

Butterfly Valves: Double-flanged, Lug- and Wafer-type, and Butt-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 Rating	3
4.4 Differential Pressure Rating	4
5 Design.....	4
5.1 General	4
5.2 Body.....	5
5.3 Face-to-face Dimensions	5
5.4 Valve Body Flange Facings	8
5.5 Disc Clearance	8
5.6 Shaft and Shaft Seals	8
5.7 Piping Connection External Bolt Holes	9
5.8 Valve Body Seat Retainer—Category B Valves Only	9
5.9 Operating Mechanisms.....	11
5.10 Antistatic Design (Electrical Continuity Between Disc, Shaft, and Body)	11
5.11 Packing Gland Bolting—Category B Valves Only	12
6 Materials	12
6.1 Body.....	12
6.2 Pressure Boundary Elements	12
6.3 Process Wetted Parts	12
6.4 Packing or Shaft Seal Materials.....	12
6.5 Gland Bolting	12
6.6 Operating Mechanisms—Category B Valves Only	12
7 Testing, Inspection, and Examination	12
7.1 Inspection and Examination.....	12
7.2 Pressure Tests	13
7.3 Electrical Continuity Test.....	13
7.4 Repair of Defects	13
8 Markings	13
9 Packaging and Shipping	14
9.1 Coatings.....	14
9.2 Shaft Packing.....	14
9.3 Packaging	14
9.4 Spare Parts.....	14
10 Purchase Order Information	14
Annex A	15

Contents

	Page
Annex B (informative) Information to be Specified by Purchaser	16
Annex C (informative) Typical Butterfly Valve Construction and Nomenclature	18
Annex D (normative) Disc-to-pipe Clearances	21
Bibliography.....	25

Figures

1	External Bolting Options for Lug- and Wafer-type Valves	10
2	Limitations for Flange Face Interruptions That Fall Within the Gasket Seating Area.....	11
C.1	Typical Part Nomenclature for Category A Concentric Disc Type	18
C.2	Typical Part Nomenclature for Category B Offset Disc Type	19
C.3	Typical Offset-type Constructions	20
D.1	Disc-to-pipe Clearance for Category A Concentric Disc Type.....	22
D.2	Disc-to-pipe Clearance for Category B Offset Disc Type.....	23

Tables

1	Minimum Seat Pressure-temperature Ratings for Category B Valves	3
2	Face-to-face Dimensions for Category A Valves (Lug- and Wafer-type)	6
3a	Face-to-face Dimensions for Category B Valves (Lug- and Wafer-type)	6
3b	Face-to-face Dimensions for Category B Valves (Double-flanged Long Pattern).....	7
3c	Face-to-face Dimensions for Category B Valves (Double-flanged Short Pattern)	7
D.1	Nominal Radial Clearances	21
D.2	Relationship of Unlined Steel Pipe Schedule to Valve Category, Size, and ASME class	24

Butterfly Valves: Double-flanged, Lug- and Wafer-type, and Butt-welding Ends

1 Scope

1.1 This standard covers design, materials, face-to-face dimensions, pressure-temperature ratings, and examination, inspection, and test requirements for gray iron, ductile iron, bronze, steel, nickel-based alloy, or special alloy butterfly valves.

1.2 The following two categories of butterfly valves are included:

- a) Category A—Manufacturer's rated cold working pressure (CWP) butterfly valves, usually with a concentric disc and seat configuration. Sizes covered are NPS 2 to NPS 60 for valves having ASME class 125 or class 150 flange bolting patterns.
- b) Category B—ASME class and pressure-temperature-rated butterfly valves that have an offset seat and either an eccentric or a concentric disc configuration. Sizes covered are listed below:
 - for lug and wafer, class 150 and 300: NPS 2 to NPS 60;
 - for lug and wafer, class 600: NPS 3 to NPS 60;
 - for double-flanged short and long pattern, class 150, 300, and 600: NPS 3 to NPS 60;
 - for butt-welding ends, class 150, 300 and 600: NPS 3 to 60;

Information to be specified by the purchaser is shown in Annex B.

1.3 Valve configurations include double-flanged, lug- and wafer-type with facings that permit installation between ASME and MSS flanges and butt-welding ends. Configurations conform to the standards and specifications listed in Section 2. Typical valve construction and nomenclature for valve parts are shown in Annex C.

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 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 B1.1¹, *Unified Inch Screw Threads (UN, UNR, and UNJ Thread Forms)*

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

ASME B16.24, *Cast Copper Alloy Pipe Flanges, Flanged Fittings, and Valves: Classes 150, 300, 600, 900, 1500 and 2500*

ASME B16.25, *Buttwelding Ends*

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

¹ ASME International, Two Park Avenue, New York, New York 10016-5990, www.asme.org.

ASME B16.42, *Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300*

ASME B16.47, *Large Diameter Steel Flanges: NPS 26 Through NPS 60 Metric/Inch Standard*

ASME B31.3, *Process Piping*

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

MSS SP-6², *Standard Finishes for Contact Faces of Pipe Flanges and Connecting-end Flanges of Valves and Fittings*

ANSI/MSS SP-25, *Standard Marking System for Valves, Fittings, Flanges, and Unions*

MSS SP-45, *Bypass and Drain Connections*

MSS SP-91, *Guidelines for Manual Operation of Valves*

ANSI/MSS SP-134, *Valves for Cryogenic Service, Including Requirements for Body/Bonnet Extensions*

ANSI/NACE MR0103³ /ISO 17945, *Petroleum, Petrochemical and Natural Gas Industries—Metallic Materials Resistant to Sulfide Stress Cracking in Corrosive Petroleum Refining Environments*

ANSI/NACE MR0175/ISO 15156, *Petroleum and Natural Gas Industries—Materials for Use in H₂S-containing Environments in Oil and Gas Production*

3 Terms and Definitions

For the purpose of this document, the following terms and 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 letters “Class” followed by a dimensionless whole number. The number following the letters “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 and is found in tables of pressure-temperature ratings.

3.2

cryogenic service

Unless a different temperature is specified by the purchaser, valves required to operate at or below $-73\text{ }^{\circ}\text{C}$ ($-100\text{ }^{\circ}\text{F}$) are in cryogenic service.

3.3

dead-end service

A condition that may occur after the companion flange and/or piping are removed from one side of a valve.

3.4

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

² Manufacturers Standardization Society of the Valve and Fittings Industry, Inc., 127 Park Street, NE, Vienna, Virginia 22180-4602, msshq.org.

³ NACE, 15835 Park Ten Place, Houston, Texas 77084, www.nace.org.

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.

3.5

pressure boundary element

Comprises the shell and related bolting that forms a part of the pressure boundary (see Annex C).

3.6

shell

Comprises the body, cover, bonnet, bonnet extension, and seat retainer that constitutes the pressure boundary of an API 609 valve (see Annex C).

4 Pressure-temperature Ratings

4.1 Valve Rating

Category A valves shall have a CWP rating that is the lesser of its shell rating, seat rating, or differential pressure rating.

4.2 Shell Rating

4.2.1 Category A valve bodies and related pressure boundary elements shall have the CWP rating assigned by the manufacturer.

4.2.2 Category B valve bodies and related pressure boundary elements shall have the pressure-temperature rating as listed in one of the following standards according to the valve’s body material:

- for ductile iron, ASME B16.42;
- for cast copper alloys, ASME B16.24;
- for steel, nickel alloy, or special alloy material, ASME B16.34.

4.3 Seat Rating

4.3.1 For Category B valves, the valve seat ratings for polytetrafluoroethylene (PTFE) or modified PTFE and reinforced polytetrafluoroethylene (RPTFE) or modified RPTFE shall be at least equal to those listed in Table 1. For seating materials not listed in Table 1, seat ratings shall be established by the manufacturer.

Table 1—Minimum Seat Pressure-temperature Ratings for Category B Valves

Temperature °C (°F)	Class 150				Class 300				Class 600	
	PTFE or modified PTFE		RPTFE or modified RPTFE		PTFE or modified PTFE		RPTFE or modified RPTFE		RPTFE or modified RPTFE	
	bar	psig	bar	psig	bar	psig	bar	psig	bar	psig
–29 to 38 (–20 to 100)	19.7	285	19.7	285	51.0	740	51.0	740	102.0	1480
66 (150)	18.8	273	18.8	273	48.8	708	48.8	708	89.6	1300
93 (200)	17.9	260	17.9	260	37.9	550	46.5	675	62.1	900
121 (250)	16.9	245	16.9	245	29.3	425	36.5	530	48.3	700
149 (300)	15.9	230	15.9	230	20.7	300	26.9	390	37.9	550
177 (350)	9.7	140	14.8	215	12.1	175	17.2	250	27.6	400
204 (400)	3.4	50	6.9	100	3.4	50	6.9	100	17.2	250

4.3.2 Valves furnished with internal liners, encapsulation, resilient seating materials, or a combination of these features shall have pressure-temperature limits conforming to the valve manufacturer's published specifications. Temperature limits shall be marked on the nameplate as required in 8.1 f).

4.4 Differential Pressure Rating

Differential pressure rating shall not exceed the seat pressure rating.

5 Design

5.1 General

5.1.1 Category B Valves

Valves manufactured in accordance with this standard shall meet the requirements of ASME B16.34 for Standard class and any additional requirements as specified in this standard. For materials not listed in ASME B16.34, the applicable requirements and design rules of ASME B16.34 shall be used. In the event of a conflict between ASME B16.34 and this standard, this standard shall prevail.

5.1.2 Fire-tested Valves

If the purchaser specifies fire-tested valves, the valve's design shall have been type tested and certified to meet all performance requirements of API 607. Fire test report shall be made available to purchaser upon request.

5.1.3 Fugitive Emissions Tested Valves

If the purchaser specifies fugitive emission valves, the valve's design shall have been type tested and certified to meet all performance requirements of API 641. Fugitive emission test report shall be made available to purchaser upon request.

5.1.4 Cryogenic Service

Valves required to operate in cryogenic service shall meet the additional requirements specified in ANSI/MSS SP-134.

5.1.5 Lockable Device

When specified in the purchase order, valves shall be furnished with a lockable device that accepts a purchaser-supplied lock that enables the valve to be locked in both the open and closed positions. The lockable device shall be designed such that a lock with an 8 mm (⁵/₁₆ in.) diameter shank, not more than 100 mm (4 in.) long, can be inserted directly through appropriate holes and locked. Provisions for a lockable device are permitted even when it is not specified in the purchase order.

5.1.6 Disc Position Indication

The indication of the position of the disc shall be integral with the valve shaft and shall be aligned with the valve disc. The indication may be accomplished by a mark on the shaft or by a shaft shape. The design shall ensure that a valve (and/or operator) cannot be assembled to falsely indicate the valve's open and closed positions.

5.1.7 Shaft-to-lever Connections

Shaft-to-lever connections shall be designed so that the lever always correctly indicates the disc position. The lever-type handle shall be mounted so that the handle is in parallel with the valve disc.