INTERNATIONAL STANDARD

ISO 10631

First edition
1994-04-15

Metallic butterfly valves for general purposes

Robinets métalliques à papillon d'usage général

Reference number
ISO 10631:1994(E)

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.

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

International Standard ISO 10631 was prepared by Technical Committee ISO/TC 153, *Valves*, Subcommittee SC 1, *Design, manufacture, marking and testing*.

Annexes A and B of this International Standard are for information only.

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

Metallic butterfly valves for general purposes

1 Scope

This International Standard specifies the requirements for metallic butterfly valves

— with centred or eccentric disc,

— with centred or eccentric shaft,

— with metallic, polymeric, elastomeric or composite seating,

— with lined or unlined body,

— coated or uncoated,

to be used in flanged or butt-welded piping systems for shut-off, throttling or flow control.

It covers butterfly valves with nominal diameters 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;

and is applicable to valves of nominal pressure PN

2,5; 6; 10; 16; 20; 25; 40; 50.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 185:1988, *Grey cast iron — Classification.*

ISO 1083:1987, *Spheroidal graphite cast iron — Classification.*

ISO 2604-1:1975, *Steel products for pressure purposes — Quality requirements — Part 1: Forgings.*

ISO 3755:1991, *Cast carbon steels for general engineering purposes.*

ISO 4991:—[1], *Steel castings for pressure purposes.*

ISO 5208:1993, *Industrial valves — Pressure testing of valves.*

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

ISO 5210:1991, *Industrial valves — Multi-turn valve actuator attachments.*

ISO 5211:—[2], *Industrial valves — Part-turn valve actuator attachments.*

ISO 5752:1982, *Metal valves for use in flanged pipe systems — Face-to-face and centre-to-face dimensions.*

ISO 5922:1981, *Malleable cast iron.*

ISO 6708:—[3], *Pipe components — Definition of nominal size (DN).*

1) To be published.

2) To be published. (Revision of ISO 5211-1:1977, ISO 5211-2:1979 and ISO 5211-3:1982)

3) To be published. (Revision of ISO 6708:1980)

ISO 7005-1:1992, *Metallic flanges — Part 1: Steel flanges.*

ISO 7005-2:1988, *Metallic flanges — Part 2: Cast iron flanges.*

ISO 7005-3:1988, *Metallic flanges — Part 3: Copper alloy and composite flanges.*

ISO 7268:1983, *Pipe components — Definition of nominal pressure.*

ISO 9328-1:1991, *Steel plates and strips for pressure purposes — Technical delivery conditions — Part 1: General requirements.*

ISO 9328-2:1991, *Steel plates and strips for pressure purposes — Technical delivery conditions — Part 2: Unalloyed and low-alloyed steels with specified room temperature and elevated temperature properties.*

ISO 9328-3:1991, *Steel plates and strips for pressure purposes — Technical delivery conditions — Part 3: Nickel-alloyed steels with specified low temperature properties.*

ISO 9328-4:1991, *Steel plates and strips for pressure purposes — Technical delivery conditions — Part 4: Weldable fine grain steels with high proof stress supplied in the normalized or quenched and tempered condition.*

ISO 9328-5:1991, *Steel plates and strips for pressure purposes — Technical delivery conditions — Part 5: Austenitic steels.*

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 6708 (DN) and ISO 7268 (PN) and the following definitions apply.

3.1 face-to-face dimensions: Distance between the body ends of the installed equipment (in accordance with ISO 5752).

3.2 differential pressure, Δp: Difference between the upstream pressure of the disc when closed and the downstream pressure. It is expressed in pascals.

3.3 flow velocity, v: Ratio of the volume rate of flow (under given pressure and temperature conditions) to the section calculated with respect to a diameter bore, expressed in millimetres, and of value equal to the DN. It is expressed in metres per second.

4 Pressure/temperature ratings

Pressure/temperature ratings of the body shall meet the specifications given in the appropriate tables of materials in ISO 7005-1, ISO 7005-2 and ISO 7005-3.

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

The butterfly valves shall also comply with the requirements for tests as in clause 8.

5 Design

5.1 Construction examples

Three examples of butterfly valve construction are given in figure 1.

5.2 End connections

5.2.1 Double-flanged valves

See figure 2.

These valves have two flanges in accordance with ISO 7005-1, ISO 7005-2 or ISO 7005-3.

5.2.2 Wafer-type valves

5.2.2.1 Valves with lugs, single flange or with U-section

See figure 3.

These valves are for clamping between pipe flanges in accordance with ISO 7005-1, ISO 7005-2 or ISO 7005-3.

5.2.2.2 Flangeless valves

See figure 4.

NOTE 1 The external shape of the valve body shall be such that nuts and bolts in accordance with the standard in force allow for centring the body with respect to the pipe flanges whilst fully ensuring tightness at the connecting flange faces and free movement of the disc.

5.2.3 Butt-welded ends

See figure 5.

5.3 Tightness at shaft seals

If dismantling of the actuator becomes necessary (lever, gear reducer, power actuator), tightness to atmosphere shall be maintained.

5.4 Operation

5.4.1 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.

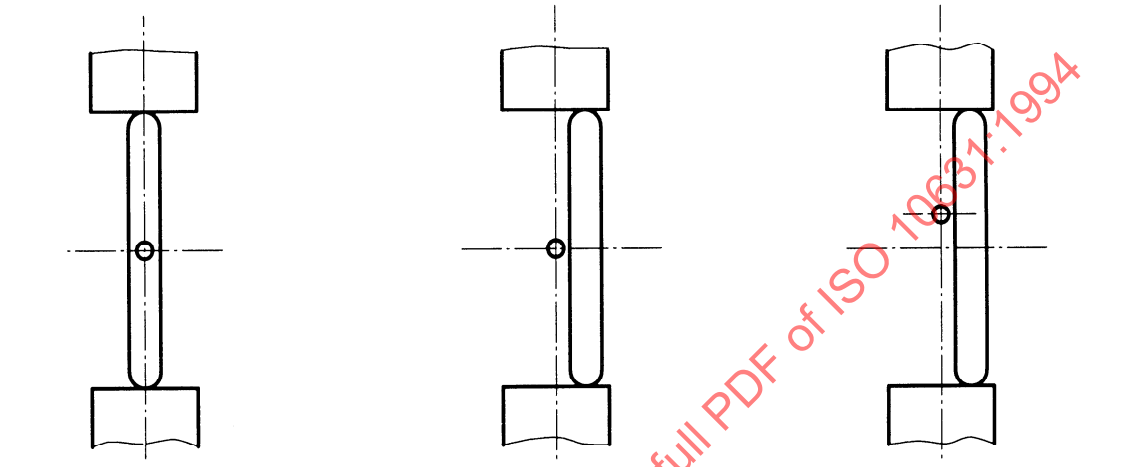


Figure 1 — Construction examples

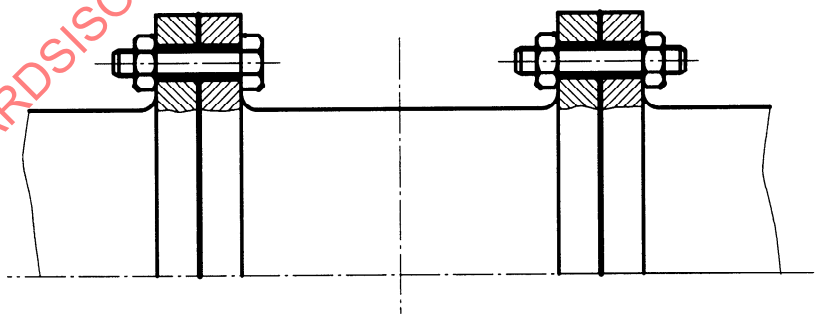
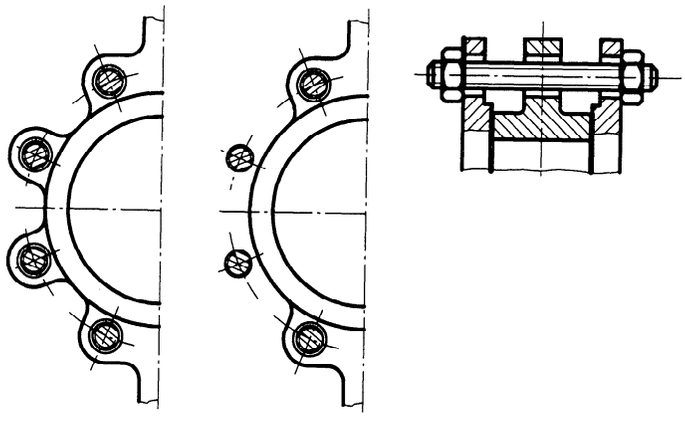
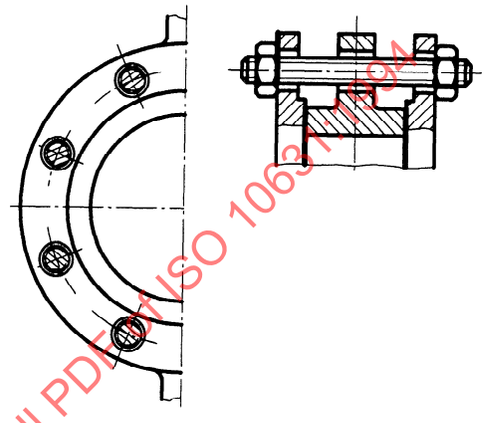


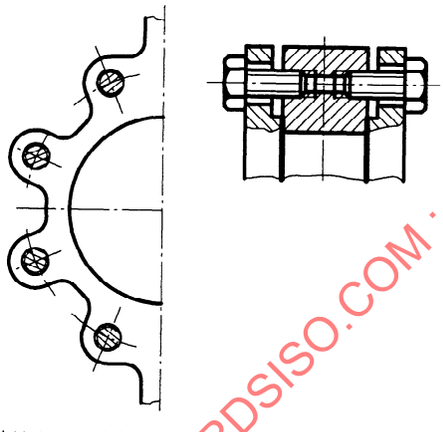
Figure 2 — Double-flanged valves



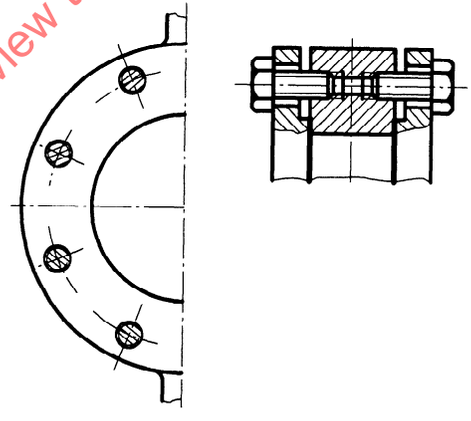
a) Valve with central lugs



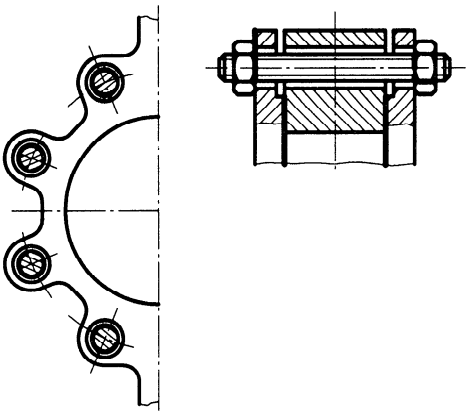
b) Central single-flange valve



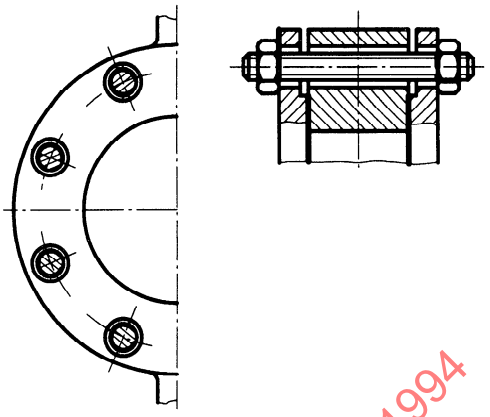
c) Valve with lugs with internally threaded bores



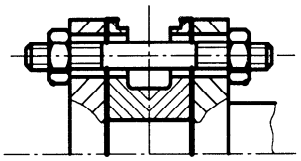
d) Single-flange valve with internally threaded bores



e) Valve with lugs with smooth bores



f) Single-flange valve with smooth bores



g) Valve with U-section

Figure 3 — Valves with lugs, single flange or with U-section

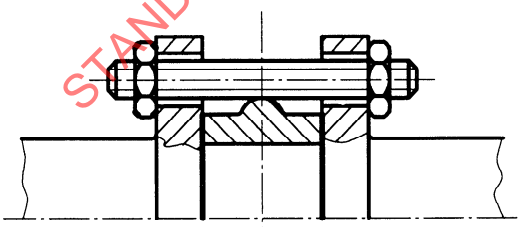


Figure 4 — Flangeless valve

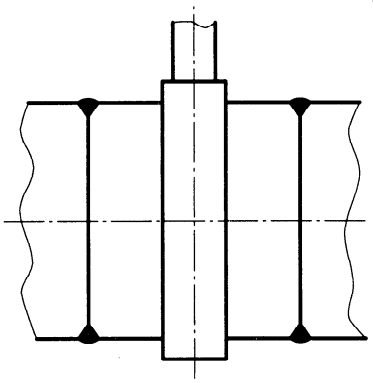


Figure 5 — Butt-welded ends

5.4.2 Actuating devices

Unless otherwise agreed between the manufacturer and the purchaser, the actuating device shall be used to open or close the disc to its fully open or fully closed position.

5.4.2.1 Direct actuation

5.4.2.1.1 Direct manual actuation

Direct manual actuation may be lever, handwheel or T-wrench.

Where a lever is used, the valve shall be open when the lever is parallel to the pipe.

5.4.2.1.2 Direct actuation by power actuator

When direct actuation is obtained by air, hydraulic or electric actuators, the design of the valve shall be such that either with or without an intermediate part, mounting of the part-turn actuator with a plate complying with ISO 5211 shall be possible.

5.4.2.2 Actuation by gear reducer

5.4.2.2.1 Manual actuation

The manual gear-reducing unit shall be of self-locking movement design (in any position) and shall be provided with stops in the two extreme travel positions.

The adjustable stops shall be set and secured in a reliable way.

The gear-reducing unit shall be fitted with a position indicator.

On request, the manufacturer shall indicate the number of turns which are necessary to complete a full opening or closing operation.

The design of the valve shall allow, with or without an intermediate part, mounting of a gear-reducing unit with a plate complying with ISO 5211.

5.4.2.2.2 Power actuation

The design of the gear-reducing unit shall allow, with or without an intermediate part, adaptation of an air, hydraulic or electric actuator fitted with a plate complying with ISO 5210.

5.4.2.3 Mounting conditions of actuating devices

The shaft end of the valve shall indicate the position of the disc, either by a mark or by its shape.

5.5 Force or torque to be applied to manually actuated valves

5.5.1 Actuating force for handwheel- or lever-actuated valves

Under first-use conditions at the maximum permissible pressure (MPP) at 20 °C and at the maximum flow velocity (table 5), the tangential force F to be applied to the handwheel (see figure 6) or the lever (see figure 7) to actuate the valve shall not exceed the values indicated in tables 1 and 2.

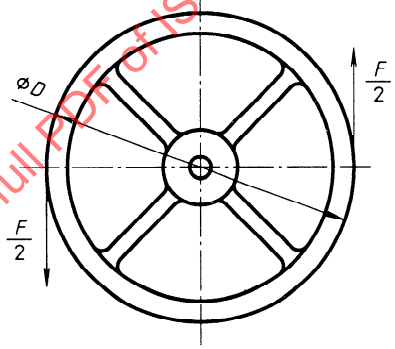


Figure 6 — Tangential force to be applied to the handwheel

Table 1 — Tangential force to be applied to the handwheel

D mm	F N
$D \leqslant 125$	200
$125 < D \leqslant 250$	300
$250 < D \leqslant 500$	400

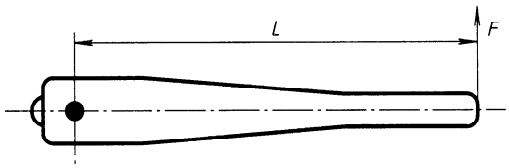


Figure 7 — Tangential force to be applied to the lever

Table 2 — Tangential force to be applied to the lever

L mm	F N
$L \leqslant 250$	300
$250 < L \leqslant 500$	400

5.5.2 Actuating torque for T-wrench-actuated valves (for example buried valves)

The valves can be actuated using a gear reducer fitted with stops at the two extreme positions. The stops shall be calculated to withstand the input torques given in table 3.

Table 3 — Input torque

Class of gear reducer	Minimum input torque N·m
1	120
2	300
3	450

The gear reducer class shall be identified by the size of the end of the reducer shaft receiving the actuating device (see table 4).

Table 4 — Nominal dimensions of the square drive end

Class of gear reducer	Nominal dimensions of square drive end
1	14
2	30
3	50

5.6 Dimensions and tolerances of body ends

5.6.1 Double-flanged body ends

5.6.1.1 Dimensions of flanges

Flange dimensions shall comply with ISO 7005-1, ISO 7005-2 or ISO 7005-3.

5.6.1.2 Face-to-face dimensions

The face-to-face dimensions shall be in accordance with ISO 5752. The basic series required should be specified.

5.6.1.3 Tolerances on face-to-face dimensions

Tolerances on face-to-face dimensions shall be in accordance with ISO 5752.

5.6.2 Body ends (wafer and flangeless valves)

5.6.2.1 Dimensions of flanges

Body ends shall be capable of mating with connecting flanges complying with the requirements of ISO 7005-1, ISO 7005-2 and ISO 7005-3.

5.6.2.2 Face-to-face dimensions

The face-to-face dimensions shall be in accordance with ISO 5752. The basic series required shall be specified by the purchaser.

5.6.2.3 Tolerances on face-to-face dimensions

Tolerances on face-to-face dimensions shall be in accordance with ISO 5752.

5.6.3 Surface finish of flanged and wafer valve ends

The surface finish of flanged ends and flangeless ends (lug or wafer) shall comply with the requirements of ISO 7005-1, ISO 7005-2 or ISO 7005-3 as appropriate.

5.6.4 Valves with welded ends

Butt-welded ends shall be in accordance with the requirements of ISO 7005-1:1992, annex A.

6 Materials

6.1 Body

The materials to be used shall be

— steels for pressure vessels in accordance with ISO 2604-1, ISO 3755, ISO 4991, ISO 9328-1, ISO 9328-2, ISO 9328-3, ISO 9328-4 and ISO 9328-5;

— cast iron in accordance with ISO 185, ISO 1083, and ISO 5922;

— copper alloys in accordance with ISO 7005-3.

The materials used may be coated with elastomers, polymers or composites.

6.2 Disc

The materials to be used shall be

— stainless ferritic or martensitic steels;

— steels for pressure vessels in accordance with ISO 2604-1, ISO 3755, ISO 4991, ISO 9328-1, ISO 9328-2, ISO 9328-3, ISO 9328-4 and ISO 9328-5;

— cast iron in accordance with ISO 185, ISO 1083 and ISO 5922;

— copper alloys in accordance with ISO 7005-3.

The materials used may be coated with elastomers, polymers or composites.

6.3 Shaft

The materials to be used shall be

— stainless ferritic or martensitic steels;

— copper alloys in accordance with ISO 7005-3.

6.4 Seating

The material to be used shall be

— elastomeric;

— polymeric or composite;

— metallic.

7 Suitability of use

7.1 Allowable leakage rate

The leakage rates shall be in accordance with ISO 5208 for butterfly valves used for shut-off service. The leakage rate shall be indicated by the manufacturer in the valve documentation.

7.2 Flow velocity

For shut-off valves, it is usually accepted that flow velocities with respect to the PN do not exceed the values given in table 5.

Table 5 — Flow velocity, v, as a function of flowing fluid

PN		2,5; 6; 10	16; 20; 25; 40; 50
Velocity m/s	liquids	3	4
	gases	30	
NOTE — For values exceeding the limits specified in this table, consult the manufacturer.			

8 Testing and inspection

8.1 Each valve shall be pressure tested in accordance with the requirements of ISO 5208 except that a shell test at 1,5 times the maximum permissible pressure is mandatory for all valve sizes.

8.2 The points shown in table 6 shall be checked by the manufacturer on each valve.

Table 6 — Inspection requirements

Requirements	Test
1 Type and trim The valve shall be in accordance with the order and product standard.	Check visually the type, its trim and accessories (for example handwheel and other items of the order).
2 Marking	Check visually that markings are complete and legible.
3 Surface condition	Examine visually prior to any coating or painting to determine that the surface is free from defects which may affect the safety and function of the valve. This check shall be made during manufacture.
4 Coating	Examine visually to determine that any specified coating has been applied.
5 Operation	Check that the valve opens and closes.

8.3 Other tests may be applied upon agreement between customer and manufacturer.

9 Marking

Every butterfly valve shall be marked in accordance with ISO 5209.

For valves with DN < 50, only markings 1 to 4 are mandatory. They shall be placed on the valve body or on an attached plate.

For all nominal diameters, the following markings are required:

a) 5, if required by the valve type;

b) 6, if required by the valve type;

c) 7, if the valve application is restricted.

If the maximum permissible differential pressure is lower than the valve maximum permissible pressure (MPP), it shall be indicated.

Markings 8 to 19 are optional.

10 Preparation for dispatch

The ports of the valves shall be suitably protected to avoid impairments of the joint facings or deterioration of the seals during transportation.

11 Example of a data sheet

An example of a data sheet is given in annex A.

Annex A
(informative)

Example of data sheet

Valve data sheet
Information to be specified by the purchaser

Fluid	— Type of fluid: ..... — Line pressure: ..... — Fluid temperature: ..... — Flow velocity: ..... — Differential pressure: .....
Service	☐ Shut off Leakage rate: ISO 5208 ☐ A ☐ B ☐ C ☐ D ☐ Throttling q_V min. = ... m^3/h p = ... bar ☐ Regulating q_V max. = ... m^3/h p = ... bar
Designation/ material	Designation according to ISO 10631 Butterfly valve | ISO 10631 | DN ..... | PN .... | Basic series ..... End connection: Figure ..... | Construction example: Type ..... Material according to ISO ..... Body ..... | Disc ..... | Seat .....
Operation	— Frequency of operation: ..... — Opening time: ..... — Closing time: .....
Actuation	☐ Hand ☐ Wrench ☐ Gear
	☐ Automatic ☐ Pneumatic ☐ Electric ☐ Hydraulic ☐ Double-acting ☐ Single-acting ☐ Failsafe open "NO" ☐ Failsafe closed "NC" Energy supply .....
Additional requirements	☐ Fire-tested design ..... ☐ Antistatic design ..... ☐ Limit switch box ..... ☐ Emergency hand control ..... ☐ Others (specify) ....