
International Standard



7121

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Flanged steel ball valves

Robinets à tournant sphérique en acier, à brides

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 7121 was prepared by Technical Committee ISO/TC 153, *Valves*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Flanged steel ball valves

0 Introduction

The intent of this International Standard is the establishment of basic requirements for flanged steel ball valves.

1 Scope and field of application

This International Standard specifies requirements for flanged steel ball valves ISO PN10 to ISO PN100, sizes DN10 to DN500.

2 References

ISO 7/1, *Pipe threads where pressure tight joints are made on the threads — Part 1: Designation, dimensions and tolerances.*

ISO 261, *ISO general purpose metric screw threads — General plan.*

ISO 263, *ISO inch screw threads — General plan and selection for screws, bolts and nuts — Diameter range 0.06 to 6 in.*

ISO 5208, *Industrial valves — Pressure testing for valves.*

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

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

ISO 6708, *Pipe components — Definition of nominal size.*

ISO 7005/1, *Metallic flanges — Part 1: Steel flanges.*¹⁾

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

3 Definitions

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

3.1 face-to-face dimensions: Distance between the two planes perpendicular to the body axis located at the extremities of the body ends.

3.2 anti-static design: Design which ensures electrical continuity between the body, ball and stem of the valve.

3.3 anti-blow-out stem: Design that ensures the valve stem cannot be blown out of the body in the event of the gland being removed while the valve is under pressure.

3.4 effective diameter: Manufacturer's minimum diameter through the flow passage of the valve when in the fully open position.

4 Patterns

Valves shall be "full-bore" or "reduced bore" (see figure 1) with face-to-face dimensions in accordance with ISO 5752.

NOTE — In certain large ISO PN10, and ISO PN16 and ISO PN20 short series valves, the ball in the fully or partially closed position may protrude beyond the end of the flange faces.

5 Nominal sizes

The nominal sizes, in DN values, shall be as follows:

10; 15; 20; 25; 32; 40; 50; 65; 80; 100; (125); 150; 200; 250; 300; 350; 400; 450; 500.

The size enclosed in brackets should be avoided in new constructions.

6 Nominal pressure range

The range of nominal pressures, in ISO PN values, is as follows:

10; 16; 20; 25; 40; 50; 100.

7 Pressure/temperature ratings

Pressure/temperature ratings for the shell shall be as specified in the appropriate material tables of ISO 7005/1 but may be limited by any seat material pressure/temperature limitation.

1) At present at the stage of draft.

These pressure/temperature limitations shall be determined by the manufacturer and shall be shown on the identification plate (see 12.3).

8 Design

Terminology used is shown in figure 3.

8.1 Body

8.1.1 General

Bodies can be of one piece or split construction [see figure 2 b)]

In the case of split body type valves, the design strength of the split body joint or joints shall at least correspond to that of the body end flange.

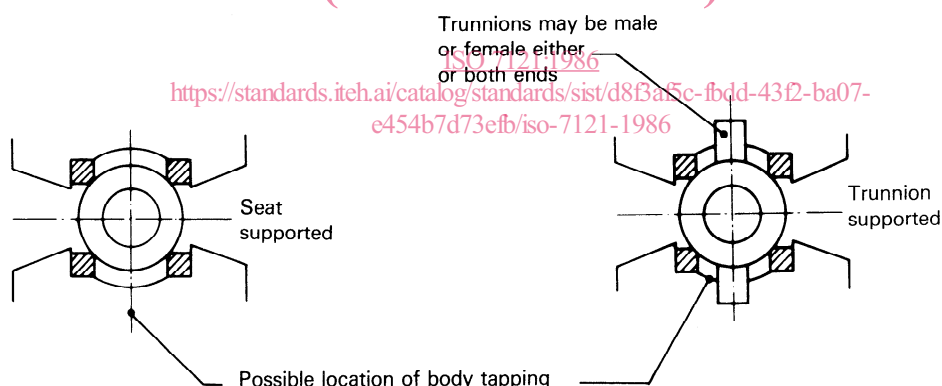
When so specified by the purchaser, arrangements shall be made to provide overpressure protection for the body cavity.

8.1.2 Body wall thickness (see figure 4)

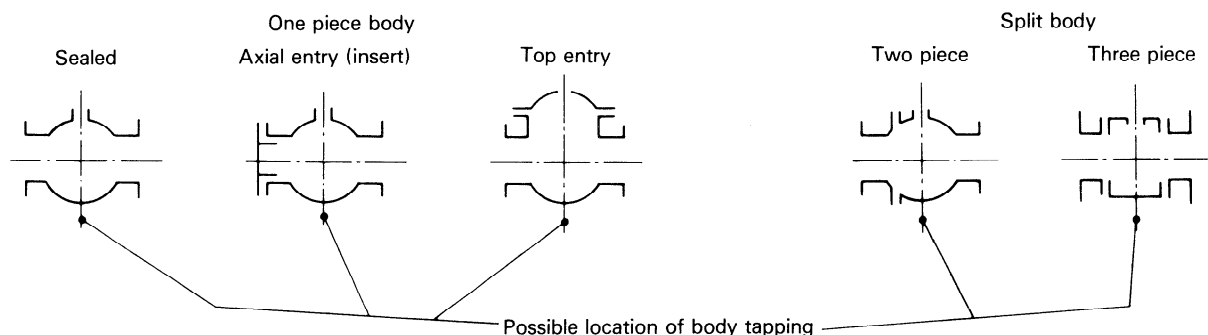
8.1.2.1 The minimum wall thickness, t_m , at the time of manufacture shall be as given in table 1, except as indicated in 8.1.2.2 and 8.1.2.3.



Figure 1 — Valve patterns
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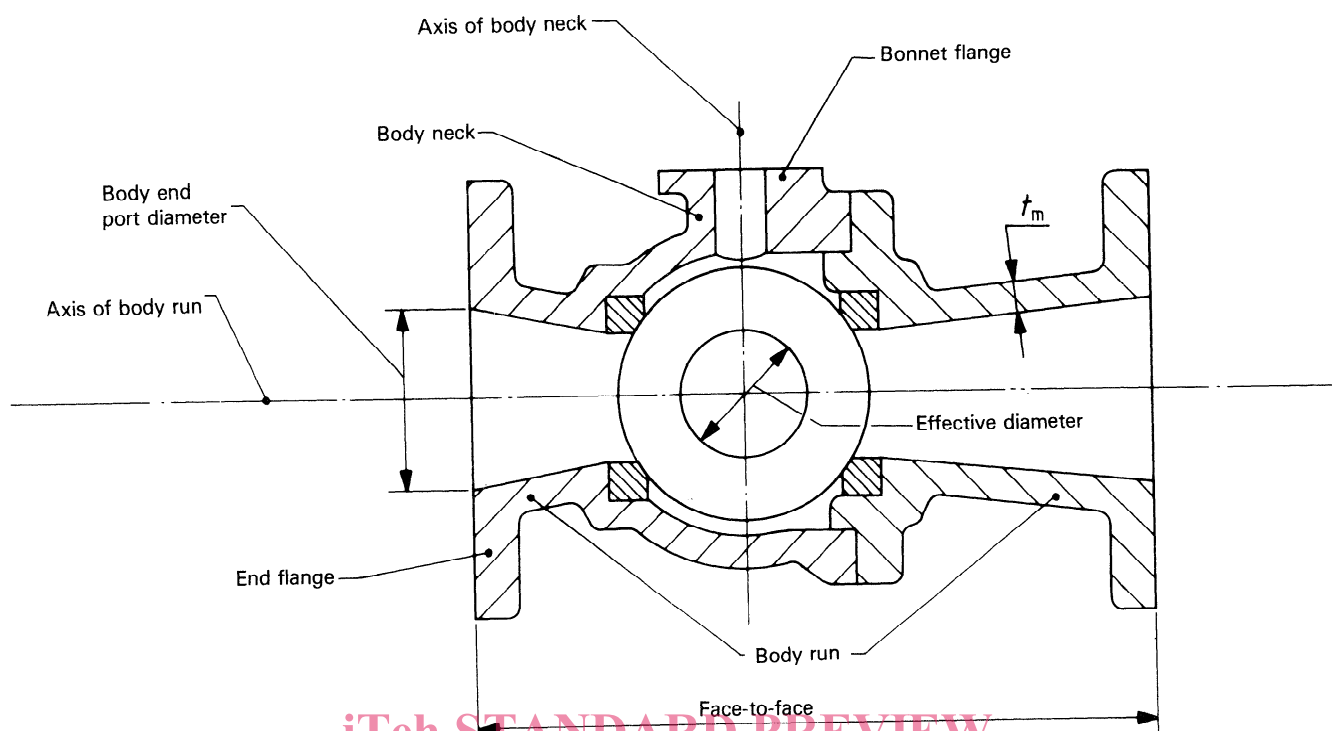


a) Type of ball



b) Type of body

Figure 2 — Typical ball valve construction variants with optional body tapping locations



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Figure 3 — Valve terminology

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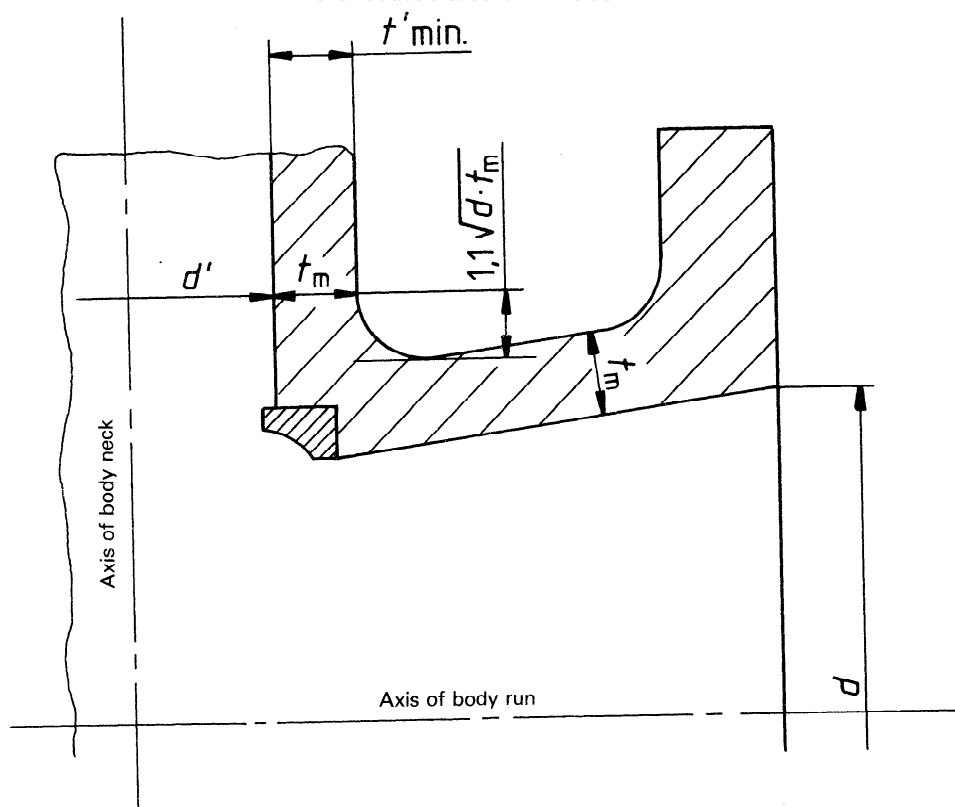


Figure 4 — Wall thickness requirements

Table 1 — Body wall thickness

Nominal size DN ¹⁾	ISO PN						
	10	16	20	25	40	50	100
	Minimum body wall thickness t_m mm						
10	3,0	3,0	3,0	3,0	3,0	3,0	3,3
15	3,0	3,0	3,0	3,0	3,1	3,1	3,4
20	3,0	3,0	3,1	3,3	3,5	3,8	4,1
25	4,0	4,0	4,1	4,2	4,6	4,8	4,8
32	4,5	4,5	4,8	4,8	4,8	4,8	4,8
40	4,5	4,5	4,8	4,8	4,8	4,8	5,6
50	5,0	5,5	5,6	5,7	6,1	6,4	6,4
65	5,0	5,5	5,6	5,8	6,4	6,4	7,1
80	5,0	5,5	5,6	5,8	6,6	7,1	7,9
100	6,0	6,0	6,4	6,6	7,3	7,8	9,6
(125) ²⁾	6,3	6,5	7,1	7,2	8,1	9,6	11,2
150	6,5	7,0	7,1	7,5	8,8	9,6	12,7
200	7,0	8,0	8,1	8,6	10,2	11,2	15,8
250	7,5	8,5	8,6	9,3	11,4	12,7	19,0
300	8,5	9,5	9,6	10,4	12,7	14,2	23,1
350	9,0	10,0	10,4	11,3	14,0	15,8	24,6
400	9,6	11,0	11,2	12,7	15,4	17,5	27,7
450	10,0	11,5	11,9	13,0	16,6	19,0	31,0
500	10,5	12,5	12,7	14,5	18,3	20,6	34,0

1) For corresponding valve inside diameter, see table 2.

2) The size enclosed in brackets should be avoided in new constructions.

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Additional metal thickness shall be provided as needed for, for example, assembly stresses, closing stresses, shapes other than circular and stress concentrations.

8.1.2.2 The valve body neck shall maintain the minimum wall thickness t_m , as required by 8.1.2.1 within a distance of $1,1 \sqrt{d \cdot t_m}$ measured from the outside of the body run along the neck direction, where d is the inside diameter as defined in 8.1.3.4.

Minimum wall thickness requirements are applicable to and measured from internally wetted surfaces, i.e. up to the point where the body-insert or body bonnet seal is affected.

Beyond the distance $1,1 \sqrt{d \cdot t_m}$ from the outside of the body run, straight circular sections of body necks with inside diameter d' shall be provided with local wall thickness at least equal to t' where t' is determined, by interpolation if necessary, as a value of t_m which would correspond to a value of d equal to $2d'/3$, using the applicable ISO PN range.

It will be noted that for any case where $d' > 1,5 d$, the newly determined minimum wall thickness for the body neck will be greater than the basic value t_m . In such case this greater wall thickness shall be provided for all of the body neck with a diameter greater than $1,5 d$.

8.1.2.3 Local areas having less than minimum wall thickness will be acceptable provided that all the following limitations are satisfied:

a) the area of sub-minimum thickness can be enclosed by a circle the diameter of which is not greater than $0,35 \sqrt{d \cdot t_m}$, where d is the inside diameter as given in table 2 and t_m is as shown in table 1;

b) the measured thickness is not less than $0,75 t_m$;

c) the enclosed circles are separated from each other by an edge-to-edge distance of not less than $1,75 \sqrt{d \cdot t_m}$.

8.1.3 Body dimensions

8.1.3.1 Face-to-face dimensions shall be in accordance with ISO 5752.

8.1.3.2 Body end flanges shall comply with ISO 7005/1.

NOTE — Where the body design does not permit through drilled flange bolt holes, threaded holes may be provided.

8.1.3.3 End flanges shall be cast or forged integral with the body or end piece of a split body design, or attached by welding by a qualified welder using an accepted welding procedure, provided that all such flanges on valves larger than DN50 shall be butt-welded. Any heat treatment necessary to ensure that the material is suitable for the full range of service temperature shall be performed.

8.1.3.4 The diameters of the body end ports for unlined valves shall be as specified in table 2.

8.1.3.5 The minimum port through both full and reduced bore bodies shall be circular, with diameters as specified in table 3.

8.1.3.6 The body design of valves of DN50 and larger shall be such that, when specified, the valve body may have a drain tapping in the position shown in figure 2, unless otherwise specified by the purchaser. Tapping threads shall be in accordance with ISO 7/1 and of the size specified in table 4.

8.2 Ball

Ball ports shall be circular with minimum diameters as specified in table 3. Where a through cylindrical bore is required this shall be specified by the purchaser.

8.3 Anti-blow-out stem

The valve design shall be such that the stem seal retaining fasteners, for example gland fasteners, alone do not retain the stem. Specifically, the design shall ensure that, while under pressure, the stem shall not be capable of ejection from the valve by the removal of the stem retainer (gland) alone.

8.4 Body seat rings

Body seat rings or seat ring assemblies shall be designed so as to be renewable except for those valves having a one-piece sealed (welded) body construction.

Table 2 — Body end port inside diameter, d

Nominal size DN	ISO PN		
	10; 16; 20; 25	40; 50	100
	$d^{1)}$ mm		
10	10	10	10
15	13	13	13
20	19	19	19
25	25	25	25
32	32	32	32
40	38	38	38
50	50	50	50
65	64	64	64
80	76	76	76
100	100	100	100
(125) ²⁾	125	125	125
150	150	150	150
200	200	200	200
250	250	250	250
300	300	300	300
350	335	335	325
400	385	385	375
450	430	430	420
500	485	485	465

1) These diameters are subject to normal manufacturing tolerances.

2) The size enclosed in brackets should be avoided in new constructions.

8.5 Bolting

All bolting shall have ISO metric coarse (ISO 261) or ISO inch (ISO 263) threads.

8.6 Anti-static design requirements

When specified, valves shall incorporate an anti-static feature which ensures electrical continuity between stem and body of valves of DN50 or smaller, or ball stem and body of larger valves. The anti-static features shall fill the following conditions:

- be so located that they are protected from ingress of foreign matter and corrosion from external surroundings;
- have electrical continuity across the discharge path with a resistance not exceeding 10 Ω from a power source not exceeding 12 V d.c. when type-tested on a new, dry, as-built valve after pressure testing and cycling of the valve at least five times;
- be designed such that the anti-static feature shall be captive and impossible to remove or by-pass other than intentionally.

Table 3 — Effective diameters

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Nominal size of valve DN	Valves		
	reduced bore	full bore	
	ISO PN		
	10 to 100	10; 16; 20; 25; 40; 50	100
	Effective diameter mm		
10		9	9
15	9,0	12,5	12,5
20	12,5	17	17
25	17	24	24
32	23	30	30
40	28	37	37
50	36	49	49
65	49	64	64
80	57	75	75
100	75	98	98
(125) ¹⁾	88	123	123
150	98	148	148
200	144	198	198
250	187	248	245
300	228	298	295
350	266	335	325
400	305	380	375
450	335	430	419
500	380	475	464

1) The size enclosed in brackets should be avoided in new constructions.

Table 4 — Drain tappings

Nominal size of valve DN	Pipe tappings
50; 65; 80; 100; (125); 150 and 200 250 to 500	1/2 3/4 1