British Standard

BRITISH STANDARD

BS 5159:1974

Incorporating Amendment Nos. 1 and 2

Specification for

Cast iron and carbon steel ball valves for general purposes

UDC 621.646.5:[669.13 + 669.14]

Co-operating organizations

The Mechanical Engineering Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Governments departments and professional and industrial organizations:

Associated Offices Technical Committee*
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Association of Mining Electrical and Mechanical Engineers
British Compressed Air Society*
British Electrical and Allied Manufacturers' Association
British Gas Corporation*
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Thames Water Authority — Metropolitan Water Division
Water Companies' Association
Individual experts from manufacturing companies

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Contents

Foreword

This standard is one of a series of new and revised standards in metric units for general purpose valves prepared under the authority of the Mechanical Engineering Industry Standards Committee.

There are no International or European standards in this field but account has been taken of all relevant proposals under consideration in the ISO Technical Committee and CEN[1)] Working Group concerned with general purpose valves.

For flanged valves the standard is based on the use of flanges complying with the requirements of BS 4504 "*Flanges and bolting for pipes, valves and fittings. Metric series*", but, by the use of Appendix A, the appropriate modifications can be made when using ANSI Class 125 cast iron or ANSI Class 150, Class 300, Class 400 and Class 600 carbon steel flanges.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 14, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

[1)] European Committee for Standardization.

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Section 1. General

1 Scope

This British Standard specifies requirements for cast iron and carbon steel straightway ball valves for general purposes.

It covers valves of nominal pressure (PN) designations of 10 bar[2)] to 100 bar, with ends flanged in accordance with the appropriate tables of BS 4504 for nominal sizes (DN) 10 to 600, or with internal screw threads in accordance with BS 21 (ISO/R 7) for nominal sizes $\frac{1}{4}$ to 4. However, when valves are required for use in ANSI (BS 1560) flanged systems, reference should be made to clause **33** and Appendix A.

Where there is an appropriate application standard or code of practice, it is the responsibility of the purchaser to ensure that its requirements are complied with; for example, attention is drawn to BS 806 and BS 759.

No provision is made in this standard for requirements for "fire-safe" valves or for protection against electrostatic build-up. Any requirements of the purchaser should be stated in the enquiry and agreed with the manufacturer.

2 References

The titles of the British Standards and international publications referred to in this standard are listed on the inside back cover.

3 Terminology and definitions

For the purposes of this British Standard, the terminology and definitions given in BS 2591-5 are generally applicable. The following definition applies to flanged valves:

face-to-face dimension

the distance between the two planes perpendicular to the body axis located at the extremities of the body end ports

4 Patterns

Valves may be "full bore" or "reduced bore" (see Figure 1) or short or long pattern. (It should be noted that in certain large PN 10 and PN 16 short pattern flanged valves, the ball in the closed position may protrude beyond the end of the flanged faces.)

Figure 1 — Valve patterns

5 Nominal sizes

5.1 For flanged ends the nominal sizes (DN) shall be as follows:

10, 15, 20, 25, 32, 40, 50, 65, 80, 100, 125, 150, 200, 250, 300, 350, 400, 450, 500, 600.

5.2 For screwed ends the nominal sizes shall be as follows:

$\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, 4.

[2)] 1 bar = 10^5 N/m^2 = 10^2 kPa.

6 Nominal pressure

Valves shall be designated by nominal pressure (PN), defined as the maximum permissible gauge working pressure (bar[3)]) at 20 °C, as follows:

PN 10, PN 16, PN 25, PN 40, PN 64 and PN 100.

7 Pressure/temperature ratings

7.1 The valves specified in this standard shall have maximum ratings for liquid, gas and steam as detailed in Table 1.

Table 1 — Pressure/temperature ratings

1	2	3	4	5	6	7	8	9	10	11	12	13
Nominal pressure PN	**Material**	**For flanged ends valves only: BS 4504 table number**	**Maximum permissible gauge working pressures at temperatures (°C) of:**									
			– 10 to 120	**150**	**180**	**200**	**220**	**250**	**260**	**300**	**350**	**400**
			bar[a]	bar[a]	bar[a]	bar[a]	bar[a]	bar[a]	bar[a]	bar[a]	bar[a]	bar[a]
10	Cast iron	10/11	10	9.2	8.5	8	8	7	6.8	6	—	—
16	Cast iron	16/11	16	14.8	13.9	13	13	11	10.8	10	—	—
	Carbon steel	16/1	16	—	—	16	—	15	—	13	11	9
25	Cast iron	25/11	25	23	21.2	20	19	18	17.5	16	—	—
	Carbon steel	25/1	25	—	—	25	—	24	—	21	17	14
40	Carbon steel	40/1	40	—	—	40	—	38	—	35	28	23
64	Carbon steel	64/1	64	—	—	64	—	61	—	53	44	36
100	Carbon steel	100/1	100	—	—	100	—	95	—	82	70	57

NOTE Intermediate values can be obtained by linear interpolation.

[a] 1 bar = 10^5 N/m^2 = 10^2 kPa.

7.2 Maximum permissible working pressures in bar gauge and operating temperatures shall comply with the requirements of BS 4504 as given in Table 1, except that these ratings may be limited by the materials of the body seat rings, and/or seals. Due to the variety of lining and lubricant materials, it will be necessary to refer to manufacturers' recommendations for pressure/temperature ratings. Seals, however, shall be capable of withstanding the body test pressures.

Regardless of any limitation imposed by the above paragraph, the body shall have a pressure/temperature capability which complies with the requirements of BS 4504.

[3)] 1 bar = 10^5 N/m^2 = 10^2 kPa.

Section 2. Body ends

8 Flanged body ends

8.1 Flange dimensions shall comply with the relevant requirements of BS 4504.

8.2 Flanges shall be at right angles to the axis of the bore and concentric with the bore. Flanges shall be drilled unless otherwise specified and bolt holes shall be "off centres".

8.3 The face-to-face dimensions of flanged valves shall be as detailed in Table 2.

Table 2 — Face-to-face dimensions

1	2	3	4	5	6	7	8	9
Nominal size DN	Cast iron or carbon steel face-to-face dimensions for nominal pressure of PN 10/16				Face-to-face dimensions for cast iron PN 25 and carbon steel PN 25/40			Carbon steel face-to-face dimensions for nominal pressure of PN 64/100, reduced bore and full bore
	reduced bore		full bore		reduced bore	full bore		
	short	long	short	long		short	long	
	mm	mm	mm	mm	mm	mm	mm	mm
10	102	—	102	120	—	—	—	—
15	108	—	108	130	140	140	—	165
20	117	—	117	150	152	152	—	190
25	127	—	127	160	165	165	—	216
32	140	—	140	180	178	178	—	229
40	165	—	165	200	190	190	200	241
50	178	203	203	230	216	216	230	292
65	190	222	222	290	241	241	290	330
80	203	241	241	310	283	283	310	356
100	229	305	305	350	305	305	350	432
125	254	356	356	400	381	381	400	508
150	267	394	394	480	403	403	480	559
200	292	457	457	600	419	502	600	660
250	330	533	533	730	457	568	730	787
300	356	610	610	850	502	648	850	838
350	381	686	686	980	762	762	980	889
400	406	762	762	1 100	838	838	1 100	991
450	432	864	864	—	914	914	—	1 092
500	457	914	914	1 250	991	991	1 250	1 194
600	508	1 067	1 067	1 450	1 143	1 143	1 450	1 397

8.4 The tolerances on the face-to-face dimensions detailed in Table 2 shall be as follows:

Face-to-face dimensions			Tolerance
mm			mm
Above	0 up to and including	200	± 1
Above	200 up to and including	400	± 2
Above	400 up to and including	600	± 3
Above	600 up to and including	800	± 4
Above	800 up to and including	1 000	± 5
Above	1 000 up to and including	1 450	± 6

9 Screwed body ends

Screwed body ends shall have female threads complying with the requirements of BS 21 (ISO/R 7) either taper or parallel at the manufacturer's option unless the particular form is specified in the order.

9.1 End faces of parallel threaded, valves shall have a smooth finish at right angles to the thread axis. The minimum outside diameters of sealing faces shall be in accordance with Table 3.

Table 3 — Minimum outside diameters of sealing faces for parallel threaded valves

1	2
Thread nominal size	**Outside diameter of sealing face (min.)**
	mm
$\frac{1}{4}$	18
$\frac{3}{8}$	22
$\frac{1}{2}$	26
$\frac{3}{4}$	32
1	39
$1\frac{1}{4}$	49
$1\frac{1}{2}$	55
2	68

NOTE The dimensions given in Table 3 comply with the requirements of ISO 1179.

9.2 Other forms of thread may be provided as specified by the purchaser.

9.3 Body ends shall be of appropriate shape to facilitate tightening.

Section 3. Design and manufacture

10 Bodies

10.1 Body construction. Bodies may be of either the one piece or split construction (see also Figure 2).

10.2 Body end ports. The body end ports shall be circular. Table 4 gives approximate values, for guidance only, for the bore dimensions at the body end ports of flanged valves. These dimensions are not necessarily applicable to lined valves.

Table 4 — Dimensions of body end ports

1	2	3	4	5	6
Nominal size	Bore dimensions for PN ratings of:				
DN	PN 10	PN 16	PN 25/40	PN 64	PN 100
	mm	mm	mm	mm	mm
10	10	10	10	10	10
15	15	15	15	15	15
20	20	20	20	20	20
25	25	25	25	25	25
32	32	32	32	32	32
40	40	40	40	40	40
50	50	50	50	50	50
65	65	65	65	65	65
80	80	80	80	80	80
100	100	100	100	100	100
125	125	125	125	125	125
150	150	150	150	150	150
200	200	200	200	200	200
250	250	250	250	250	250
300	300	300	300	300	300
350	350	335	335	335	325
400	400	385	385	385	375
450	450	440	430	430	420
500	500	490	485	480	465
600	600	590	585	575	560

11 Body tappings

Provision shall be made whenever practicable on valves of DN 80 or nominal size 3 and above for body tappings at the bottom of each body. Body tappings, when required, shall be of the following sizes and shall comply with the requirements of BS 21 (ISO/R 7).

Flanged valve (DN)	80 to 125	150 to 200	250 to 600
Screwed valve (nominal size)	3 and 4	—	—
Body tapping sizes	$\frac{1}{2}$	$\frac{3}{4}$	1

The location of such tappings is shown in Figure 2 for different types of ball and body construction.

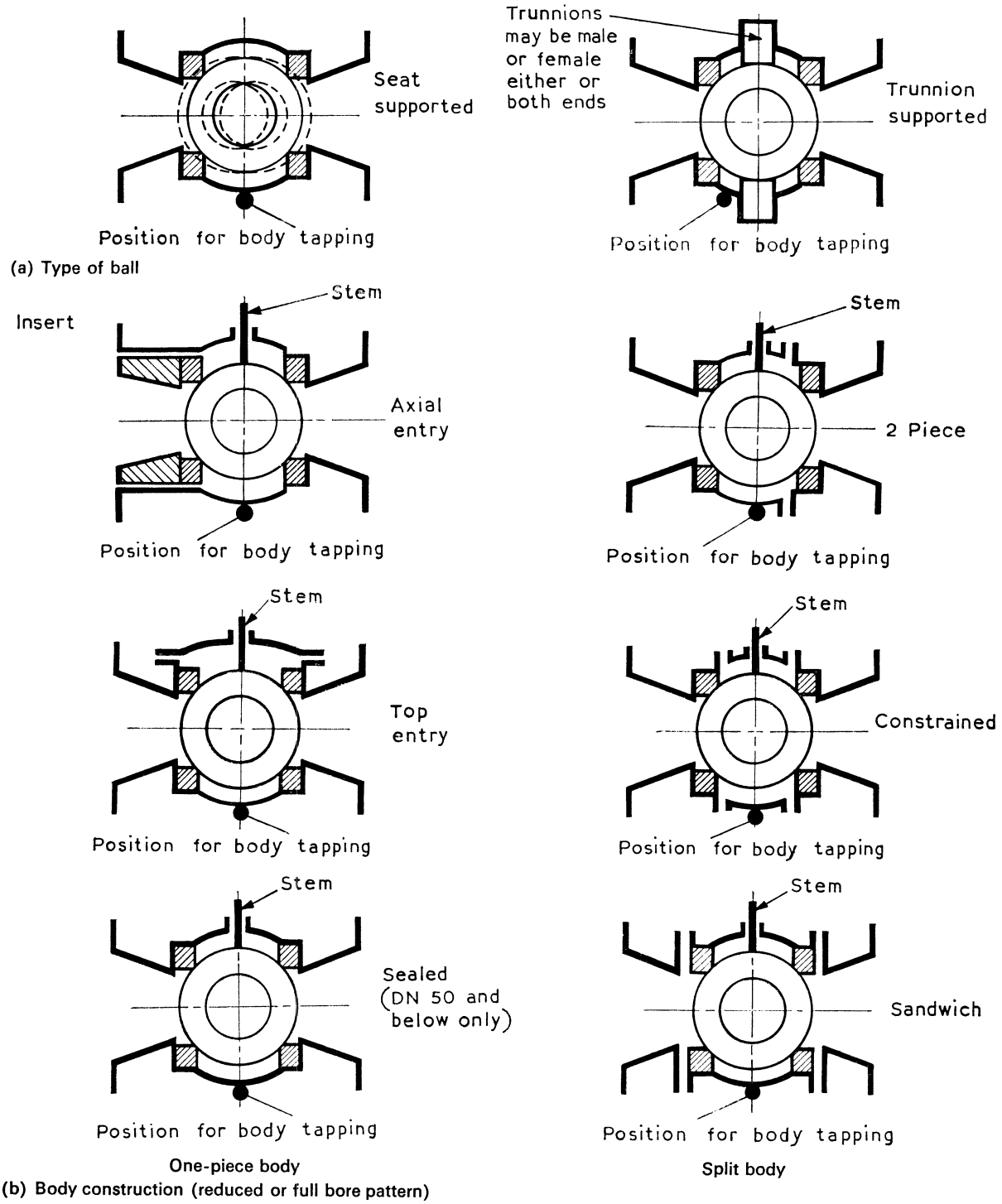

Figure 2 — Typical ball valve construction variants with body tapping locations

12 Operation

12.1 Means. Unless otherwise specified, valves shall be designed to be operated by a handwheel or wrench.

12.2 Direction. Unless otherwise specified, manually operated valves shall be closed by turning the handwheel or wrench in a clockwise direction when facing the handwheel or wrench.

12.3 Handwheels. Handwheels shall be marked CLOSE or SHUT with an arrow to indicate the direction of closure. In addition handwheels may be marked OPEN with an arrow to indicate the anti-clockwise direction of opening. Alternatively, these markings may be shown on a plate secured below the handwheel nut.

12.4 Wrenches. Valves supplied with wrenches shall, unless otherwise specified, have the wrench mounted parallel to the flow passage through the ball.

12.5 Handwheels and wrenches. Handwheels and wrenches shall be fitted in such a way that, whilst held securely, they may be removed and replaced when necessary.

12.6 Indicators. All valves shall be provided with some form of indicator for the position of the ball port.

12.7 Stops. Suitable stops shall be provided for both the fully open and fully closed positions of the valve.

12.8 Chainwheel operation. If chainwheel operation is required, the type of chainwheel shall be specified in the order which shall also specify any chain to be supplied.

12.9 Gear operation. If gear operation is required, the type of gearing and its arrangement shall be specified in the enquiry and order.

12.10 Actuator operation. If actuator operation is required, the details of the actuator and its power supply together with the design maximum pressure differential across the valve shall be specified in the enquiry and order.

The dimensions of the actuator attachment flange shall comply with the requirements of BS . . . . "*Flange attachment dimensions of actuators to general purpose valves*" (in course of preparation).

13 Bolting

Bolting threads shall be in accordance with ISO metric or Unified inch standards. The dimensions and finish of bolting shall comply with the requirements of the following British Standards as may be appropriate:

Metric	Inch
BS 3692	BS 1768 (below $\frac{1}{2}$ in)
BS 4168 (cap head)	BS 1769
BS 4190	BS 2470 (cap head UNC)
BS 4439	BS 2693-1
BS 4882	BS 2708
	BS 4882

IMPORTANT NOTE

For the period up to and including 31 December 1976, the following sentence A applies. From 1 January 1977, the following sentence B applies.

A. Bolting with Whitworth form threads complying with BS 916, BS 1083 or BS 2693-1 or bolting with other head forms otherwise complying with the requirements of the specified standards is not precluded.

B. Bolting with other head forms otherwise complying with the requirements of the specified standards is not precluded.

14 End flanges

End flanges of steel valves may be integral with or welded to the body unless a particular form of attachment is specified in the order. Where flanges are welded they shall comply with the requirements of BS 806 or BS 3351. Other welding techniques shall be the subject of agreement between the manufacturer and the purchaser.

15 Joints

Joints between the bodies and body connectors or inserts shall not, in the case of screwed valves, be adversely affected by normal unscrewing or screwing in of connecting pipework nor, in the case of flanged valves, by normal bolting or unbolting of the connecting pipework.

Section 4. Materials

16 Choice of materials

This standard is based on materials specified in Table 5. Unless otherwise agreed, the manufacturer has the option of selecting materials listed in Table 5 or using other materials, providing they are at least as suitable in all relevant respects.

17 Trim

Where valves are required with a particular trim, this shall be specified by the purchaser and in this case the materials used shall be subject to agreement between the manufacturer and the purchaser.

Table 5 — Basic materials

1	2	3	4	5	6	7
Components	**Cast iron valves**			**Carbon steel valves**		
	Material	**BS**	**Grade or designation**	**Material**	**BS**	**Grade or designation**
Body Body connector cover ball insert	Cast iron	1 452	220 180[c]	Carbon steel	1504-161	B
					1503-161	28
					1501-151	26
					970-1	070M20[a]
Bolting	Carbon steel; minimum tensile strength 390 N/mm^2 (= MPa)[b]			Carbon steel; minimum tensile strength 390 N/mm^2 (= MPa)[b]		
Seals gaskets	Manufacturer's standard; suitable for duty			manufacturer's standard; suitable for duty		

[a] In the normalized or cold drawn from hot-rolled conditions only.

[b] Free cutting steel shall not be used. If different bolting is fitted because of design or performance requirements it shall be readily identifiable.

[c] Grade 180 cast iron for this application is permitted as an alternative to grade 220 only where the section thickness at any point does not exceed 15 mm.

Section 5. Testing and inspection

18 Testing

18.1 General. All valves shall be tested hydrostatically by the manufacturer before despatch. Tests shall be carried out with water unless the use of another liquid is agreed between the purchaser and the manufacturer.

The test pressures shall be determined from the following relationships:

a) body tests 1.5 PN;

b) seat tests 1.0 PN or the, manufacturer's recommended service pressure, whichever is the lesser.

These pressures shall be obtained without any significant hydraulic shock. The valves shall be tested before the application of paint or other similar treatment unless otherwise agreed between the purchaser and the manufacturer.

There shall be no air trapped within the parts of the valve subjected to the test pressure.

There shall be no visible evidence of leakage during the tests.

The test durations shall be as given in Table 6 unless otherwise agreed between the purchaser and the manufacturer.

Table 6 — Test durations

1	2	3	4
Flanged: nominal size DN	**Screwed: nominal size**	**Minimum test duration (min)**	
		body	**seat**
Up to and including 50	Up to and including 2	0.25	0.25
65 to 150	$2\frac{1}{2}$ to 4	1	1
200 to 300	—	2	2
350 and above	—	5	5

18.2 Body tests. All completely assembled valves shall be tested as follows.

a) The body ends shall be blanked so that the valve is subjected to the full pressure stresses in all directions induced by the test pressure.

b) The valve shall be tested in the partly open position.

18.3 Seat tests. All completely assembled valves shall be tested as follows.

a) The seating surfaces of the valve shall be cleaned unless a surface treatment forms an integral part of the design or the use of a temporary surface treatment has been agreed between the manufacturer and the purchaser to avoid the possibility of damage under the conditions of the test.

b) The valve shall be tested after closing in the normal manner.

c) The seat shall be tested by successively subjecting each end of the closed valve to pressure, the other end being open to the atmosphere.

19 Test certificate

When specified by the purchaser, the manufacturer shall issue a test certificate confirming that the valves have been tested in accordance with this standard, and stating the actual pressures and medium used in the test.

20 Inspection

If inspection is required, this shall be stated in the enquiry and order. The purchaser or his authorized representative shall have access to the manufacturer's works at all reasonable times to inspect the assembled valves to his order.

21 Witnessing of tests

When the purchaser desires to witness the tests the manufacturer shall notify him to enable his inspector to be present.

22 Certificate of conformity

The manufacturer shall, when so stated in the order, supply a certificate stating that the valves and valve parts comply in all respects with the requirements of this standard and the order.

Section 6. Preparation for despatch

23 After testing

Each valve shall be drained, cleaned, prepared and suitably protected (painting of the finished valves shall be at the option of the manufacturer unless specified by the purchaser) for despatch in such a way as to minimize the possibility of damage and deterioration during transit and storage.

24 Ball position

All valve balls shall be in the open position when despatched.

25 Body ends

When specified, body ends shall be suitably sealed to exclude foreign matter during transit and storage.

26 Jointing surfaces

When specified, valves shall have their jointing surfaces protected.

Section 7. Marking

27 General

Each valve shall be marked clearly with the body and identification plate markings specified in clauses **28** and **29** (except as provided for in clause **32**).

28 Body markings

Body markings shall be integral with the body or on a plate securely fixed to the body. If on a plate, this shall be separate and distinct from the identification plate referred to in clause **29**. Body markings shall be as follows.

a) Nominal size DN (see **5.1**) or nominal size (see **5.2**).

b) Nominal pressure rating (PN . .).

c) Body material designation (e.g. "CI") (see clause **30**).

d) Manufacturer's name or trade mark.

e) Arrow to indicate direction of flow (uni-directional flow valves only).

29 Body or identification plate markings

Body or identification plate markings shall be as follows.

a) Any limiting temperature (°C) when the valve is not suitable for the range of temperatures specified in BS 4504 (see clause **7**).

b) The number of this British Standard, i.e. BS 5159.

c) Seat material designation, if different from that of the body.

d) Ball material designation, if different from that of the body.

30 Material symbols

Where appropriate the following symbols shall be used for body material designation [see clause **28** c)] and seat and ball material designation [see clause **29** c) and d)], and identification of the type of seat.

Cast iron, grey	CI	Carbon steel	CS or STEEL
malleable	MI	Stainless steel	SS
spheroidal graphite	SG	Nickel alloy	NA
Gunmetal	GM		
Brass	BR	Integral seats	INT
Aluminium bronze	AB	Resilient seats	RES

The symbol for the identification of the type of seat shall be marked immediately after the appropriate body material designation [see clause **28** c)] or seat or ball material designation [see clause **29** c) and d)].

31 Additional markings

Additional markings may be used at the option of the manufacturer providing they do not conflict with any of the specified markings.

32 Omission of markings

On valves smaller than DN 50 or nominal size 2 the following body marking may be omitted provided they are shown on the identification plate.

a) Nominal size.

b) Nominal pressure rating (PN).

c) Material designation.

d) Manufacturer's name or trade mark.

Section 8. Valves for use in ANSI flanged piping systems

33 Requirements

The requirements for valves to be used in ANSI flanged piping systems are specified in Appendix A.

Section 9. Enquiry or order information

34 Information to be supplied

The following information should be supplied by the purchaser in an enquiry or order.

a) If valves are to be "fire-safe" or are to be protected against electrostatic build-up (see clause **1**).

b) Pattern of valve (see clause **4**).

c) Nominal size DN (see **5.1**) or nominal size (see **5.2** and **A.1**).

d) Nominal pressure (PN) designation (see clause **6**) or ANSI pressure classification (see **A.2**).

e) Maximum and minimum service temperature (see **7.2** and **A.6**).

f) The body ends required

1) If flanged, state whether in accordance with BS 4504 or in accordance with ANSI Class 125, Class 150, Class 300, Class 400 or Class 600 (see clause **8** or **A.3**) and if flanges are to be undrilled (see **8.2**); also whether for PN 10/16, PN 25 (cast iron) and PN 25/40 (carbon steel) valves the short or long series of face-to-face dimensions is required (see **8.3**).

2) If screwed state whether a specific thread form (parallel or taper) is required (see clause **9**) and if other than in accordance with BS 21 (ISO/R 7), the type required (see **9.2**).

g) If chainwheel operation is required, details of chainwheel and chain (see **12.8**).

h) If gear operation is required, details of the gearing and its arrangement (see **12.9**).

i) If actuator operation is required, details of the actuator and its power supply and the design maximum pressure differential across the valve (see **12.10**).

j) If a particular form of attachment of the end flanges is required (see clause **14**).

k) If possible, the specific purpose for which the valve is required and any preference for materials (see clauses **16** and **17**).

l) State if any of the following is required:

1) a body tapping and, if a plug is required, its material (see clause **11**);

2) a wrench (see **12.4**);

3) test certificate (see clause **19**);

4) inspection or witnessing of tests or certificate of conformity (see clauses **20** to **22**);

5) painting (see clause **23**);

6) body ends sealed for despatch (see clause **25**);

7) jointing surfaces protected (see clause **26**).

Appendix A Cast iron and carbon steel ball valves for general purposes with ANSI Class 125, Class 150, Class 300, Class 400 and Class 600 flanges

When valves in accordance with this standard are required for use in ANSI (BS 1560) flanged piping systems, all the requirements of this standard apply, with the following qualifications.

A.1 Nominal sizes. For cast iron valves with Class 125 flanges the range of nominal sizes is listed in Table 7.

For carbon steel valves the ranges of nominal sizes shall be as follows (inch equivalents in parentheses):

Class 150, Class 300 and Class 600: 15 ($\frac{1}{2}$), 20 ($\frac{3}{4}$), 25 (1), 32 ($1\frac{1}{4}$)[4)], 40 ($1\frac{1}{2}$), 50 (2), 65 ($2\frac{1}{2}$)[4)], 80 (3), 100 (4), 150 (6), 200 (8), 250 (10), 300 (12), 350 (14), 400 (16), 450 (18), 500 (20), 600 (24).

Class 400: 100 (4), 150 (6), 200 (8), 250 (10), 300 (12), 350 (14), 400 (16), 450 (18), 500 (20), 600 (24).

A.2 Pressure classification. Valves complying with the requirements of this appendix shall be designated Class 125, Class 150, Class 300, Class 400 or Class 600 valves as appropriate. The numerals in the class designation represent the primary service pressure rating of the valve in pounds-force per square inch.

A.3 Face-to-face dimensions. The face-to-face dimensions of Class 125, Class 150, Class 300, Class 400 and Class 600 valves shall correspond to those listed in Table 2 according to the following relations, except that for steel ring-joint flanges the valves of *X* in Table 7 shall be added to the face-to-face dimensions given in Table 2.

Class	PN	
125	10/16	all patterns and series
150	10/16	
300	25 and 25/40	
400	64/100	
600	64/100	

Table 7 — Value X for steel ring-joint flanges

1		2	3	4
Nominal size of valve		*X*		
		Class 150	Class 300	Class 400 and Class 600
DN	in	mm	mm	mm
25	1	13	13	0
(32)[a]	($1\frac{1}{4}$)[a]	(12)	(12)	(0)
40	$1\frac{1}{2}$	13	13	0
50	2	12	16	3
(65)[a]	($2\frac{1}{2}$)[a]	(13)	16	3
80	3	13	15	3
100	4	12	16	3
150	6	13	16	3
200	8	13	16	4
250	10	13	16	4
300	12	12	16	3
350	14	13	16	3
400	16	13	16	3
450	18	12	16	3
500	20	13	20	6
600	24	13	22	10

[a] These sizes have been retained only for the purpose of replacing existing valves. Their use for new construction in piping systems using BS 1560-2 flanges should be avoided.

[4)] These sizes have been retained only for the purpose of replacing existing valves. Their use for new construction in piping systems using BS 1560-2 flanges should be avoided.

A.4 Flange dimensions. The dimensions of ANSI Class 125 cast iron flanges shall be in accordance with Table 8.

Table 8 — Dimensions of ANSI Class 125 flanges[a]

1	2	3	4	5	6	7	8
Nominal size of valve		**Diameter of flange**	**Minimum thickness of flange**	**Diameter of bolt circle**	**Number of bolts**	**Diameter of bolt holes**	
DN	in	mm	mm	mm		mm	in
25	1	108	11.1	79.4	4	15.9	$\frac{5}{8}$
(32)[b]	($1\frac{1}{4}$)[b]	117	12.7	88.9	4	15.9	$\frac{5}{8}$
40	$1\frac{1}{2}$	127	14.3	98.4	4	15.9	$\frac{5}{8}$
50	2	152	15.9	120.6	4	19.0	$\frac{3}{4}$
(65)[b]	($2\frac{1}{2}$)[b]	178	17.5	139.7	4	19.0	$\frac{3}{4}$
80	3	190	19.0	152.4	4	19.0	$\frac{3}{4}$
100	4	229	23.8	190.5	8	19.0	$\frac{3}{4}$
150	6	279	25.4	241.3	8	22.2	$\frac{7}{8}$
200	8	343	28.6	298.4	8	22.2	$\frac{7}{8}$
250	10	406	30.2	362.0	12	25.4	1
300	12	483	31.8	431.8	12	25.4	1
350	14	533	34.9	476.2	12	28.6	$1\frac{1}{8}$
400	16	597	36.5	539.8	16	28.6	$1\frac{1}{8}$
450	18	635	39.7	577.8	16	31.8	$1\frac{1}{4}$
500	20	698	42.9	635.0	20	31.8	$1\frac{1}{4}$
600	24	813	47.6	749.3	20	34.9	$1\frac{3}{8}$

[a] Source of data: ANSI B 16.1.

[b] These sizes have been retained only for the purpose of replacing existing valves. Their use for new construction in piping systems using BS 1560-2 flanges should be avoided.

A.5 Flange thickness tolerance. The tolerance on flange thickness in Table 8 shall be:

a) up to and including 32 mm thick $^{+3.0}_{-0}$ mm;

b) over 32 mm thick $^{+4.5}_{-0}$ mm.

The dimensions of ANSI (BS 1560) Class 150, Class 300, Class 400 and Class 600 carbon steel flanges shall be in accordance with the requirements of the appropriate tables of BS 1560-2.

A.6 Pressure/temperature ratings. Pressure/temperature ratings shall be as in **A.6** a) and **A.6** b) except that restrictions on operating temperature may be imposed by the manufacturer, from whom details should then be sought, (see also **7.2**).

a) For Class 125 cast iron valves the pressure/temperature ratings shall be as given in Table 9.

Table 9 — Pressure/temperature ratings[a] for Class 125 valves

1	2	3
Temperature	**Maximum permissible gauge working pressure for nominal size**	
	up to and including DN 300 or 12 in	**DN 350 or 14 in and above**
°C	bar[b]	bar[b]
– 10 to 66	13.8	10.3
93	13.1	9.3
107	12.4	9.0
121	12.1	8.6
135	11.7	8.3
149	11.4	7.6
163	10.7	7.2
177	10.3	6.9
191	10.0	—
204	9.7	—

[a] Source of data: BS 5150.
[b] 1 bar = 10^5 N/m^2 = 10^2 kPa.

NOTE Intermediate values may be obtained by linear interpolation.

b) For Class 150, Class 300, Class 400 and Class 600 carbon steel valves the pressure/temperature ratings shall be in accordance with th‘e relevant tables of BS 1560-2.

A.7 Testing and inspection. Valves with ANSI flanges shall be tested and inspected in accordance with section 5 of this standard except that the test pressures given in Table 10 shall apply.

Table 10 — Test pressure (gauge) for Class 125, Class 150, Class 300, Class 400 and Class 600 valves

1	2	3
	Gauge test pressure for:	
Class	**body**	**seat**
	bar[a]	bar[a]
125 (up to and including DN 300)	24.1	13.8
125 (DN 350 and above)	18.3	10.3
150	30.0	22.0
300	76.0	55.0
400	100.0	69.0
600	150.0	110.0

[a] 1 bar = 10^5 N/m^2 = 10^2 kPa.

NOTE The seat test pressure shall be equal to the manufacturer’s recommended service pressure if less than the above.

A.8 Marking. Valves complying with the requirements of this appendix shall be marked in accordance with section 7 of this standard except that the valves shall be marked on the body with the appropriate class designation, e.g. “Class 125”[5)] and with the nominal size in inches. These markings may be in place of, or additional to, those required in clause **28**, at the manufacturer’s option.

[5)] Where, due to the small size of the valve, it is impracticable to incorporate the word “Class” this may be omitted.

Publications referred to

This standard makes reference to the following British Standards and international publications:

BS 21, *Pipe threads for tubes and fittings where pressure-tight joints are made on the threads.*

BS 759, *Valves, gauges and other safety fittings for application to boilers and to piping installations for and in connection with boilers.*

BS 806, *Ferrous pipes and piping installations for and in connection with land boilers.*

BS 970, *Wrought steels in the form of blooms, billets, bars and forgings.*

BS 970-1, *Carbon and carbon manganese steels including free cutting steels.*

BS 1452, *Grey iron castings.*

BS 1501-6, *Steels for use in the chemical, petroleum and allied industries.*

BS 1501, *Steels for fired and unfired pressure vessels: Plates.*

BS 1501-1, *Carbon and carbon manganese steels: Imperial units.*

BS 1503, *Steels for fired and unfired pressure vessels. Forgings.*

BS 1560, *Steel pipe flanges and flanged fittings (nominal sizes ½ in to 24 in) for the petroleum industry.*

BS 1560-2, *Metric dimensions.*

BS 1768, *Unified precision hexagon bolts, screws and nuts (UNC and UNF threads). Normal series.*

BS 1769, *Unified black hexagon bolts, screws and nuts (UNC and UNF threads). Heavy series.*

BS 2470, *Hexagon socket screws and wrench keys. Inch series.*

BS 2591, *Glossary for valves and valve parts (for fluids).*

BS 2591-5, *Ball valves.*

BS 2693, *Screwed studs.*

BS 2693-1, *General purpose studs.*

BS 2708, *Unified black square and hexagon bolts, screws and nuts (UNC and UNF threads). Normal series.*

BS 3351, *Piping systems for petroleum refineries and petrochemical plants.*

BS 3692, *ISO metric precision hexagon bolts, screws and nuts.*

BS 4168, *Hexagon socket screws and wrench keys — metric series.*

BS 4190, *ISO metric black hexagon bolts, screws and nuts.*

BS 4439, *Screwed studs for general purposes.*

BS 4504, *Flanges and bolting for pipes, valves and fittings. Metric series.*

BS 4882, *Bolting for flanges and pressure containing purposes.*

BS . . . ., *Flange attachment dimensions of actuators to general purpose valves*[6)].

ISO/R 7, *Pipe threads for gas list tubes and screwed fittings where pressure-tight joints are made on the threads (⅛ inch to 6 inches).*

ISO 1179, *Pipe connections for plain end steel and other metal tubes in industrial applications.*

[6)] In course of preparation.

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