

Specification for

Steel plug valves

UDC 621.646.614:669.1:001.4:620.1

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW



Document Sharing Hub

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Piping Systems Components Standards Committee (PSE/-) to Technical Committee PSE/7, upon which the following bodies were represented:

- Amalgamated Union of Engineering Workers
- Associated Offices Technical Committee
- Association of Bronze and Brass Founders
- Association of Building Component Manufacturers Ltd.
- British Chemical Engineering Contractors Association
- British Compressed Gases Association
- British Foundry Association
- British Gas plc
- British Maritime Technology
- British Shipbuilders
- British Valve and Actuator Manufacturers' Association Ltd.
- Chartered Institution of Building Services Engineers
- Copper Development Association
- Copper Tube Fittings Manufacturers' Association
- Department of the Environment (Property Services Agency)
- Electricity Supply Industry in England and Wales
- Energy Industries Council
- Engineering Equipment and Materials Users' Association
- GAMBICA (BEAMA Ltd.)
- Health and Safety Executive
- Institute of British Foundrymen
- Institution of Chemical Engineers
- Institution of Gas Engineers
- Institution of Mechanical Engineers
- Institution of Water and Environmental Management (IWEM)
- Society of British Gas Industries
- Steel Casting Research and Trade Association
- Water Authorities Association
- Water Companies Association

The following body was also represented in the drafting of the standard, through subcommittees and panels:

Scottish Council Development and Industry

This British Standard, having been prepared under the direction of the Piping Systems Components Standards Committee, was published under the authority of the Board of BSI and comes into effect on 28 February 1989

© BSI 07-1999
First published June 1980
First revision February 1989

The following BSI references relate to the work on this standard:
Committee reference PSE/7
Draft for comment 87/70333 DC

ISBN 0 580 17081 0

Amendments issued since publication

Amd. No.	Date of issue	Comments

Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
Section 1. General	
1 Scope	1
2 Definitions	1
3 Valve patterns	2
4 Nominal sizes	2
5 Pressure designation	2
6 Pressure/temperature ratings	2
7 Dimensions	2
Section 2. Design and materials	
8 Design	5
9 Operation	7
10 Materials	7
Section 3. Testing	
11 Pressure testing	9
12 Fire testing	9
13 Anti-static testing	9
14 Manufacturer's certificate	9
Section 4. Marking	
15 General	10
Section 5. Preparation for storage and transportation	
16 General	11
17 Body ends	11
Appendix A Information to be supplied by purchaser	12
Appendix B Weld-end preparations	13
Appendix C Typical plug valve constructions	15
Figure 1 — Location of tappings	6
Figure 2 — Weld-end preparation	13
Figure 3 — Typical bevel for shell wall thicknesses (t) 22 mm or less for pipeline applications	14
Figure 4 — Lubricated plug valve. Parallel plug	15
Figure 5 — Lubricated plug valve. Taper plug	16
Figure 6 — Lubricated plug, taper plug, pressure balanced	17
Figure 7 — Soft seated plug valve	18
Table 1 — Nominal size of valves and pressure designation	3
Table 2 — Minimum pressure/temperature soft seat ratings	3
Table 3 — Class 800 body pressure/temperature ratings	4
Table 4 — End-to-end dimensions of butt-weld-end valves	4
Table 5 — Socket-weld-end details	4
Table 6 — Minimum shell wall thickness	5
Table 7 — Body tappings	6
Table 8 — Additional materials permitted for use in the manufacture of valves smaller than DN 50 from bar-stock	8
Table 9 — Pressure test durations	9
Table 10 — Typical material symbols	10
Publications referred to	20

Foreword

This revision of this British Standard has been prepared under the direction of the Piping Systems Components Standards Committee and supersedes BS 5353:1980 which is withdrawn.

The opportunity has been taken in carrying out this revision to introduce internationally agreed pressure/temperature ratings, based on the definition of nominal pressure (PN) given in International Organization for Standardization (ISO) standard 7268, covering ratings previously given in German (DIN) and American (ANSI) standards. However, in this revision the use of PN has been limited to valves with flanges designated PN 10, PN 16, PN 25 and PN 40 in accordance with BS 4504-3.1. For valves with flanges complying with BS 1560-3.1, Class ratings have been retained.

The designation Class 800 for threaded and socket weld end valves has also been retained as there is no equivalent in the PN system.

This revision also takes account of the latest agreements in ISO/TC 153/SC 1, Valves — Design, construction, marking and testing, and ISO/TC 5/SC 10, Metallic flanges and their joints. On this basis the terminology and definitions in this standard are in accordance with those given in ISO standards and the minimum bore dimensions conform to those agreed in ISO/TC 153/SC 1. However at the time of publication of this British Standard no corresponding international standard exists.

The main differences between this British Standard and the 1980 edition are as follows.

- a) Class 400 valves have been omitted.
- b) The range of sizes for PN designated valves has been extended to nominal sizes up to and including DN 600.
- c) Details of socket-weld end dimensions are included.
- d) A greater choice of materials is available for the pressure containing shell and some additional requirements are given for trim component materials.
- e) Details of anti-static testing are included and reference is made to BS 6755-1 for production pressure testing. Pressure test durations have changed.
- f) Requirements for fire type-testing are included. In clause 12 reference is made to both BS 5146-1 and BS 6755-2 for fire testing. It is intended that BS 5146-1 will be withdrawn on 31 July 1990 and thereafter clause 12 will be amended to require fire testing in accordance with BS 6755-2 only.

The minimum pressure/temperature seat ratings given in this standard for soft seated valves are based on the use of PTFE without fillers, of virgin material completely free of reclaimed processed material for the valve seats, but attention is drawn to the use of alternative seat materials that could give higher pressure/temperature ratings.

Pressure/temperature ratings of the soft seated valve are dependent on both the body rating and the pressure capability of the seats. Seat pressure capability will be limited by the strength of the seat material, particularly by the loss of strength which may occur at elevated temperatures. The applicable valve pressure rating at any temperature will, therefore, be limited by either the body rating or the seat rating.

Throughout this British Standard those dimensions shown in parentheses are non-preferred. The non-preferred sizes are given for replacement of existing valves; they are not recommended for new pipework systems.

Attention is drawn to BS 5158, which specifies cast iron valves for less arduous duties than valves covered by this standard and to BS 6683 for guidance on the installation of valves.

Product certification. Users of this British Standard are advised to consider the desirability of third party certification of product conformity with this British Standard based on testing and continuing surveillance which may be coupled with assessment of a supplier's quality systems against the appropriate Part of BS 5750.

Enquiries as to the availability of third party certification schemes will be forwarded by BSI to the Association of Certification bodies. If a third party certification scheme does not already exist, users should consider approaching an appropriate body from the list of Association members.

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 20, 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.

Section 1. General

1 Scope

This British Standard specifies requirements for the valve seat and body pressure/temperature ratings and the design, including materials, dimensions, operation, performance, testing and marking of lubricated, and soft seated and lined plug valves having a steel shell with specified shell wall thickness. This standard also specifies anti-static requirements, an optional fire tested design and the option of a steel or cast iron plug.

It applies to short, regular or venturi pattern valves. The range of valves covered by this standard are given in Table 1 (see also clause 4).

Pressure/temperature ratings of the linings of lined valves and flange attachment methods, other than those specified in 8.4, are outside the scope of this standard.

NOTE 1 The information to be supplied by the purchaser at the time of the enquiry/order is given in Appendix A.

Appendix B shows typical weld-end preparations. Examples of typical plug valve constructions are contained in Appendix C.

NOTE 2 The titles of the publications referred to in this standard are listed on page 20.

2 Definitions

For the purposes of this British Standard, the following definitions apply.

2.1

face-to-face dimension

for flanged valves, the distance between the extremities of the flange faces

2.2

end-to-end dimension

for butt-weld end valves, the distance between the extremities of the connecting ends

2.3

anti-static design

a feature that may be inherent or incorporated in the design of the valve that ensures electrical continuity between the plug, stem and the body of the valve

2.4

fire type-tested design

a design that is capable of complying with BS 6755-2

2.5

anti-blow-out stem

a design that ensures the valve stems cannot be blown out of the body in the event of the stem seal retainer, e.g. gland, being removed while the valve is under pressure

2.6

nominal size (DN)

a numerical designation of size which is common to all components in a piping system other than those components designated by outside diameter or by thread size. It is a convenient round number for reference purposes and it is normally only loosely related to manufacturing dimensions

NOTE 1 Nominal size is designated by the letters DN followed by a number.

NOTE 2 This definition is identical with that given in ISO 6708.

2.7

nominal pipe size (NPS)

a designation of size in inches which is common to all components in a piping system other than those components designated by outside diameter. It is a convenient number for reference purposes and it is normally only loosely related to manufacturing dimensions

NOTE 1 Nominal pipe size is designated by the letters NPS followed by a number.

NOTE 2 NPS is used only in association with the "Class" rating system.

2.8

thread size (TS)

a fractional designation of size independent of any unitary system that is used to identify threaded (BS 21) connections in valves

2.9

nominal pressure (PN)

a numerical designation which is a convenient rounded number for reference purposes
all the equipment of the same nominal size (DN) designated by the same PN number shall have compatible mating dimensions

NOTE 1 The maximum allowable working pressure depends on materials, design and working temperatures, and should be selected from the tables of pressure/temperature ratings given in the appropriate standards.

NOTE 2 Nominal pressure is designated by the letters PN followed by the appropriate reference number.

NOTE 3 This definition is identical with that given in ISO 7268.

2.10

class

a numerical designation for reference purposes

NOTE 1 The maximum allowable working pressure depends on materials, design and design temperature and should be selected from the tables of pressure/temperature ratings given in the appropriate standards.

NOTE 2 Class is designated by the word Class followed by the appropriate reference number.

2.11**lubricated plug valve**

a valve having the mating surfaces of the plug and body separated from each other by a pressurized, renewable film of lubricant/sealant (see Appendix C)

2.12**soft seated plug valve**

a non-lubricated valve having soft seats of a low frictional material fitted between the body and the plug (see Appendix C)

2.13**lined plug valve**

a valve having a fully moulded, bonded or keyed non-removable lining on all internal wetted surfaces that may be lubricated or non-lubricated

2.14**short plug valve**

a valve having end-to-end dimensions corresponding with wedge gate valves (as specified in BS 2080)

2.15**regular plug valve**

a valve generally having plug ports of greater area than short or venturi valves

2.16**venturi plug valve**

a valve having reduced plug port area and a body throat approximating to a venturi

3 Valve patterns

Valves shall be short, regular or venturi pattern.

NOTE In Class 150, PN 10 and PN 16 the venturi and regular pattern are available only in the long series of end-to-end dimensions in accordance with BS 2080. In all other cases short, venturi and regular pattern valves have the same end-to-end dimensions.

4 Nominal sizes

Valves shall be of nominal sizes (DN) or nominal pipe sizes (NPS) or threaded sizes (TS) according to type of end fitting as given in Table 1.

5 Pressure designation

Pressure designation of valves shall be as given in Table 1.

6 Pressure/temperature ratings

NOTE 1 The pressure/temperature ratings of the linings of lined valves are outside the scope of this standard.

NOTE 2 Since the maximum or minimum operating temperature may be limited by the grade of lubricant/sealant used in the valve, attention is drawn to 10.10.

6.1 Soft seated valves

Minimum pressure/temperature seat ratings of soft seated valves shall be as given in Table 2. With the exception of the soft seats and primary seals, all valve components shall be capable of withstanding the pressure/temperature ratings as specified in BS 1560-3.1, BS 4504-3.1 or Table 3, as appropriate.

6.2 Metal seated valves

Pressure/temperature ratings of metal seated valves shall be as specified in BS 1560-3.1, BS 4504-3.1 or Table 3, as appropriate.

7 Dimensions**7.1 Flanged-end valves**

7.1.1 Flange dimensions shall comply with BS 1560-3.1 for Class designated valves or BS 4504-3.1 for PN designated valves.

NOTE See Table 1 for PN/Class relationship.

7.1.2 Face-to-face dimensions shall be in accordance with BS 2080. Valves having flanges complying with BS 4504-3.1 and pressure ratings (PN) as given in Table 1 shall have the same face-to-face dimensions as the corresponding Class designated valves (see Table 1).

7.2 Butt-weld-end valves

End-to-end dimensions shall be in accordance with the following:

- a) Table 4 for PN 10, PN 16, PN 25, PN 40, Class 150 and Class 300 valves;
- b) BS 2080 for Class 600, Class 900, Class 1500 and Class 2500 valves.

NOTE The details for the weld preparation for butt-weld-end valves are not a requirement of this standard but attention is drawn to Appendix B which gives details of various weld-end preparations and it is incumbent upon the purchaser to specify a particular weld-end preparation, if required (see Figure 2 and Figure 3), and the schedule or diameter and wall thickness of the connecting pipe.

7.3 Socket-weld-end valves

Socket-weld-end dimensions shall be as given in Table 5. The minimum metal thickness at the socket-weld-end shall be as given in Table 6.

7.4 Soft seated extended-weld-end valves

The overall length of weld-end soft seated valves when fitted with extended ends shall be 400 ± 1 mm. Valves of nominal sizes DN 15 to DN 40 intended for butt-welding shall have ends square or bevelled for welding and valves intended for socket welding shall have the end prepared in accordance with 7.3.

NOTE Valves of nominal size DN 50 should have bevelled ends in accordance with Appendix B which gives details of typical weld-end preparations and it is incumbent upon the purchaser to specify a particular weld-end preparation, if required (see Figure 2 and Figure 3).

Table 1 — Nominal size of valves and pressure designation

Nominal size of valve		Pressure designation						
DN	NPS or TS	Class 150 PN 10, PN 16	Class 300 PN 25, PN 40	Class 600	Class 800	Class 900	Class 1500	Class 2500
8	¼	—	—	—	C	—	— — —	—
10	⅜	—	—	—	C	—	— — —	—
15	½	B C D	B C D	B C D	C D	—	B C D	B C D
20	¾	B C D	B C D	B C D	C D	—	B C D	B C D
25	1	B C D	B C D	A C D	C D	—	A C D	A C D
(32)	(1 ¼)	B C D	B C D	B C D	C D	—	A C D	A C D
40	1 ½	B C D	B C D	A C D	C D	—	A C D	A C D
50	2	A C D	A C D	A C D	C D	—	A C D	A C D
(65)	(2 ½)	A	A	A	— —	—	A — —	A —
80	3	A	A	A	— —	A	A — —	A —
100	4	A	A	A	— —	A	A — —	A —
150	6	A	A	A	— —	A	A — —	A —
200	8	A	A	A	— —	A	A — —	A —
250	10	A	A	A	— —	A	A — —	A —
300	12	A	A	A	— —	A	A — —	A —
350	14	A	A	A	— —	—	A — —	— —
400	16	A	A	A	— —	—	A — —	— —
450	18	A	A	A	— —	—	— — —	— —
500	20	A	A	A	— —	—	— — —	— —
600	24	A	A	A	— —	—	— — —	— —

NOTE 1 A = flanged and butt-weld ends, B = flanged ends only, C = threaded ends and D = socket-weld ends.
NOTE 2 Non-preferred sizes are shown in parentheses (see foreword).

Table 2 — Minimum pressure/temperature soft seat ratings

Nominal size of valve DN	Minimum non-shock pressure rating at service temperature							
	40 °C	50 °C	75 °C	100 °C	125 °C	150 °C	175 °C	200 °C
8 to 150	bar ^a	bar	bar	bar	bar	bar	bar	bar
8 to 150	48	47	43	39	36	32	29	25
200 to 300	35	34	31	28	25	23	20	17

NOTE 1 Pressure/temperature ratings given are for steady state conditions; where pressure and/or temperature cycling occurs the manufacturer should be consulted.
NOTE 2 The minimum pressure/temperature ratings are based on seats made from polytetrafluoroethylene (PTFE) without fillers, of virgin material completely free of reclaimed processed material (see 10.4).
NOTE 3 See Table 1 for equivalent NPS and TS.

^a 1 bar = 100 kN/m² = 100 kPa.