British Standard

BRITISH STANDARD

BS 7350:1990

Incorporating
Amendment No. 1

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
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
Water Companies' Association
Water Services' Association of England and Wales
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

This British Standard, having been prepared under the direction of the Piping Systems Components Standards Policy Committee, was published under the authority of the Board of BSI and comes into effect on 28 October 1990

The following BSI references relate to the work on this standard:
Committee reference PSE/7
Draft for comment 89/76940 DC

ISBN 0 580 18850 7

Amendments issued since publication

Amd. No.	Date	Comments
6865	December 1991	Indicated by a sideline in the margin

Contents

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.

a) *linear characteristic.* At constant pressure difference, the flow rate is directly proportional to the valve lift.

b) *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, ½, ¾, 1, 1¼, 1½, 2;

c) compression ends: 15 mm, 22 mm, 28 min.

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:

a) type 1 flow measurement devices for flange mounting [see **8.3.2** b)];

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:

a) BS 4504-3.1 for steel flanges;

b) BS 4504-3.2 for cast iron flanges;

c) 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 = 10^5 N/m^2 = 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 = 10^5 N/m^2 = 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	
20	150	146	
25	160	162	
32	180	184	
40	200	200	
50	230	238	± 2.0
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.

Table 5 — Hole diameters or slot widths of pressure tapping point or adaptor

Nominal size of flow measurement device			Hole diameter or slot width of pressure tapping point or adaptor	
Flanged ends	Threaded ends	Compression ends	minimum	maximum
DN		mm	mm	mm
10	⅜			
15	½	15	1.5	3.0
20	¾	22		
25	1	28		
32	1¼			
40	1½			
50	2		1.5	4.0
65				
80				
100				
125				
150				
200			1.5	5.0
250				
300				

8.1.4 ***Operation***

Valves shall be operated by handwheel or provided with lockshield for key operation. Valves shall be closed by turning the handwheel or key in a clockwise direction when facing the handwheel or key.

8.1.5 ***Bolting***

Bolting threads shall be ISO metric and the dimensions and finish of bolting shall be in accordance with the following British Standards, as appropriate:

BS 3692

BS 4168

BS 4190

BS 4439

BS 4882.

8.1.6 ***Seats***

Separate body seat rings, when fitted, shall be of such design as to prevent them from coming loose in service. Threaded body seat rings shall be designed to facilitate removal for replacement purposes.

8.1.7 ***Disks***

Disks which are detachable or of multi-piece construction shall be of such design that they cannot become detached in service.

8.1.8 ***Direction of flow***

Valves shall be designed for operation with the upstream pressure under the disk.

8.2 Specific design requirements for double regulating globe valves

8.2.1 ***Position indicator***

Each valve shall be provided with an indicator to show the position of the valve disk (see **13.7.1**).

8.2.2 ***Setting facility***

Each valve shall be provided with an adjustable stop device to limit the opening movement of the handwheel or key such that the valve is prevented from opening beyond a selected position but it shall permit the valve to be closed.

8.3 Flow measurement devices

NOTE Typical constructions are given in Appendix B.

8.3.1 ***Pressure tapping points***

All flow measurement devices shall have two pressure tapping points in accordance with **8.4**.

8.3.2 ***Type 1 Flow measurement devices***

These devices shall be a fixed orifice fitting of one of the following.

a) An orifice fitting having an integral orifice, with ends threaded internally and/or externally or with ends having compression fittings [see Figure 1 (a)].

b) An orifice fitting in the form of an orifice plate suitable for mounting between flanges [see Figure 1 (b)].

The orifice shall be an integral part of the body of the orifice fitting or formed in a separate component which is fitted concentrically within the body and secured to prevent loosening in service.

NOTE Type 1 flow measurement devices may be close coupled to a non-regulating type of isolating valve with an unrestricted flow way when fully open (e.g. a gate valve) where it is convenient to provide a means of isolation and flow measurement in the form of a combined unit, provided that the flow measurement device is installed on the upstream (inlet) side of the isolating valve.

8.3.3 ***Type 2 Flow measurement devices***

These devices shall be fixed orifice valves of globe valve design and be in accordance with **8.1**.

Valves shall have threaded, flanged or compression body ends [see **7.1** to **7.3** and Figure 2 (a) and Figure 2 (b)].

When fitted with a position indicator, the indicator shall be marked in accordance with **13.7.2**.

NOTE Requirements for a position indicator should be stated in the enquiry and/or order (see Appendix A).

8.3.4 *Type 3 Flow measurement devices*

These devices shall comprise a fixed orifice fitting combined with a double regulating globe valve. Each combined unit shall comprise a double regulating globe valve in accordance with **8.1** and **8.2** and a fixed orifice positioned upstream of the valve seat.

The fixed orifice shall be formed by either:

a) a type 1 fixed orifice fitting in accordance with **8.3.2** close coupled to the valve [see Figure 3 (a) and Figure 3 (b)]; or

NOTE A fixed orifice designed for close coupling may be supplied unassembled by the manufacturer and, where so supplied, assembly should be in accordance with the manufacturer's instructions.

b) a fixed orifice integral with the valve [see Figure 3 (c) and Figure 3 (d)]

8.3.5 *Type 4 Flow measurement devices*

These devices shall be a variable orifice valve, e.g. a double regulating globe valve in accordance with **8.1** and **8.2** but provided with two pressure tapping points in accordance with **8.4** [see Figure 4 (a) and Figure 4 (b)].

8.4 Pressure tapping points

Pressure tapping points shall be located one either side of the fixed or variable orifice and the axis of the tappings shall be at right angles to the flow way axis of the flow measurement device in the plane in which they are positioned.

NOTE 1 When installed in a pipework system the pressure tapping points should be positioned such that they will not be subject to an accumulation of pipeline debris.

Each pressure tapping point shall be provided with a means of connection to pressure measuring equipment. The connector shall either be an integral part of the pressure tapping point or a screwed-in adaptor. The bottom of screwed-in adaptors shall not project into the flow way of the flow measurement device. Any thread in the body of the flow measurement device intended to receive a screwed-in adaptor shall be in accordance with BS 21, with a maximum size of $R_C¼$ or $R_P¼$, as appropriate.

The bore and other internal surfaces of the pressure tapping point or adaptor shall be clean and free of all burrs and wire edges (see **7.4** and Table 5 for tapping point hole diameters or slot widths).

Each pressure tapping point or screwed-in adaptor shall be suitable for the working pressure and temperature of the flow measurement device (see clause **6**). Each pressure tapping point on the adaptor outlet shall have an additional seal to prevent the ingress of dirt and other debris.

NOTE 2 It is recommended that the purchaser selects products fitted with pressure tapping points or adaptor which have independent means of isolation in addition to any self-acting closure devices when used in applications where temperatures are in excess of 95 °C.

9 Materials

NOTE The material of the pressure tapping point or adaptor is outside the scope of this standard. It is recommended that the material is selected so that bimetallic corrosion is avoided.

9.1 Double regulating globe valves and types 2 and 4 flow measurement devices shall be manufactured from the materials specified in BS 5152, BS 5154 and BS 5160 for valves having body material in cast iron, copper alloy and steel respectively.

NOTE 1 Both series A and series B materials specified in BS 5154 may be used for copper alloy bodied valves and devices.
NOTE 2 The bonnet and body trim components of cast iron bodied valves may be constructed from the materials specified in BS 5154.

9.2 Type 1 flow measurement devices shall be manufactured from the materials given in Table 6.

9.3 Type 3 flow measurement devices shall have the double regulating globe valve manufactured from the materials specified in **9.1**, as appropriate, and the close coupled fixed orifice fitting constructed from the materials given in Table 6.

10 Hydraulic performance

10.1 General

When tested in accordance with Appendix C, the hydraulic performance and accuracy of double regulating globe valves and flow measurement devices shall comply with the requirements of **10.2** to **10.6** as appropriate.

NOTE 1 The possibility of using other methods of test by the manufacturer for establishing the hydraulic performance is not precluded.
NOTE 2 Table 7 gives the range of system flow rates within which the stated sizes of double regulating globe valves and flow measurement devices are regularly used.
Individual products may not be suitable for operation across the full range of flow rates given in Table 7. The user should consult the manufacturer's literature to confirm the suitability of the product to operate at the chosen system design flow rate (see **10.6**).

Table 6 — Materials for the manufacture of type 1 flow measurement devices

Type	Component		Material	BS reference	Grade or designation
Orifice fitting (threaded ends)	Body		Gunmetal	BS 1400	LG2
			DZR brass	BS 2874	CZ132
				BS 5154	see note 1
Orifice fitting (flange mounting)	Body	with integral orifice	Stainless steel	BS 970-1	316S31 316S33 316S11 316S13
		with separate orifice	Cast iron	BS 1452	220
			Steel	BS 970-1	070M20
				BS 1501	161-430
	Orifice (see note 2)		Stainless steel	BS 970-1	316S31 316S33 316S11 316S13
			Brass	BS 2874	CZ121
	Orifice retaining bush or sleeve (see note 2)		Stainless steel	BS 970-1	316S31 316S33 316S11 316S13
			Steel	BS 970-1	070M20
				BS 1501	161-430
			Gunmetal	BS 1400	LG2

NOTE 1 The specification is given in Appendix B of BS 5154:1989.
NOTE 2 This component is only supplied when body has a separate orifice.

10.2 Hydraulic performance of double regulating globe valves

NOTE 1 Requirements specified in this clause also apply to type 3 flow measurement devices which comprise a fixed orifice close coupled with a double regulating globe valve (see **10.4**).
NOTE 2 To minimize the practical problem of setting valves in accordance with the required flow rate especially where such settings may be towards the closed position of the valve, double regulating globe valves should display a valve characteristic which is generally linear or tends towards equal percentage form (see **2.16**).
NOTE 3 The extent to which a double regulating globe valve retains its valve characteristic in practice depends on the ratio of the valve headloss to total pressure loss in the circuit.

The flow coefficient (K_v) of double regulating globe valves exclusive of the integral orifice or close coupled orifice fitting, in the case of type 3 flow measurement devices, shall, in the fully open position, be as given in Table 8. Additionally, the K_v values in the fully open and 25 % open positions shall be in accordance with the manufacturer's nominated values within the tolerances given in **10.3**.

10.3 Accuracy of double regulating globe valves

All K_v values derived from the test shall be in accordance with the manufacturer's nominated values over the manufacturer's nominated range of flow rates within the following tolerances:

a) ± 18 % at the 25 % open position;

b) ± 10 % at the fully open position.

10.4 Hydraulic performance of flow measurement devices

The flow coefficient (K_{vs}) of types 1 and 3 flow measurement devices and types 2 and 4 flow measurement devices in the fully open position shall be given in Table 9.

NOTE This requirement ensures that the pressure differential, measured across the pressure tapping points, with due regard to the flow rates employed, is of sufficient magnitude for accurate flow measurement.

The K_{vs} value shall be in accordance with the manufacturer's nominated values within the tolerances given in **10.5**.

Table 7 — Range of system flow rates

Nominal size			Flow rate	
Flanged ends	Threaded ends	Compression ends	Minimum	Maximum
DN			L/s	L/s
10	⅜	15	0.031	0.074
15	½	22	0.062	0.148
20	¾	28	0.138	0.325
25	1		0.258	0.603
32	1¼		0.540	1.25
40	1½		0.810	1.88
50	2		1.52	3.51
65			3.02	6.95
80			6.40	15.36
100			10.85	26.04
125			16.56	39.75
150			23.71	56.91
200			41.86	100.47
250			66.58	156.78
300			94.16	225.99

NOTE The flow rates given in the table are for water flow in black steel pipe selected from:
DN 10 to DN 65 CIBSE Guide: 1986-C4 Table C4.12 to provide a pressure loss of 100 to 500 Pa per metre run of BS 1387 medium grade pipe.
DN 80 to DN 300 CIBSE Guide: 1986-B1, Table B1.13 and Table 14 to provide limiting pipe velocities of 1.25 m/s to 3.0 m/s in BS 1387 medium grade pipe for sizes DN 65 to DN 150 and in pipe to BS 3600 having wall thickness equal to 6.3 mm for sizes DN 200 and DN 250 or 7.1 mm for size DN 300.

Additionally, for type 3 devices, the double regulating valve portion of the device shall comply with **10.2** and **10.3**.

NOTE To avoid possible errors in reading pressure differential values with available measuring equipment it is recommended that the user selects devices which will give a pressure differential signal value of not less than 1 kPa.

10.5 Accuracy of flow measurement devices

All K_{vs} values derived from the test shall be in accordance with the manufacturer's nominated values over the manufacturer's nominated range of flow rates within the following tolerances:

a) ± 5 % for types 1 and 3 flow measurement devices;

b) ± 10 % for types 2 and 4 flow measurement devices.

NOTE The tolerances on accuracy of flow measurement devices relate to manufacturing tolerances and do not take account of errors due, for example, to the accuracy of measuring equipment, installation, setting and human error.

Table 8 — Flow coefficient (K_v) for double regulating globe valves

Nominal size			K_v	
Flanged ends	Threaded ends	Compression ends	Minimum	Maximum
DN		mm	m^3/h	m^3/h
10	⅜		1	3
15	½	15	2	5
20	¾	22	3	12
25	1	28	5	20
32	1¼		12	30
40	1½		20	42
50	2		30	63
65			63	100
80			100	150
100			150	250
125			250	350
150			350	500
200			500	900
250			900	1 500
300			1 500	2 000

Table 9 — Flow coefficient (K_{vs}) for flow measurement devices

Nominal size			K_{vs}	
Flanged ends	Threaded ends	Compression ends	Minimum	Maximum
DN		mm	m^3/h	m^3/h
10	⅜		—	2.5
15	½	15	1.75	6
20	¾	22	3.75	12
25	1	28	6	20
32	1¼		10	32
40	1½		17.5	45
50	2		25	67
65			56	150
80			100	200
100			150	300
125			250	450
150			350	700
200			500	1 200
250			950	2 500
300			1 350	3 500

NOTE Flow measurement devices having a flow coefficient closer to the maximum value than the minimum give a low signal and are intended for use in systems designed for operation with water flow velocities exceeding 0.75 m/s in pipe sizes 50 mm and below and 1.25 m/s in pipe sizes above 50 mm. Where systems are designed to have water flow velocities below these values it is recommended that flow measurement devices are used having a flow coefficient, closer to the minimum value than the maximum, which give a high signal. Flow velocities resulting in head losses in the pipe of less than 200 Pa/m may not be sufficient to provide a signal which ensures accurate flow measurement.

10.6 Publication of nominated flow coefficients

The manufacturer shall make available the nominated flow coefficients (K_v) for double regulating globe valves in the fully open and 25 % open positions and the nominated flow coefficients (K_{vs}) for all flow measurement devices, in the fully open position in the case of types 2 and 4 flow measurement devices. These nominated values for flow coefficients shall be packaged with the product or published separately in catalogue form. If published in a catalogue the manufacturer shall identify each product sufficiently to allow the required information to be obtained from the catalogue.

NOTE 1 When design changes are made that affect the nominated K_v/K_{vs} values so that they no longer lie within the tolerances given in **10.3** and **10.5** recalibration will be necessary and the revised values should be published accordingly.

NOTE 2 Information provided in the manufacturer's catalogue and/or data sheets should typically provide:

a) the nominated flow coefficients (K_v or K_{vs}) detailed in **10.6**; additionally, flow coefficients (K_v) for types 1 and 2 flow measurement devices may be provided;

b) calibration charts in graphical form giving the relationship between flow rate and valve headloss in the fully open, 25 % open and other valve positions stated by the manufacturer for double regulating globe valves and between flow rate and pressure differential (signal) for flow measurement devices. For variable orifice valves this relationship should be shown with the valve in the fully open position and any other positions stated by the manufacturer.

11 Type testing

11.1 General

Every size of each product shall be type tested.

11.2 Shell test

The shell test shall include all parts which are subject to internal pressure in service.

The test equipment shall be of such design that it does not subject the product to externally applied stresses affecting the test results.

The shell test shall be carried out using water as the test fluid. The test procedure shall be in accordance with BS 6755-1, and there shall be:

a) no visible leakage through the pressure containing walls or from any joint, including the stuffing box, which is part of the product at test pressures up to and including, but not exceeding, 2.25 times the maximum permissible working pressure at 20 °C for a test duration of 5 min;

b) on increasing the test pressure to 3.0 times the maximum permissible working pressure at 20 °C and maintaining that pressure for 5 min, there shall be no mechanical failure of any component.

NOTE Leakage from joints, glands and stem seals is acceptable at pressures above 2.25 times the maximum permissible working pressure at 20 °C.

12 Production testing

12.1 Pressure test requirements

Every double regulating globe valve and flow measurement device shall be pressure tested by the manufacturer before dispatch to the production pressure testing requirements and durations given in BS 6755-1.

The shell test shall include all parts which are subject to internal pressure in service.

The pressure tests shall be as follows.

a) For type 1 flow measurement devices the shell tests shall be either:

i) hydrostatic; or

ii) pneumatic, for threaded ends only.

b) For double regulating globe valves and types 2, 3 and 4 flow measurement devices, but excluding type 3 devices in the form of a type 1 device close coupled to a double regulating globe valve with flanged ends, the pressure tests shall be either:

i) hydrostatic shell and seat tests; or

ii) for copper alloy valves in size 2 or DN 50 and smaller, pneumatic shell and seat tests.

c) For type 3 flow measurement devices in the form of a type 1 fixed orifice fitting close coupled to a double regulating globe valve, the fixed orifice fitting component shall be tested in accordance with **12.1** a) and the double regulating globe valve component in accordance with **12.1** b).

The maximum allowable seat leakage rate shall be as follows:

1) rate A (as given in BS 6755-1), i.e. no visually detectable leakage for the duration of the test for products having non-metallic seating; or

2) rate B (as given in BS 6755-1), i.e. 0.01 $mm^3/s \times DN$ for hydrostatic tests and 0.3 $mm^3/s \times DN$ for pneumatic tests for metal-to-metal seating.

NOTE If metal seated valves having leakage rate A are required this should be stated by the purchaser in the enquiry or order (see Appendix A).

12.2 Test certificate

If a test certificate is issued it shall contain a statement by the manufacturer confirming that the products have been tested in accordance with this standard and stating the actual pressures and medium used in the test.

NOTE A test certificate is not normally provided. If a test certificate is required this should be stated by the purchaser in the enquiry or order (see Appendix A).

13 Marking

13.1 General

Double regulating globe valves shall be clearly marked in accordance with BS 5418 except as given in **13.2** and **13.3**.

Flow measurement devices and double regulating globe valves shall be clearly marked in accordance with **13.2** to **13.8**, as appropriate.

13.2 Body marking

Body marking shall be integral with the body or on a plate securely fixed to the body. The plate (if used) shall be separate and distinct from the identification plate referred to in **13.3** (but see **13.4**).

Body marking shall include the following.

a) Nominal size (DN), thread size or pipe outside diameter (see clause **4**).

b) Nominal pressure designation (PN), if applicable (see clause **5**).

Type 1 flow measurement devices (orifice fittings) designed for mounting between flanges of more than one PN rating shall be marked with the range of PN ratings for which they are suitable.

c) Body material designation (see **13.8**) of the following:

i) flanged end valves and type 1 flow measurement devices (orifice fittings) for flange mounting, nominal size DN 50 and above;

ii) threaded end valves and type 1 flow measurement devices (orifice fittings) with threaded ends, size 2 only.

d) Manufacturer's name or trademark.

e) For uni-directional products only, an arrow to indicate the direction of flow.

Body markings, with the exception of the nominal pressure designation on valves with flanged ends of nominal size DN 50 and smaller, shall be integral with the body. Valves with flanged ends of nominal size DN 50 and smaller shall be deemed to comply with this standard if the nominal pressure designation is clearly marked on the rim of the flange. Valves having compression ends shall be marked to indicate that the end fittings comply with BS 864-2.

13.3 Body or identification plate marking

Body or identification plates shall be marked with the following:

a) the number of this British Standard, i.e. BS 7350[1)];

b) any limiting temperature when the valve or device is not suitable for the range of temperatures given in Table 2 or Table 3;

c) a manufacturer's identification number common to all double regulating globe valves and flow measurement devices having identical design and constructed using identical materials.

NOTE 1 Valves having these markings integral with the handwheel, when fitted, are deemed to comply with this standard (see **13.5**).

NOTE 2 Other additional markings may be used at the option of the manufacturer or at the request of the purchaser, provided that they do not conflict with any of the markings specified in this standard.

13.4 Omission of markings

If it is necessary to omit the body markings on valves sizes DN 40, 1½ or 28 mm and smaller, they shall be omitted in the following order, provided that they are shown on the identification plate or on the handwheel:

a) nominal size, thread size or pipe outside diameter;

b) manufacturer's name or trademark;

c) nominal pressure designation.

13.5 Handwheel markings

Handwheels, or a plate secured below the handwheel nut, shall be marked CLOSE or SHUT with an arrow to indicate the direction of closure.

NOTE Additionally, handwheels, or a plate secured below the handwheel nut, may be marked OPEN with an arrow to indicate the direction of opening.

13.6 Pressure tapping points

Pressure tapping points or their adaptor for all unidirectional flow measurement devices shall be marked to indicate the upstream and downstream tappings.

NOTE Examples of markings are:

a) colour codings, the upstream tapping coloured red and the downstream tapping coloured blue.

b) plus (+) and minus (–) symbols to indicate the upstream and downstream tappings respectively.

13.7 Position indicator markings

13.7.1 Double regulating globe valves shall be marked to indicate the fully closed, fully open and not less than three intermediate positions.

[1)] Marking BS 7350 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

NOTE Markings on the position indicator may be one of the following forms; other forms are not excluded:

a) the words SHUT or CLOSED and OPEN with intermediate positions shown as fractions of the fully open position;

b) a series of numbers (0, 1, 2, 3, etc.) which relate to the amount of opening or the number of turns of the valve handwheel or valve spindle. Conventionally, zero relates to the fully closed position and the highest number to the fully open position.

13.7.2 When type 2 flow measurement devices are fitted with a position indicator, it shall be marked to indicate the fully open and fully closed positions. The markings shall be OPEN and SHUT or CLOSED respectively.

13.8 Body material designation

Designations used to identify body materials for the purposes of marking shall be as given in Table 10.

Table 10 — Body material designation

Material	Symbol
Gunmetal	GM
Dezincification resistant brass (DZR brass)	CR or OR
Grey cast iron	CI
Carbon steel	CS, STEEL or WCB
Brass	BR
Spheroidal graphite cast iron	SG
Stainless steel	SS

14 Preparation for storage and transportation

14.1 General

After testing, all products shall be drained of test liquid, cleaned of any extraneous matter and suitably protected against damage in preparation for storage and transportation.

NOTE Painting is not a requirement of this standard. If painting is required this should be stated by the purchaser in the enquiry or order (see Appendix A).

14.2 Disk position

Valves with metallic disks and body seats shall be in the closed position when the valves are dispatched. Valves with non-metallic body seat rings and/or disk facing rings shall be opened so as to just lift the disk from the body seat.

14.3 Body ends

Body ends shall be protected to exclude foreign matter during transportation and storage.

NOTE Suitable protection may be in the form of plastics caps or plugs, perforated plastics bags, cartons or boxes.

14.4 Installation and operating instructions

For double regulating globe valves and flow measurement devices, the manufacturer shall make available installation and operating instructions. These instructions shall be packaged with the product or published separately in catalogue form. If published in a catalogue the manufacturer shall identify each product sufficiently to allow the required information to be selected from the catalogue.

15 Manufacturer's certificate

When required by the purchaser the manufacturer shall supply a certificate stating that the valves and/or flow measurement devices comply in all respects with the requirements of this standard.

NOTE If a manufacturer's certificate is required this should be stated by the purchaser in the enquiry or order (see Appendix A).

Appendix A Information to be supplied by the purchaser

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

a) type of valve or flow measurement device (see clause **3**);

b) nominal size (see clause **4**);

c) nominal pressure (see clause **5**);

d) body ends required (see clause **7**);

e) for metal seated valves, if seat leakage rate A is required [see **12.1** a)];

f) material of valve and/or flow measurement device body (see clause **9**);

g) state if any of the following is required:

i) drain plug facility (see **8.1.2**);

ii) whether a position indicator is required for type 2 flow measurement devices (see **8.3.3**);

iii) specific trim material (see clause **9**);

iv) test certificate (see **12.2**);

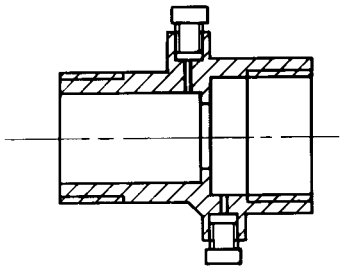
v) valve painting (see **14.1**);

vi) manufacturer's certificate (see clause **15**);

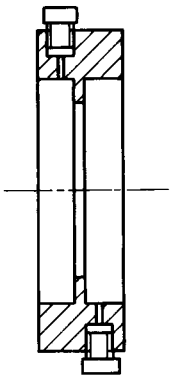
vii) independent means for positive isolation on pressure tapping point or adaptor (see **8.4**).

Appendix B Typical flow measurement device constructions

Typical constructions of flow measurement devices are shown in Figure 1, Figure 2, Figure 3 and Figure 4 which are composite sketches for the purpose of showing some typical variations in individual details. A product utilizing any combination of the details shown in each particular figure (except when such a combination may be specifically prohibited in the text) or similar construction will be acceptable provided it complies with this standard in all other respects. The sketches shown are for illustrative purposes only.

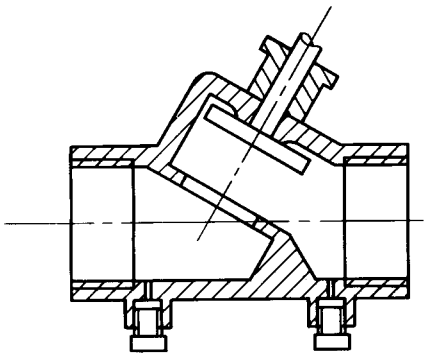


(a) Type 1 flow measurement device, fixed orifice fitting with threaded ends

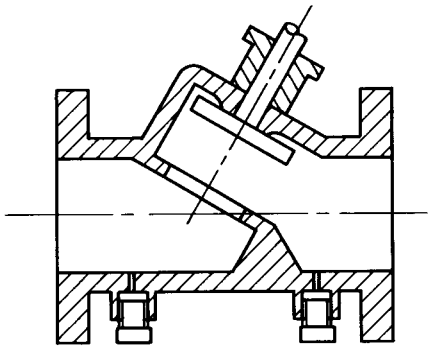


(b) Type 1 flow measurement device, fixed orifice fitting for flange mounting

Figure 1 — Type 1 flow measurement devices

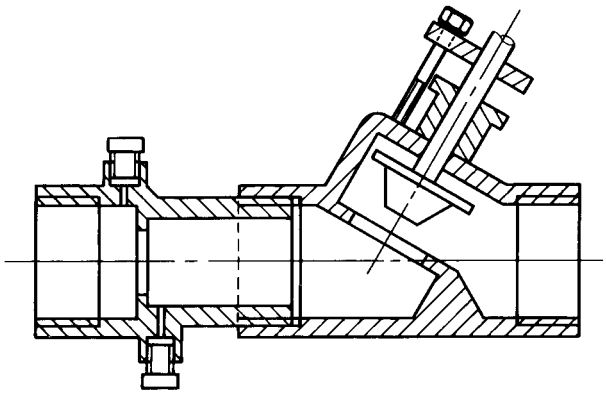


(a) Type 2 flow measurement device, fixed orifice valve with threaded ends

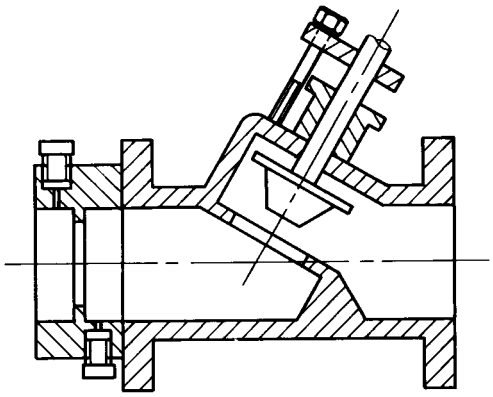


(b) Type 2 flow measurement device, fixed orifice valve with flanged ends

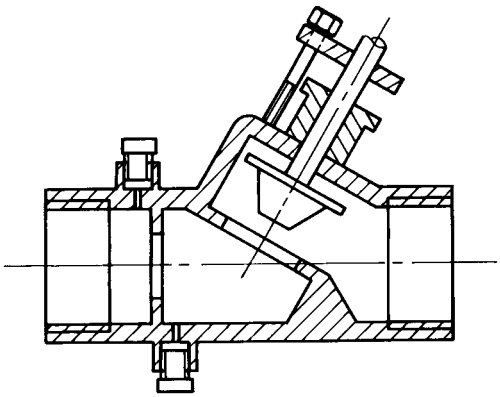
Figure 2 — Type 2 flow measurement devices



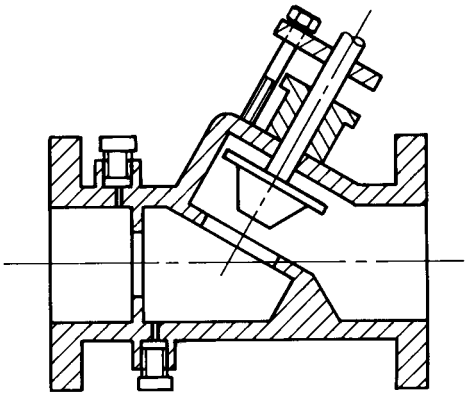
(a) Type 3 flow measurement device comprising fixed orifice fitting, close-coupled to oblique pattern double regulating globe valve with threaded ends



(b) Type 3 flow measurement device comprising fixed orifice fitting close-coupled to oblique pattern double regulating globe valve with flanged ends

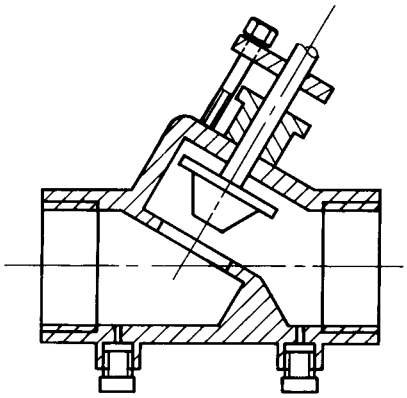


(c) Type 3 flow measurement device comprising fixed orifice integral with oblique pattern double regulating globe valve with threaded ends

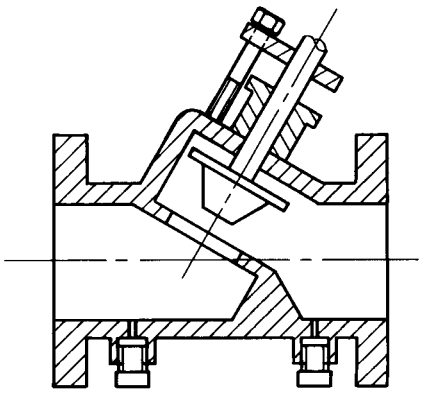


(d) Type 3 flow measurement device comprising fixed orifice integral with oblique pattern double regulating globe valve with flanged ends

Figure 3 — Type 3 flow measurement devices



(a) Type 4 variable orifice valve with threaded ends



(b) Type 4 variable orifice valve with flanged ends

Figure 4 — Type 4 flow measurement devices

Appendix C Flow coefficient method of test

C.1 General

The method of test described in this appendix is applicable for deriving the flow coefficient (K_v) of double regulating globe valves and the flow coefficient (K_{vs}) for flow measurement devices.

C.2 Nomenclature

Symbol	Description	Unit
K_v	flow coefficient related to pressure loss through valve	$m^3/(h.bar)$
K_{vs}	flow coefficient related to differential pressure signal	$m^3/(h.bar)$
ΔP_v	pressure loss attributable to double regulating valves only	bar
ΔP_s	pressure differential	bar
ΔP_t	pressure differential between test section tappings with valve installed	bar
ΔP_e	pressure differential between test section tappings without valve installed	bar
Q	volume flow rate	m^3/h
T	temperature of water	K

C.3 Preliminary procedure

For double regulating globe valves and variable orifice valves (type 4 flow measurement devices) check that when the disk is in the fully closed position it corresponds with the closed position indicated by the position indicator.

C.4 Test equipment

NOTE A typical test system is shown in Figure 5.

C.4.1 *Test section with test piece fitted,* consisting of two lengths of straight pipe assembled upstream and downstream of the test piece, the length of each test pipe as given in Figure 6.

Use pipes of a size and type appropriate to the end connections of the test piece as follows:

a) *test pieces with threaded ends.* Steel pipe to BS 1387 (medium grade) with the ends threaded in accordance with BS 21, together with a threaded socket when the test piece is a type 1 flow measurement device with male end thread(s);

b) *test piece with flanged ends or intended for mounting between flanges.* Steel pipe to BS 1387 (medium grade) for sizes DN 10 to DN 125 and to BS 3600 for sizes DN 150 to DN 300, together with a flange screwed or welded on to each length of pipe; use mating flanges having a pressure rating and flange facing appropriate to the test piece;

NOTE Manufacturers are required to record the grade or wall thickness of the BS 3600 pipe.

c) *test piece with compression ends.* Copper tube to Table X of BS 2871-1.

Provide each length of test pipe with a pressure tapping point in the positions shown in Figure 6. Provide the pressure tapping points with a means of connection to pressure differential measuring equipment which do not project into the flow way of the test pipes.

NOTE These pressure tapping points will only be used when the test piece is a double regulating globe valve. When testing flow measurement devices only, use the test pipes prepared in accordance with Figure 6 or alternatively use test pipes in accordance with Figure 8.

C.4.2 *Test section without test piece fitted,* comprising either:

a) the test pipes prepared for the test with test piece fitted (Figure 6) but with the test piece removed and the two test pipes joined together so that their bores are concentric with each other and there is no clearance between them; or

b) one length of straight pipe of the same nominal size and type and having the same internal diameter as the test pipes prepared for the test section with test piece fitted (Figure 6), but with pressure tapping points in the positions shown in Figure 7.

C.4.3 *Volume flow rate measuring equipment,* having an accuracy of ± 2 % and a resolution not exceeding 0.5 %.

C.4.4 *Pressure differential measuring equipment,* having an accuracy of ± 1 % and a resolution not exceeding 0.5 %.

C.4.5 *Flow control valve,* of a type suitable for achieving the full range of flow rates for any one size and type of test piece, appropriate to the available flow capacity of the test system.

C.4.6 *Mains water,* without any additives, at a temperature of between 5 °C and 20 °C and during any one test which does not deviate by more than 3 °C from the mean temperature.

NOTE Water temperature may be measured upstream or downstream of the test section.

C.5 Test methods

C.5.1 *Double regulating globe valves*

C.5.1.1 Fit the test valve into the test section described in **C.4.1** and in the case of valves having compression ends check that the diameter of the connecting pipework has not been so affected that it is no longer within the range specified in BS 2871-1.

NOTE Care should be taken to align flanges of flanged end valves to the flanges of the upstream and downstream pipework.

C.5.1.2 Set the test valve at the indicated fully open position and adjust the flow control valve, successively to provide each of five flow rate test conditions, i.e. approximately equal to the minimum and maximum flow rates given in Table 7 and at three intermediate flow rates approximating to 25 %, 50 % and 75 % of the total flow rate band indicated in Table 7 for the particular size of double regulating valve being tested. At each flow rate test condition, record the flow rate (Q), the pressure differential between the test section tappings (ΔP_t) and the temperature of the water (T).

C.5.1.3 Set the test valve at the indicated 25 % open position and repeat the tests for each of the five flow velocities specified in **C.5.1.2**.

C.5.1.4 Remove the test section and replace with the test section described in **C.4.2**. Adjust the flow control valve successively to the flow rates used in **C.5.1.2** and at each record the pressure differential (ΔP_e) and the temperature of the water.

C.5.2 *Flow measurement devices (types 1, 2, 3 and 4)*

C.5.2.1 Assemble the test flow measurement device into the test section described in **C.4.1** and in the case of devices having compression ends check that the diameter of the connecting pipework has not been so affected that it is no longer within the range specified in BS 2871-1.

NOTE Care should be taken to align devices for flange mounting and flanges of flanged end devices with flanges of the upstream and downstream pipework.

C.5.2.2 Set the flow measurement device at the indicated fully open position. Adjust the flow control valve successively to provide each of five flow rate test conditions, i.e. approximately equal to the minimum and maximum flow rates given in Table 7 and three intermediate flow rates approximating to 25 %, 50 % and 75 % of the total flow rate band indicated in Table 7 for the particular size of flow measurement device being tested. At each test condition record the flow rate (Q), the pressure differential between the device tappings (ΔP_s) and the temperature of the water (T).

NOTE As far as is practicable the minimum and maximum flow rates given in Table 7 are recommended as the two extreme flow rates. When either or both of these values are outside the capacity of the test rig or the manufacturer nominates a different flow rate range (see note 2 to **10.1**) the range of flow rates over which the device has been tested, has to be recorded and it is essential that any subsequent approval of the product includes an appropriate statement to this effect.

C.6 Determination of flow coefficients

C.6.1 K_v *for double regulating globe valves*

Calculate the flow coefficient (K_v) value for each of the two valve positions and for each flow rate by the following method.

a) Determine the pressure loss (ΔP_v) attributable to the double regulating valve for each data point and valve setting using the following equation:

$$\Delta P_v = \Delta P_t - \Delta P_e$$

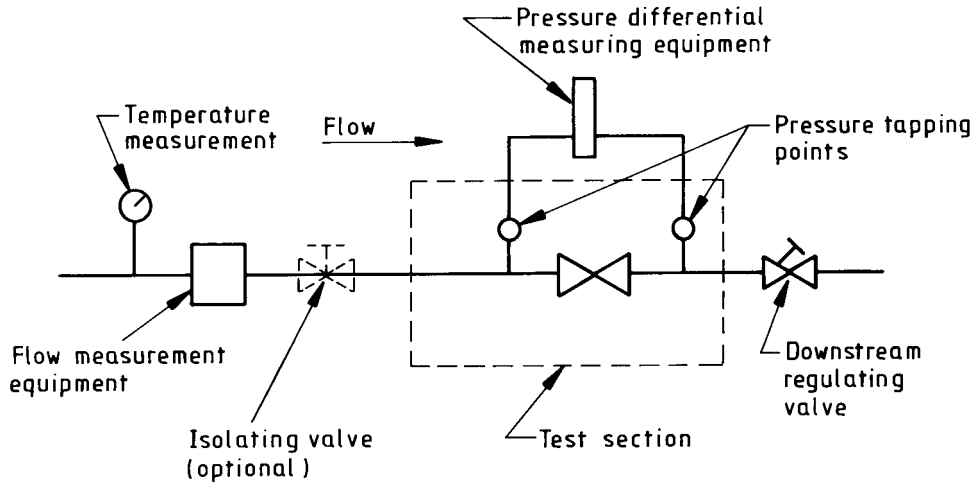
b) Calculate K_v at each data point and valve setting using the following equation:

$$K_v = \frac{Q}{\sqrt{(\Delta P_v)}}$$

C.6.2 K_{vs} *for flow measurement devices*

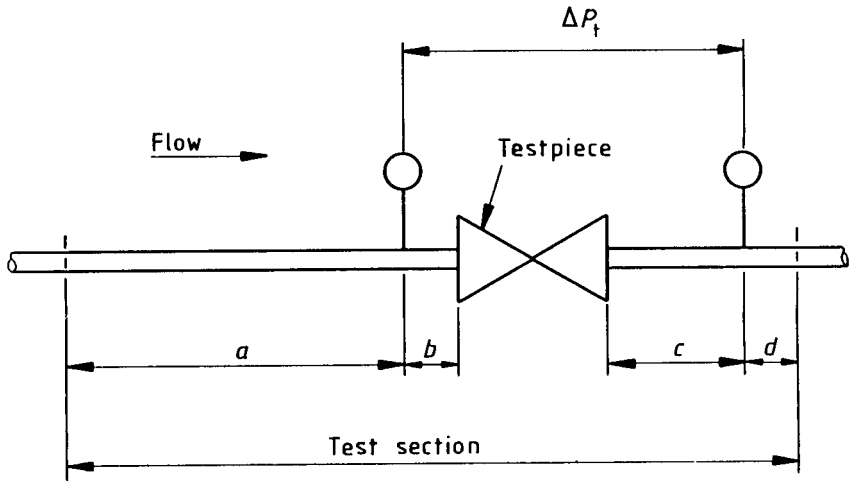
Calculate the flow coefficient (K_{vs}) value for each flow rate from the following equation:

$$K_{vs} = \frac{Q}{\sqrt{(\Delta P_s)}}$$



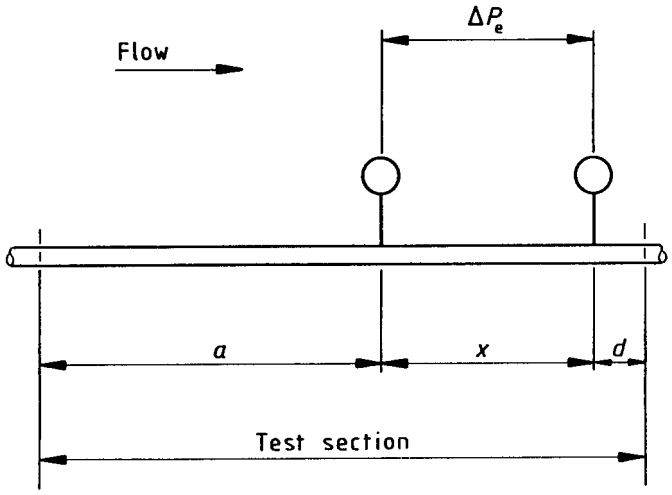
NOTE For test section see Figure 6, Figure 7 or Figure 8 as appropriate.

Figure 5 — Typical test system



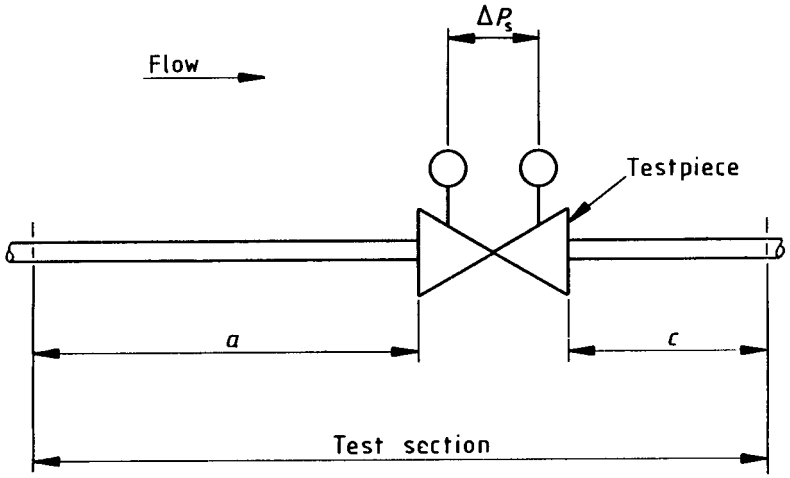
NOTE Lengths of straight pipe are:
a = 13 D minimum
b = 2 D minimum
c = 6 D minimum
d = 2 D minimum
where
D is the nominal pipe size.

Figure 6 — Test section with test piece fitted



NOTE 1 Lengths of straight pipe are:
a = 13 D minimum
b = 2 D minimum
c = 6 D minimum
d = 2 D minimum
where
D is the nominal pipe size.
NOTE 2 x is the sum of lengths of pipe chosen for b and c in test with test piece fitted (see Figure 6).

Figure 7 — Test section without test piece fitted



NOTE Lengths of straight pipe are:
a = 13 D minimum
c = 6 D minimum
where
D = nominal pipe size.

Figure 8 — Test section for flow measurement device only

Publications referred to

BS 21, *Specification for pipe threads for tubes and fittings where pressure-tight joints are made on the threads (metric dimensions).*

BS 864, *Capillary and compression tube fittings of copper and copper alloy.*

BS 864-2, *Specification for capillary and compression fittings for copper tubes.*

BS 970, *Specification for wrought steels for mechanical and allied engineering purposes.*

BS 970-1, *General inspection and testing procedures and specific requirements for carbon, carbon manganese, alloy and stainless steels.*

BS 1042, *Measurement of fluid flow in closed conduits.*

BS 1042-1, *Pressure differential devices.*

BS 1387, *Specification for screwed and socketed steel tubes and tubulars and for plain end steel tubes suitable for welding or for screwing to BS 21 pipe threads.*

BS 1400, *Specification for copper alloy ingots and copper alloy and high conductivity copper castings.*

BS 1452, *Specification for grey iron castings.*

BS 1501, *Steels for pressure purposes: plates.*

BS 2080, *Specification for face-to-face, centre-to-face, end-to-end and centre-to-end dimensions of valves.*

BS 2871, *Specification for copper and copper alloys. Tubes.*

BS 2871-1, *Copper tubes for water, gas and sanitation.*

BS 2874, *Specification for copper and copper alloy rods and sections (other than forging stock).*

BS 3600, *Specification for dimensions and masses per unit length of welded and seamless steel pipes and tubes for pressure purposes.*

BS 3692, *Specification for ISO metric precision hexagon bolts, screws and nuts. Metric units.*

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

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

BS 4439, *Specification for screwed studs for general purposes. Metric series.*

BS 4504, *Circular flanges for pipes, valves and fittings (PN designated).*

BS 4504-3, *Steel, cast iron and copper alloy flanges.*

BS 4504-3.1, *Specification for steel flanges.*

BS 4504-3.2, *Specification for cast iron flanges.*

BS 4504-3.3, *Specification for copper alloy and composite flanges.*

BS 4882, *Specification for bolting for flanges and pressure containing purposes.*

BS 5152, *Specification for cast iron globe and globe stop and check valves for general purposes.*

BS 5154, *Specification for copper alloy globe, globe stop and check, check and gate valves.*

BS 5160, *Specification for steel globe valves, globe stop and check valves and lift type check valves.*

BS 5418, *Specification for marking of general purpose industrial valves.*

BS 5750, *Quality systems*[2)].

BS 5793, *Industrial-process control valves.*

BS 5793-2, *Flow capacity.*

BS 5793-2.3, *Methods of test.*

BS 6683, *Guide to installation and use of valves*[2)].

BS 6755, *Testing of valves.*

BS 6755-1, *Specification for production pressure testing requirements.*

BS 6880, *Code of practice for low temperature hot water heating systems of output greater than 45 kW.*

BS 6880-1, *Fundamental and design considerations.*

BS 6880-2, *Selection of equipment.*

BS 6880-3, *Installation, commissioning and maintenance.*

[2)] Referred to in foreword only.

ISO 6708, *Pipe components — Definition of nominal size.*
ISO 7268, *Pipe components — Definition of nominal pressure.*
CIBSE Commissioning code Series W[3)4)].
BSRIA Application guide AG/2 Commissioning of water systems in buildings[3)5)].
HSE Guidance Note GS4 Safety in pressure testing[6)].
PSA Standard specification M & E No. 3[3)6)].

[3)] Referred to in foreword only.
[4)] Published by The Chartered Institution of Building Services Engineers.
[5)] Published by The Building Services Research and Information Association.
[6)] Published by HMSO.

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: 020 8996 9000. Fax: 020 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: 020 8996 9001. Fax: 020 8996 7001.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: 020 8996 7111. Fax: 020 8996 7048.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: 020 8996 7002. Fax: 020 8996 7001.

Copyright

BSI
389 Chiswick High Road
London
W4 4AL