INTERNATIONAL STANDARD

ISO 10434

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Bolted bonnet steel gate valves for the petroleum, petrochemical and allied industries

Robinets-vannes en acier à chapeau boulonné pour les industries du pétrole, de la pétrochimie et les industries connexes

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Contents

Page

Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 10434 was prepared by Technical Committee ISO/TC 153, *Valves*, Subcommittee SC 1, *Design, manufacture, marking and testing* in collaboration with Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 6, *Processing equipment and systems*.

This second edition cancels and replaces the first edition (ISO 10434:1998), which has been technically revised.

Introduction

The purpose of this International Standard is to establish the basic requirements and practices for flanged and butt-welding end steel gate valves of bolted bonnet construction that parallel those given in American Petroleum Institute API Standard 600, eleventh edition, 2001 (ISO 10434:1998). It is not the purpose of this International Standard to replace ISO 6002 or any other International Standard that is not identified with petroleum refinery, petrochemical or natural gas industry applications.

Bolted bonnet steel gate valves for the petroleum, petrochemical and allied industries

1 Scope

This International Standard specifies the requirements for a heavy-duty series of bolted bonnet steel gate valves for petroleum refinery and related applications where corrosion, erosion and other service conditions would indicate a need for full port openings, heavy wall sections and large stem diameters.

This International Standard sets forth the requirements for the following gate valve features:

— bolted bonnet;

— outside screw and yoke;

— rising stems;

— non-rising handwheels;

— single or double gate;

— wedge or parallel seating;

— metallic seating surfaces;

— flanged or butt-welding ends.

It covers valves of the nominal sizes DN:

— 25; 32; 40; 50; 65; 80; 100; 150; 200; 250; 300; 350; 400; 450; 500; 600;

corresponding to nominal pipe sizes NPS:

— 1; 1 1/4; 1 1/2; 2; 2 1/2; 3; 4; 6; 8; 10; 12; 14; 16; 18; 20; 24;

and applies for pressure Class designations:

— 150; 300; 600; 900; 1500; 2500.

2 Normative references

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

ISO 7-1, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation*

ISO 5208, *Industrial valves — Pressure testing of valves*

ISO 5209, *General purpose industrial valves — Marking*

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

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

ISO 9606-1, *Approval testing of welders — Fusion welding — Part 1: Steels*

ISO 15607, *Specification and qualification of welding procedures for metallic materials — Part 1: General rules*

ISO 15609-1, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 1: Arc welding*[1)]

ISO 15610, *Specification and qualification of welding procedures for metallic materials — Qualification based on tested welding consumables*

ISO 15614-1, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys*

ISO 15614-2, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 2: Arc welding of aluminium and its alloys*[2)]

ASME B1.1, *Unified inch screw threads (UN and UNR thread form)*

ASME B1.5, *Acme screw threads*

ASME B1.8, *Stub acme screw threads*

ASME B1.12, *Class 5 interference-fit thread*

ASME B1.20.1, *Pipe threads, general purpose (inch)*

ASME B16.5, *Pipe flanges and flanged fittings*

ASME B16.10, *Face-to face and end-to-end dimensions of valves*

ASME B16.11, *Forged fittings, socket-welding and threaded*

ASME B16.34:1996, *Valves — Flanged, threaded and welding end*

ASME B18.2.2, *Square and hex nuts — Inch series*

ASME BPVC-IX, *BPVC Section IX — Welding and brazing qualifications*

ASTM A193, *Standard specification for alloy-steel and stainless steel bolting materials for high temperature service*

ASTM A194, *Standard specification for carbon and alloy steel nuts for bolts for high pressure or high temperature service, or both*

1) To be published. (Replaces ISO 9956-2:1995)

2) To be published. (Replaces ISO 9956-4:1995)

ASTM A307, *Standard specification for carbon steel bolts and studs, 60 000 PSI tensile strength*

MSS-SP-55, *Quality standard for steel castings for valves, flanges and fittings and other piping components — Visual method for evaluation of surface irregularities*

3 Terms and definitions

For the purposes of this document, the definitions for pressure designation, Class, and nominal valve size NPS given in ASME B16.34, and the following apply.

3.1
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

[ISO 6708:1995, definition 2.1]

4 Pressure/temperature ratings

4.1 The pressure/temperature ratings applicable to valves specified in this International Standard shall be in accordance with those specified in the tables of ASME B16.34 for Standard Class for the applicable material specification and the applicable Class. Restrictions of temperature and pressure, for example, those imposed by special soft seals or special trim materials, shall be marked on the valve identification plate, see 8.4.

4.2 The temperature for a corresponding pressure rating is the maximum temperature of the pressure-containing shell of the valve. In general, this temperature is the same as that of the contained fluid. The use of a pressure rating corresponding to a temperature other than that of the contained fluid is the responsibility of the user.

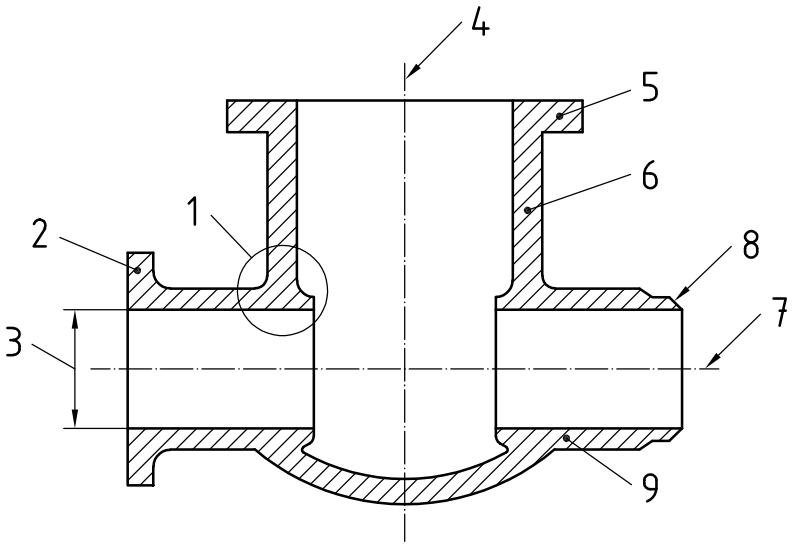
4.3 For temperatures below the lowest temperature listed in the pressure/temperature tables (see 4.1), the service pressure shall be no greater than the pressure for the lowest listed temperature. The use of valves at lower temperatures is the responsibility of the user. Consideration should be given to the loss of ductility and impact strength of many materials at low temperature.

4.4 Double seated valves, in some design configurations, may be capable of trapping liquid in the centre cavity of the valve when in the closed position. If subjected to an increase in temperature, an excessive build-up of pressure may occur leading to a pressure boundary failure. Where such condition is possible it is the responsibility of the user to provide, or require to be provided, means in design, installation or operating procedure to assure that the pressure in the valve does not exceed that allowed by this International Standard for the resultant temperature.

5 Design

5.1 Body wall thickness

5.1.1 A valve body schematic is shown as Figure 1. The minimum body wall thickness, t_m, at the time of manufacture shall be as given in Table 1, except as indicated in 5.1.2 for butt-welding valve ends. Additional metal thickness needed for assembly stresses, stress concentrations, and shapes other than circular shall be determined by individual manufacturers, since these factors vary widely.



Key

1 junction of body run and body neck
2 body end flange
3 body end port inside diameter
4 axis of body neck
5 body/bonnet flange
6 body neck
7 axis of body run
8 butt-welding end
9 body run

Figure 1 — Identification of terms

Table 1 — Minimum wall thickness for body and bonnet

Nominal size DN	Class designation						Nominal size NPS
	150	300	600	900	1500	2500	
	Minimum wall thickness t_m mm						
25	6,4	6,4	7,9	12,7	12,7	15,0	1
32	6,4	6,4	8,6	14,2	14,2	17,5	11/4
40	6,4	7,9	9,4	15,0	15,0	19,1	11/2
50	8,6	9,7	11,2	19,1	19,1	22,4	2
65	9,7	11,2	11,9	22,4	22,4	25,4	21/2
80	10,4	11,9	12,7	19,1	23,9	30,2	3
100	11,2	12,7	16,0	21,3	28,7	35,8	4
150	11,9	16,0	19,1	26,2	38,1	48,5	6
200	12,7	17,5	25,4	31,8	47,8	62,0	8
250	14,2	19,1	28,7	36,6	57,2	67,6	10
300	16,0	20,6	31,8	42,2	66,8	86,6	12
350	16,8	22,4	35,1	46,0	69,9	—	14
400	17,5	23,9	38,1	52,3	79,5	—	16
450	18,3	25,4	41,4	57,2	88,9	—	18
500	19,1	26,9	44,5	63,5	98,6	—	20
600	20,6	30,2	50,8	73,2	114,3	—	24

5.1.2 The weld end preparation in butt-welding end valves (see 5.3.2) shall not reduce the body wall thickness to less than the values specified in 5.1.1 within a region closer than t_m to the outside surface of the body neck, measured along the run direction. The transition to the weld preparation shall be gradual and the section shall be essentially circular through the entire length of the transition. Sharp discontinuities or abrupt changes in section in areas that infringe into the transition shall be avoided, except that test collars or bands, either welded or integral, are allowed. In no case shall the thickness be less than 0,77 t_m at a distance of 1,33 t_m from the weld end.

5.2 Bonnet wall thickness

The minimum bonnet wall thickness at the time of manufacture, except for the neck extension that contains the packing, shall be t_m as given in Table 1. For the neck extension, the local minimum wall thickness shall be based on the local diameter, e.g. the inside diameter of the stem bore or packing box bore, and shall be in accordance with Table 2.

5.3 Body dimensions

5.3.1 Flanged ends

5.3.1.1 Body end flanges shall comply with the dimensional requirements of ASME B16.5. Unless otherwise specified by the purchaser, gasket contact facing finish of the end flanges shall be in accordance with ASME B16.5. Raised face end flanges shall be provided unless ring-joint or flat face flanges are specified by the purchaser.

Table 2 — Minimum wall thickness for bonnet neck extension

Bonnet neck extension inside diameter mm	Class designation					
	150	300	600	900	1500	2500
	Minimum wall thickness [a] mm					
15	2,8	3,0	3,6	4,2	5,3	7,6
16	2,8	3,1	3,6	4,4	5,6	7,9
17	2,8	3,2	3,7	4,5	5,8	8,2
18	2,9	3,5	3,9	4,7	5,9	8,5
19	3,0	3,8	4,1	5,1	6,1	8,9
20	3,3	4,0	4,2	5,2	6,3	9,2
25	4,0	4,8	4,8	6,3	7,1	11,0
30	4,6	4,8	4,8	6,5	8,2	13,1
35	4,8	4,8	5,1	7,1	9,7	14,6
40	4,9	5,0	5,7	7,5	10,2	16,4
50	5,5	6,2	6,3	7,9	11,6	19,8
60	5,6	6,4	6,8	8,9	13,4	23,2
70	5,6	6,9	7,4	9,9	15,8	26,5
80	5,8	7,2	8,1	11,0	17,4	30,1
90	6,4	7,4	8,8	12,0	19,1	33,2
100	6,4	7,7	9,5	12,8	20,8	36,7
110	6,4	8,1	10,3	14,1	22,9	40,1
120	6,6	8,6	10,9	14,9	24,8	43,5
130	7,1	8,8	11,3	16,2	26,5	46,9
140	7,1	9,2	12,0	17,3	28,3	50,2

[a] See 5.2.

5.3.1.2 Face-to-face dimensions for flanged end valves, Class 150, 300, and 600, shall be in accordance with ASME B16.10 or ISO 5752, Basic Series 3, 4 and 5, except that the applicable tolerance shall be in accordance with the tolerances specified in Table 4. For Class > 600, the face-to-face dimensions shall be the same as the end-to-end dimensions given in Table 4.

5.3.1.3 Body end flanges and bonnet flanges shall be cast or forged integral with the body. However, when specified by the purchaser, forged flanges may be attached by welding by a qualified welding operator using a qualified welding procedure. It is required that when these flanges are attached by welding, a butt-welded type joint shall be used. Heat treatment to ensure that the welded material is suitable for the full range of service conditions shall be performed in accordance with the material specification.

5.3.2 Butt-welding ends

5.3.2.1 Butt-welding ends shall be in accordance with Figure 2 and Table 3 unless otherwise specified by the purchaser.