

INTERNATIONAL STANDARD

ISO 12149

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Bolted bonnet steel globe valves for general-purpose applications

*Robinets à soupape en acier à chapeau boulonné pour applications
générales*

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Reference number
ISO 12149:1999(E)

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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 12149 was prepared by Technical Committee ISO/TC 153, *Valves*, Subcommittee SC 1, *Design, manufacture, marking and testing*.

Annex A of this International Standard is given for information only.

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Introduction

The intent of this International Standard is the establishment of the basic requirements and recommendations for flanged, threaded, socket-welding or butt-welding end steel globe valves of bolted bonnet construction for general-purpose applications.

To maintain compatibility with ISO 7005-1, in which the American flanges previously designated by a class rating have been converted to nominal pressure (PN) ratings, this International Standard follows the same system. The equivalent ratings are as follows:

- Class 150: PN 20;
- Class 300: PN 50;
- Class 600: PN 110.

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Bolted bonnet steel globe valves for general-purpose applications

1 Scope

This International Standard specifies the requirements for bolted bonnet steel globe valves for general-purpose applications and having the following features:

- bolted bonnets;
- flanged, threaded, socket-welding (DN 65 and smaller) or butt-welding ends;
- outside screw and yoke, inside screw and rising stem;
- with metallic or soft obturator (disc, piston) or seat seals.

It covers valves of the following nominal sizes, DN:

- 10; 15; 20; 25; 32; 40; 50; 65; 80; 100; 125; 150; 200; 250; 300; 350; 400;

and applies to valves of the following nominal pressures, PN:

- 10; 16; 20; 25; 40; 50; 110.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 7-1:1994, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation.*

ISO 7-2:1982, *Pipe threads where pressure-tight joints are made on the threads — Part 2: Verification by means of limit gauges.*

ISO 261:1998, *ISO general-purpose metric screw threads — General plan.*

ISO 263:1973, *ISO inch screw threads — General plan and selection for screws, bolts and nuts — Diameter range 0.06 to 6 in.*

ISO 4200, *Plain end steel tubes, welded and seamless — General tables of dimensions and masses per unit length.*

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

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

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

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

ISO 6708, *Pipework components — Definition and selection of DN (nominal size).*

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

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

ANSI/ASME B1.20.1:1983 (R1992), *Pipe threads, General purpose (inch).*

ANSI/ASME B16.11:1991, *Forged fittings — Socket — Welding and threaded.*

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

3 Terms and definitions

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

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 ISO 7005-1 for steel flanges of the applicable PN and material specification. Restrictions on temperature or pressure, for example those imposed by soft seals and special trim materials, shall be indicated on the valve identification plate (see 8.4.2).

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

4.3 For temperatures below the lowest temperature shown in the pressure/temperature rating tables in ISO 7005-1, the service pressure shall be no greater than the rating shown for that lowest 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.

5 Design

5.1 Body wall thickness

5.1.1 A schematic diagram of a valve body is shown in Figure 1. The minimum wall thickness t_m at the time of manufacture shall be as given in Table 1 except as indicated in 5.1.2, 5.1.3, and 5.1.4.

Additional metal thickness needed for assembly stresses, closing stresses, stress concentrations and shapes other than circular shall be determined by individual manufacturers, since these factors vary widely.

5.1.2 The weld preparation in butt-welding end valves (see 5.2.2.2) shall not reduce the body wall thickness to less than the values required by 5.1.1 within a region closer to the outside surface of the body neck than t_m 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 $0,77t_m$ at a distance of $1,33t_m$ from the weld end.

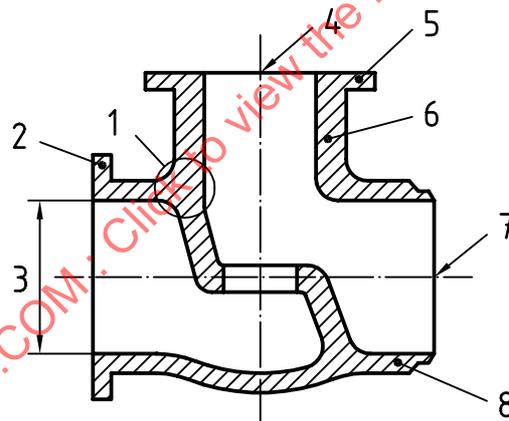
5.1.3 The valve body neck shall maintain the minimum wall thickness t_m as required by 5.1.1 within the distance of $1,1\sqrt{dt_m}$ measured from outside of the body run along the neck direction, where d is the nominal inside diameter as defined in 5.2.1.4.

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

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

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

- the area of sub-minimum thickness can be enclosed by a circle whose diameter is no greater than $0,35\sqrt{dt_m}$, where d is the nominal inside diameter as given in Table 2 and t_m is the minimum body wall thickness as shown in Table 1;
- the measured thickness is no less than $0,75t_m$;
- enclosure circles are separated from each other by an edge-to-edge distance of no less than $1,75\sqrt{dt_m}$.



Key

- | | | | |
|---|------------------------------------|---|------------------|
| 1 | Junction of body run and body neck | 5 | Bonnet flange |
| 2 | Body end flange | 6 | Body neck |
| 3 | Body end port inside diameter | 7 | Axis of body run |
| 4 | Axis of body neck | 8 | Body run |

Figure 1 — Identification of terms

Table 1 — Body wall thickness

Nominal size DN ^a	Nominal pressure PN						
	10	16	20	25	40	50	110
	Minimum body wall thickness, t_m mm						
10	3	3	3	3	3	3	3,3
15	3	3	3	3	3,1	3,1	3,4
20	3	3	3,1	3,3	3,5	3,8	4,1
25	4	4	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	5,5	5,6	5,7	6,1	6,4	6,4
65	5	5,5	5,6	5,8	6,6	6,4	7,1
80	5	5,5	5,6	5,8	6,6	7,1	7,9
100	6	6	6,4	6,6	7,3	7,8	9,6
125	6,3	6,5	7,1	7,2	8,1	9,6	11,2
150	6,5	7	7,1	7,5	8,8	9,6	12,7
200	7	8	8,1	8,6	10,2	11,2	15,8
250	7,5	8,5	8,6	9,3	11,4	12,7	19
300	8,5	9,5	9,6	10,4	12,7	14,2	23,1
350	9	10	10,4	11,3	14	15,8	24,6
400	9,6	11	11,2	12,7	15,4	17,5	27,7

^a For the corresponding body end port nominal inside diameter, see Table 2.

5.2 Body dimensions

5.2.1 Flanges

5.2.1.1 Face-to-face dimensions for flanged end valves shall be in accordance with Table 8 of ISO 5752:1982 for straight pattern and Table 9 for angle pattern.

5.2.1.2 Body end flanges shall comply with the requirements of ISO 7005-1.

5.2.1.3 End flanges shall be cast or forged integral with the body except that flanges may be attached by welding by a qualified welding operator using a qualified welding procedure, provided that all such flanges on valves DN 50 and larger shall be butt-welded. Any heat treatment necessary to ensure that the material is suitable for the full range of service temperatures shall be performed.

5.2.1.4 For unlined flanged valves, the nominal inside diameter d of the body end port shall be as specified in Table 2 as applicable.

Table 2 — Body end port nominal inside diameter, d

DN	PN		
	10; 16; 20; 25	40; 50	110
	d 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	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

5.2.2 Butt-welding ends

5.2.2.1 End-to-end dimensions for butt-welding end valves shall be in accordance with Table 8 of ISO 5752:1982 for straight pattern and Table 9 for angle pattern.

5.2.2.2 Butt-welding ends shall be in accordance with the details shown in Figure 2, unless otherwise specified in the purchase order.

5.2.3 Threaded and socket-welding ends

5.2.3.1 End-to-end dimensions for threaded and socket-welding end valves shall be the manufacturer's standard.

5.2.3.2 Valve body threads shall be taper or parallel threads in accordance with ISO 7-1 or taper threads in accordance with ANSI/ASME B1.20.1 as appropriate.

5.2.3.3 Threads shall be gauged in accordance with ISO 7-2 or taper threads in accordance with ANSI/ASME B1.20.1, as appropriate.

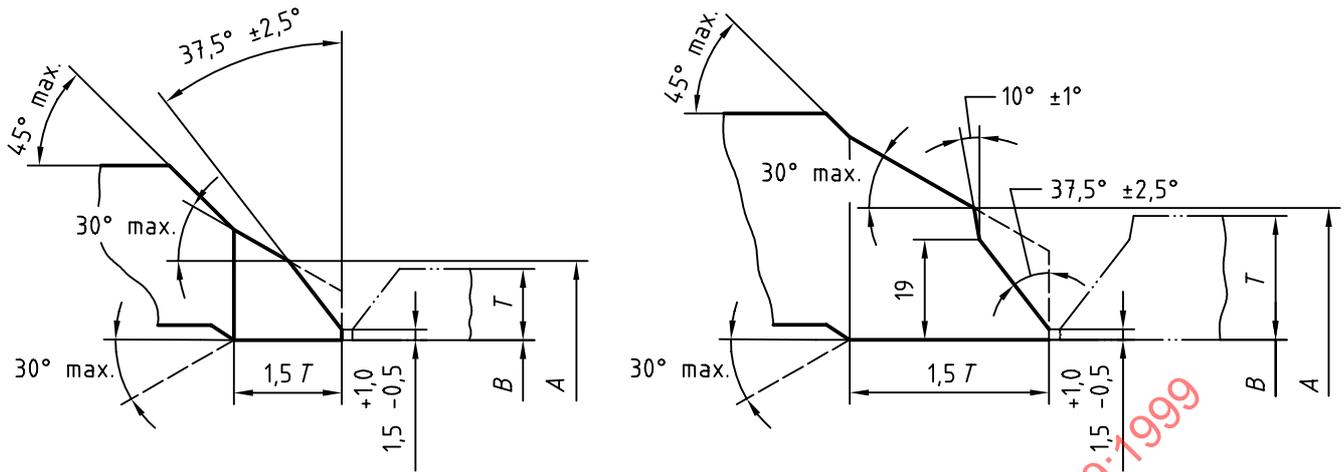
5.2.3.4 Socket-welding end dimensions shall be in accordance with Table 3.

Table 3 — Socket bore and depth

DN	Socket bore mm $\pm 0,3$	Socket depth mm min.
10	17,8	9
15	22,0	10
20	27,3	13
25	34,1	13
32	42,8	13
40	48,9	13
50	61,4	16
65	74,1	16

NOTE These dimensions are equal to those in ANSI/ASME B16,11 for socket-welding ends and similar to those in ISO 7005-1 for socket-welding flanges.

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a) Welding end for connection to pipe of wall thickness $T \leq 22$ mm

b) Welding end for connection to pipe of wall thickness $T > 22$ mm

A = Nominal outside diameter of welding end

B = Nominal inside diameter of pipe

T = Nominal wall thickness of pipe

Nominal size, DN	25	32	40	50	65	80	100	125	150	200	250	300	350	400	
nom.	35	44	50	62	78	91	117	144	172	223	278	329	362	413	
A mm	tol.	+2,5 -1,0						+4 -1							
B mm	tol.	+1 -1										+2 -2			

NOTE 1 Dotted lines denote the maximum envelope for transitions from the welding groove.

NOTE 2 The inside and outside surfaces of valve welding ends shall be machine-finished overall. Contour within the envelope is at the manufacturer's option unless specifically ordered otherwise.

NOTE 3 Intersections should be slightly rounded.

NOTE 4 Valves having a minimum wall thickness $t_m \leq 3$ mm may have ends cut square or slightly chamfered.

NOTE 5 For the normal outside diameters and wall thicknesses of standard steel pipes, see ISO 4200.

Figure 2 — Butt-welding ends

5.2.3.5 The minimum wall thickness adjacent to the threaded or socket-welding end shall be in accordance with Table 4.

Table 4 — Wall thickness, *C*

DN	Wall thickness, <i>C</i> min. mm	
	PN 20 to PN 50	PN 110
10	3,0	3,6
15	3,3	4,1
20	3,6	4,3
25	3,8	5,1
32	3,8	5,3
40	4,1	5,6
50	4,6	6,1
65	5,6	7,6

NOTE In conformity with ANSI/ASME B16.34.

5.3 Auxiliary connections

5.3.1 Provisions for auxiliary connections are not required unless specified in the purchase order.

5.3.2 Auxiliary connections shall be identified as indicated in Figure 3. Each connection location is designated by a letter.

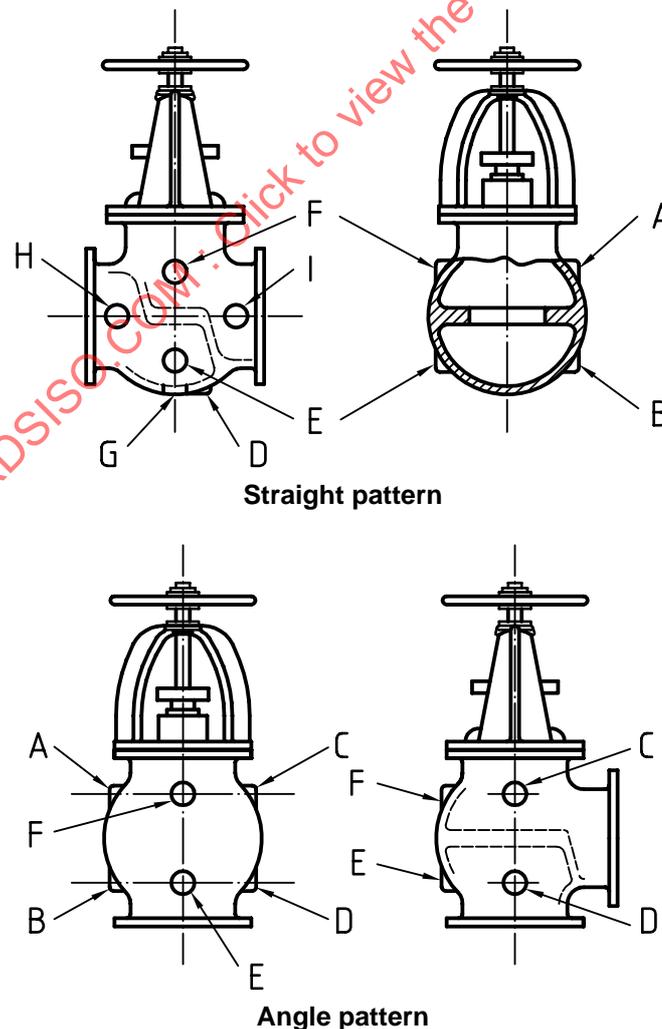


Figure 3 — Location of tappings

5.3.3 Unless otherwise specified in the purchase order, auxiliary connections shall be in accordance with Table 5.

Table 5 — Auxiliary-connection size

Valve size range DN	Auxiliary-connection size	
	DN	NPS ^a
10 ≤ DN < 50	10	3/8
50 ≤ DN < 100	15	1/2
125 ≤ DN < 200	20	3/4
250 ≤ DN	25	1

^a NPS is nominal pipe size.

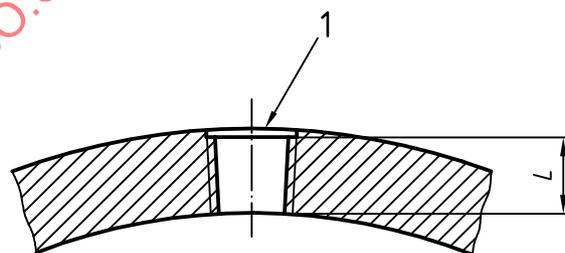
5.3.4 When bosses are required to obtain adequate metal thickness, the inscribed diameter shall be as shown in Table 6.

Table 6 — Minimum boss diameter

Auxiliary-connection size		Minimum boss diameter mm
DN	NPS	
10	3/8	32
15	1/2	38
20	3/4	44
25	1	54

5.3.5 The wall of the valve may be tapped if the metal is thick enough to allow the minimum thread length specified in Figure 4 and Table 7.

Where this length is insufficient or the tapped hole needs reinforcement, a boss shall be added as specified in 5.3.4. Threads shall be tapered as shown in Figure 4.



Key

1 Pipe thread ISO 7-1 Rc or ANSI/ASME B1.20.1

Figure 4 — Thread length for auxiliary connections

Table 7 — Minimum thread lengths for auxiliary connections

Auxiliary connection size		Minimum thread length <i>L</i> mm
DN	NPS	
10	3/8	10
15	1/2	14
20	3/4	14
25	1	18

5.3.6 Sockets for socket-welding connections may be provided if the metal is thick enough to accommodate the depth of the socket and the retaining wall as specified in Figure 5 and Table 8. Where the wall thickness is insufficient or the socket requires reinforcement, a boss shall be added as specified in 5.3.4. The length of the leg of the attachment weld shall be 1,09 times the nominal pipe wall thickness of the auxiliary connection or 3 mm, whichever is greater.

Dimensions in millimetres

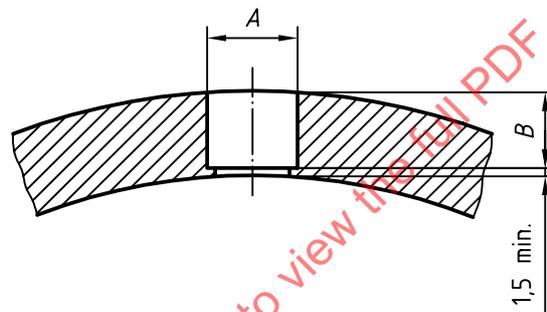


Figure 5 — Sockets for socket-welding of auxiliary connections

Table 8 — Dimensions of sockets for socket-welding connections

Auxiliary-connection size		A_{min}	B_{min}
DN	NPS	mm	mm
10	3/8	18	5
15	1/2	22	5
20	3/4	27	6
25	1	34	6

5.3.7 Auxiliary connections may be attached by butt-welding directly to the wall of the valve as illustrated in Figure 6. Where the size of the opening is such that reinforcement is necessary, a boss shall be added as specified in 5.3.4.

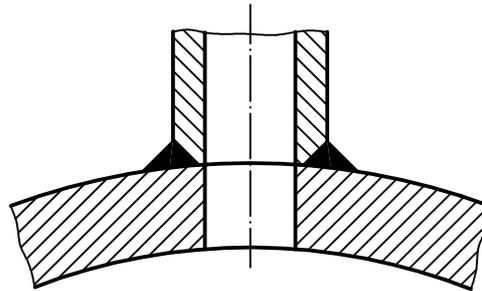


Figure 6 — Butt-welding for auxiliary connections

5.4 Operation

5.4.1 Unless otherwise specified by the purchaser, the valve shall be supplied with a handwheel. The valve shall be closed by turning the handwheel in the clockwise direction. Where size permits, the word "open" and an arrow pointing in the direction of opening shall be marked on the handwheel.

5.4.2 If operation by a chainwheel, gearbox or actuator is required, the purchaser shall specify as applicable:

- for chainwheel operation, the distance from the centreline of the valve stem to the bottom of the chain loop;
- the type of gear (spur or bevel) and the position of the gearing relative to the pipe axis;
- the type of actuator (electric, hydraulic, pneumatic or other);
- the maximum service temperature and the differential pressure across the valve;
- the power supply (for actuators).

5.4.3 Any special requirements, such as actuator mating dimensions, shall comply with ISO 5210.

5.4.4 If a limit on handwheel effort is applicable, the maximum shall be specified.

6 Materials

6.1 Materials other than trim materials

Materials for components shall be selected from Table 9.

6.2 Trim

6.2.1 Trim comprises the following:

- a) the stem;
- b) the obturator (disc, piston) seat surfaces;
- c) the body seat surfaces;
- d) the bushing, or a deposited weld for the backseat and stem guide hole;
- e) the disc nut.

6.2.2 Standard trim materials shall be of the general (chemical) composition specified in Table 10.

NOTE Other trim materials are permitted by agreement between manufacturer and purchaser.

6.2.3 The stem shall be made of wrought or forged material.

Table 9 — Component materials

Component	Material
Body/bonnet	To be selected from ISO 7005-1
Obturator (disc, piston)	Stainless steel
Soft seals	If used, any retaining ring in the obturator shall be of a material compatible with the obturator and any retaining bolting shall be of 18-8 CrNi type steel
Auxiliary-connection plugs	Steel at least equal in corrosion resistance to that of the shell material. Cast iron plugs shall not be used.
Yoke separate from bonnet	Carbon steel or same material as bonnet
Lantern ring	Steel
Handwheel	Steel Malleable iron Ductile iron
Handwheel-retaining nut	Copper alloy Steel
Stem nuts	Copper alloy Stainless steel
Identification plate	Corrosion-resistant material attached to the valve by fasteners of corrosion-resistant material or by welding

Table 10 — Standard trim materials

Location	Material	Minimum Brinell hardness, HB	Materials description
Stem	CrNi		Chromium-nickel alloy
	Cr13		Steel with 11,5 % min. chromium
	NiCu		Nickel-copper alloy
Seating surfaces	Cr13	250 ^a	Steel with 11,5 % min. chromium
	HF	350	HF hardfacing alloy
	NiCu		Nickel-copper alloy
	CrNi		Chromium-nickel alloy

^a A hardness differential of 50 HB is required between the body and obturator seating surfaces if both are made of Cr13.

6.3 Bolting

All bolting shall have ISO metric coarse (ISO 261) threads by preference. The use of ISO inch (ISO 263) threads shall be phased out gradually.

7 Testing and inspection

7.1 Each valve shall be pressure-tested in accordance with the requirements of ISO 5208, except that a shell test at no less than 1,5 times the 38 °C pressure rating is mandatory for all valve sizes.

The maximum obturator leakage rate shall be rate B for metal-seated valves and rate A for soft-seated valves (see ISO 5208).

7.2 The items shown in Table 11 shall be checked on each valve by the manufacturer.

Table 11 — Inspection requirements

Item	Requirements
1 Type and trim The delivered valve shall comply with the order and with the product standard.	To check visually the type, its trim, accessories (for example, handwheels) and other requirements of the order (e.g. obturator closed).
2 Marking The marking shall comply with clause 8.	To check visually that markings are complete and legible.
3 Surface condition Where protective coatings are specified, they shall have been applied.	To examine visually to determine that any specified coating has been applied.
4 Actuation	To check that the valve opens and closes properly.

8 Marking

8.1 Legibility

Each valve manufactured in accordance with this International Standard shall be clearly marked.

8.2 Body markings

8.2.1 The following markings are mandatory on the body, subject to the provisions of 8.2.1:

- a) the manufacturer's name or trademark;
- b) the body material;
- c) the PN designation;
- d) the nominal size (DN);
- e) the certification code, if officially allowed by an authorized certification authority.

8.2.2 For valves smaller than DN 50, if the size or shape of the valve body precludes the inclusion of all the required markings, one or more may be omitted provided they are shown on the identification plate. The sequence of omission shall be as follows:

- a) the nominal size (DN);
- b) the PN number;
- c) the material.

8.2.3 The manufacturer's name or trademark identifying the manufacturer of the valve shall not be omitted.