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Safety and control devices for use in hot water systems —

**Part 2: Specification for temperature
relief valves for pressures from 1 bar
to 10 bar**

Committees responsible for this British Standard

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 Association of Manufacturers of Domestic Unvented Supply Systems Equipment (MODUSSE)
 Association of Water Officers Ltd.
 British Bathroom Council
 British Gas plc
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 British Plastics Federation
 British Plumbing Fittings Manufacturers' Association
 British Valve and Actuator Manufacturers' Association
 Builders' Merchants' Federation
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Foreword

This Part of BS 6283 has been prepared under the direction of the Building Services Standards Policy Committee at the request of the Department of the Environment on the advice of the Standing Technical Committee on Water Regulations. It supersedes BS 6283-2:1982 which is withdrawn. Each Part of BS 6283 specifies requirements for a particular device for preventing overheating and/or excess pressures in water installations, and is intended to be suitable for citing as deemed to satisfy the relevant regulations or byelaws.

This British Standard comprises the following Parts:

- *Part 1: Specification for expansion valves for pressures up to and including 10 bar;*
- *Part 2: Specification for temperature relief valves for pressures from 1 bar to 10 bar;*
- *Part 3: Specification for combined temperature and pressure relief valves for pressures from 1 bar to 10 bar;*
- *Part 4: Specification for drop-tight pressure reducing valves of nominal size up to and including DN 50 for supply pressures up to and including 12 bar.*

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 10, an inside back cover and a back cover.

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

Section 1. General

1.1 Scope

This Part of BS 6283 specifies the design, construction and testing requirements for temperature relief valves of the automatic reseating type, of nominal sizes DN 15 to DN 40 for working pressures from 1 bar¹⁾ to 10 bar. The valves are intended for the protection of storage heaters of the unvented type that are required to operate at temperatures not normally exceeding 90 °C and not exceeding 100 °C under emergency conditions. However, they may be used for other water applications where appropriate.

This Part of BS 6283 does not cover the application or installation of these valves.

Advice on the information to be supplied by the purchaser is given in Appendix A.

NOTE The titles of the publications referred to in this Part of BS 6283 are listed on the inside back cover.

1.2 Definitions

For the purposes of this Part of BS 6283 the following definitions apply.

1.2.1

temperature relief valve

a temperature actuated valve which opens automatically at a specified temperature to discharge fluid. It is fitted to water heaters to prevent the temperature in the container from exceeding 100 °C

1.2.2

maximum working pressure

the maximum static water pressure at which a temperature relief valve is designed to be used

1.2.3

set temperature

the nominal temperature at which a temperature relief valve is set to open in service

1.2.4

reseating temperature

the temperature at which a temperature relief valve closes after discharging

1.2.5

rated discharge capacity

the power that can be dissipated through the temperature relief valve under the conditions described in the discharge capacity test

1.3 Nominal size

The nominal size of the temperature relief valve and the nominal size of the appropriate inlet connection shall be as given in Table 1.

Table 1 — Nominal size of valve

Nominal size of valve	Nominal size of inlet connection		
	Screwed (complying with BS 2779 or BS 21)	Compression (complying with BS 864-2)	Flanged (complying with BS 4504-2)
DN			
15	½	15/18	15
20	¾	22	20
25	1	28	25
32	1¼	35	32
40	1½	42	40

1.4 Marking

1.4.1 Flow marking

Each temperature relief valve shall be legibly and permanently marked to identify the discharge connection. This marking shall be stamped, etched, cast or moulded on the valve.

1.4.2 Identification marking

Each temperature relief valve shall be legibly and permanently marked with the following:

- the number of this British Standard, i.e. BS 6283/2²⁾;
- the manufacturer's or agent's name, trademark or symbol;
- the name or model number of the valve and its nominal size;
- the month and year of manufacture, e.g. 12-91;
- the rated discharge capacity in kilowatts, to the nearest 0.1 kW;
- the set temperature in °C.

NOTE Adhesive labels complying with BS 4781 are considered to be permanent for the purposes of this Part of BS 6283.

¹⁾ 1 bar = 10⁵ N/m² = 100 kPa. All pressures are gauge pressures unless otherwise stated.

²⁾ Marking BS 6283/2 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.

Section 2. Materials

2.1 General

Any non-metallic materials, under the conditions for which the valve is designed, shall comply with BS 6920-1.

2.2 Bodies and associated parts

The bodies and associated parts of temperature relief valves shall be constructed from those materials specified in clause 9 of BS 5412 and BS 5413-5:1976. Materials that are in contact with water shall be capable of complying with clause 7 of BS 2872:1989.

The sheath of the temperature sensing element shall be made of copper complying with BS 2870 or BS 2871 or of a nickel-copper (monel) alloy complying with BS 3074.

The temperature probe (sensing element) shall be protected by a coating or sleeve which shall show no visible evidence of degradation (e.g. blistering) during or following testing of the valve.

2.3 Sealing and diaphragm materials

Sealing members and diaphragm materials shall comply with items 3) and 4) of clause 6 of BS 3457:1973. They shall also be capable of complying with the test criteria in Appendix C of BS 5412 and BS 5413-5:1976.

2.4 Spring materials

Springs shall be made of one of the following:

- a) stainless steel complying with BS 970-4 or BS 2056;
- b) nickel-copper alloy (monel) complying with BS 3075;
- c) phosphor bronze complying with grade PB 102 of BS 2874;
- d) when not in contact with water, carbon steel, complying with grades 094A65HS and 735A50HS of BS 2803 or grades HS2 and HS3 of BS 5216.

Section 3. Design and construction

3.1 General

Temperature relief valves shall be so constructed that failure of any part will not obstruct the free and full discharge from the valve. The valves shall not open under pressure alone at pressures below 16 bar.

The inlet and discharge connections shall be unobstructed except for the portion of the temperature sensing element within the inlet of the temperature relief valve. The section of the element within the inlet shall not exceed the limits given in Table 2.

The thermally responsive material of temperature sensing elements shall be sealed against water entry.

3.2 End connections and flow dimensions

3.2.1 Type of connections

3.2.1.1 General

End connections shall be screwed ends, compression ends or flanged ends complying with 3.2.1.2, 3.2.1.3 or 3.2.1.4 respectively.

3.2.1.2 Screwed ends

Where the end connection is screwed, the thread shall be a parallel pipe thread complying with BS 2779 for internal threads and class B of BS 2779 or BS 21 for external threads of lengths given in Table 6 of BS 864-2:1983. Screwed end connections shall be designed so that when a pipe or fitting is screwed into the connection it shall not reduce the area of flow through the valve, distort any part of the valve body or adversely affect the operation of the valve.

3.2.1.3 Compression ends

Where compression end connections are provided they shall comply with BS 864-2 or BS 864-5.

3.2.1.4 Flanged ends

Where flanged end connections are provided they shall comply with Table 9 of BS 4504-3.3:1989.

3.2.2 Size of connections

End connections shall be either the same nominal size as the valve (see Table 1) or, in the case of discharge connections only, one size larger than the nominal size of the valve. Temperature relief valves with rated discharge capacities up to and including 7.5 kW shall be not smaller than DN 15. Temperature relief valves with rated discharge capacities exceeding 7.5 kW shall be not smaller than DN 20.

The minimum internal diameter of end connections shall be as given in Table 2.

3.2.3 Total flow area

The minimum total flow area at any point within the valve body, other than at the end connections and at the seating, shall be as given in Table 2.

Where the total flow area is divided into two or more flow passages in parallel, the minimum flow area of any such passage shall be as given in Table 2.

Calculation of total flow area shall exclude any portion in a corner of the flow area that would not be included in a 5 mm diameter circle positioned tangentially to two sides of the flow area.

3.2.4 Width of passages

3.2.4.1 The clearance around the shroud shall be as shown in Figure 1(e) and Figure 1(f).

3.2.4.2 The smallest cross-sectional dimension of all the other flow passages shall be not less than 5 mm, except when the smallest dimension of the flow area below the lip of the shroud is at least 5 mm, in which case the clearance between the valve body wall and the valve shroud shall be not less than 1.5 mm (see Figure 1).

Table 2 — Minimum dimensions of flow passages (see Figure 1)

Nominal size of valve	Minimum internal diameter of end connections (see 3.2.2)	Minimum total flow area (see 3.2.3)	Minimum flow area of any body passage (see 3.2.3)	Maximum diameter of the portion of sensing element within the valve inlet (see 3.1) ^a	Minimum volume under seating bore
DN	mm	mm ²	mm ²	mm	mL
15	14	200	100	7	5
20	18	344	172	8	7
25	24	558	279	11	10
32	32	968	484	14	14
40	38	1 316	658	17	17

^a These dimensions include the protective coating or sleeve.

3.2.4.3 The flow-way between the walls of the orifice and any part of a temperature sensing element extending through the orifice may be less than 5 mm, but it shall be not less than 3 mm. The minimum dimension between any part of a temperature sensing element below the orifice, which is larger than that part extending through the orifice, and the lower edges of the orifice shall be 5 mm (see Figure 1).

3.2.5 Minimum seating bore

Temperature relief valves shall have a seating bore, *B*, of not less than 11 mm diameter. The minimum volume under the seating bore shall be as given in Table 2. The volume under the seating excludes any volume contained within the inlet connection. If the seating bore diameter is less than 90 % of the minimum internal diameter of end connections given in Table 2, the length of the seating bore shall not exceed the seating bore diameter. However, twice the length shall be permissible until January 1994.

3.3 Valve seat attachment

Where separate seats are fitted to the valve disc or body they shall be secured to prevent them from working loose or blowing out.

3.4 Guides and moving parts

Means shall be provided to guide the valve disc and to prevent it from being misaligned during working. Disc guides shall be located on the discharge side of the valve, except that shallow conical self-centring guides integral with the disc may be used on the inlet side [see Figure 1(c)]. Wing or similar guides shall not be used on the inlet side of the valve [see Figure 1(d)]. Moving parts shall have sufficient clearance to ensure freedom of movement under the intended conditions of service.

3.5 Provision for deposits and drainage

The outlet from a temperature relief valve shall be constructed so that the centreline of the discharge connection is not more than dimension *X*, as shown in Figure 1, above both the face of the valve seat and the lowest part of the valve shroud when closed.

NOTE The maximum value of *X* is given in Table 3.

Table 3 — Maximum value of dimension *X* as shown in Figure 1

Valve outlet size	Maximum value of dimension <i>X</i>
DN	mm
15	3
20	6
25	9
32	12
40	15

3.6 Adjustment

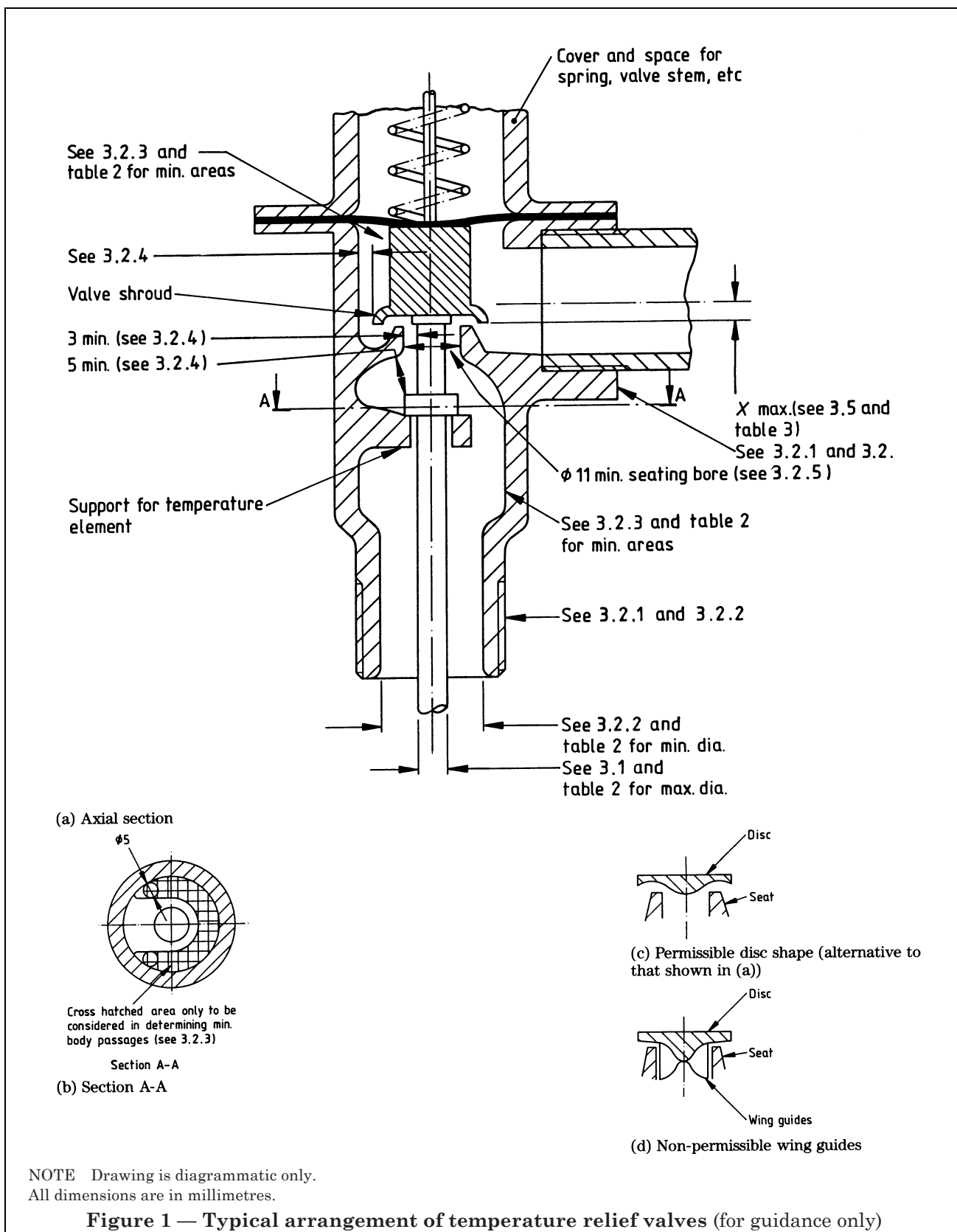
Means for factory adjustment shall be secured in position and sealed. Means for field adjustment or repair of the valve shall not be provided.

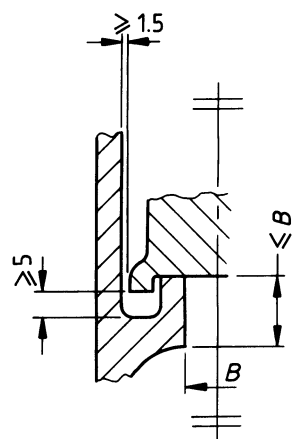
3.7 Springs

Springs shall be designed in accordance with BS 1726-1. Springs shall be protected against contact with water by membranes or seals. The space between active coils when the valve is lifted to discharge its rated discharge capacity shall be not less than 1 mm.

3.8 Easing gear

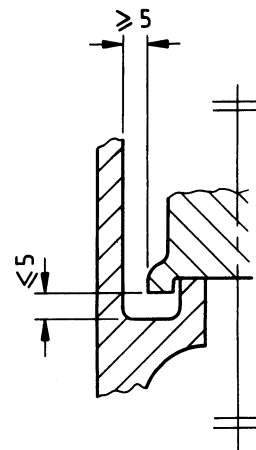
Temperature relief valves shall be fitted with manually operated easing gear capable of raising the valve disc off its seat a distance of at least 1.5 mm at ambient temperature when the valve is not subject to pressure. The easing gear shall be operated by either a lift handle or a rotary handle and shall be designed so that the valve can not remain in the open position when the manual effort is removed.





B = Actual seating bore

(e) Valve clearance type I



(f) Valve clearance type II

Figure 1 — Typical arrangement of temperature relief valves (for guidance only) (concluded)

Section 4. Performance

NOTE For all performance requirements a tolerance of $\pm 10\%$ should be assumed unless otherwise specified.

4.1 Production tests

When tested in accordance with **B.1** each valve shall not show any visible sign of external leakage. When tested in accordance with **B.2** each valve shall not show any visible sign of leakage.

4.2 Type tests

4.2.1 General

Each temperature relief valve shall be capable of complying with the appropriate requirements when tested as specified in **4.2.2** to **4.2.8**. These tests shall be carried out to prove the design of each type and size of valve. They shall be repeated if there is any change in design, material or manufacturing method, and in any case at intervals not exceeding 1 year.

The tests shall be carried out on three valves of each type and size in the following order:

- a) opening and reseating temperature test;
- b) easing gear test;
- c) torque test;
- d) back pressure test;
- e) discharge capacity test;
- f) water discharge test;
- g) endurance test.

4.2.2 Opening and reseating temperature test

The valve shall be tested in accordance with Appendix E. When tested in accordance with **E.3** the valve shall be closed. When tested in accordance with **E.4** the valve shall be open. When tested in accordance with **E.5** the valve shall be closed.

4.2.3 Easing gear test

The effort required to operate the easing gear while the valve is not under pressure shall not exceed a force of 50 N or a torque of 1.5 N m.

4.2.4 Torque test

When tested in accordance with Appendix C the valve shall not break or show permanent deformation. After testing in accordance with Appendix C the valve shall not show any visible sign of leakage when tested in accordance with **B.2**.

4.2.5 Back pressure test

When tested in accordance with Appendix D the valve shall not show any visible sign of leakage.

4.2.6 Discharge capacity test

When tested in accordance with Appendix F the rated discharge capacity of the valve shall be not less than the declared rated discharge capacity of the valve.

4.2.7 Water discharge test

When tested in accordance with Appendix G the discharge rate, in kg/h, from the valve shall be not less than 20 multiplied by the declared rated discharge capacity of the valve.

4.2.8 Endurance test

When the valve is tested in accordance with Appendix H the following requirements shall be complied with.

- a) When tested in accordance with **B.2** there shall not be any visible sign of leakage.
- b) When tested in accordance with **E.3** the valve shall be closed.
- c) When tested in accordance with **E.4** the valve shall be open.
- d) When tested in accordance with **E.5** the valve shall be closed.
- e) When tested in accordance with Appendix F the rated discharge capacity of the valve shall be not less than the declared rated discharge capacity of the valve.
- f) When tested in accordance with Appendix G the discharge rate, in kg/h, from the valve shall be not less than 20 multiplied by the declared rated discharge capacity of the valve.
- g) There shall be no visible evidence of degradation of the protective coating or sleeve, i.e. blistering.

Appendix A Information to be supplied by the purchaser

When ordering, the purchaser should supply information sufficient to specify the valve required, including where appropriate the following:

- the number of this British Standard, i.e. BS 6283-2;
- the inlet and outlet sizes;
- the rated discharge capacity in kilowatts.

Appendix B Production tests

B.1 Body strength test

Prior to the assembly of the valve, seal all apertures except the inlet port and apply a hydrostatic pressure of $16 + 0.5, - 0$ bar to the inlet port for 60 ± 1 s.

B.2 Leakage test

Apply a hydrostatic pressure of 10 ± 0.1 bar at not more than 80°C water temperature at the inlet of the valve and maintain this pressure for not less than 60 ± 1 s with the valve outlet open to atmosphere.

Appendix C Torque test

Connect short lengths of pipe to the end connections of the completely assembled valve in the way in which it is intended to be used in practice. Subject the valve to the appropriate torque given in Table 4 by applying the torque to each end connection in turn in one of the following ways:

- by holding one length of pipe stationary and applying the torque through the other length of pipe;

- if the valve has compression end connections, by holding one length of pipe, or its associated cap nut, stationary and applying the torque to the other length of pipe, or its cap nut.

After the torque has been applied for not less than 15 s, release it and examine the valve for breakage or deformation.

Then subject the valve to the leakage test described in B.2.

Table 4 — Torque

Nominal size of valve	Torque
DN	N m
15	50
20	75
25	100
32	125
40	150

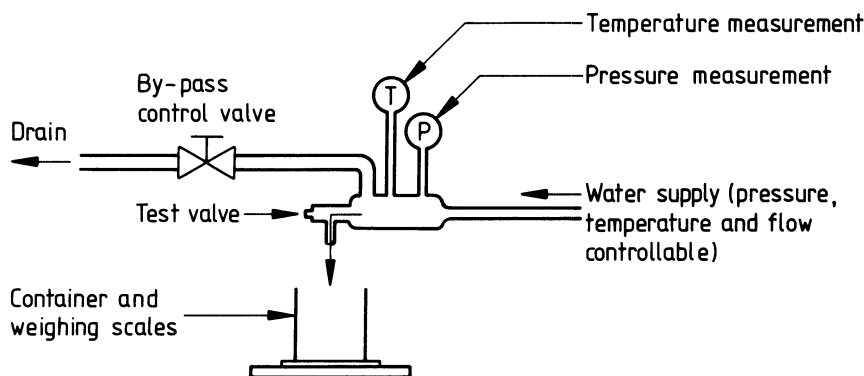
Appendix D Back pressure test

Render inoperative any auxiliary pressure relief device in the discharge and any integral vacuum relief valve. Apply a hydrostatic pressure of 0.7 bar at ambient temperature to the discharge of the valve and maintain this pressure for 60 ± 1 s.

Appendix E Opening and reseating temperature test

NOTE Typical test apparatus is shown in Figure 2.

E.1 Precondition the valve to be tested by allowing it to stand for 7 days at a room temperature of between 15°C and 25°C , without operating the lifting gear (easing gear).



NOTE Drawing is diagrammatic only.

Figure 2 — Test arrangement for opening and reseating temperatures

E.2 Connect the valve to a water supply that can be controlled in temperature, pressure and flow rate. Measure the water temperature at a point 50 ± 5 mm from the lower end of the temperature probe within 10 mm of the outer wall of the probe tube.

E.3 Establish a flow velocity of 0.5 ± 0.1 m/s at 2.0 ± 0.1 bar or 50 ± 5 % of the nominal pressure whichever is the lower pressure. Raise the temperature of the water to $89 + 0, - 2$ °C. Maintain this temperature and flow velocity for a minimum of 2 min. Record the condition of the valve (open or closed) at 2 min.

E.4 Raise the temperature of the water to 96 ± 1 °C and maintain for a minimum of 2 min. Record the condition of the valve (open or closed) at 2 min.

E.5 Reduce the temperature of the water to 70 ± 2 °C and maintain for a minimum of 2 min. Record the condition of the valve (open or closed) at 2 min.

Appendix F Discharge capacity test

F.1 Procedure

NOTE Typical test apparatus is shown in Figure 3.

Use discharge pipework and a condenser with a combined flow resistance equivalent to a 9 ± 0.05 m length of copper tube complying with Table X of BS 2871-1:1971, of the same nominal size as the discharge connection, and a test fluid of saturated steam. Turn on the condenser cooling water and gradually increase the test fluid pressure until a pressure of 1 bar and the corresponding saturation temperature are attained. Maintain these conditions for a period of at least 5 min before carrying out the measurement.

Measure the flow through the valve by weighing the condensate discharged over a period of at least 5 min or by means of an accurately calibrated flowmeter.

F.2 Calculation of results

Calculate the rated discharge capacity H (in kW) from the equation:

$$H = 0.3G$$

where:

G is the lowest discharge rate of the three valves tested or 90 % of the average of the three discharge rates, whichever is the lesser (in kg/h).

Appendix G Water discharge test

NOTE Typical test apparatus is shown in Figure 3.

Using discharge pipework with a flow resistance equivalent to a 9 ± 0.05 m length of copper tube complying with Table X of BS 2871-1:1971, of the same nominal size as the discharge connection, connect the valve to a water supply that can be controlled in temperature and pressure, and measure the water temperature and pressure as close as possible to the inlet of the valve.

Maintain for at least 5 min a flow of water through the valve at a temperature of $99 + 0, - 1$ °C and at a pressure of 1 bar before carrying out the measurement.

Measure and record³⁾ the flow through the valve by weighing the water discharged over a period of at least 5 min or by means of an accurately calibrated flowmeter.

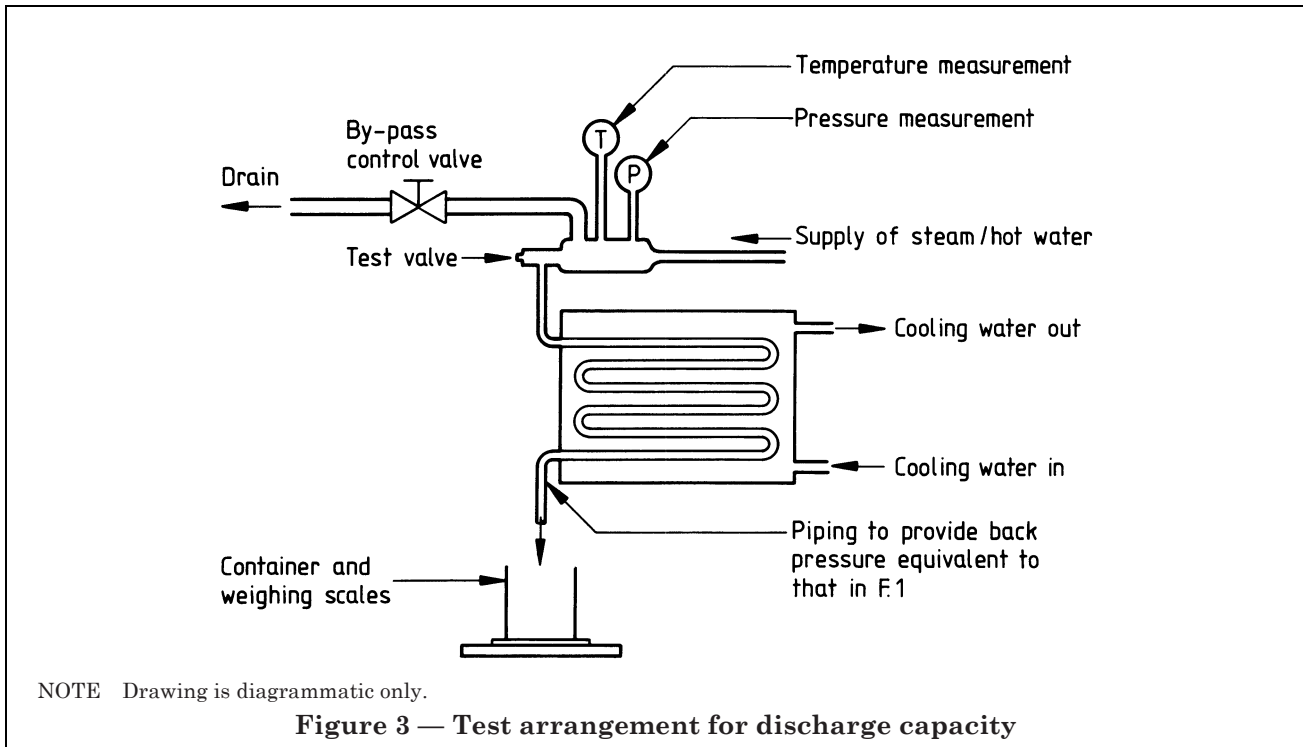
Appendix H Endurance test

NOTE Typical test apparatus is shown in Figure 2.

Connect the valve to a water supply that can be controlled in temperature, pressure and flow rate and measure the water temperature and pressure as close as possible to the inlet of the valve. Circulate water past the valve at a temperature not exceeding 30 °C at a rate of not less than 0.02 L/s and at a pressure between 0.5 bar and 0.75 bar. Steadily increase the water temperature to $100 + 0, - 1$ °C. Then reduce the temperature to below 30 °C. Repeat this test cycle until the valve has opened and closed $100 + 2, - 0$ times. Remove the valve from the test rig and expose it to water at $120 + 5$ °C for 1 h.

At the conclusion of the test subject the valve again, without any adjustment, to the leakage test described in B.2 and the opening reseating temperature test described in Appendix E, omitting E.1, and measure the discharge capacity as described in Appendix F and the water discharge as described in Appendix G.

³⁾ This information is required to assist in complying with BS 7206.



Publication(s) 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 970-4, *Valve steels.*
- BS 1726, *Coil springs.*
- BS 1726-1, *Guide for the design of helical compression springs.*
- BS 2056, *Specification for stainless steel wire for mechanical springs.*
- BS 2779, *Specification for pipe threads for tubes and fittings where pressure-tight joints are not made on the threads (metric dimensions).*
- BS 2803, *Specification for pre-hardened and tempered carbon and low alloy round steel wire for springs for general engineering purposes.*
- BS 2870, *Specification for rolled copper and copper alloys: sheet, strip and foil.*
- BS 2871, *Specification for copper and copper alloys. Tubes.*
- BS 2871-1, *Copper tubes for water, gas and sanitation.*
- BS 2872, *Specification for copper and copper alloy forging stock and forgings.*
- BS 2874, *Specification for copper and copper alloy rods and sections (other than forging stock).*
- BS 3074, *Specification for nickel and nickel alloys: seamless tube.*
- BS 3075, *Specification for nickel and nickel alloys: wire.*
- BS 3457, *Specification for materials for water tap and stopvalve seat washers.*
- BS 4504, *Circular flanges for pipes, valves and fittings (PN designated).*
- BS 4504-3.3, *Specification for copper alloy and composite flanges.*
- BS 4781, *Specification for pressure-sensitive adhesive plastics labels for permanent use.*
- BS 5216, *Specification for patented cold drawn carbon steel wire for mechanical springs.*
- BS 5412, *Specification for the performance of draw-off taps with metal bodies for water services.*
- BS 5413, *Specification for the performance of draw-off taps with plastics bodies for water services.*
- BS 5413-5, *Physio-chemical characteristics: materials, coatings.*
- BS 6283, *Safety and control devices for use in hot water systems.*
- BS 6283-1, *Specification for expansion valves for pressures up to and including 10 bar⁴⁾.*
- BS 6283-3, *Specification for combined temperature and pressure relief valves for pressures from 1 bar to 10 bar⁴⁾.*
- BS 6283-4, *Specification for drop-tight pressure reducing valves of nominal size up to and including DN 50 for supply pressures up to and including 12 bar⁴⁾.*
- BS 6920, *Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water.*
- BS 6920-1, *Specification.*
- BS 7206, *Specification for unvented hot water storage units and packages.*

⁴⁾ Referred to in the foreword only.

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