 Body
2 Hinge
3 Nut
4 Closure plate/stud assembly
5 Seat ring
6 Bearing spacers
7 Hinge pin
8 Hinge pin retainers
9 Direction of flow

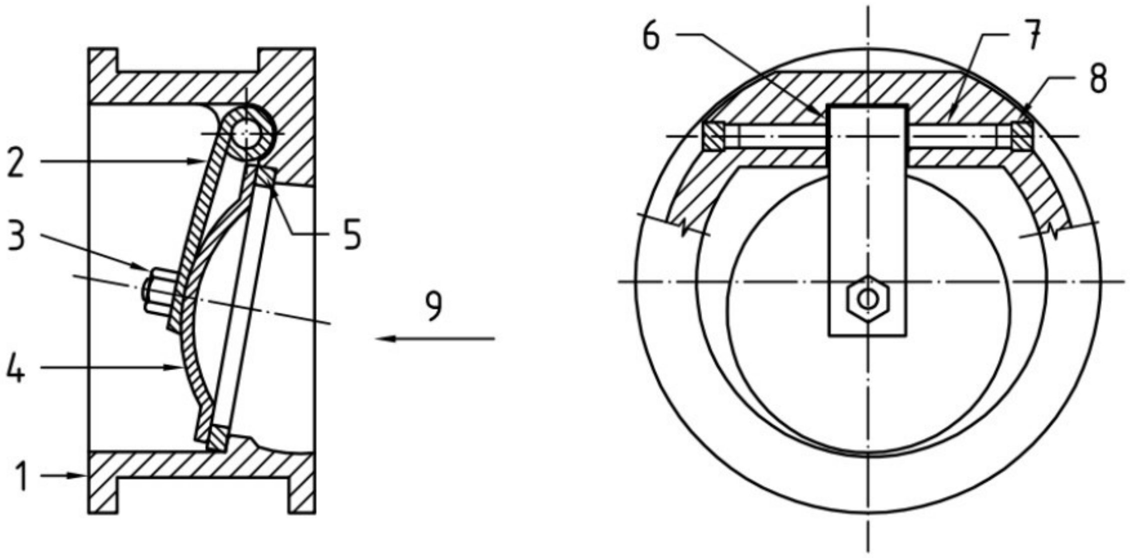
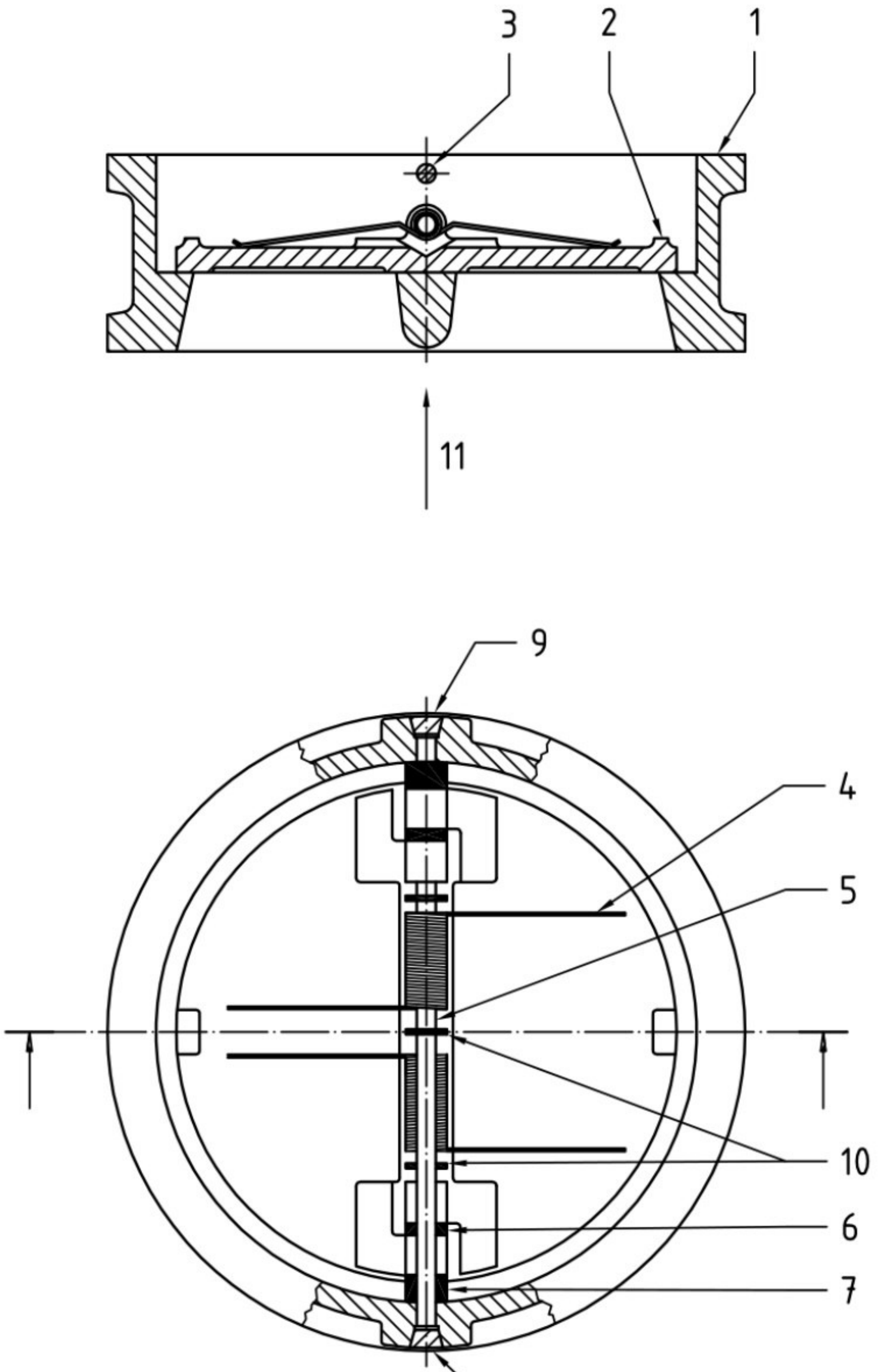


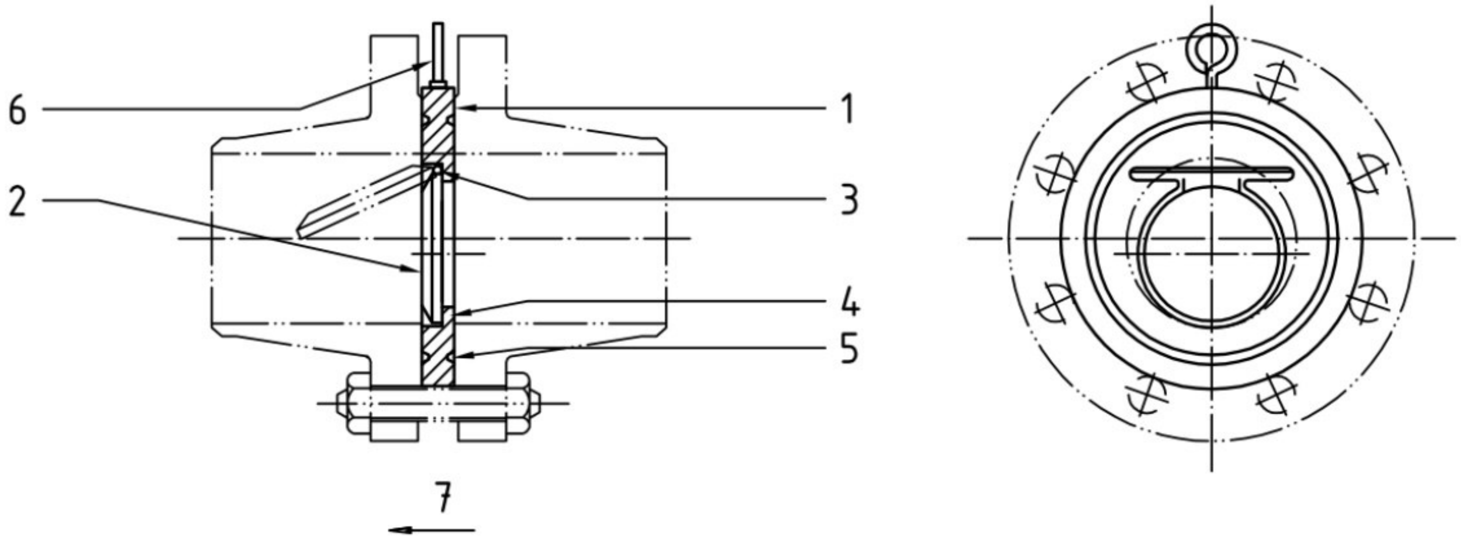
Figure 9—Single-plate wafer-type check valve, long pattern



Key

1 Body
2 Closure plate
3 Stop pin
4 Spring
5 Hinge pin
6 Plate lug bearings
7 Body lug bearings
8 Stop pin retainers
9 Hinge pin retainers
10 Spring bearings
11 Direction of flow

Figure 10—Typical dual-plate wafer-type check valve, long pattern



Key

1	Body	5	Body seal
2	Clapper	6	Lifting eye
3	Pin	7	Direction of flow
4	Clapper seal		

Figure 11—Single-plate wafer-type check valve, short pattern

6 Design

6.1 Pressure and temperature rating

The nominal pressure (PN) class or the ANSI rating class shall be used for the specification of the required pressure class.

Valves covered by this International Standard should be furnished in one of the following classes:

PN 20 (Class 150)

PN 50 (Class 300)

PN 64 (Class 400)

PN 100 (Class 600)

PN 150 (Class 900)

PN 250 (Class 1500)

PN 420 (Class 2500)

Pressure classes shall be specified by the purchaser in accordance with the applicable rating tables for material groups in ASME B16.34.

The purchaser may specify intermediate design pressures and temperatures for his specific application.

Allowable operating pressures and temperatures for valves made of materials not covered by ASME B16.34 shall be determined by calculations in accordance with an agreed pressure vessel design standard, such as ASME Section VIII, Division 1 and Division 2, or BS 5500.

Non-metallic parts may limit minimum and maximum operating pressures and temperatures.

The maximum operating pressure at the minimum and maximum operating temperatures shall be marked on the nameplate.

6.2 Sizes

All valves, except for reduced-opening valves, shall be furnished in the nominal sizes (DN) listed in Tables 2 to 6. Reduced-opening valves shall be furnished in the nominal sizes in accordance with Table 1.

NOTE In this International Standard, DN sizes are stated first followed by the equivalent NPS size between brackets.

Except for reduced-opening valves, valve sizes shall be specified by the nominal sizes (DN) or nominal pipe size (NPS).

Reduced-opening valves with a circular opening through the obturator shall be specified by the nominal size of the end connections and the nominal size of the minimum bore of the obturator in accordance with Table 1, except that for valve sizes DN 50 (NPS 2) or smaller the actual bore of the obturator shall be specified. For example, a DN 400 valve with a reduced 334-mm-diameter circular opening through the obturator shall be specified as 400 × 350.

Reduced-opening valves with a non-circular opening through the obturator and reduced-opening check valves shall be designated as reduced-bore valves and specified by the nominal size corresponding to the end connections followed by the letter "R". For example, a reduced-bore valve with DN 400 end connections and a 381 × 305 mm rectangular opening through the obturator shall be specified as 400R.

6.3 Face-to-face and end-to-end dimensions

Unless otherwise agreed, face-to-face and end-to-end dimensions of valves shall be in accordance with Tables 2 to 6.

Face-to-face and end-to-end dimensions for valve sizes not specified in Tables 2 to 6 shall be in accordance with ASME B16.10. Face-to-face and end-to-end dimensions not shown in Tables 2 to 6 or in ASME B16.10 shall be established by agreement.

The length of valves having one welding end and one flanged end shall be determined by adding half the length of a flanged-end valve to half the length of a welding-end valve.

Tolerances on the face-to-face and end-to-end dimensions shall be ±2 mm for valve sizes DN 250 and smaller, and ±3 mm for valve sizes DN 300 and larger.

The nominal size and face-to-face or end-to-end dimensions shall be stated on the nameplate if not specified in or not in accordance with Tables 2 to 6.

10 Pressure testing

10.1 General

Each valve shall be tested in accordance with this clause prior to shipment. The purchaser shall specify which particular supplementary tests in Annex C shall be performed, together with the frequency of testing.

Testing shall be performed in the sequence used in this clause for specifying the test requirements. Shell pressure testing shall be carried out before painting of the valves.

Test fluids shall be fresh water which may contain a corrosion inhibitor and, by agreement, antifreeze. The chloride content of test water for austenitic and ferritic-austenitic (duplex) stainless-steel body/bonnet valves shall not exceed 30 µg/g (30 ppm).

Valves shall be tested with the seating and sealing surfaces free from sealant except where the sealant is the primary means of sealing.

Tests specified with the valve half-open may also be performed with the valve fully open provided the body cavity is simultaneously filled and pressurized through a cavity connection.

Methods for monitoring pressures and/or leakage shall be adequate also when valve body connections are not available for direct monitoring.

A sufficient stabilization period shall be allowed for all pressure tests.

Pressure testing shall be performed in accordance with documented procedures.

10.2 Stem backseat test

Unless otherwise agreed, stem backseat testing shall be performed prior to shell testing.

Where a valve has a stem backseat feature, testing of the backseat shall commence with the seat free. Self-energized packing or seals shall be removed unless a test port is provided for this test.

The valves shall be filled with the ends closed off and the obturator in the partially open position until leakage of the test fluid around the stem is observed. The backseat shall then be closed and a minimum pressure of 1,1 times the pressure rating determined in accordance with 6.1 for material at 38°C (100°F) is applied for the duration specified in Table 9.

Monitoring for leakage shall be through a test access port or by monitoring leakage around the loosened packing.

No visible leakage is permitted at this test pressure.

Table 9—Minimum duration of stem backseat tests

Valve size		**Test duration** (minutes)
DN (mm)	**NPS** (inches)	
≤ 100	≤ 4	2
≥ 150	≥ 6	5

10.3 Hydrostatic shell test

Hydrostatic shell testing shall be performed on the fully assembled valve prior to painting.

Valves shall be closed off and the obturator placed in the partially open position during the test. If specified by the purchaser, the method of closing the ends shall permit the transmission of the full-pressure force acting on the end blanks to the valve body. Where present, external relief valves shall be removed and their connections plugged.

The test pressure shall be 1,5 or more times the pressure rating determined in accordance with 6.1 for material at 38°C (100°F). The duration shall not be less than that specified in Table 10.

Table 10—Minimum duration of hydrostatic shell tests

Valve size		**Test duration** (minutes)
DN (mm)	**NPS** (inches)	
15 – 100	$^{1}/_{2}$ – 4	2
150 – 250	6 – 10	5
300 – 450	12 – 18	15
≥ 500	≥ 20	30

No visible leakage is permitted during the hydrostatic shell test.

After hydrostatic shell testing, external relief valves shall be (re)fitted to the valve. The connection to the valve body shall be tested at 95% of the set pressure of the relief valve for 2 minutes for valve sizes up to and including DN 100 (NPS 4), and 5 minutes for valve sizes DN 150 (NPS 6) and larger. The relief valve connection shall be free of visible leakage during this period.

Where provided, the external relief valve shall be set to relieve at the specified pressure and tested. The set pressure of relief valves shall be between 1,1 and 1,33 times the valve pressure rating determined in accordance with 6.1 for material at 38°C (100°F).

10.4 Hydrostatic seat test

10.4.1 Alternative test

High-pressure gas seat testing in accordance with clause C.4 may be performed in lieu of the hydrostatic seat test described below.

10.4.2 Preparation

Lubricants shall be removed from seats and obturator sealing surfaces except, by agreement, for assembly lubricants for metal-to-metal contact sufaces.

10.4.3 Test pressure and duration

The test pressure for all seat tests shall not be less than 1,1 times the pressure rating determined in accordance with 6.1 for material at 38°C (100°F). The test duration shall be in accordance with Table 11.

Table 11—Minimum duration of seat tests

Valve size		Test duration (minutes)
DN (mm)	NPS (inches)	
15 – 100	$^{1}/_{2}$ – 4	2
≥ 150	≥ 6	5

10.4.4 Acceptance criteria

Leakage for soft-seated valves and lubricated plug valves shall not exceed ISO 5208 Rate A (no visible leakage). For metal-seated valves the leakage rate shall not exceed ISO 5208 Rate D, except that the leakage rate during the seat test in 10.4.5.5.2 shall not be more than two times ISO 5208 Rate D unless otherwise specified. The test procedures for various types of block valve are given in 10.4.5.

10.4.5 Test procedures for block valves

10.4.5.1 Uni-directional

With the valve half-open, the valve and its cavity shall be completely filled with test fluid. The valve shall then be closed and the test pressure applied to the appropriate end of the valve.

Leakage from each seat shall be monitored via the valve body cavity vent or drain connection. For valves without a body cavity connection, seat leakage shall be monitored from each seat at the respective downstream end of the valve (the valve end downstream of the pressurized test fluid).

10.4.5.2 Bi-directional

With the valve half-open, the valve and its cavity shall be completely filled with test fluid. The valve shall then be closed and the test pressure applied successively to both ends of the valve.

Seat leakage shall be monitored from each seat via the valve body cavity vent or drain connection. For valves without a body cavity vent or drain connection, seat leakage shall be monitored from the respective downstream end of the valve.

10.4.5.3 Twin-seat, both seats bi-directional

Each seat shall be tested in both directions.

Cavity relief valves shall be removed if fitted. The valve and cavity shall be filled with test fluid, with the valve half-open, until the test fluid overflows through the cavity relief connection.

To test for seat leakage in the direction of the cavity, the valve shall be closed. The test pressure shall be applied successively to each valve end to test each seat separately from the upstream side. Leakage shall be monitored via the valve cavity pressure relief connection.

Thereafter, each seat shall be tested as a downstream seat. Both ends of the valve shall be drained and the valve cavity filled with test fluid. Pressure shall then be applied whilst monitoring leakage through each seat at both ends of the valve.

10.4.5.4 Twin-seat, one seat uni-directional and one seat bi-directional

10.4.5.4.1 Uni-directional seat

With the valve half-open, the valve and the test cavity shall be completely filled with test fluid until fluid overflows though the valve cavity vent connection. The valve shall then be closed and the vent valve on the test closure opened to allow fluid to overflow, or the test closure on the downstream end of the valve removed. The test pressure shall then be applied to the upstream end (uni-directional seat end) and leakage monitored from the cavity connection. If leakage is also occurring through the downstream seat, the upstream seat leakage shall be taken as the sum of the leakage measured from the cavity and the downstream connections.

10.4.5.4.2 Bi-directional seat

The test in 10.4.5.4.1 shall be repeated to test the bi-directional seat in its upstream-sealing direction.

To test the bi-directional seat in its downstream-sealing direction, both ends of the valve shall be blanked off. With the valve half-open, the valve shall be completely filled with test fluid and pressurized to the test pressure. The valve shall then be closed and test fluid allowed to overflow from a connection on the test closure fitted to the end of the valve at the bi-directional seat end (i.e., downstream of the bi-directional seat). The test pressure shall be maintained on the cavity connection whilst monitoring seat leakage of the bi-directional seat at the overflow connection on the downstream test closure.

10.4.5.5Double-block-and-bleed valves

10.4.5.5.1 Single-seat test

With the valve half-open, the valve and its cavity shall be completely filled with test fluid. The valve shall then be closed and the valve body vent valve opened to allow excess test fluid to overflow from the valve cavity test connection. The test pressure shall then be applied to one end of the valve and the pressure released at the other end. This test shall be repeated for the other valve end.

Seat tightness shall be monitored during each test via overflow from the valve cavity connection.

10.4.5.5.2 Double-block seat test

With the valve half-open, the valve and its cavity shall be completely filled with test fluid. The valve shall then be closed and the valve body vent valve opened to allow excess test fluid to overflow from the valve cavity test connection. The test pressure shall be applied simultaneously from both valve ends.

Seat tightness shall be monitored via overflow through the valve cavity connection.

The tests in 10.4.5.5 may be performed in any order by the manufacturer.

10.4.5.6Check valves

The pressure shall be applied in the direction of the required flow blockage.

10.4.5.7Installation of body connections after testing

Pressure-containing parts, such as vent/or drain plug(s) and cavity relief valves, shall be fitted, on completion of testing, in accordance with documented procedures.

10.5 Draining

Valves shall be drained of test fluids and, where applicable, lubricated before shipment.

11 Marking

11.1 Requirements

Valves shall be marked in accordance with Table 12.

On valves whose size or shape limits the body markings, they may be omitted in the following order:

— size;

— rating;

— material;

— manufacturer's name or trademark.

The nameplate and serial number may be omitted for valves smaller than DN 50 (NPS 2). The purchaser may specify requirements for the marking of valve components.

Table 12—Valve marking

	Marking	Application
1.	Manufacturer's name or trademark	On both body and nameplate
2.	Pressure class	On both body and nameplate
3.	Pressure/temperature rating:	On nameplate
	a) Maximum operating pressure at maximum operating temperature	
	b) Maximum operating pressure at minimum operating temperature	
4.	Face-to-face/end-to-end dimension (6.3)	On nameplate
5.	Body material designation:	
	Material symbol, e.g., AISI, ASME, ASTM or ISO NOTE When body is fabricated of more than one type of steel, the end connection material governs marking.	On both body and nameplate. Melt identification (e.g., cast or heat number) on body only.
6.	Bonnet/cover material designation:	
	Material symbol e.g., AISI, ASME, ASTM, ISO	On bonnet/cover [including melt identification (e.g., heat number)]
7.	Trim identification:	
	Symbols indicating material of stem and sealing faces of closure members if different from that of body	On nameplate
	NOTE MSS SP-25 gives guidance on marking.	
8.	Nominal valve size	On body or nameplate or both (where practicable)
	a) Full-opening valves: nominal valve size	On body or nameplate or both (where practicable)
	b) Reduced-opening valves: shall be marked as specified in 6.2	On body or nameplate or both (where practicable)
9.	Ring joint groove number	On valve flange edge
10.	SMYS and minimum wall thickness	On body weld bevel ends
11.	Flow direction (for check valves only)	On body of uni-directional valves only
12.	Seat sealing direction	Separate identification plate on valve body
13.	Unique serial number	On both body and nameplate
14.	Date of manufacture (month and year)	On nameplate
15.	ISO 14313	On nameplate

Valve data sheet

Specification required______________________________
Valve location and function______________________________
Nominal valve size______________________________
Maximum operating pressure______________________________
Maximum field test pressure (see clause A.2)______________________________
Valve pressure class______________________________
Maximum service temperature______________________________
Minimum service temperature______________________________
Liquid or gas service______________________________
Flow medium composition______________________________
Special flow requirements: Blow down, solids, pigs, etc.______________________________

Valve

Type of valve:_________ Gate________________ Plug________________ Ball________________ Check______________
Design type ______________________________
Full round opening required?______________________________ Minimum bore______________________________

End connections

Upstream pipe: OD________________________ ID______________________________ Material______________________
Flanged end? Yes____________ No_____________
Plain raised face or ring joint?______________________________
If ring joint, flat or raised face?______________________________
Size and pressure class, as per ASME B16.5_____ or MSS SP-44________ or ASME B16.47, Series A___________
Ring gasket or other gasket type and size______________________________
Note: Gaskets are not furnished as a part of the valve.
Welding end? Yes___________ No______________
Attach specifications for welding-end configuration.
Special flanges or mechanical joints?______________________________
Downstream pipe: OD________________________ ID______________________________ Material______________________
Flanged end? Yes___________ No______________
Plain raised face or ring joint?______________________________
If ring joint, flat or raised face?______________________________
Size and pressure class, as per ASME B16.5_____ or MSS SP-44_________ or ASME B16.47, Series A__________
Ring gasket or other gasket type and size______________________________
Note: Gaskets are not furnished as a part of the valve.
Welding end? Yes___________ No______________
Attach specifications for welding-end configuration.
Special flanges or mechanical joints?______________________________
Length: Any special requirements for end-to-end or face-to-face dimension?______________________________

Valve operation

Is gearbox with handwheel required? If so, give details:______________________________
For a handwheel on a horizontal shaft, give distance from centreline of valve opening to handwheel:______________________mm
Or, for a handwheel on a vertical shaft, give distance from centreline of valve opening to centre of rim of handwheel:________________mm
Note: For plug valves having loose wrenches, wrenches must be ordered separately.
Wrench required?______________________________
Locking device required?______________________________ Type______________________________

Valve support

Support ribs or legs required?______________________________

Other requirements

Supplementary requirements (see Annexes B and C)______________________________
Fire test design? Yes_______________ No_______________
NACE MR 0175? Yes_______________ No_______________
Pressure relief: If pressure relief devices are required, are there special requirements for these devices?______________________
Drain connections: Any requirements?______________________________
Bypass connections: Any requirements?______________________________
Supplementary documentation required? (See Annex D)______________________________
Third-party witness of processes/testing______________________________
Painting or coating required?______________________________