INTERNATIONAL STANDARD

ISO 14313

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

Industries du pétrole et du gaz naturel — Systèmes de transport par conduites — Robinets de conduites

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Contents

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

This International Standard was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum and natural gas industries*, Subcommittee SC 2, *Pipeline transportation systems*.

Annexes B, C and D form a normative part of this International Standard. Annex A is for information only.

Introduction

This International Standard is based on API Specification 6D, twenty-first edition, March 1994.

Users of this International Standard should be aware that further or differing requirements may be needed for individual applications. This International Standard is not intended to inhibit a vendor from offering, or the purchaser from accepting, alternative equipment or engineering solutions for the individual application. This may be particularly applicable where there is innovative or developing technology. Where an alternative is offered, the vendor should identify any variations from this International Standard and provide details.

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 1/2 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, NY 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, OH 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, PA 19428-2959, USA)

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

(The American Welding Society, 550 NW LeJeune Road, Miami, FL 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.

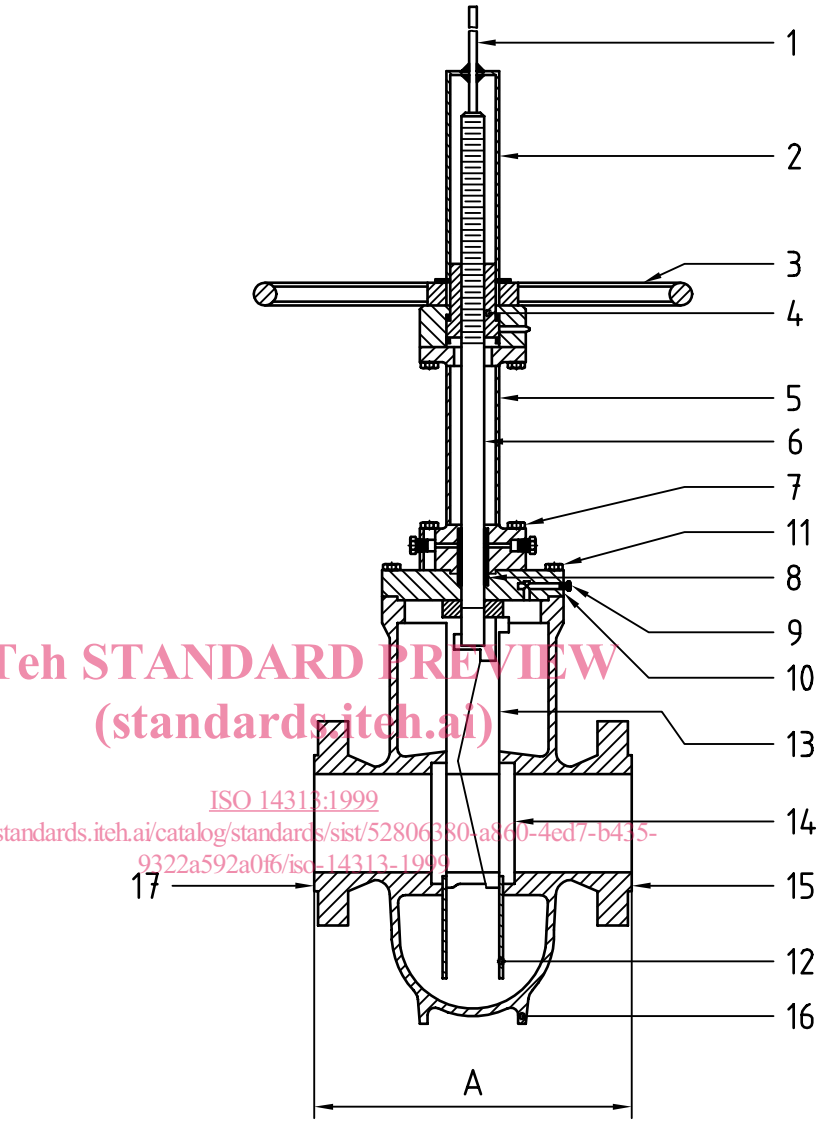
Welding-end valves may require a smaller bore at the welding end to mate with the pipe.

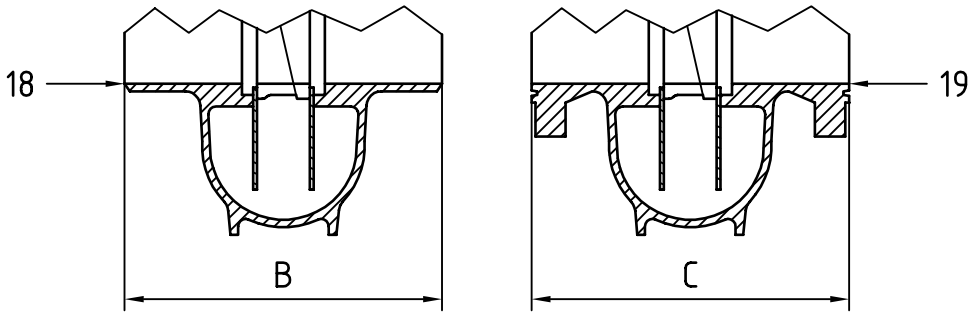
5.2.2 Reduced-opening valves

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

Table 1 — Minimum bore for full-opening valves (mm)

DN (mm)	NPS (inches)	Pressure class			
		PN 20 to 100 (Class 150 to 600)	PN 150 (Class 900)	PN 250 (Class 1500)	PN 420 (Class 2500)
15	½	13	13	13	13
20	¾	19	19	19	19
25	1	25	25	25	25
32	1¼	32	32	32	32
40	1½	38	38	38	38
50	2	49	49	49	42
65	2½	62	62	62	52
80	3	74	74	74	62
100	4	100	100	100	87
150	6	150	150	144	131
200	8	201	201	192	179
250	10	252	252	239	223
300	12	303	303	287	265
350	14	334	322	315	—
400	16	385	373	360	—
450	18	436	423	—	—
500	20	487	471	—	—
550	22	538	522	—	—
600	24	589	570	—	—
650	26	633	617	—	—
700	28	684	665	—	—
750	30	735	712	—	—
800	32	779	760	—	—
850	34	830	808	—	—
900	36	874	855	—	—
950	38	925	—	—	—
1 000	40	976	—	—	—
1 050	42	1 020	—	—	—
1 200	48	1 166	—	—	—
1 350	54	1 312	—	—	—
1 400	56	1 360	—	—	—
1 500	60	1 458	—	—	—





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