INTERNATIONAL STANDARD

ISO 10631

Second edition
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Metallic butterfly valves for general purposes

Robinets métalliques à papillon d'usage général

Reference number
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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

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The committee responsible for this document is ISO/TC 153, *Valves*, Subcommittee SC 1, *Design, manufacture, marking and testing*.

This second edition cancels and replaces the first edition (ISO 10631:1994), which has been technically revised.

Metallic butterfly valves for general purposes

1 Scope

This International Standard specifies requirements for design, materials (e.g. steel, cast iron, ductile iron, copper alloy), pressure/temperature ratings and testing for butterfly valves having metallic bodies for use in general purpose flanged or butt welding piping systems.

This International Standard covers butterfly valves of the following nominal sizes, DN and NPS:

— DN 40; 50; 65; 80; 100; 125; 150; 200; 250; 300; 350; 400; 450; 500 (550); 600 (650); 700; 750; 800; 900; 1 000; 1 200; 1 400; 1 600; 1 800; 2 000; 2 200; 2 400.

— NPS 1 1/2; 2; 2 1/2; 3; 4; 5; 6; 8; 10; 12; 14; 16; 18; 20; (22); 24; (26); 28; 30; 32; 36; 40; 48; 56; 64; 72; 80; 88; 96.

This International Standard is applicable to butterfly valves of the following pressure designations, PN and Class:

— PN 2,5; PN 6; PN 10; PN 16; PN 25; PN 40;

— Class 125; 150; 300.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 185, *Grey cast irons — Classification*

ISO 1083, *Spheroidal graphite cast irons - Classification*

ISO 3755, *Cast carbon steels for general engineering purposes*

ISO 4991, *Steel castings for pressure purposes*

ISO 5208:2008, *Industrial valves — Pressure testing of metallic valves*

ISO 5209:1977, *General purpose industrial valves — Marking*

ISO 5211, *Industrial valves — Part-turn actuator attachments*

ISO 5752, *Metal valves for use in flanged pipe systems — Face-to-face and centre-to-face dimensions*

ISO 5922, *Malleable cast iron*

ISO 7005-3, *Metallic flanges — Part 3: Copper alloy and composite flanges*

ISO 9327-1, *Steel forgings and rolled or forged bars for pressure purposes — Technical delivery conditions — Part 1: General requirements*

ISO 9327-2, *Steel forgings and rolled or forged bars for pressure purposes — Technical delivery conditions — Part 2: Non-alloy and alloy (Mo, Cr and CrMo) steels with specified elevated temperature properties*

ISO 9327-3, *Steel forgings and rolled or forged bars for pressure purposes — Technical delivery conditions — Part 3: Nickel steels with specified low temperature properties*

ISO 9327-4, *Steel forgings and rolled or forged bars for pressure purposes — Technical delivery conditions — Part 4: Weldable fine grain steels with high proof strength*

ISO 9327-5, *Steel forgings and rolled or forged bars for pressure purposes — Technical delivery conditions — Part 5: Stainless steels*

ISO 9328-1, *Steel flat products for pressure purposes — Technical delivery conditions — Part 1: General requirements*

ISO 9328-2, *Steel flat products for pressure purposes — Technical delivery conditions — Part 2: Non-alloy and alloy steels with specified elevated temperature properties*

ISO 9328-3, *Steel flat products for pressure purposes — Technical delivery conditions — Part 3: Weldable fine grain steels, normalized*

ISO 9328-4, *Steel flat products for pressure purposes — Technical delivery conditions — Part 4: Nickel-alloy steels with specified low temperature properties*

ISO 9328-5, *Steel flat products for pressure purposes — Technical delivery conditions — Part 5: Weldable fine grain steels, thermomechanically rolled*

EN 1092-1:2007, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories PN designated — Part 1: Steel flanges*

EN 1092-2, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated — Part 2: Cast iron flanges*

EN 1092-3, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated — Part 3: Copper alloy flanges*

EN 12516-1, *Industrial valves — Shell design strength — Part 1: Tabulation method for steel valve shells*

EN 12516-2, *Industrial valves — Shell design strength — Part 2: Calculation method for steel valve shells*

EN 12516-4, *Industrial valves — Shell design strength — Part 4: Calculation method for valve shells manufactured in metallic materials other than steel*

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

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

ASME B16.25, *Buttwelding Ends*

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

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*

3 Terms and definitions

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

3.1
nominal size
DN
alphanumeric designation of size for components of a pipework system, which is used for reference purposes, comprising the letters DN followed by a dimensionless whole number which is indirectly related to the physical size, in millimetres, of the bore or outside diameter of the end connections

[SOURCE: ISO 6708:1995, definition 2.1]

3.2
nominal pressure
PN
numerical designation relating to pressure that is a convenient rounded number for reference purposes, and which comprises the letters PN followed by the appropriate reference number

Note 1 to entry: It is intended that all equipment of the same nominal size (DN) designated by the same PN number have compatible mating dimensions.

Note 2 to entry: The maximum allowable pressure depends on materials, design, and working temperature, and is to be selected from the tables of pressure/temperature ratings given in the appropriate standards.

[SOURCE: ISO 7268:1983, Clause 2, modified — The definition and Notes 1 and 2 have been slightly modified.]

3.3
NPS
alphanumeric designation of size for components of a pipework system, which is used for reference purposes, and which comprises the letters NPS followed by a dimensionless number indirectly related to the physical size of the bore or outside diameter of the end connections

Note 1 to entry: The number following the letters NPS does not represent a measurable value and is not intended to be used for calculation purposes except where specified in the relevant standard.

3.4
Class
alphanumeric designation used for reference purposes related to a combination of mechanical and dimensional characteristics of a component of a pipework system, which comprises the word “Class” followed by a dimensionless whole number

Note 1 to entry: The number following the word “Class” does not represent a measurable value and is not intended to be used for calculation purposes except where specified in the relevant standard.

3.5
face-to-face dimension
distance between the body ends of the installed equipment in accordance with ISO 5752

3.6
differential pressure
Δp
limiting pressure difference across the upstream and downstream sides of the closure element seals when the valve is in the closed position

Note 1 to entry: Differential pressure is expressed in bar.[1)]

3.7
cold working pressure
CWP
maximum fluid pressure assigned to a valve for operation at a fluid temperature between - 20 °C and 38 °C

1) 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm^2.

4 Pressure/temperature ratings

The pressure/temperature ratings of the valve shall meet the specification given in the appropriate pressure/temperature tables of the standards listed in Table 1.

Table 1

Body material	PN-designated valve	Class-designated valve
Steel	EN 12516-1	ASME B16.34
Cast iron	EN 1092-2	ASME B16.1
Ductile iron		ASME B16.42
Copper alloy	EN 1092-3	ASME B16.24

The complete assembly shall comply with differential pressure Δp/temperature ratings. The maximum allowable temperature and/or the design differential pressure may be limited by restrictions in the pressure/temperature ratings of materials used for certain components.

Restrictions shall be marked on the valve by the manufacturer (see Clause 8).

For temperatures below the lowest temperature listed in the pressure/temperature tables, the working pressure shall be no greater than the pressure for the lowest listed temperature. The use of valves at lower temperatures is the responsibility of the user. Consideration should be given to the loss of ductility and impact strength of materials at low temperature.

5 Design

5.1 Wall thickness

The minimum wall thickness shall be determined using the standards indicated in Table 2.

For pressure-temperature ratings of the valve bodies outside the size ranges of the referenced standards of Table 2, design and calculations for pressure-containing elements shall be in accordance with an internationally recognised design code or standards with consideration of pipe loads, operating forces, etc. The choice of standard shall be by agreement.

NOTE Examples of internationally recognised design codes or standards are ASME Section VIII, Division 1, or Division 2, and EN 13445-3.

Table 2

Body material	PN-designated valve	Class-designated valve
Steel	EN 12516-1 EN 12516-2	ASME B16.34
Cast iron	EN 12516-4	ASME B16.1
Ductile iron		ASME B16.42
Copper alloy		ASME B16.24

5.2 Construction examples

The valve shall be of either concentric disc design [see Figure 1 a)] or eccentric disc design [see Figure 1 b)]. The offset may be single, double or triple.

a) — Concentric design

b) — Eccentric design (double offset design shown)

Figure 1 — Construction illustrations

5.3 End connections

5.3.1 Double-flanged valves

End connections of double-flanged valves shall be in accordance with 5.7.2.1. See Figure 2.

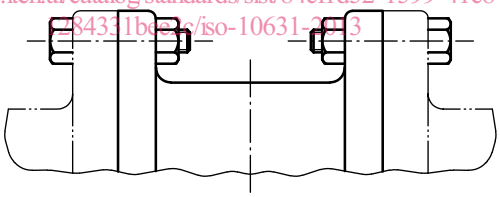


Figure 2 — End connections of double-flanged valves

5.3.2 Wafer-type valves

5.3.2.1 General

The PN-designated valves are for installation between pipe flanges that are in accordance with EN 1092-1, EN 1092-2 and EN 1092-3.

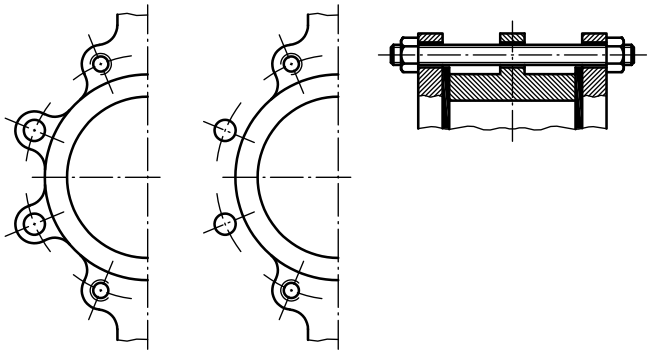
The Class-designated valves are for installation between pipe flanges that are in accordance with ASME B16.5 for NPS ≤ 24 or ASME B16.47 for NPS > 24.

Where through bolting is used with the result that the valve shaft holes are too close to the bolt holes, threaded bolt holes may be substituted.

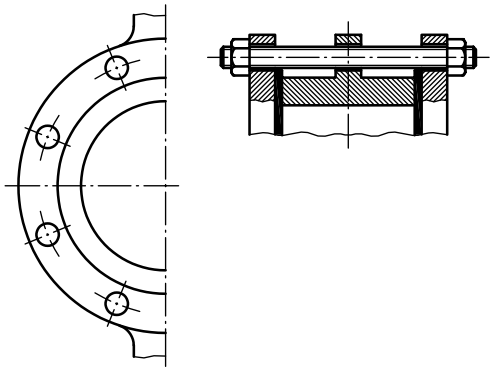
In case of valve size outside the scope of EN 1092, ASME B16.5 or ASME B16.47, another flange standard may be used by agreement between the manufacturer and the purchaser. The wall thickness is to be calculated by linear interpolation from standards specified in Table 2.

5.3.2.2 Wafer valve bodies with or without lugs

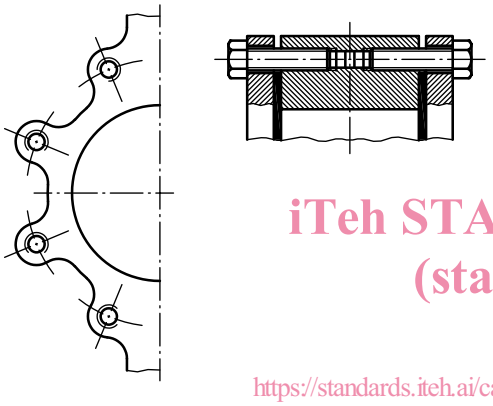
Configurations of valves covered by this subclause are illustrated in Figure 3.



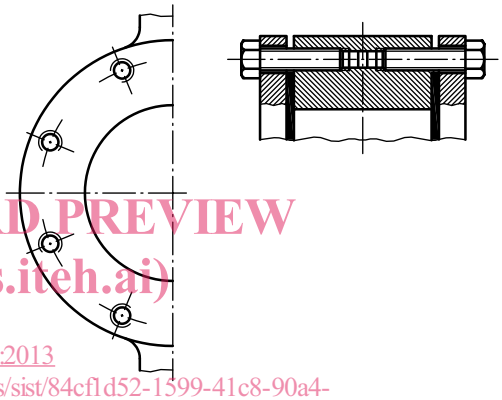
a) Valve with central lugs



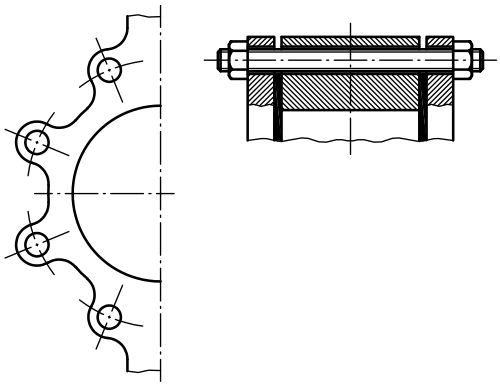
b) Central single-flange valve



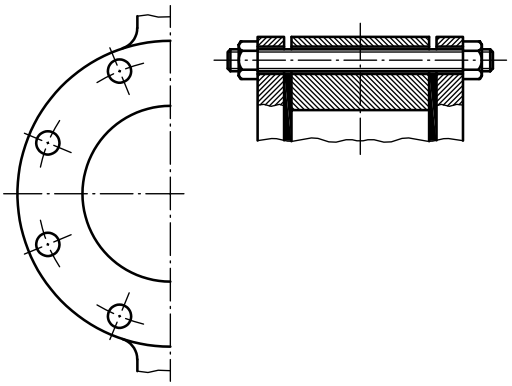
c) Valve with lugs with internally threaded holes



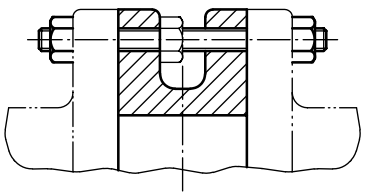
d) Single-flange valve with internally threaded holes



e) Valve with lugs with drilled holes



f) Single-flange valve with drilled holes



g) Valve with U-section

Figure 3 — Wafer valve bodies bolting configurations

5.3.2.3 Flangeless valves

Configurations of flangeless valves covered by this subclause are illustrated in Figure 4.

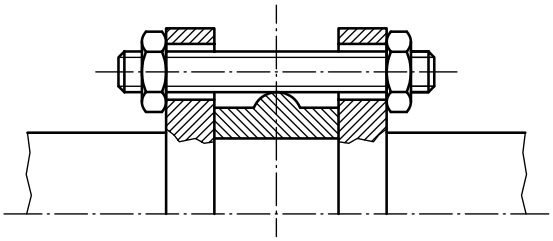


Figure 4 — Typical flangeless valves

The external diameter of a wafer-type valve body shall be such that the valve body is made to align with the flange bolting and the gasket surfaces.

5.3.3 Butt-welded ends

Configurations of butt-welded ends covered by this subclause are illustrated in Figure 5.

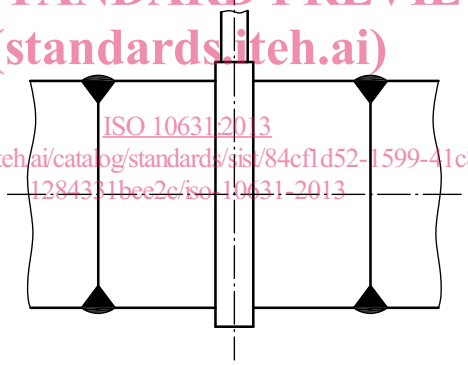


Figure 5 — Butt-welded ends

NOTE Weld ends are limited to steel valve bodies.

5.4 Shaft

If removal of external parts from the valve becomes necessary while the valve is under pressure,

— the shaft shall not be ejected out of the valve, and

— the shaft tightness to the atmosphere shall remain.

NOTE External parts are parts which are not included in the bare shaft valve (bracket, lever, actuator, etc.).

5.5 Operation

5.5.1 Direction of rotation

Unless otherwise specified in the synopsis data sheet, the valve shall be closed by operating the handwheel, lever or T-wrench in the clockwise direction when facing those devices.