

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

API STANDARD 609

TENTH EDITION, APRIL 20XX

API MONOGRAM PROGRAM EFFECTIVE DATE: OCTOBER 2021

Special Notes

API publications necessarily address problems of a general nature. With respect to particular circumstances, local, state, and federal laws and regulations should be reviewed. The use of API publications is voluntary. In some cases, third parties or authorities having jurisdiction may choose to incorporate API standards by reference and may mandate compliance.

Neither API nor any of API's employees, subcontractors, consultants, committees, or other assignees make any warranty or representation, either express or implied, with respect to the accuracy, completeness, or usefulness of the information contained herein, or assume any liability or responsibility for any use, or the results of such use, of any information or process disclosed in this publication. Neither API nor any of API's employees, subcontractors, consultants, or other assignees represent that use of this publication would not infringe upon privately owned rights.

API publications may be used by anyone desiring to do so. Every effort has been made by the Institute to ensure the accuracy and reliability of the data contained in them; however, the Institute makes no representation, warranty, or guarantee in connection with this publication and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use or for the violation of any authorities having jurisdiction with which this publication may conflict.

API publications are published to facilitate the broad availability of proven, sound engineering and operating practices. These publications are not intended to obviate the need for applying sound engineering judgment regarding when and where these publications should be used. The formulation and publication of API publications is not intended in any way to inhibit anyone from using any other practices.

Any manufacturer marking equipment or materials in conformance with the marking requirements of an API standard is solely responsible for complying with all the applicable requirements of that standard. API does not represent, warrant, or guarantee that such products do in fact conform to the applicable API standard.

Users of this standard should not rely exclusively on the information contained in this document. Sound business, scientific, engineering, and safety judgment should be used in employing the information contained herein.

Foreword

Nothing contained in any API publication is to be construed as granting any right, by implication or otherwise, for the manufacture, sale, or use of any method, apparatus, or product covered by letters patent. Neither should anything contained in the publication be construed as insuring anyone against liability for infringement of letters patent.

The verbal forms used to express the provisions in this document are as follows.

Shall: As used in a standard, "shall" denotes a minimum requirement to conform to the standard.

Should: As used in a standard, "should" denotes a recommendation or that which is advised but not required to conform to the standard.

May: As used in a standard, "may" denotes a course of action permissible within the limits of a standard.

Can: As used in a standard, "can" denotes a statement of possibility or capability.

This document was produced under API standardization procedures that ensure appropriate notification and participation in the developmental process and is designated as an API standard. Questions concerning the interpretation of the content of this publication or comments and questions concerning the procedures under which this publication was developed should be directed in writing to the Director of Standards, American Petroleum Institute, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001. Requests for permission to reproduce or translate all or any part of the material published herein should also be addressed to the director.

For API Monogram Program licensees and APIQR Program registrants, this standard shall become effective on the program date printed on the cover but may be used voluntarily from the date of publication.

Generally, API standards are reviewed and revised, reaffirmed, or withdrawn at least every five years. A one-time extension of up to two years may be added to this review cycle. Status of the publication can be ascertained from the API Standards Department, telephone (202) 682-8000. A catalog of API publications and materials is published annually by API, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001.

Suggested revisions are invited and should be submitted to the Standards Department, API, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001, standards@api.org.

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 **construction** configuration. Sizes covered are DN 50 to DN 1500 (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 construction** configuration. Sizes covered are listed below:
 - for lug and wafer, Classes 150, 300, and 600: DN 50 to DN 1500 (NPS 2 to NPS 60);
 - for lug and wafer, Class 900: DN 50 to DN 1200 (NPS 2 to NPS 48);
 - for double-flanged short and long pattern, Classes 150, 300, and 600: DN 80 to DN 1500 (NPS 3 to NPS 60);
 - for double-flanged short and long pattern, Class 900: DN 80 to DN 1200 (NPS 3 to NPS 48);

- for butt-welding ends, Classes 150, 300 and 600: DN 80 to DN 1500 (NPS 3 to NPS 60);
- for butt-welding ends, Class 900: DN 150 to DN 1200 (NPS 6 to NPS 48)

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.

1.4 Users of this standard should refer to API RP 615 for background, guidance and definitions related to butterfly valves."

Formatted: Font: Bold

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 Recommended Practice 615, *Valve Selection Guide*

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 B16.1, *Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250*

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

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

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

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

ASME B16.25, *Butt-welding Ends*

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

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

¹ The American Society of Mechanical Engineers, Two Park Avenue, New York, New York 10016-5990, www.asme.org.

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*

ISO 15848-1², Industrial valves – Measurement, test and qualification procedures for fugitive emissions – Part 1: Classification system and qualification procedures for type testing of valves

Formatted: Font color: Pink

Formatted: Font color: Pink

Formatted: Font color: Pink

ISO 28921-1, Industrial valves — Isolating valves for low-temperature applications — Part 1: Design manufacturing and production testing

MSS SP-6³, Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings

Formatted: Font color: Pink

ANSI/MSS SP-25⁴, Standard Marking System for Valves, Fittings, Flanges, and Unions

Formatted: Font color: Pink

MSS SP-45, Bypass and Drain Drain and Bypass Connections

MSS SP-67, Butterfly Valves

Formatted: Font: Not Italic, Font color: Pink

Formatted: Font color: Pink

MSS SP-91, Guidelines for Manual Operation of Valves

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

MSS SP-160, Valves for Hydrogen Fluoride Alkylation Service

ANSI/NACE MR0103⁵/ISO 17945, Petroleum, petrochemical and natural gas industries—Metallic materials resistant to sulfide stress cracking in corrosive petroleum refining environments

Formatted: Font color: Pink

ANSI/NACE MR0175/ISO 15156, Petroleum and natural gas industries—Materials for use in H₂S-containing environments in oil and gas production

²International Organization for Standardization, ISO Central Secretariat, Chemin de Blandonnet 8, CP 401 – 1214 Vernier, Geneva, Switzerland, www.iso.org

Formatted: Font color: Pink

Formatted: Font color: Pink

³Manufacturers Standardization Society of the Valve and Fittings Industry, Inc., 127 Park Street, NE, Vienna, Virginia 22180-4602, msshq.org.

⁴American National Standard Institute, Inc. 25 West 43rd Street, Fourth floor, New York, NY 10036-7406, www.ansi.org

Formatted: Font color: Pink

Formatted: Font color: Pink

Formatted: Font color: Pink, Superscript

Formatted: Font color: Pink

⁵ Association for Materials Protection and Performance (AMPP), 15835 Park Ten Place, Houston, Texas 77084, www.ampp.org.

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 °C (-100 °F) are in cryogenic service.

3.5.3

CWP (Cold Working Pressure)

The maximum pressure rating allowed under normal "ambient" temperature conditions, which is usually understood to be up to 38 °C (100 °F).

3.6 DN (Diameter Nominal)

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.

3.34

dead-end service

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

3.65

DN (Diameter Nominal)

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.

3.46

NPS (Nominal Pipe Size)

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.

3.5

CWP (cold working pressure)

Rated pressure at ambient temperature.

Formatted: Font color: Pink

Formatted: Font color: Pink

Formatted: Font color: Pink

Formatted: Font color: Pink

Formatted: Font color: Pink

Formatted: Font color: Pink

Formatted: Font color: Pink

Formatted: Font: Not Bold, Font color: Pink

Formatted: Font color: Pink

~~3.5 CWP (Cold Working Pressure)~~

~~The maximum pressure rating allowed under normal "ambient" temperature conditions, which is usually understood to be up to 38 °C (100 °F).~~

~~3.6 DN (Diameter Nominal)~~

~~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.~~

~~3.53.7~~

pressure boundary element

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

~~3.63.8~~

Shell

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

~~3.9~~

Differential Pressure rating

~~The differential pressure rating is the maximum differential pressure applied across the disc in closed position. "As per API598 design differential pressure".~~

4 Pressure-temperature Ratings

4.1 Valve Rating

Category A valves shall have a CWP rating that is the lesser of its shell rating and seat differential pressure 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 gray iron ASME B16.1
- for ductile iron, ASME B16.42;
- for cast copper alloys, ASME B16.24;
- for steel, nickel alloy, or special alloy material, ASME B16.34.

Formatted: Indent: Left: 0.25", Hanging: 0.25", No bullets or numbering

4.3 Seat Differential Pressure Rating

4.3.1 For Category B valves, the valve seat differential pressure 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 non-metallic seating materials not listed in Table 1, the seat differential pressure ratings shall be established by the manufacturer.

Table 1—Minimum Seat Differential Pressure Rating Versus Temperature for Category B Valves (Soft seated)

| 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, non-PTFE 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 8.3.4 d).

4.3.3 Unless otherwise agreed, the differential pressure ratings for metal seated, including combination soft and metal seated (e.g., laminated) valves shall be fully rated to the shell ratings.

4.4 Differential Pressure Rating

Formatted: Font color: Pink

Commented [MO1]: [M.O., 23-Jan-'25] Revised for B/C #30. TBD.

5 Design

5.1 General

5.1.1 Valve Categories

a) Category A Valves:

Valves manufactured in accordance with this standard shall meet the requirements of MSS SP-67 or the manufacturer's design and any additional requirements as specified in this standard. In the event of a conflict of requirements between the standards, this standard shall prevail.

b) 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

When a fire-tested butterfly valve is specified in the purchase order, the valve design supplied shall have successfully passed API 607. The test report shall be made available to purchaser upon request

5.1.3 Fugitive Emissions Tested Valves

a) Category A: If the purchaser specifies low fugitive emission valves, the valve's design shall be qualified by type testing to meet the low fugitive emission requirements of API 641

b) Category B: Valves within the scope of API 641 shall be qualified by type testing to meet the low fugitive emission requirements of API 641.

c) Category A and Category B: For valves outside the scope of API 641, other low fugitive emissions type testing such as ISO15848-1 may be specified by the purchaser.

/ISO15848 part 1. The test report shall be made available to purchaser upon request. (ISO15848 part 1 or API641 should be optional?)

5.1.4 Cryogenic Service

Formatted: Font: Bold, No underline

Formatted: No underline

Formatted: Font: Bold, No underline

Formatted: No underline, Font color: Pink

Formatted: No underline

Formatted: Font color: Pink

Formatted: Font color: Pink

Formatted: Normal, Adjust space between Latin and Asian text, Adjust space between Asian text and numbers

Formatted: Font color: Pink

Formatted: Font color: Pink

Formatted: Font color: Red

Formatted: Font color: Pink

~~Valves required to operate in cryogenic service shall meet the additional requirements specified in (ANSI/MSS SP-134 (ASME B16.34). ISO28921-1. it has design requirements for the extension (this is a different design?).~~ When valves are specified for cryogenic service, the design shall additionally meet the requirements of ANSI/MSS SP-134 unless otherwise specified by purchaser (e.g. ISO 28921-1).

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 permanent marking on the shaft or by a shaft shape.

The gearbox and actuator (if installed) shall be provided with a position indicator to indicate the disc position

The design shall ensure that the valve and 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.

5.1.8 Category B Valves - Differential Pressure Rating by Direction

Unless otherwise agreed, valve shall be bidirectional, having the same differential pressure rating in both directions. The differential pressure rating shall be marked on the name plate in accordance with 8.3 e) and f) d).

Formatted: Head3

Formatted: Paragraph, Indent: Left: 0"

5.1.9 Dead-end Service

When specified by the purchaser, all components of lug-type and double-flanged valves shall pass the API 598 high-pressure closure test at 110% of the valve's differential pressure rating in each direction.

Valves designed for uni-directional dead-end service shall pass the API 598 high-pressure closure test at 110% of the valve's differential pressure rating in one direction and require additional marking per 8.5.

When the seat retainer is on the downstream side, the high-pressure closure test shall be performed with the seat retainer fully unrestrained (i.e. no downstream flange or clamping of the retainer).

5.1.10 Disc Seal Retention

Removable valve parts and seat rings shall be positively secured against loosening. The application of spring tension pins is not allowed.

5.1.11 Lifting

The manufacturer shall determine the need of lifting points of the valve and provide lifting and handling recommendation for safe lifting operations for valves weighing more than 23 kg (50 lb).

5.2 Body

5.2.1 The minimum body-wall thickness shall comply with the applicable ASME B16 standards listed in Section 2 based on the body material. If the applicable standard covers fittings (i.e., ASME B16.1, ASME B16.24, ASME B16.42) for a particular material, the valve minimum wall thickness shall be as specified for fittings. The valve design shall be structurally suitable for its stated pressure and temperature limits, taking into account that localized thinning may be necessary between the shaft bore in the body and the adjacent bolt holes. Such sections shall be designed in accordance with the requirements of ASME B16.34.

5.2.2 When a wafer-type valve is installed between piping flanges and the disc is in the closed position, the valve shall be self-centering to the flange bolting pattern, that is, designed to center itself within the bolt circle. Self-centering may be achieved by using the valve's outside diameter or by means of integral or attached alignment devices.

5.2.3

(a) End flanges for double-flanged valves shall be integrally cast or forged with the body; however, flanges may be attached by full-penetration butt-welding if agreed to by the purchaser. End flanges attached by

welding shall conform to ASME B16.5 or ASME B16.47 as applicable and have butt-welding ends for use without backing rings. ~~Unless otherwise~~ Unless otherwise specified by the purchaser specification, welds, welding procedure, and welder or welding operator qualification shall conform to ASME B31.3. The finished weld thickness shall not be less than the minimum body-wall thickness. 5-2.3

(b) End flanges for double-flanged valves and bolt hole drilling templates of lugs of lug-type valves shall comply with the dimensional requirements of the applicable ASME B16 standards to the shell rating as per 4.2.

5.2.4 Butt-welding ends shall conform to the requirements of ASME B16.25 with an inside diameter (denoted as "B" in ASME B16.25) tolerance per ASME B16.34.

5.2.5 If drain or bypass connections are specified by the purchaser, they shall conform to ASME B16.34 or MSS SP-45, as applicable.

5.3 Face-to-face Dimensions

5.3.1 Face-to-face dimensions for lug- and wafer-type valves shall be as listed in Table 2 and Table 3a. The as-installed and compressed dimension shall be used for valves that use nonmetallic liners, sleeves, or auxiliary seals extending from or over the body contact faces.

NOTE: When valve body liners, sleeves, or O-ring seals act as flange-sealing surfaces, separate gaskets are typically not required unless specifically recommended by the manufacturer.

5.3.2 Face-to-face dimensions for double-flanged valves shall be as listed in Table 3b for long pattern valves or Table 3c for short pattern valves.

NOTE Table 3c includes two acceptable variations of face-to-face dimensions for Class 300 category B valves.

5.3.3 Face-to-face dimensions in Table 3a and Table 3c apply to flanged valves with raised face and ring joint facings. Special lengths may be provided for valves with ring joint facings when agreed between the manufacturer and purchaser.

5.3.4 Face-to-face dimensions in Table 3b apply to flanged valves with raised face facings. For valves with ring joint facings, ASME B16.10-2022, Table 3.3-1, X dimension shall be added to the face-to-face dimension in Table 3b.

5.3.5 Face-to-face dimensions for butt-welding end valves shall be the manufacturer's standard.

Table 2—Face-to-face Dimensions for Category A Valves (Lug- and Wafer-type)

| Valve Size | | Face-to-face Dimensions | | Maximum Variance ± | |
|------------|-------|-------------------------|------|--------------------|------|
| DN | NPS | mm | in. | mm | in. |
| 50 | 2 | 43 | 1.69 | 1.5 | 0.06 |
| 65 | 2 1/2 | 46 | 1.81 | 1.5 | 0.06 |
| 80 | 3 | 46 | 1.81 | 1.5 | 0.06 |
| 100 | 4 | 52 | 2.06 | 1.5 | 0.06 |

Formatted: Font color: Pink, Strikethrough

Formatted: Font color: Pink

| | | | | | |
|---|----------|----------------|-------|-----|------|
| 125 | 5 | 56 | 2.19 | 1.5 | 0.06 |
| 150 | 6 | 56 | 2.19 | 1.5 | 0.06 |
| 200 | 8 | 60 | 2.38 | 3.3 | 0.13 |
| 250 | 10 | 68 | 2.69 | 3.3 | 0.13 |
| 300 | 12 | 78 | 3.06 | 3.3 | 0.13 |
| 350 | 14 | 78 | 3.06 | 3.3 | 0.13 |
| 400 | 16 | 102 | 4.00 | 3.3 | 0.13 |
| 450 | 18 | 114 | 4.50 | 3.3 | 0.13 |
| 500 | 20 | 127 | 5.00 | 3.3 | 0.13 |
| 600 | 24 | 154 | 6.06 | 3.3 | 0.13 |
| 750 | 30 | 165 | 6.50 | 6.4 | 0.25 |
| 900 | 36 | 200 | 7.88 | 6.4 | 0.25 |
| 1050 | 42 | 251 | 9.88 | 6.4 | 0.25 |
| 1200 | 48 | 276 | 10.88 | 6.4 | 0.25 |
| 1250 to 1500 | 50 to 60 | — ^a | | 6.4 | 0.25 |
| ^a Dimensions shall be manufacturer's standard or as agreed between purchaser and manufacturer. | | | | | |

Table 3a—Face-to-face Dimensions for Category B Valves (Lug- and Wafer-type)

| Valve Size | | Class 150 | | Class 300 | | Class 600 | | Class 900 | | Maximum Variance ± | |
|------------|-------|----------------|------|-----------|------|----------------|------|----------------|-----|-----------------------|------|
| DN | NPS | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. |
| 50 | 2 | — ^a | | | | | | | | 3.3 | 0.13 |
| 65 | 2 1/2 | 48 | 1.88 | 48 | 1.88 | — ^a | | | | 3.3 | 0.13 |
| 80 | 3 | 48 | 1.88 | 48 | 1.88 | 54 | 2.12 | — ^a | | 3.3 | 0.13 |
| 100 | 4 | 54 | 2.12 | 54 | 2.12 | 64 | 2.50 | — ^a | | 3.3 | 0.13 |

| | | | | | | | | | | |
|--|----------|----------------|------|-----|------|-----|------|----------------|-----|------|
| 150 | 6 | 57 | 2.25 | 59 | 2.31 | 78 | 3.06 | — ^a | 3.3 | 0.13 |
| 200 | 8 | 64 | 2.50 | 73 | 2.88 | 102 | 4.00 | — ^a | 3.3 | 0.13 |
| 250 | 10 | 71 | 2.81 | 83 | 3.25 | 117 | 4.62 | — ^a | 3.3 | 0.13 |
| 300 | 12 | 81 | 3.19 | 92 | 3.62 | 140 | 5.50 | — ^a | 3.3 | 0.13 |
| 350 | 14 | 92 | 3.62 | 117 | 4.62 | 155 | 6.12 | — ^a | 3.3 | 0.13 |
| 400 | 16 | 102 | 4.00 | 133 | 5.25 | 178 | 7.00 | — ^a | 3.3 | 0.13 |
| 450 | 18 | 114 | 4.50 | 149 | 5.88 | 200 | 7.88 | — ^a | 3.3 | 0.13 |
| 500 | 20 | 127 | 5.00 | 159 | 6.25 | 216 | 8.50 | — ^a | 3.3 | 0.13 |
| 600 | 24 | 154 | 6.06 | 181 | 7.12 | 232 | 9.13 | — ^a | 3.3 | 0.13 |
| 650 to 1200 | 26 to 48 | — ^a | | | | | | | 6.4 | 0.25 |
| 1250 to 1500 | 50 to 60 | — ^a | | | | | | — | 6.4 | 0.25 |
| a Dimensions shall be manufacturer's standard or as agreed between purchaser and manufacturer. | | | | | | | | | | |

Table 3b—Face-to-face Dimensions for Category B Valves (Double-flanged Long Pattern)

| Valve Size | | Class 150 ^a | | Class 300 ^a | | Class 600 ^a | | Class 900 ^a | | Maximum Variance ± | |
|------------|-----|------------------------|-------|------------------------|-------|------------------------|-------|------------------------|-------|-----------------------|------|
| DN | NPS | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. |
| 80 | 3 | 203 | 8.00 | 282 | 11.12 | 356 | 14.00 | — ^b | | 3.3 | 0.13 |
| 100 | 4 | 229 | 9.00 | 305 | 12.00 | 432 | 17.00 | — ^b | | 3.3 | 0.13 |
| 150 | 6 | 267 | 10.50 | 403 | 15.88 | 559 | 22.00 | 610 | 24.00 | 3.3 | 0.13 |
| 200 | 8 | 292 | 11.50 | 419 | 16.50 | 660 | 26.00 | 737 | 29.00 | 3.3 | 0.13 |
| 250 | 10 | 330 | 13.00 | 457 | 18.00 | 787 | 31.00 | 838 | 33.00 | 3.3 | 0.13 |
| 300 | 12 | 356 | 14.00 | 502 | 19.75 | 838 | 33.00 | 965 | 38.00 | 3.3 | 0.13 |
| 350 | 14 | 381 | 15.00 | 762 | 30.00 | 889 | 35.00 | 1029 | 40.50 | 3.3 | 0.13 |
| 400 | 16 | 406 | 16.00 | 838 | 33.00 | 991 | 39.00 | 1130 | 44.50 | 3.3 | 0.13 |
| 450 | 18 | 432 | 17.00 | 914 | 36.00 | 1092 | 43.00 | 1219 | 48.00 | 3.3 | 0.13 |
| 500 | 20 | 457 | 18.00 | 991 | 39.00 | 1194 | 47.00 | 1321 | 52.00 | 3.3 | 0.13 |
| 600 | 24 | 508 | 20.00 | 1143 | 45.00 | 1397 | 55.00 | 1549 | 61.00 | 4.0 | 0.16 |

| | | | | | | | | | | |
|--------------|----------|----------------|-------|------|-------|------|-------|----------------|-----|------|
| 650 | 26 | 559 | 22.00 | 1245 | 49.00 | 1448 | 57.00 | — ^b | 4.0 | 0.16 |
| 700 | 28 | 610 | 24.00 | 1346 | 53.00 | 1549 | 61.00 | — ^b | 4.0 | 0.16 |
| 750 | 30 | 610 | 24.00 | 1397 | 55.00 | 1651 | 65.00 | — ^b | 4.0 | 0.16 |
| 800 | 32 | 711 | 28.00 | 1524 | 60.00 | 1778 | 70.00 | — ^b | 4.0 | 0.16 |
| 850 | 34 | — ^b | | | | | | | 4.0 | 0.16 |
| 900 | 36 | 711 | 28.00 | 1727 | 68.00 | 2083 | 82.00 | — ^b | 5.0 | 0.19 |
| 950 to 1200 | 38 to 48 | — ^b | | | | | | | 5.0 | 0.19 |
| 1250 to 1500 | 50 to 60 | — ^b | | | | | | — ^b | 5.0 | 0.19 |

^a Dimensions listed agree with ASME B16.10 for flanged gate valves.

^b Dimensions shall be manufacturer's standard or as agreed between purchaser and manufacturer.

Table 3c—Face-to-face Dimensions for Category B Valves (Double-flanged Short Pattern)

| Valve Size | | Class 150 ^a or Class 300 ^a | | Class 300 ^b | | Class 600 ^b | | Class 900 ^c | | Maximum Variance ± | |
|------------|-----|--|-------|------------------------|-------|------------------------|--------------------|------------------------|--------------------|--------------------|------|
| DN | NPS | mm | in. | mm | in. | mm | in. | mm | in. | Mm | in. |
| 80 | 3 | 114 | 4.50 | 180 | 7.09 | 180 | 7.09 | — ^d | | 3.3 | 0.13 |
| 100 | 4 | 127 | 5.00 | 190 | 7.48 | 190 | 7.48 | — ^d | | 3.3 | 0.13 |
| 150 | 6 | 140 | 5.50 | 210 | 8.27 | 210 | 8.27 | 225 | 8.86 | 3.3 | 0.13 |
| 200 | 8 | 152 | 6.00 | 230 | 9.06 | 230 | 9.06 | 275 | 10.83 | 3.3 | 0.13 |
| 250 | 10 | 165 | 6.50 | 250 | 9.84 | 250 | 9.84 | 325 | 12.80 | 3.3 | 0.13 |
| 300 | 12 | 178 | 7.00 | 270 | 10.63 | 270 | 10.63 | 375 | 14.76 | 3.3 | 0.13 |
| 350 | 14 | 190 | 7.50 | 290 | 11.42 | 290 | 11.42 | 425 | 16.73 | 3.3 | 0.13 |
| 400 | 16 | 216 | 8.50 | 310 | 12.20 | 310 | 12.20 | 475 | 18.70 | 3.3 | 0.13 |
| 450 | 18 | 222 | 8.75 | 330 | 12.99 | 330 | 12.99 | 500 | 19.69 | 3.3 | 0.13 |
| 500 | 20 | 229 | 9.00 | 350 | 13.78 | 350 | 13.78 | 575 ^e | 22.64 ^e | 3.3 | 0.13 |
| 600 | 24 | 267 | 10.50 | 390 | 15.35 | 390 | 15.35 | 675 ^e | 26.58 ^e | 4.0 | 0.16 |
| 650 | 26 | 292 | 11.50 | 410 | 16.14 | 410 ^e | 16.14 ^e | — ^d | | 4.0 | 0.16 |
| 700 | 28 | 292 | 11.50 | 430 | 16.93 | 430 | 16.93 | — ^d | | 4.0 | 0.16 |
| 750 | 30 | 318 | 12.52 | 450 | 17.72 | 450 ^e | 17.72 ^e | — ^d | | 4.0 | 0.16 |

| | | | | | | | | | | |
|--------------|----------|----------------|-------|-----|-------|------------------|--------------------|----------------|-----|------|
| 800 | 32 | 318 | 12.52 | 470 | 18.50 | 470 | 18.50 | — ^d | 4.0 | 0.16 |
| 850 | 34 | — ^d | | | | | | | 4.0 | 0.16 |
| 900 | 36 | 330 | 12.99 | 510 | 20.08 | 510 | 20.08 | — ^d | 5.0 | 0.19 |
| 950 | 38 | 410 | 16.14 | 530 | 20.87 | 530 ^e | 20.87 ^e | — ^d | 5.0 | 0.19 |
| 1000 | 40 | 410 | 16.14 | 550 | 21.65 | 550 | 21.65 | — ^d | 5.0 | 0.19 |
| 1050 | 42 | 410 | 16.14 | 570 | 22.44 | 570 ^e | 22.44 ^e | — ^d | 6.0 | 0.24 |
| 1100 to 1150 | 44 to 46 | — ^d | | | | | | | 6.0 | 0.24 |
| 1200 | 48 | 470 | 18.50 | 630 | 24.80 | 630 | 24.80 | — ^d | 6.0 | 0.24 |
| 1250 to 1500 | 50 to 60 | — ^d | | | | | | | 6.0 | 0.24 |

NOTE: See NOTES TO PURCHASER, B.1.3.e).

^a The dimensions listed agree with ISO 5752 Basic Series 13, EN 558 and EN 593, where applicable.

^b The dimensions listed agree with ISO 5752 Basic Series 14, EN 558 and EN 593, where applicable.

^c The dimensions listed agree with ISO 5752 Basic Series 8a up to DN 450 (NPS 18).

^d Dimensions shall be manufacturer's standard or as agreed between purchaser and manufacturer.

^e Special lengths may be provided by agreement between the purchaser and manufacturer.

5.4 Valve Body Flange Facings

5.4.1 Body contact faces of gray iron, ductile iron, and cast copper alloy valves that require separate gaskets shall be finished as specified in MSS SP-6

5.4.2 Body contact faces of steel or alloy valves that require separate gaskets shall be finished as specified in ASME B16.5 or ASME B16.47 as applicable.

5.5 Disc Clearance

The manufacturer shall design the valve to provide clearance between the disc and the inside diameter of the connecting pipe or flange as specified in Annex D, in accordance with the ASME class rating for the valve.

NOTE For lug- and wafer-type valves and some double-flanged designs, the disc will protrude beyond the body faces when the valve is open.

5.6 Shaft and Shaft Seals

5.6.1 The shaft-to-disc connection and all parts of the shaft within the pressure boundary shall, under torsional load, exceed the strength of the shaft that lies outside the pressure boundary by more than 10 %. Determination of the shaft strength and the shaft-to-disc connection strength shall be by calculation or testing.

5.6.2 The design shall ensure that with an unbroken shaft or shaft-to-disc connection, the shaft cannot be removed from the valve by disassembly or removal of the gland bolting, gearbox, actuator, or gearbox/actuator mounting hardware.

5.6.3 The shaft shall be an anti-blowout design to ensure that if failure of the shaft occurs within the pressure boundary, no portion of the shaft can be ejected from the valve by internal pressure. The design may use the gland and gland bolting to retain a broken shaft. The design shall not rely on actuation components (e.g. gear operators, actuators, levers, mounting hardware, etc.) to prevent shaft ejection.

5.6.4 Category B valves shall have adjustable shaft packing. The packing mechanism shall allow packing adjustment while the valve is pressurized with line fluid.

5.7 Piping Connection External Bolt Holes

5.7.1 Unless specified otherwise in the purchase order, lugs of lug-type valves shall be provided with threaded holes for studs or bolts. Threaded through holes may be fully or partially threaded through the lug.

5.7.2 Threaded bolt holes shall allow full thread engagement to a depth at least equal to the nominal bolt diameter; however, when the bolt hole is adjacent to the shaft, engagement to a depth of 67 % of the nominal bolt diameter is acceptable.

5.7.3 Threaded body-flange holes for bolts 1 in. or less in diameter shall be drilled and tapped in accordance with ASME B1.1, coarse-thread series, Class 2B. For bolts 1¹/₈ in. or more in diameter, such holes shall be drilled and tapped in accordance with ASME B1.1, eight-thread series, Class 2B.

5.7.4 Typical bolting options for lug- and wafer-type valves are shown in Figure 1.

5.8 Valve Body Seat Retainer—Category B Valves Only

5.8.1 Seat retainer plate is a separate part intended to retain and compress the valve seat. When mechanically fastened to the valve body, retaining fasteners shall be recessed to or below the flange gasket surface (see Figure 2). Seat retainer, bolting design, and materials shall comply with ASME B16.34.

5.8.2 For gasket seating surface interruptions, interruptions in the seating area of a centered ASME B16.20 spiral-wound gasket shall not exceed the limitations given in Figure 2.

NOTE The degree of interruption may affect the sealability of a spiral-wound gasket.

Formatted: Font: Bold

Formatted: Font: Bold

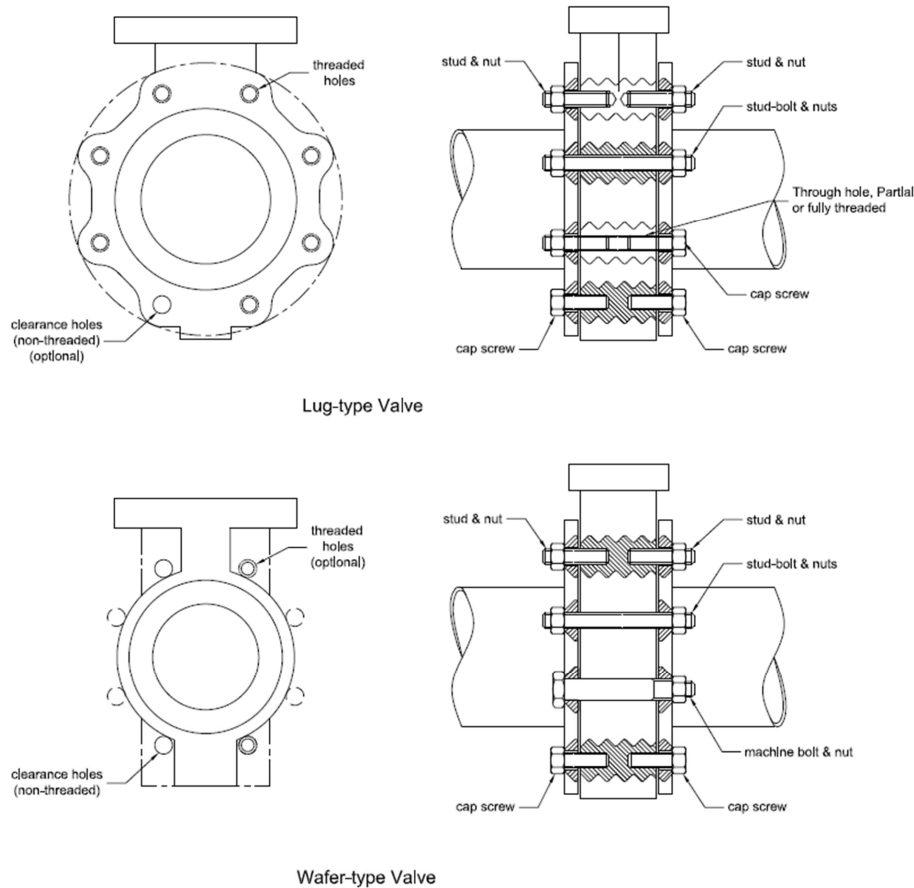
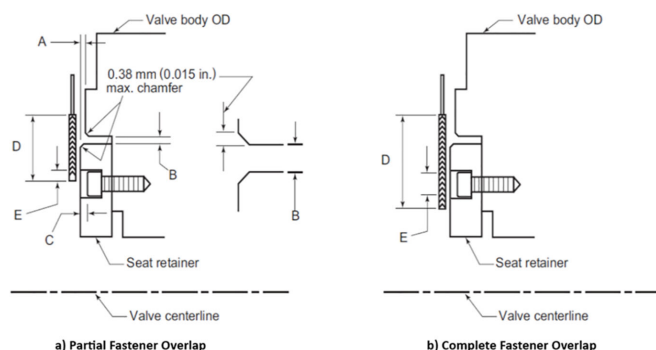


Figure 1—External Bolting Options for Lug- and Wafer-type Valves

WARNING — Some lug-type valves may only be suitable for dead-end service when installed with the seat retainer plate on the pressurized side. Valves with installation limitations for dead-end service are required to be marked by the manufacturer per Section 8. Failure to follow the manufacturer's installation markings may result in downstream leakage or blow-out into the atmosphere, potentially causing property damage and bodily injury.



NOTE: Seat retainer shown with socket head cap screws. Other screw types are permissible.

| Dimension | Definition | Range mm | Range in. |
|-----------|---|--|---------------------|
| A | Protrusion of seat retainer plate above valve body face (after being compressed by mating flange). Negative value denotes insert below valve body face. | +0.00 to -0.25 | +0.000 to -0.010 |
| B | Radial width of annular gap between valve body and seat retainer plate (exclusive of chamfer). | 0.76 max. | 0.030 max. |
| C | Distance of screw head below face of seat retainer plate. | 0.00 to 1.27 | 0.000 to 0.050 |
| D | Width of sealing area of spiral-wound gasket for valve's size and rating. | — | — |
| E | Distance gasket sealing area overlaps fastener opening in face of seat retainer plate (may occur at the ID or OD of the gasket). | < DN 150 (NPS 6): < 50 % of D ≥ DN 150 (NPS 6): < 35 % of D | |

Figure 2—Limitations for Flange Face Interruptions That Fall Within the Gasket Seating Area

5.9 Operating Mechanisms

5.9.1 Levers, gear operators, handwheel, and power actuators shall be equipped with provisions to prevent movement of the disc from the desired set position during normal operating conditions. Normal operating conditions include throttling service when specified by the purchaser.

5.9.2 Valves shall be closed by turning the shaft and attached operating device (such as a handle) in the clockwise direction.

5.9.3 The operating mechanism (lever or gear) shall be designed such that the operator input force applied to handle or handwheel required to operate the valve at the manufacturer's published torque requirement does not exceed the operator input force capability values given in MSS SP-91, using a position multiplier of 0.5. For handle lengths and handwheel diameters outside the scope of MSS SP-91, the input force shall not exceed 360 N (80 lb).

5.9.4 Lever lengths shall not exceed the following values:

| Valve Size | Maximum Lever Length |
|---|----------------------|
| Sizes less than or equal to DN 80 (NPS 3) | 360 mm (14 in.) |
| Sizes DN 100 and 125 (NPS 4 and 5) | 460 mm (18 in.) |
| Sizes DN 150 (NPS 6) and larger | 560 mm (22 in.) |

Note: The lever length is measured from the stem axis centerline to the end of the lever.

5.9.5 Handwheel diameter shall not exceed the following:

| Valve Size | Maximum Handwheel diameter |
|--|----------------------------|
| Sizes less than or equal to DN 150 (NPS 6) | 4 times the valve size |
| Sizes DN 200 and 250 (NPS 8 and 10) | 3 times the valve size |
| Sizes DN 300 (NPS 12) and larger | 900 mm (36 in.) |

5.10 Antistatic Design

When Antistatic design specified in the purchase order, valves shall incorporate an antistatic feature that ensures electrical continuity between the disc, shaft and body. 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.~~

NOTE: See 7.3 for information on optional testing of electrical resistance.

5.11 Packing Gland Bolting—Category B Valves Only

5.11.1 Gland bolting shall pass through holes in the gland flange. The use of open slots is not permitted in the cover flange, cover, or gland.

5.11.2 Packing gland bolts shall be designed so that the bolt stresses shall not exceed one-third ($\frac{1}{3}$) of the minimum ultimate tensile strength of the bolt with a packing stress of 38 MPa (5500 psi) and a gland bolt temperature of 38 °C (100 °F).

6 Materials

6.1 Body

~~6.1~~ Bodies of butterfly valves shall be made of a material conforming to a purchaser-selected material specification permitted in ASME B16.1, ASME B16.24, ASME B16.34, or ASME B16.42.

Formatted: Font color: Pink, Strikethrough

Formatted: Font color: Pink

6.2 Pressure Boundary Elements

All materials for pressure boundary elements shall be the manufacturer's standard and shall have equal or better corrosion resistance as the body. Purchaser may specify materials other than the manufacturer's standard. The design of pressure boundary elements and materials selected shall comply with the body pressure-temperature rating.

Formatted: Font: 10 pt, Not Bold

Formatted: Font: 10 pt, Not Bold

6.3 Process Wetted Parts

Formatted: Space Before: 0 pt, After: 0 pt, Line spacing: single

6.3.1 All process wetted parts, metallic and nonmetallic, shall be the manufacturer's standard unless otherwise agreed upon between the manufacturer and the purchaser.

6.3.2 Seats in the body and on the disc may be either separate or integral. Facings, overlays, and hard coatings may be applied to valve bodies, discs, or both as deposited metal, integral metal, mechanically retained metal, or resilient materials.

6.3.3 Process wetted parts shall not be welded to gray iron, ductile iron or cast copper alloy.

6.3.4 When sour service is specified on the purchase order, wetted parts shall meet the requirements of ANSI/NACE MR0103/ISO 17945 or ANSI/NACE MR0175/ISO 15156, whichever is specified by the purchaser.

6.4 Packing or Shaft Seal Materials

Packing or shaft seal materials shall be suitable for the specified service at the valve's pressure-temperature rating and shall be the manufacturer's choice, unless otherwise specified in the purchase order.

6.5 Gland Bolting

Gland bolts shall be at least intermediate strength as defined in ASME B16.5, to allow interchangeability of packing requiring higher bolt stress.

6.6 Operating Mechanisms—Category B Valves Only

Materials for the valve handle or gear box operator shall have a melting temperature of 760 °C (1400 °F) or higher.

7 Testing, Inspection, and Examination

7.1 Inspection and Examination

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

7.1.2

If inspection is specified in the purchase order, inspection shall be in accordance with API 598 and purchase order requirements.

Formatted: P3

7.2 Pressure Tests

7.2.1 Each valve shall be pressure tested as specified in API 598.

7.2.2 In addition to pressure testing per 7.2.1, When specified by the purchaser, valves for cryogenic service shall be low temperature tested per ANSI/MSS SP-134 or ISO 28921-1, as applicable, unless otherwise agreed by the purchaser.

7.3 Antistatic Testing

7.3.1 When specified, antistatic testing shall be performed.

Formatted: Font: Bold, Font color: Pink

7.3.2 The electrical resistance shall be tested with a power source not exceeding 12 V across the discharge path listed in 5.10 to not exceed 10 ohm on a dry valve.

Formatted: P3

Formatted: Font: Bold, Font color: Pink

7.4 Repair of Defects

7.4.1 When examination, inspection, or testing reveals a defect in the body of a steel, alloy, or nonferrous valve, the defect shall be repaired as permitted by the material specification to which the valve was manufactured.

7.4.2 Welding, brazing, plugging, peening, or impregnation to repair defects in gray iron, ductile iron, or copper alloy castings is not permitted.

8 Markings

8.1 Category B valves of steel, nickel alloy, or special alloy shall be marked in accordance with the requirements of ASME B16.34. All other butterfly valves shall be marked in accordance with ANSI/MSS SP-25.

8.2 A nameplate shall be attached to a steel or alloy body by welding or with pins made of a material similar to that permitted for the nameplate. For other valve body materials, a nameplate shall be attached to the body by suitable pins. The nameplate shall be made of austenitic stainless steel or nickel alloy, and

Formatted: Font: Bold

8.3 The nameplate shall include the following information:

Formatted: Font: Bold

- a) manufacturer's name;
- b) catalog reference number;
- c) size (DN or NPS);
- d) rating designation;

Category A:

- CWP rating (pressure rating at 38 °C (100 °F), the lesser of the shell rating or differential pressure rating considering both directions). Only the lesser rating shall be marked to represent both directions.
- pressure and temperature at maximum allowable temperature (the lesser of its shell rating or differential pressure rating considering both directions). Only the lesser rating shall be marked to represent both directions.
- the lesser of the shell or differential pressure ratings that represents both directions shall be marked, for both temperature conditions listed below
 - CWP rating [i.e., pressure rating up to 38 °C (100 °F)]
 - pressure rating at maximum allowable temperature

Category B:

- ASME pressure rating class designation (shell rating)
- shell rating at 38 °C (100 °F)
- differential pressure and temperature at maximum allowable temperature. When it is not same in both directions, both ratings shall be marked.
- ASME body (shell) pressure rating class designation
- the lesser of the shell or differential pressure ratings shall be marked for both temperature conditions listed below. If the lesser rating is not same in both directions, then the rating for each direction shall be marked.
 - pressure rating at 38 °C (100 °F)
 - pressure rating at maximum allowable temperature

g) identification of materials- (ASTM, EN or UNS number) except as noted in ASME B16.34 and/or MSS SP-25, including those used in the body, shaft, disc, seat, disc seating surface, body seating surface, and any internal liner or encapsulation (see 4.3.2);

Formatted: Font color: Pink

h) the marking "API 609A E10" (Category A valves) or "API 609B E10" (Category B valves) if the valve complies with this standard;

Formatted: Font color: Pink

i) the marking "API 641" if the valve is qualified in accordance with API 641.

Formatted: Font color: Pink

8.24 Valves having a manufacturer's preferred installation direction in the closed position and unidirectional valves shall be clearly and permanently marked "High-pressure side", "HP Side" or "HP" on the appropriate side in a location that is visible after the valve is installed. If a marking plate is used it shall conform to the requirements of 8.2.

Formatted: Font: Bold

Commented [GK2]: This requires more discussion 19March'24

8.5 Valves designed for dead-end service in only one direction shall be clearly and permanently marked "For Unidirectional Dead-end Service Only" and "High-pressure Side" per 8.4.

8.6 Unless otherwise specified by the purchaser an arrow mark to indicate high-pressure side or flow direction should not be used.

Formatted: Font: Bold

9 Packaging and Shipping

9.1 Coatings

9.1.1 Machined surfaces of materials that are not rust resistant shall be coated with easily removable rust preventive.

Formatted: Font: Bold

9.1.2 Unmachined exterior surfaces of a tested and inspected valve of ferrous materials shall be primed and coated in accordance with the manufacturer's standard practice unless otherwise specified.

9.1.3 Nonferrous and austenitic stainless steel valves need not be primed and coated unless otherwise specified.

Formatted: Font: Bold

9.2 Shaft Packing

Valves shall be shipped with the shaft packing installed.

NOTE Adjustment of the packing glands may be required before the valves are placed in service.

9.3 Packaging

~~Consider adding: "All valves shall be drained of any test fluids and dried in conformance with manufacturers documented procedures prior to packaging or shipping."~~

Formatted: Font color: Pink, Strikethrough

9.3.1 Unless otherwise specified by the purchaser, valve ends shall be fully covered to protect the sealing surfaces and valve internals during shipment and storage. The protective covers shall be wood, wood fiber, plastic, or metal and shall be securely attached to the valve ends by bolting, straps, clips, or suitable friction-locking devices. Covers shall not be of pressed cardboard (hardboard). Covers shall be designed so that the valves cannot be installed without the complete removal of the covers. Valves packaged in close-fitting corrugated cartons do not require additional end protection.

9.3.2 When export packaging is not specified in the purchase order, valves may be shipped loose, palletized, or packed in a box or crate. Valves shall be packaged to prevent potential damage during shipment.

9.3.3 When export packaging is specified in the purchase order, valves shall be packed in a wooden or corrugated cardboard box or crate suitable for overseas transport by ship. Valves shall be packed individually or collectively in a manner that will prevent shifting and potential damage during shipment.

9.3.4 Valves shipped with mounted actuators shall be packaged to prevent damage during transit.

9.3.5 All valves shall be drained of any test fluids and dried in conformance with manufacturers documented procedures prior to packaging or shipping.

Formatted: Font: Bold

9.4 Spare Parts

When specified in the purchase order, the vendor shall submit a complete list of recommended spare parts. The list shall include cross-sectional or assembly-type drawings for the purpose of part number identification.

9.10 Special Services

Formatted: Font color: Pink

When specified in the purchase order, valves in Hydrogen Fluoride (HF) Alkylation Service shall additionally meet the requirements of MSS SP-160.

10 Purchase Order Information

Purchase order information items listed in B.1.3 are considered an integral part of this standard and should be specified by the purchaser.

Annex A

The information in this annex has been intentionally removed.

See Annex A of API Specification Q1 or the API website for information pertaining to the API Monogram Program and use of the API Monogram on applicable products.

The following is stated in API 608 regarding Q1—API 608 Annex A states:

Annex A

The information in this annex has been intentionally removed. See Annex A of API Specification Q1 or the API website for information pertaining to the API Monogram Program and use of the API Monogram on applicable products.

Annex B

(Normative Informative)

Information to be Specified by Purchaser

B.1 Purchase Order

B.1.1 General

If no exceptions are to be taken to this standard, the purchase order need only refer to API 609 and specify the items listed in B.1.3 and any optional items listed in B.1.4.

B.1.2 Deviating Requirements

If the purchaser needs requires a butterfly valve that deviates from this standard, the deviating requirements shall be stated in the purchase order.

B.1.3 Required on the Purchase Order

The following items are required on the purchase order:

- a) valve size and class (see 1.2);

- b) valve category: A or B (see 1.2);
- c) type of body style (double-flanged, lug- or wafer-type, or butt-welding) (see 1.2);
NOTE For double-flanged valves, specify long pattern or short pattern (see Table 3b and Table 3c);
- d) facing requirements for Category B valves (raised, ring joint) (see 5.3.3 and 5.3.4);
- e) Class 300 **double-flanged** short pattern has two sets of dimensions (purchaser shall specify which is required [see Table 3c]);
- f) ~~cryogenic service (see 3.2 and 5.1.4);~~

Formatted: Font color: Pink

~~hf)~~ operator type: lever or other (see 5.9);

Formatted: Font color: Pink

~~ig)~~ materials of construction, including those for pressure boundary elements, process wetted parts and those for packing or shaft seals (see Section 6);

Formatted: Font color: Pink

Formatted: Font color: Pink

~~ih)~~ Body end connections (see 5.2.2, 5.2.3 and 5.2.4);

Formatted: Font color: Pink

— If applicable, series A or B of ASME B16.47 ~~or as~~ required

Formatted: Font color: Pink

— butt weld bevel end type and wall thickness

Formatted: Font color: Pink, Strikethrough

Formatted: Font color: Pink

B.1.4 Optional Items That ~~May~~ Can Be Specified

The following items can be specified on the purchase order:

- a) conformance with API 607 for applications where a fire-tested valve is required (see 5.1.2);
- b) conformance with API 641 for applications where compliance with low fugitive emissions is required (see 5.1.3);
- c) lockable device (see 5.1.5);
- d) end flanges attached by welding (see 5.2.3 ~~a~~);
- e) drain or bypass connections (see 5.2.5);
- f) through drilling or special tapping of lug-bolt holes (see 5.7.1);
- g) antistatic feature (see 5.10);
- h) antistatic testing (see 7.3);
- i) on-off or throttling service (see 5.9.1);
- j) operating conditions including maximum operating temperature, flow rate or line velocity, maximum pressure drop, fluid media, and specific gravity;
- k) materials for wetted parts to be suitable for sour service per ANSI/NACE MR0103/ISO17945 or ANSI/NACE MR0175/ISO15156 (see 6.3.4);
- l) packing or shaft seal materials (see 6.4);
- m) inspection by the purchaser (see 7.1.2);
- n) end protection (see 9.3.1) export packaging (see 9.3.3);
- o) special external coating (see 9.1.2);

Formatted: Font color: Pink

- p) recommended spare parts information (see 9.4);
- q) type of mating flange (slip-on, welding-neck, or other), mating flange specification, and flange bore or pipe inside diameter, as applicable;
- ~~st~~ special tagging/marking requirements;
- ~~ts~~ additional documentation requirements to be shipped with order such as MTR's, certificate of conformance or other;
- ~~st~~ use of welded on body extensions;
- t) ~~face-to-face dimensions for valve sizes not included in Tables 2, 3a, 3b, or 3c (manufacturer's standard or as agreed between purchaser and manufacturer).~~
- ~~tu~~ face-to-face dimension for valve sizes indicated as manufacturer's standard or as agreed between purchaser and manufacturer in Tables 2, 3a, 3b, or 3c;
- ~~uv~~ refer to API 598 for additional items that may need to be specified, including supplementary examination, the extent of inspection by the purchaser, the inspector's address, and optional high-pressure closure test;
- ~~vw~~ For category B Valves the purchaser may specify type of offset (single, double, triple, etc) ~~per refer Annex C;~~
- ~~wx~~ For operation by a chainwheel the purchaser shall specify the following, as applicable:
- the dimension from the centerline of the gearbox shaft to the bottom of the chain loop;
 - spur or bevel gear and the position of gearing handwheel relative the pipe axis;

NOTE Chainwheels may present a risk of injury or damage if not properly designed, installed, secured, operated, and maintained.

- ~~xy~~ For operation by electric, hydraulic, pneumatic, or other actuator type;
- maximum operating temperature and pressure differential across the valve disc in each direction;

~~z~~ dead end service (see 5.1.9);

~~yaa~~ cryogenic service (see 3.2, 5.1.4, and 7.2.2);

~~z~~ dead end service (see 5.1.9);

Formatted: Font color: Pink

Formatted: Font color: Pink

Formatted: Font color: Pink

Formatted: Font color: Pink

Formatted: Font color: Pink

Formatted: Font color: Pink

Formatted: Font color: Pink

Formatted: Font color: Pink

Formatted: Font color: Pink

Formatted: Font color: Pink

Formatted: Font color: Pink

Formatted: Font color: Pink

Formatted: Font color: Pink

Annex C

(informative)

Typical Butterfly Valve Construction and Nomenclature

Figure C.1 shows the typical construction and part nomenclature for a Category A concentric disc-type butterfly valve. Figure C.2 shows the typical construction and part nomenclature for a Category B offset disc-type butterfly valve. Figure C.3 depicts variations in disc offset constructions from concentric disc with no offset to triple offset.

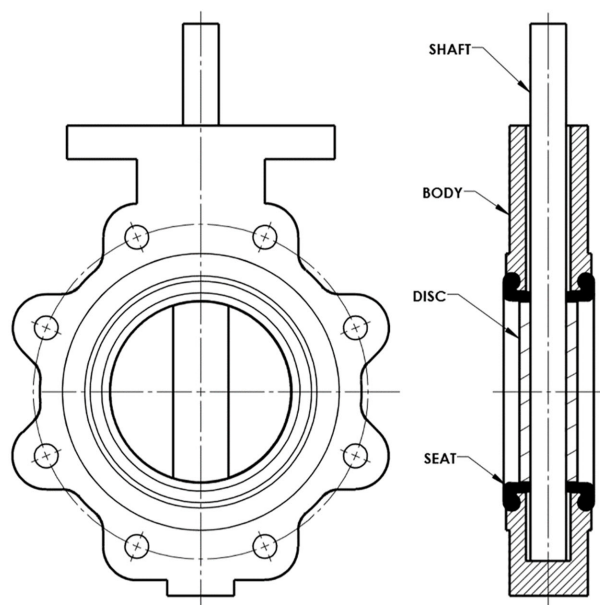


Figure C.1—Typical Part Nomenclature for Category A Concentric Disc Type

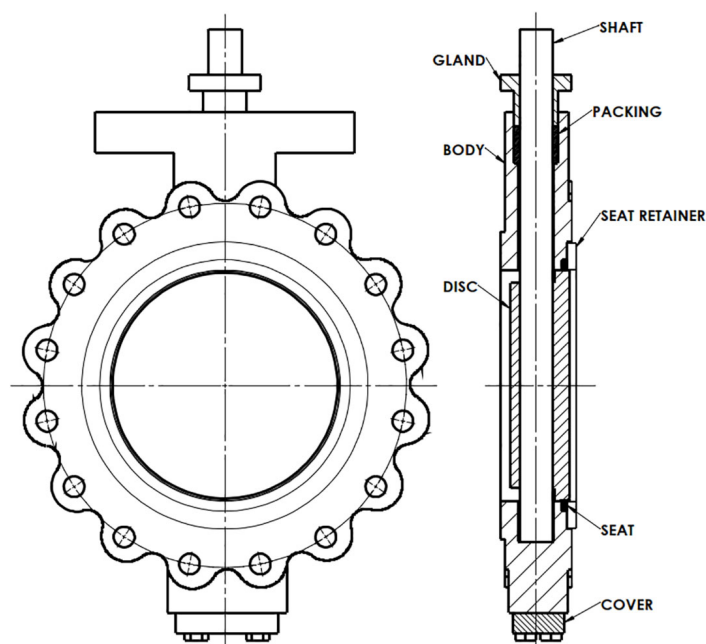
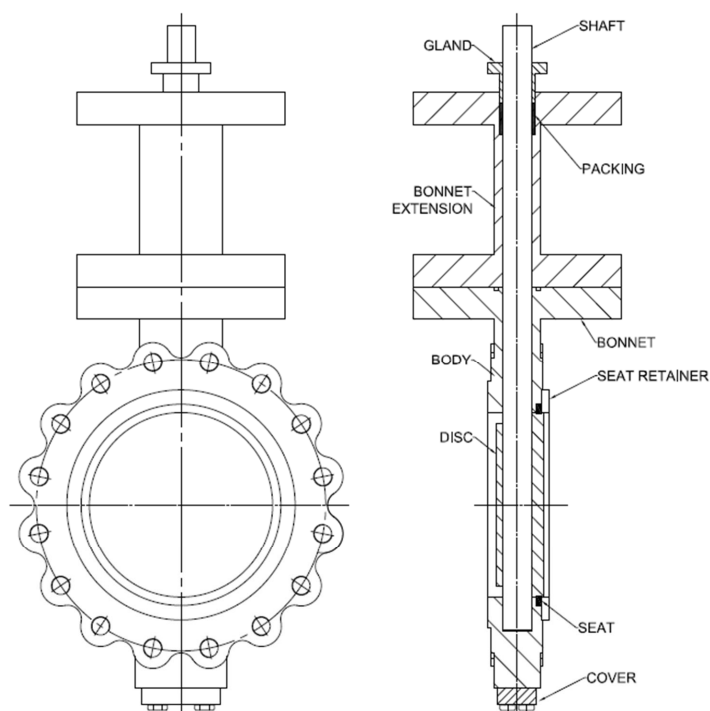


Figure C.2—(a) Typical Part Nomenclature for Category B Offset Disc Type design without bonnet extension



(b) design with bonnet extension

Figure C.2— Typical Part Nomenclature for Category B Offset Disc Type

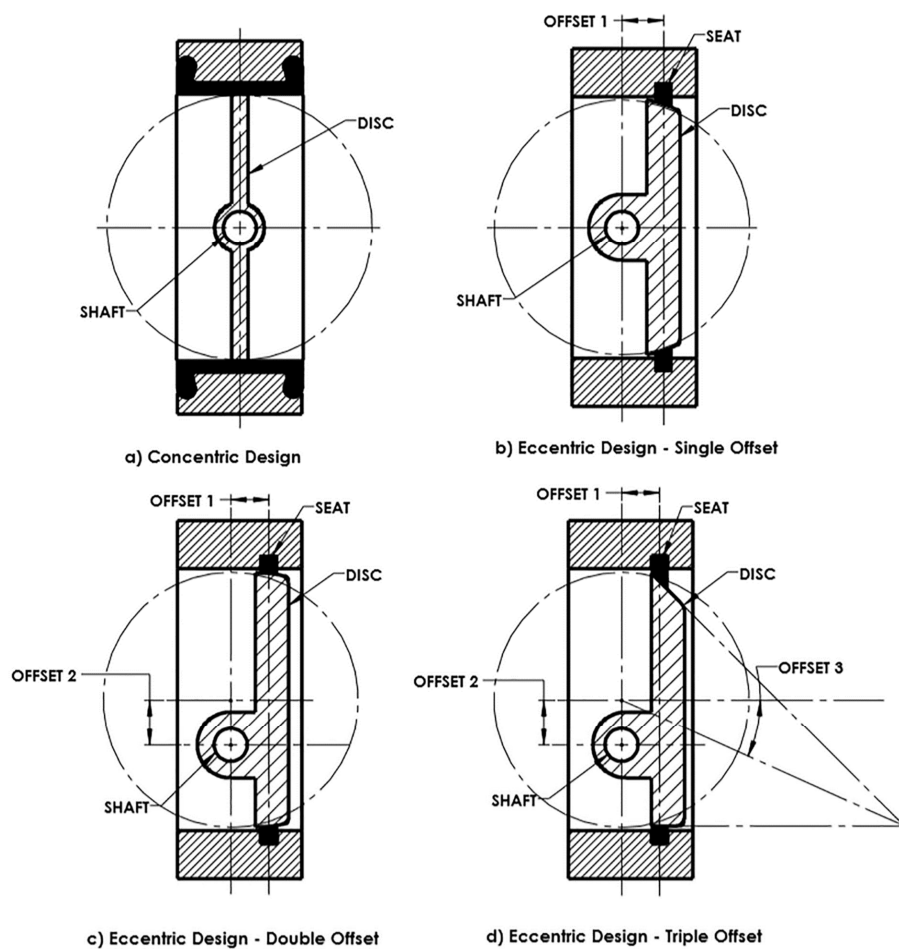


Figure C.3—Typical Offset-type Constructions

SCOPE

Annex D

(normative)

Disc-to-pipe Clearances

The maximum diameter of a concentric-type disc for a given size of valve and a given inside diameter of the connecting pipe or flange shall be determined as follows.

First, calculate the chord of the disc with the following equation:

$$a = d - 2c$$

Then use the result to determine the maximum disc diameter with the following equation:

$$D = \sqrt{W^2 + a^2}$$

where

- a is the chord of the disc in an open position, in millimeters (inches), as determined by the intersection of a plane through the installed face of the valve body (see Figure D.1);
- c is the nominal radial clearance between the disc and the inside of the pipe or flange, in millimeters (inches), when the disc and valve are concentrically located (see Table D.1 and Figures D.1 and D.2);
- d is the inside diameter of the connecting pipe or flange, in millimeters (inches), (see Figure D.1);

NOTE The inside diameter of the steel pipe may be determined by subtracting twice the nominal wall thickness from the outside diameter, using the appropriate dimensions listed in ASME B36.10.

- D is the maximum disc diameter, in millimeters (inches), (see Figure D.1);
- W is the minimum installed face-to-face dimension of the valve, in millimeters (inches), (see Figure D.1).

The calculation above assumes concentric location of the disc and shaft in the valve body. Equivalent nominal radial clearances shall be provided for eccentric or offset shaft construction at all angles of disc rotation.

Figure D.1 shows dimensional location for concentric disc-type construction. Figure D.2 shows the nomenclature and depicts offset disc-type construction. Table D.2 indicates the relationship of unlined steel pipe schedules to valve category, size, and ASME Class.

CAUTION — Purchaser shall ensure the proper disc-to-pipe clearance when a greater pipe wall thickness and/or an internal lining is being used. Failure to do so may cause the disc edge to come into contact with the pipe, causing damage to the disc and pipe.

Table D.1—Nominal Radial Clearances

| Valve Size | | Nominal Radial Clearance (c) | |
|-------------|----------|------------------------------|------|
| DN | NPS | mm | in. |
| 50 to 150 | 2 to 6 | 1.5 | 0.06 |
| 200 to 500 | 8 to 20 | 3.0 | 0.12 |
| 600 to 1500 | 24 to 60 | 6.4 | 0.25 |

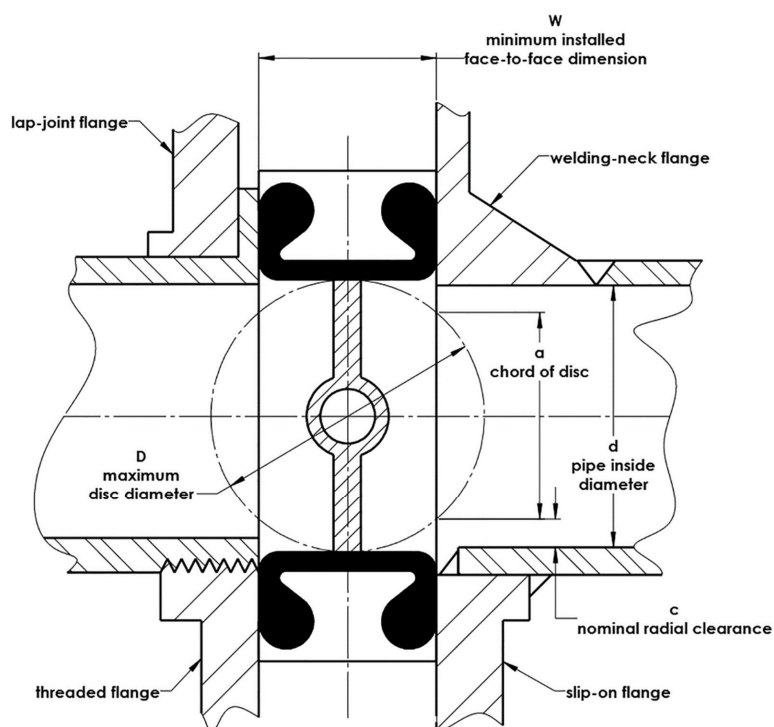


Figure D.1—Disc-to-pipe Clearance for Category A Concentric Disc Type

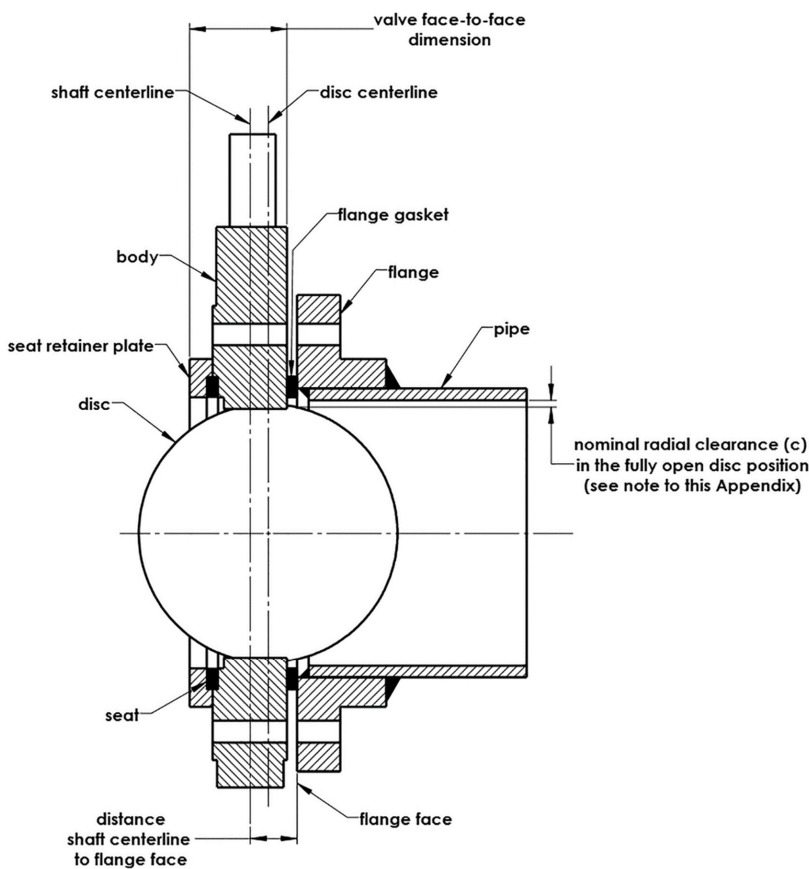


Figure D.2—Disc-to-pipe Clearance for Category B Offset Disc Type

Table D.2—Relationship of Unlined Steel Pipe Schedule to Valve Category, Size, and ASME Class

| Valve Size | | Category A | Category B | | |
|------------|------------|-----------------|-----------------|--------------|----------------|
| DN | NPS | | Class 150 | Class 300 | Class 600 |
| 50 to 65 | 2 to 2 1/2 | Standard weight | Standard weight | Extra strong | Not applicable |
| 80 to 100 | 3 to 4 | | | | Extra strong |
| 125 | 5 | | Not applicable | | |

| | | | | | |
|--------------|----------|----------------|-----------------|----------------|----------------|
| 150 | 6 | | Standard weight | Extra Strong | Extra strong |
| 200 to 350 | 8 to 14 | | | | Schedule 100 |
| 400 | 16 | | | Schedule 40 | |
| 450 to 600 | 18 to 24 | | | | |
| 650 to 950 | 26 to 38 | Extra strong | Extra strong | — ^a | — ^a |
| 1000 to 1500 | 40 to 60 | — ^a | — ^a | — ^a | — ^a |

NOTE This table considers full flange rating for ASTM A106 Grade B pipe with a mill tolerance of –12.5 % and a corrosion allowance of 3.175 mm (0.125 in.) except as noted below.

^aThere are no standard pipe schedules available for the required wall thickness. Pipe wall thicknesses are calculated for actual operating conditions rather than the full flange rating.

Bibliography

[1] ASME B16.1, *Gray Iron Pipe Flanges and Flanged Fittings—Classes 25, 125, and 250*

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

[21] EN 558, *Industrial valves—Face-to-face and centre-to-face dimensions of metal valves for use in flanged pipe systems—PN and Class-designated Valves*

[32] EN 593, *Industrial valves—Metallic butterfly valves for general purposes*

[48] ISO 5752, *Metal valves for use in flanged pipe systems—Face-to-face and center-to-face dimensions*

⁶European Committee for Standardization, CEN-CENELEC Management Centre, Avenue Marnix 17, B-1000 Brussels, Belgium, www.cen.eu.

⁷International Organization for Standardization, ISO Central Secretariat, Chemin de Blandonnet 8, CP 401—1214 Vernier, Geneva, Switzerland, www.iso.org.

Formatted: Font color: Pink

Formatted: Font color: Pink, Strikethrough

Formatted: Font color: Pink, Strikethrough

Formatted: Font color: Pink

Formatted: Font color: Pink, Strikethrough

Formatted: Font color: Pink, Strikethrough

Formatted: Strikethrough

[54] MSS SP-44, *Steel pipeline flanges*

[65] MSS SP-68, *High pressure butterfly valves with offset design*

SCOPV Committee Use Only-Not for distribution