

Specification for

Double regulating globe valves and flow measurement devices for heating and chilled water systems

Committees responsible for this British Standard

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

Amalgamated Engineering Union
 Associated Offices Technical Committee
 Association of Bronze and Brass Founders
 Association of Building Component Manufacturers
 British Chemical Engineering Contractors' Association
 British Compressed Gases Association
 British Foundry Association
 British Gas plc
 British Maritime Technology
 British Plumbing Fittings Manufacturers' Association
 British Valve and Actuator Manufacturers' Association
 Chartered Institution of Building Services Engineers
 Copper Development Association
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 Electricity Supply Industry in England and Wales
 Energy Industries Council
 Engineering Equipment and Materials Users' Association
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 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
 Water Companies' Association
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 West Midlands CBI

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

Building Services Research and Information Association
 Institute of Refrigeration

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Foreword

This British Standard has been prepared under the direction of the Piping Systems Components Standards Policy Committee. At the time of publication of this British Standard, no corresponding international standard exists.

Double regulating globe valves, and fixed and variable orifice valves specified in this standard have been generally, but not exclusively, developed from globe valves used for general purposes specified in BS 5152 (for cast iron bodies), BS 5154 (for copper alloy bodies) and BS 5160 (for steel bodies). The materials specified for the valves in this standard are the same as those specified in BS 5152, BS 5154 and BS 5160.

The orifice plates specified in this British Standard are distinct from the orifice plates specified in BS 1042-1.

The satisfactory performance of any valve or flow measurement device depends on design, manufacture, correct installation and maintenance. This standard does not specify selection, installation and maintenance requirements, for which reference should be made to an appropriate guide or code of practice, e.g. BS 6683, BS 6880-1, BS 6880-2 and BS 6880-3, CIBSE Commissioning code series W, PSA Standard specification M & E No. 3 or BSRIA Application guide AG12.

It has been assumed in the drafting of this British Standard that the execution of its provisions is entrusted to appropriately qualified and experienced people because it calls for procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage. This refers, in particular, to pressure testing and attention is drawn to Guidance Note GS4, produced by the Health and Safety Executive.

CAUTION. Strict compliance with the manufacturer's instructions and recommendations for installation, operation and maintenance of double regulating globe valves and flow measurement devices is necessary. Where there is an appropriate code of practice it is the responsibility of the installer and/or user to ensure that such practices are followed.

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 and ii, pages 1 to 18, 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 Scope

This British Standard specifies pressure/temperature ratings, dimensions, some aspects of design, materials, performance requirements, testing (both type and production testing), marking and preparation for storage and transportation of double regulating globe valves and flow measurement devices used for heating and chilled water systems.

This standard covers double regulating globe valves and flow measurement devices in the form of fixed and variable orifice valves and as individual orifice fittings made from steel, cast iron and copper alloys with flanged, threaded and compression ends, or for mounting between flanges, in a range of sizes and nominal pressure designations.

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

NOTE 2 This standard does not cover methods of installation.

NOTE 3 The titles of the publications referred to in this standard are listed on pages 18 and 19.

2 Definitions

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

2.1

nominal size (DN)

a numerical designation of size that is common to all components in piping systems other than those components designated by outside diameters or by thread size. It is a convenient round number for reference purposes and 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 to that given in ISO 6708.

2.2

nominal pressure (PN)

a numerical designation which is a convenient rounded number for reference purposes. All 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 It is designated by the letters PN followed by the appropriate reference number.

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

2.3

face-to-face dimension (for flanged double regulating globe valves and flow measurement devices)

the distance, expressed in millimetres, between the two planes perpendicular to the product axis located at the extremities of the body end ports

2.4

double regulating globe valve

a globe valve for the regulation of flow rate having an established valve characteristic and provided with indicated positions of the valve opening and an adjustable stop device to limit the opening movement such that the valve can be closed for isolation purposes and re-opened to the previously determined set position (see 8.2)

2.5

flow measurement device

a device in which a difference in pressure is induced across an orifice, fixed or variable, the measurement of which enables the corresponding flow rate to be established by reference to a calibration chart

2.6

fixed orifice

that part of a flow measurement device which induces a difference in pressure for flow measurement purposes and which is of fixed dimensions and geometry

NOTE Such orifices may be in the form of a fixed orifice fitting or based on conventional globe valves used in the fully open position. In this latter form these devices are commonly known as fixed orifice valves (see 2.9).

2.7

variable orifice

that part of a flow measurement device which induces a difference in pressure for flow measurement purposes and which is of variable dimensions and geometry

NOTE Such orifices are based on double regulating globe valves used with the disk in varying positions. These devices are commonly known as variable orifice valves (see 2.10).

2.8

fixed orifice fitting

a fitting in which a circular aperture has been machined (see 8.3.2 and Appendix B)

2.9

fixed orifice valve

a globe valve with pressure tapping points having an established valve characteristic used, in the fully open position for the determination of flow rates, and for isolating purposes (see 8.3.3 and Appendix C)

2.10**variable orifice valve**

a double regulating globe valve with pressure tapping points used for the determination of flow rates and also for regulating and isolating purposes (see 8.3.5 and Appendix B)

2.11**pressure tapping point**

a hole in the wall of the flow measurement device, the internal end of which is flush with the internal surface of the flow measurement device, and which can be connected to pressure measuring equipment through a suitable adaptor to enable pressure differential to be measured (see 8.4)

2.12**pressure differential**

the difference in pressure between any two pressure tapping points

NOTE Pressure differential signal is the difference in pressure existing between upstream and downstream pressure tapping points on any flow measurement device.

2.13**valve or device headloss**

loss in total pressure to a pipework system attributable to the valve or device as installed within that system

2.14**flow coefficient (K_v) (double regulating globe valves and flow measurement devices)**

the flow of water through a double regulating globe valve or flow measurement device at a temperature between 5 °C and 40 °C and measured in cubic metres per hour that will induce a valve or device headloss of 1 bar

2.15**flow coefficient (K_{vs}) (flow measurement devices only)**

the flow of water through a flow measurement device at a temperature between 5 °C and 40 °C and measured in cubic metres per hour that will induce a pressure differential of 1 bar across the pressure tapping points

2.16**valve characteristic**

the relationship between flow and valve lift resulting from the application of a constant pressure difference across the valve

NOTE Examples of valve characteristics are as follows.

- linear characteristic.* At constant pressure difference, the flow rate is directly proportional to the valve lift.
- equal percentage characteristic.* At constant pressure difference, the change in flow rate resulting from a unit change in valve lift, when expressed as a percentage of the previous flow rate is a constant percentage.

2.17**valve lift**

the total displacement of the valve disk from the fully closed position to the fully open position

3 Types**3.1 Double regulating valve**

Double regulating valves shall be globe type (used for regulating and isolating purposes).

3.2 Flow measurement devices

Flow measurement devices shall be one of the following types.

- type 1: a fixed orifice fitting (used for measuring only).
- type 2: a fixed orifice valve (used for measuring and isolating only).
- type 3: a fixed orifice either integral with, or as a type 1 fixed orifice fitting close coupled to a double regulating globe valve (used for measuring, regulating and isolating).
- type 4: a variable orifice valve (used for measuring, regulating and isolating).

NOTE See Appendix B which gives sketches of typical flow measurement device constructions.

4 Ranges of nominal sizes

Double regulating globe valves and flow measurement devices shall be one of the following nominal sizes appropriate to their end connections:

- a) flanged ends: DN 10, DN 15, DN 20, DN 25, DN 32, DN 40, DN 50, DN 65, DN 80, DN 100, DN 125, DN 150, DN 200, DN 250, DN 300;
- b) threaded ends: 3/8, 1/2, 3/4, 1, 1 1/4, 1 1/2, 2;
- c) compression ends: 15 mm, 22 mm, 28 mm.

5 Ranges of nominal pressure

Double regulating globe valves and flow measurement devices shall be selected from the nominal pressure designations (PN) according to the valve body material and type of end connections as given in Table 1.

NOTE Type 1 fixed orifice fittings for flange mounting may be suitable for a range of PN ratings.

6 Pressure/temperature ratings

6.1 All products, with the exception of those with non-metallic disks or components as given in 6.2, shall have the pressure/temperature ratings appropriate to the body material as given in Table 2 or Table 3.

Table 1 — Ranges of nominal pressure (PN)

Body material	End connections	Nominal pressure ^a				
		PN 10	PN 16	PN 20	PN 25	PN 40
Copper alloy	flanged		✓		✓	✓
	threaded		✓	✓		
	compression ^b					
Cast iron	flanged	✓	✓			
Steel	flanged		✓		✓	✓

^a A tick (✓) indicates an available nominal pressure designation.
^b Double regulating globe valves and flow measurement devices having compression ends do not have nominal pressure (PN) designations.

6.2 Double regulating globe valves and flow measurement devices which have non-metallic disks or other permanently attached components, e.g. pressure tapping points or adaptor, which are not designed for the full pressure/temperature ratings given in Table 2 and Table 3 shall have the maximum temperature limitation of the limiting material or component marked on the valve or device [see 13.3 b)].

7 Dimensions and tolerances

7.1 Flanged ends

7.1.1 Face-to-face dimensions

Face-to-face dimensions of flanged double regulating globe valves and flow measurement devices shall be as given in Table 4 with the following exceptions:

- type 1 flow measurement devices for flange mounting [see 8.3.2 b)];
- type 3 flow measurement devices consisting of type 1 fixed orifice fitting close coupled to the valve [see 8.3.4 b)].

NOTE The face-to-face dimensions of the devices given in a) and b) are outside the scope of this standard.

7.1.2 Tolerances on face-to-face dimensions

The tolerances on face-to-face dimensions shall be as given in Table 4.

7.1.3 Dimensions of flanges

Dimensions of body end flanges shall be in accordance with the following, as appropriate:

- BS 4504-3.1 for steel flanges;
- BS 4504-3.2 for cast iron flanges;
- BS 4504-3.3 for copper alloy flanges.

Type 1 flow measurement devices intended for flange mounting shall be suitable for assembly between flanges complying with BS 4504-3.1, BS 4504-3.2 or BS 4504-3.3 and for the selected PN rating or range of PN ratings as appropriate (see clause 5).

7.2 Threaded ends

Threads shall be in accordance with designations R_C , R_P or R of BS 21, as appropriate.

7.3 Compression ends

Compression ends shall comply with BS 864-2.

7.4 Pressure tapping point

The hole diameters or slot widths of the pressure tapping point or adaptor at the point of entry into the main flow shall be as given in Table 5.

8 Design

8.1 General design requirements for double regulating globe valves and type 2 flow measurement devices

NOTE See 8.2 for specific design requirements for double regulating globe valves and 8.3.3 for type 2 flow measurement devices.

8.1.1 Body end ports

The body end ports shall be circular.

NOTE For a flanged valve the diameter of the bore at the body end port is approximately equal to the nominal size of the valve.

8.1.2 Body tappings for drain plugs

When drain plugs are fitted the body tappings shall be threaded in accordance with BS 21, designations R_C or R_P as appropriate.

NOTE 1 Requirements for body tappings for drain plugs should be specified in the enquiry and/or order, see Appendix A.

NOTE 2 Body tappings for drain plugs in accordance with 8.1.2 are distinct from any threaded body tappings or connections provided for an integral drain valve facility used for draining, back filling or air venting purposes.

8.1.3 Body-to-bonnet connection

Valves of nominal size up to and including DN 50 or size 2 shall have screwed, union or bolted body-to-bonnet connections. Bonnets shall be attached to bodies by bolting for valves of nominal sizes DN 65 and larger.

Table 2 — Pressure/temperature ratings: flanged and threaded ends

Service temperature	Maximum allowable non-shock working gauge pressure								
	PN 10	PN 16			PN 20	PN 25		PN 40	
	Cast iron (flanged)	Copper alloy (flanged and threaded)	Cast iron (flanged)	Steel (flanged)	Copper alloy (threaded)	Copper alloy (flanged)	Steel (flanged)	Copper alloy (flanged)	Steel (flanged)
°C	bar ^a	bar	bar	bar	bar	bar	bar	bar	bar
– 10 to 100	10.0	16.0	16.0	16.0	20.0	25.0	25.0	40	40.0
120	10.0	13.5	16.0	16.0	17.2	21.8	25.0	40	40.0
140	9.3	10.8	14.9	15.8	14.4	18.3	24.6	39.0	39.0
150	9.0	9.5	14.4	15.7	13.0	16.5	24.5	38.5	39.0
160	8.8	8.2	14.1	15.6	11.7	14.8	24.2	37.0	38.8
170	8.6	7.0	13.8	15.5	10.4	13.1	24.1	35.5	38.6
175	8.5	—	13.5	15.4	9.4	11.8	24.0	34.4	38.5
180	—	—	13.4	15.4	9.0	11.3	24.0	34.0	38.4
185	—	—	13.2	15.3	—	10.5	23.9	32.8	38.3
195	—	—	13.0	15.3	—	—	23.8	31.0	38.1
200	—	—	—	15.2	—	—	23.8	30.0	38.0
220	—	—	—	—	—	—	23.3	25.5	37.2

NOTE 1 The material quoted in Table 2 is a reference to the body material only. Other components may be constructed from different materials (see clause 9).

NOTE 2 Intermediate values can be obtained by linear interpolation.

^a 1 bar = 10⁵ N/m² = 100 kPa.

Table 3 — Pressure/temperature ratings: compression ends

Service temperature	Maximum allowable non-shock working gauge pressure
°C	bar ^a
20	16
30	16
65	10
110	6
120	5

^a 1 bar = 10⁵ N/m² = 100 kPa.

Table 4 — Face-to-face dimensions of flanged double regulating globe valves and flow measurement devices

Nominal size (DN)	Face-to-face dimension		Tolerance
	Double regulating globe valves and types 2, 3 and 4 flow measurement devices		
	PN 10, PN 16, PN 25 and PN 40 (see note 1)	Alternative series for PN 40 only	
	mm	mm	mm
15	130	133	± 2.0
20	150	146	
25	160	162	
32	180	184	
40	200	200	
50	230	238	
65	290	—	
80	310	—	
100	350	—	
125	400	—	
150	480	—	
200	600	—	
250	730	—	
300	850	—	± 3.5

NOTE 1 Face-to-face dimensions are in accordance with basic series 1 of BS 2080.