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Date: 01 November 2024

Origin: National

Latest date for receipt of comments: 6 January 2025

Project No. 2023/01967

Responsible committee: PSE/18/2 Gate, globe, diaphragm and check valves

Interested committees: NFE/34, PVE/1, PVE/1/15, PVE/2, RHE/2, RHE/17, RHE/24

Title: Draft BS 7350 Heating and chilled water systems - Double regulating globe valves and flow measurement devices - Specification

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Introduction

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BS 7350, Heating and chilled water systems – Double regulating globe valves and flow measurement devices – Specification

DRAFT

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Foreword

Publishing information

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on XX Month 202X. It was prepared by Subcommittee PSE/18/2, *Gate, globe, diaphragm and check valves*, under the authority of Technical Committee PSE/18, *Industrial valves, steam traps, actuators and safety devices against excessive pressure*. A list of organizations represented on these committees can be obtained on request to the committee manager.

Supersession

This British Standard supersedes BS 7350:1990 (incorporating Amendment No. 1:1991), which is withdrawn.

Information about this document

This British Standard does not require that the dimensions of orifice plates comply with a specific international standard.

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 [1], Defence Estate Organisation Specification 036 [2] or BSRIA Commissioning Guide BG4/2011 [3] and BG2/2010 [4].

This is a full revision of the document, and introduces the following principal changes:

- the scope of the standard has been limited to double regulating globe valves and flow measurement devices for low temperature and medium temperature hot water and chilled water systems;
- reference to Type 2 flow measurement devices has been deleted;
- a definition has been provided for “fixed orifice valve”;
- the standard has been revised to use basic European standards for design, materials, pressure temperature ratings, testing and marking;
- pressure temperature ratings and design requirements for steel pressure envelope materials for double regulating and variable orifice valves have been deleted from the standard;
- the operating element to be sized using BS EN 12570 has been introduced;
- Annex B on correspondence between DN and NPS and nominal diameter, Annex D on materials for copper alloy series A and series B globe valves and Annex F on pressure/temperature ratings have been introduced; and
- the numbering has been updated: Annex E was Appendix C and Annex C was Appendix B.

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Presentational conventions

The provisions of this document are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is “shall”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Where words have alternative spellings, the preferred spelling of the *Shorter Oxford English Dictionary* is used (e.g. “organization” rather than “organisation”).

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1 Scope

This document specifies requirements for metallic double regulating globe valves and flow measurement devices having flanged, wafer, threaded or compression end connections.

This document specifies requirements for performance and function including materials, pressure/temperature ratings, dimensions, testing, hydraulic performance and marking.

This document applies to metallic double regulating globe valves and flow measurement devices in the form of fixed and variable orifice valves and as individual orifice fittings used for low temperature hot water and medium temperature hot water heating and chilled water systems.

The range of nominal sizes covered is:

a) flanged:

DN10, DN15, DN20, DN25, DN32, DN40, DN50, DN65, DN80, DN100, DN125, DN150, DN200, DN250, DN300;

b) threaded:

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

c) compression:

15 mm, 22 mm 28 mm.

The range of pressure designations is covered by:

a) Flanged:

PN10, PN16, PN20, PN25, PN40

b) Threaded:

PN10, PN16, PN20, PN25, PN32, PN40

c) Compression:

PN16.

NOTE 1 For compression ends and loose nut/union end bodies in copper alloy materials there are no PN designations. Use BS EN 1254-2, which gives the details of the body ends for compression end valves covered in this document rather than the PN designation system given in BS EN 1333.

NOTE 2 Low temperature hot water heating systems have a maximum temperature of 90 °C and Medium Temperature Hot Water systems have a maximum temperature of 120 °C as per CIBSE Guide B1 2016 [5].

Information to be supplied by the purchaser is given for information in Annex A. The correspondence between DN, NPS and nominal diameters is given for information in Annex B.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes provisions, or limits the application, of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Standards Publications

BS EN 10217-1:2019, *Welded steel tubes for pressure purposes – Technical delivery conditions – Electric welded and submerged arc welded non-alloy steel tubes with specified room temperature properties*

BS EN 10226-1:2004, *Pipe threads where pressure tight joints are made on the threads – Taper external threads and parallel internal threads – Dimensions, tolerances and designation*

BS EN 10226-2:2005, *Pipe threads where pressure tight joints are made on the threads – Taper external threads and taper internal threads – Dimensions, tolerances and designation*

BS EN 10255, *Non-alloy steel tubes suitable for welding and threading – Technical delivery conditions*

BS EN 10269:2013, *Steels and nickel alloys for fasteners with specified elevated and/or low temperature properties*

BS EN 1057:2006+A1:2010, *Copper and copper alloys – Seamless, round copper tubes for water and gas in sanitary and heating applications*

BS EN 1092-1:2018, *Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories, PN designated – Part 1: Steel flanges*

BS EN 1092-2:2023, *Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories, PN designated – Cast iron flanges*

BS EN 1092-3:2003, *Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories, PN designated – Part 3: Copper alloy flanges*

BS EN 12163, *Copper and copper alloys – Rod for general purposes*

BS EN 12164, *Copper and copper alloys – Rod for free machining purposes*

BS EN 12167, *Copper and copper alloys – Profiles and bars for general purposes*

BS EN 12168, *Copper and copper alloys – Hollow rod for free machining purposes*

BS EN 12266-1:2012, *Industrial valves – Testing of metallic valves – Pressure tests, test procedures and acceptance criteria – Mandatory requirements*

BS EN 12351:2010, *Industrial valves – Protective caps for valves with flanged connections*

BS EN 12420, *Copper and copper alloys – Forgings*

BS EN 12516-1:2014+A1:2018, *Industrial valves – Shell design strength – Part 1: Tabulation method for steel valve shells*

BS EN 12516-2, *Industrial valves – Shell design strength – Part 2: Calculation method for steel valve shells*

BS EN 12516-3:2002, *Valves – Shell design strength – Part 3: Experimental method*

BS EN 12516-4:2014+A1:2018, *Industrial valves – Shell design strength – Part 4: Calculation method for valve shells manufactured in metallic materials other than steel*

BS EN 1254-2:2021, *Copper and copper alloys – Plumbing fittings – Compression fittings for use with copper tubes*

BS EN 1254-4:2021, *Copper and copper alloys – Plumbing fittings – Threaded fittings*

BS EN 12570:2000, *Industrial valves – Method for sizing the operating element*

BS EN 19:2023, *Industrial valves – Marking of metallic valves*

BS EN 558:2022, *Industrial valves – Face-to-face and centre-to-face dimensions of metal valves for use in flanged pipe systems – PN and Class designated valves*

BS EN 736-1:2018, *Valves – Terminology – Part 1: Definition of types of valves*

BS EN 736-2:2016, *Valves – Terminology – Part 2: Definition of components of valves*

BS EN 736-3:2008, *Valves – Terminology – Part 3: Definition of terms*

BS EN ISO 228-1:2003, *Pipe threads where pressure-tight joints are not made on the threads – Part 1: Dimensions, tolerances and designation*

BS EN ISO 6509, *Corrosion of metals and alloys – Determination of dezincification resistance of copper alloys with zinc – Test method*

BS EN ISO 12944-5:2019, *Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Part 5: Protective paint systems*

Other Publications

[N1] The American Society of Mechanical Engineers. *Pipe Threads – General Purpose – Inch. B1.20.1*. ASME. New York, USA: 2013.

3 Terms, definitions and abbreviated terms

For the purposes of this document, the terms and definitions given in BS EN 736-1, BS EN 736-2 and BS EN 736-3 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1 double regulating globe valve

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 4.2.1.4)

3.2 fixed orifice

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 can 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 fitting (see 3.2)

3.3 fixed orifice fitting

fitting in which a circular aperture has been machined (see 4.2.2.3 and Annex C, Type 1)

3.4 flow measurement device

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 or digital device

3.5 pressure tapping point

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 4.2.2.1)

3.6 pressure differential

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.

3.7 valve or device headloss

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

3.8 variable orifice

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 3.1.6).

3.9 variable orifice valve

double regulating globe valve with pressure tapping points used for the determination of flow rates and also for regulating and isolating purposes (see **4.2.2.3** and Annex C)

4 Requirements

4.1 Performance requirements

4.1.1 Double regulating globe valve construction

4.1.1.1 Bonnet

Bonnets shall be attached to bodies by bolting for valves of nominal sizes DN65 and larger.

4.1.1.2 Direction of flow

Valves shall be installed with the upstream pressure under the disk.

4.1.1.3 Position indication

Each valve shall be provided with an indicator to show the position of the valve disk in the fully closed, fully open and not less than three intermediate positions.

4.1.1.4 Setting facility

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

NOTE Examples of operating device can be either a) handwheel or b) removable key.

4.1.2 Flow measurement device construction

4.1.2.1 Flow measurement device

A flow measurement device shall be one of the following types:

- a) Type 1: a fixed orifice fitting with two pressure tapping points;
- b) Type 3: a fixed orifice fitting close coupled or integral with a double regulating globe valve with two pressure tapping points; or
- c) Type 4: a variable orifice valve with two pressure tapping points.

NOTE Annex C gives typical construction details of the three different types of flow measurement devices.

4.1.2.2 Pressure tapping points

Pressure tapping points shall be located on either side of the fixed or variable orifice. 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 (see Figures F.1 to F.3).

NOTE 1 When installed in a pipework system the pressure tapping points should be positioned such that they are not 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 conform to BS EN 10226-1 or BS EN 10226-2 or BS EN ISO 228-1:2003, with a maximum thread size of $\frac{1}{4}$. The bore and other internal surfaces of the pressure tapping point or adaptor shall be clean and free of all burrs and wire edges. The hole diameter of the pressure tapping point or adaptor at the point of entry into the main flow shall be a minimum of 1.5 mm. Each pressure tapping point or screwed-in adaptor shall be suitable for the working pressure and temperature of the flow measurement device (see **4.1.2.1**). Each pressure tapping point on the adaptor outlet shall have an additional seal to prevent the ingress of dirt and other debris. For applications where temperatures are in excess of 95 °C, pressure tapping points or adaptors shall have an independent means of isolation in addition to self-acting closure devices.

4.1.2.3 Fixed orifice fitting

A fixed orifice fitting shall be 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 F.1(a)].
- b) An orifice fitting in the form of an orifice plate suitable for mounting between flanges [see Figure F.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 can 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.

4.1.2.4 Valve series

Two series of valves shall be specified for copper alloy globe valves: series A for flanged and threaded end valves and series B for flanged, threaded, capillary, compression and loose nut/union end valves.

Series A valves shall have the shell components constructed from the materials specified in **4.1.2.7.1** and **4.1.2.7.2** and are suitable for the pressure/temperature ratings given in BS EN 1092-3.

Series B valves shall have the shell components constructed from copper-zinc-lead or complex copper-zinc alloys materials specified in **4.1.2.7.3** and have lower allowable pressures at elevated temperatures than series A valves.

4.1.2.5 Hazard Analysis

The manufacturer shall conduct a hazard analysis for the intended use and for the reasonably foreseeable conditions.

NOTE This hazard analysis should be documented.

If the manufacturer identifies hazards which apply to the valve the manufacturer shall take account of this analysis by appropriate measures in order to reduce or eliminate the hazard identified.

4.1.2.6 Shell design strength

The shell design strength shall be determined as follows:

- a) for cast iron and copper alloy globe valves: designed by the calculation method in accordance with BS EN 12516-2 and BS EN 12516-4; and
- b) for $PS \times DN < 3\,000$: a validation by an experimental method in accordance with BS EN 12516-3 is possible, otherwise the experimental method shall only be applied in addition to the tabulation or calculation method.

4.1.2.7 Materials

4.1.2.7.1 Pressure shell materials shall be selected in accordance with BS EN 12516-1 and BS EN 12516-4. For copper alloy refer to BS EN 12516-1:2014+A1:2018, Table 8 and cast irons refer to BS EN 12516-4:2014+A1:2018, Table 2.

4.1.2.7.2 In addition to **4.1.2.7** pressure shell materials listed in Annex D, Table D.1 shall be selected for Series A copper alloy globe valves.

4.1.2.7.3 Pressure shell materials listed in Annex D, Table D.2 shall be selected for Series B copper alloy globe valves.

4.1.2.7.4 All the internal parts in contact with the fluid shall be made of a material or coated with a material whose corrosion resistance to the fluid being carried is at least equal to the body and bonnet material.