BRITISH STANDARD

BS EN
1490:2000

Building valves — Combined temperature and pressure relief valves — Tests and requirements

The European Standard EN 1490:2000 has the status of a British Standard

ICS 91.140.60

National foreword

This British Standard is the official English language version of EN 1490:2000. It supersedes BS 6283-3:1991 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee B/504, Water supply, to Subcommittee B/504/7, Control and safety devices in drinking water systems, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

Cross-references

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FOREWORD

This European Standard has been prepared by Technical Committee CEN/TC 164, Water supply, the Secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2000, and conflicting national standards shall be withdrawn at the latest by September 2000.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Annex A of this European Standard is informative.

INTRODUCTION

In respect of potential adverse effect on the quality of water intended for human consumption caused by the product covered by this standard:

a) this standard provides no information as to whether the product may be used without restriction in any of the Member States of the EU or EFTA;

b) it should be noted that, whilst awaiting the adoption of verifiable European criteria, existing national regulations concerning the use and or the characteristics of this product remain in force.

1 SCOPE

This European Standard specifies, dimensions, materials and performance requirements (including methods of test) for combined temperature and pressure relief valves, of nominal sizes from DN 15 to DN 40, having working pressures[1)] from 0,1 MPa (l bar) to 1,0 MPa (10 bar).

Combined temperature and pressure relief valves are intended for fitting to storage water heaters, having a maximum distribution temperature of 95 °C, for all energy sources.

Combined temperature and pressure relief valves control and limit the temperature and pressure of the water contained in a hot water heater to the valves rating pressure and a temperature not exceeding 100 ºC and will prevent water to steam formation when other temperature controls fail.

They are not intended to act as an expansion valve under normal conditions and do not control cold water flow.

Alone the valve does not constitute the control functions for a water heater.

> NOTE: The use of the device specified in this standard does not override the need to use controls (e.g. thermostats and cut-outs) which act directly on the power sources of water heaters.

2 NORMATIVE REFERENCES

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest addition of the publication referred to applies.

EN 1254-2	Copper and copper alloys - Plumbing fittings - Part 2: Fittings with compression ends for use with copper tubes.
EN 1982	Copper and copper alloys - Ingots and castings.
EN 12420	Copper and copper alloys – Forgings.
EN ISO 6509	Corrosion of metals and alloys - Determination of dezincification resistance of brass (ISO 6509:1981).
ISO 7-1:1994	Pipe threads where pressure-tight joints are made on the threads - Part 1: Dimensions, tolerances and designation.
ISO 228-1:1994	Pipe threads where pressure-tight joints are not made on the thread - Part 1: Dimensions, tolerances and designation.
ISO 7005-3:1988	Metallic flanges - Part 3: Copper alloy and composite flanges.

[1)] All pressures are gauge unless otherwise stated.

3 DEFINITIONS

For the purposes of this standard, the following definitions apply.

3.1 temperature relief valve temperature activated valve which opens automatically at a specified set temperature to discharge fluid. It is fitted to water heaters to prevent the temperature of the contained water from exceeding 100 °C

3.2 pressure relief valve pressure activated valve which opens automatically at a specified set pressure to discharge fluid. It is fitted to prevent the pressure in a water heater from exceeding the maximum working pressure

3.3 combined temperature and pressure relief valve valve which is capable of performing the function of both a temperature relief valve and a pressure relief valve

3.4 thermal element provides the thermal control; comprising a thermal probe and associated control rods

3.5 Pressures

3.5.1 nominal set pressure (P_{nr}) pressure of the combined temperature and pressure relief valve which is set on production

3.5.2 water tightness pressure (P_e) pressure up to which the combined temperature and pressure relief valve is closed (see Figure 1)

3.5.3 initial opening pressure (P_{dc}) pressure at which the combined temperature and pressure relief valve opens for the first time, as indicated by the first droplet of water, after a period of storage (see Figure 1)

3.5.4 opening pressure (P_o) pressure at which a flow rate of 2,4 litre/hour of water is attained through the combined temperature and pressure relief valve (see Figure 1)

3.5.5 rating pressure (P_{dn}) pressure at which the water discharge capacity of the combined temperature and pressure relief valve corresponds to the rated flow (see Figure 1)

3.5.6 closing pressure (P_f) pressure at which the combined temperature and pressure relief valve closes after having reached the rating pressure (see Figure 1)

3.6 Temperatures

3.6.1 maximum working temperature maximum temperature at which the combined temperature and pressure relief valve is designed to be used

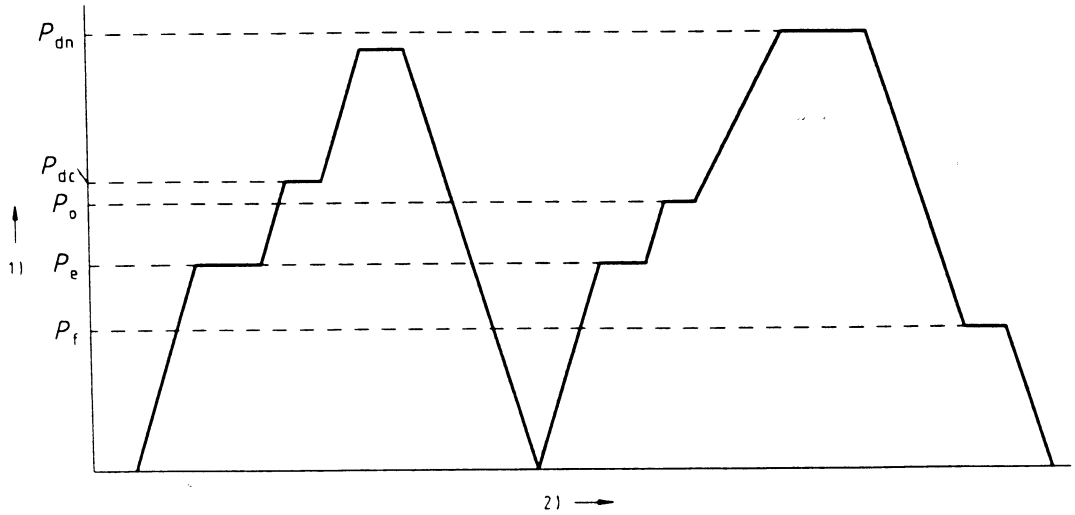
3.6.2 nominal set temperature temperature range, 90 °C to 95 °C, in which the combined temperature and pressure relief valve is set to operate

3.6.3 initial opening temperature temperature at which the combined temperature and pressure relief valve opens, as indicated by the first droplet of water, after a period of storage

3.6.4 closing temperature temperature at which the combined temperature and pressure relief valve closes after discharging under temperature conditions

3.6.5 rated steam discharge capacity minimum rate of steam discharge, kilogram/hour, that can be discharged through the valve under the conditions specified in the test in section 6.5

3.6.6 water discharge capacity rate of water discharge, litre/hour, that can be discharged through the combined temperature and pressure relief valve under the conditions specified in the test in section 6.4



Key

1) Pressure
2) Time

Figure 1 - Pressures - see Definitions

3.6.7 nominal power rating power rating, in Table 9, to be assigned to a combined temperature and pressure relief valve, as appropriate, which meets the test criteria of tests in sections 6.4 and 6.5

4 MATERIALS AND SURFACE FINISHES

4.1 General

The selection of materials is the responsibility of the manufacturer, provided they satisfy the following requirements:

a) materials and coatings shall not contaminate the drinking water, when in normal or accidental contact;

b) in a technical document, the manufacturer shall state the nature of the materials and coatings used;

c) material with inadequate corrosion resistance shall have additional protection; and

d) the materials used shall not deteriorate at a temperature of 95 °C for 1 hour and be suitable under the temperatures specified in the tests in this standard.

4.2 Nature of materials

Examples of bronze and brass which may be used, without coating, for manufacturing purposes are given in Table 1.

Table 1 - Examples of copper alloys

Material designation		European Standard
Symbol	Reference number	
Cu Sn 5 Pb 5 Zn 5 - C	CC491K	EN 1982
Cu Sn 3 Zn 8 Pb 5 - C	CC490K	EN 1982
Cu Zn 39 Pb 3	CW614N	EN 12420
Cu Zn 40 Pb 2	CW617N	EN 12420
Cu Zn 36 Pb 2 As	CZ132	—

Copper-zinc alloys containing more than 10 % zinc are subject to dezincification when submitted to water capable of dezincification. In the countries where the use of products made of dezincification resistant materials is required, the products have to guarantee a dezincification depth less than 200 µm in any direction; they have to be tested in accordance with the standard EN ISO 6509 and have to be marked in compliance with the indications under section 11.

5 DESIGN AND DIMENSIONAL REQUIREMENTS

5.1 General guidance

a) The combined temperature and pressure relief valve shall be of the type where the spring is isolated from the water.

b) All components shall be designed so as to avoid any risk of seizing, scaling or sticking.

c) Sliding or rotating parts shall not be in contact with water, except for the thermal element.

d) The components controlling the setting of pressure and temperature valve shall not be accessible to the end user without damage to the valve.

e) The thermal element shall be so designed that contact by water on the thermally responsive material is prevented.

f) Wing or similar guides shall not be used on the inlet side of the combined temperature and pressure relief valve [see Figure 2d)].

g) For combined temperature and pressure relief valves with threaded ends, two spanner flats shall be provided on the body.

h) The normal operation of the combined temperature and pressure relief valve shall not be influenced by external forces.

i) If there is only one direction for operation of rotary controls of a combined temperature and pressure relief valve, it shall be anti-clockwise.

j) Where separate seats are fitted to the combined temperature and pressure relief valve disc or body, they shall be secured to prevent them from working loose in normal service.

5.2 Pressures

For set pressures below 0,3 MPa (3 bar), the same differential pressures shall be used as for 0,3 MPa (3 bar).

EXAMPLE: a combined temperature and pressure relief valve with a set pressure of 0,2 MPa (2 bar) shall have a rating pressure of P_{dn} equal to 0,23 MPa (2,3 bar), see Figure 1.

5.2.1 Nominal set pressure (P_{nr})

The nominal set pressure shall not be greater than 1,0 MPa (10 bar).

5.2.2 Water tightness pressure (P_e)

The water tightness pressure is related to the nominal set pressure (P_{nr}) by:

$$P_{e\ minimum} = 0{,}95\ P_{nr}$$

5.2.3 Opening pressure (P_o)

The opening pressure P_o is related to the nominal set pressure (P_{nr}) by:

$$P_o = 1{,}1\ P_{nr}$$

5.2.4 Rating pressure (P_{dn})

The rating pressure is related to the nominal set pressure (P_{nr}) by:

$$P_{dn} = 1{,}2\ P_{nr}$$

5.2.5 Closing pressure (P_f)

The closing pressure is related to the nominal set pressure (P_{nr}) by:

$$P_{f\ minimum} = 0{,}75\ P_{nr}$$

5.3 Dimensional characteristics

The nominal outlet diameter of the combined temperature and pressure relief valve shall be at least equal to the inlet dimension.

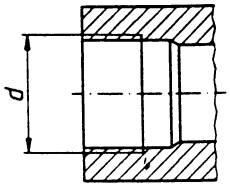
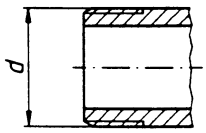
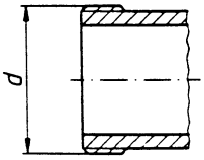
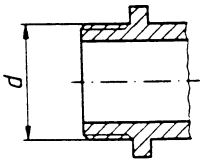
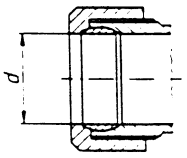
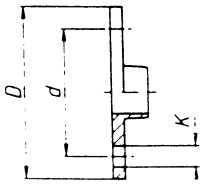
5.3.1 End connections

Examples of end connections shall be as given in Table 2.

5.3.2 Other connections (e.g. unions)

Connections, other than those specified in section 5.3.1, shall be tested in accordance with section 7.2.3.2.

Table 2 - Examples of end connections and nominal sizes (DN)

Type	1)	DN 15	DN 20	DN 25	DN 32	DN 40
 a) internal thread to ISO 7-1:1994	*d*	Rp 1/2	Rp 3/4	Rp 1	Rp 1 1/4	Rp 1 1/2
 b) External taper thread to ISO 7-1:1994	*d*	R 1/2	R 3/4	R 1	R 1 1/4	R 1 1/2
 c) Flat faced external thread to ISO 228-1:1994	*d*	G 3/4 B	G 1 B	G 1 1/4 B	G 1 1/2 B	G 1 3/4 B
 d) External thread with shoulder to ISO 228-1:1994	*d*	G 1/2 B	G 3/4 B	G 1 B	G 1 1/4 B	G 1 1/2 B
 e) compression fitting for copper pipe to EN 1254-2	*d*	15/18	22	28	35	42
 f) flange to ISO 7005-3:1988	*D* *d* *K*	95 75 14	105 75 14	115 85 14	140 100 18	150 110 18
1) reference dimensions						

5.3.3 Exclusions

Connections requiring the use of heat to make or break the joint (e.g. capillary) are not permitted.

5.4 Flow passages

5.4.1 Total flow area

Except for the area of the seating bore, every flow passage inside the combined temperature and pressure relief valve shall have a minimum flow area as given in Table 3 column 3 and as shown in Figure 2.

Table 3 - Minimum dimensions of flow passages (see Figure 2)

Nominal valve size of combined temperature and pressure relief valves	Minimum total flow area around thermal element support (see section 5.4.2)	Minimum flow area of any passages (see note 1)	Maximum diameter of the portion of the thermal element within the combined temperature and pressure relief valve inlet (see note 2)
DN	mm^2	mm^2	mm
15	200	100	7
20	344	172	8
25	558	279	11
32	968	484	14
40	1 316	658	17

NOTE 1: In principle, the same minimum flow area should also be extended into the water heater to prevent blockages.

NOTE 2: These dimensions include any protective coating or sleeve.

5.4.2 Minimum total flow area

Where the thermal element is inside the combined temperature and pressure relief valve body, the minimum cross-sectional area is given in Table 3 column 2.

The distance between the probe support and other parts of the combined temperature and pressure relief valve shall be a minimum of 5 mm.

5.4.3 Provision for facilitating drainage and avoiding deposits

The outlet from a combined temperature and pressure relief valve shall be constructed so that the centre line of the discharge connection is not more than dimension *X*, as shown in Figure 2 and Table 4, above the face of the combined temperature and pressure relief valve seat.

Table 4 - Maximum value of dimension *X* as shown in Figure 2

Valve outlet size, DN	Maximum value of dimension *X*, mm
15	3
20	6
25	9
32	12
40	15

5.4.4 Easing gear (manual control device)

Combined temperature and pressure relief valves shall be fitted with manually operated easing gear capable of raising the combined temperature and pressure relief valve disc off its seat a distance of at least 1,5 mm at ambient temperature when the combined temperature and pressure relief 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 combined temperature and pressure relief valve cannot be locked in the open position when the manual effort is removed.

6 HYDRAULIC AND TEMPERATURE TESTS AND REQUIREMENTS

The tests shall be carried out on three combined temperature and pressure relief valves of each type and size in the following order, with the exception that the test given in section 6.6 shall be carried out concurrently on a separate combined temperature and pressure relief valve of each type and size.

6.1 Tolerances

Unless otherwise specified, all tolerances shall be ±5 %.

6.2 Opening and reseating temperature test

Test apparatus is shown in Figure 4.

6.2.1 Preparation

Precondition the combined temperature and pressure relief valve to be tested by allowing it to stand for 8 days at a room temperature of between 15 ºC and 25 ºC, without operating the easing gear.

Connect the combined temperature and pressure relief 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 and within 10 mm of the outer wall of the probe tube.

6.2.2 Verification that the combined temperature and pressure relief valve is closed

Procedure:

Establish a flow velocity through the test apparatus (past the combined temperature and pressure relief valve's thermal element) of (0,5 ± 0,1) m/s at (0,02 ± 0,005) MPa [(0,2 ± 0,05) bar]. Raise the temperature of the water to $(89\ ^{+0}_{-2})$ ºC. Maintain this temperature and flow velocity for a minimum period of 120 s. Record the condition of the combined temperature and pressure relief valve (open or closed) at 120 s.

Requirement:

The combined temperature and pressure relief valve shall be closed.

6.2.3 Opening temperature

Procedure:

Raise the temperature of the water to (96 ± 1) ºC whilst maintaining a pressure of (0,02 ± 0,005) MPa [(0,2 ± 0,05) bar] and maintain for a minimum period of 120 s. Record the condition of the combined temperature and pressure relief valve (open or closed) at 120 s.

Requirement:

The combined temperature and pressure relief valve shall be open.

6.2.4 Closing temperature

Procedure:

Reduce the temperature of the water to (70 ± 2) ºC whilst maintaining a pressure of (0,02 ± 0,005) MPa [(0,2 ± 0,05) bar] and maintain for a minimum period of 120 s. Record the condition of the combined temperature and pressure relief valve (open or closed) at 120 s.

Requirement:

The combined temperature and pressure relief valve shall be closed.

6.3 Water tightness test, opening and reseating pressure test, and pressure of nominal flow test

Test apparatus is shown in Figure 4.

6.3.1 Water tightness pressure (P_e)

Procedure:

Connect the combined temperature and pressure relief valve to be tested by its water heater connection to the test apparatus having water at ambient temperature (maximum 25 ºC).

Increase the pressure until the combined temperature and pressure relief valve opens.

Requirement:

This pressure at which the combined temperature and pressure relief valve opens shall be in the range P_e to P_{dn}.

Procedure:

Decrease the pressure to 0,4 P_{nr}.

Increase the pressure to 0,95 P_{nr} (tightness pressure).

Requirement:

The combined temperature and pressure relief valve shall be watertight over a period of (120 ± 2) s.

6.3.2 Nominal opening pressure (P_o)

Procedure:

Increase the water pressure until a flow rate of 2,4 litre/hour is achieved. Record the pressure as P_o.

Requirement:

P_o shall not be greater than 1,1 P_{nr}.

6.3.3 Nominal flow pressure

Procedure:

Increase the flow to the appropriate value given in Table 5 and measure the pressure.

Requirement:

The pressure determined shall not be greater than 1,2 P_n.

Table 5 - Discharge flow rate

Nominal size, DN	15	20	25	32	40
Nominal set pressure (P_{nr})	Discharge flow rate in litre/hour				
0,1 MPa	125	250	500	725	1 225
0,2 MPa	175	350	700	1 050	1 750
0,3 MPa	200	425	850	1 275	2 125
0,4 MPa	225	475	975	1 475	2 450
0,5 MPa	275	550	1 100	1 650	2 750
0,6 MPa	300	600	1 200	1 800	3 000
0,7 MPa	325	650	1 300	1 950	3 250
0,8 MPa	325	675	1 400	2 075	3 475
0,9 MPa	350	725	1 475	2 200	3 675
1,0 MPa	370	775	1 550	2 325	3 875

6.3.4 Closing pressure (P_f)

Procedure:

Decrease the pressure to 0,4 P_{nr}.

Increase the pressure to a maximum of 1,1 P_{nr} (opening pressure) which gives at least 2,4 litre/hour flow rate.

Decrease the pressure to a minimum of 0,75 P_{nr}.

Requirement:

There shall be no discharge through the combined temperature and pressure relief valve over the period of (300 ± 2) s.

6.3.5 Repeat tests

Procedure:

Repeat the tests given in sections 6.3.1 to 6.3.4 with the same temperature and pressure relief valve to give a total of three determinations of each parameter. Then increase the water temperature to (80 ± 2) ºC and maintain the temperature and repeat the tests with the same combined temperature and pressure relief valve to give three further determinations of each parameter.

Requirement:

Each determination shall meet the stated requirement given in sections 6.3.1 to 6.3.4.

6.4 Water discharge test

Test apparatus is shown in Figure 5. An accurately calibrated flow meter can be used in place of the weighting method.

Procedure:

Using discharge pipework with a flow resistance equivalent to a (3 ± 0,05) m length of copper tube of the same nominal size as the discharge connection, connect the combined temperature and pressure relief valve to a water supply that can be controlled in temperature and pressure, and

measure the water temperature in the manner described in section 6.2.1 and the pressure as close as possible to the inlet of the temperature and pressure relief valve.

Maintain for a period of at least 300 s a flow of water through the combined temperature and pressure relief valve at a temperature of $(99\ ^{+0}_{-3})$ ºC and a pressure of (0,1 ± 0,005) MPa [(1 ± 0,05) bar] before carrying out the measurement.

Measure and record the flow rate through the combined temperature and pressure relief valve by weighing the water discharge over a period of at least 300 s or by means of an accurately calibrated flow meter.

Requirement:

The water discharge rate in litre/hour shall be not less than the values given in Table 6, as appropriate.

Table 6 - Water discharge rate

Nominal size, DN	15	20	25	32	40
Minimum water discharge rate, litre/hour (from section 6.4)	500	750	1 000	1 500	2 000

Table 7 - Steam discharge rate

Nominal size, DN	15	20	25	32	40
Minimum steam rate kilogram/hour (from section 6.5)	35	90	180	275	370

6.5 Temperature steam discharge capacity test

Test apparatus is shown in Figure 5.

Procedure:

Use discharge pipework with a flow resistance equivalent to a (3 ± 0,05) m length of copper tube of the same nominal size as the discharge connection and connect the inlet of the combined temperature and pressure relief valve to a test fluid of saturated steam. Gradually increase the test fluid pressure until a saturation temperature of (121 ± 1) ºC, measured adjacent to the mid-length of the thermal element, is attained. Maintain these conditions for a period of at least 300 s before carrying out the measurement.

Measure the flow through the combined temperature and pressure relief valve over a period of at least 300 s by means of a gauged flow meter and determine the flow rate in kilogram/hour.

Requirement:

The steam discharge rate in kilogram/hour shall not be less than the values given in Table 7, as appropriate. There shall be no visible deterioration of any protective coating or sleeve on the thermal element.

Repeat tests.

At the conclusion of the test subject the combined temperature and pressure relief valve again, without any adjustment, to the back pressure test described in section 7.1.1 and the opening and reseating temperature test described in section 6.2, the opening and reseating pressure test described in section 6.3.4.

Requirement:

The temperature and pressure relief valve shall meet the requirements of each test.

6.6 Endurance test

Test apparatus is shown in Figure 4.

Test 1:

a) Pressure

Connect the combined temperature and pressure relief valve to a water supply that can be controlled in temperature, pressure and flow rate and measure the water temperature in the manner described in section 6.2.1 and the pressure as close as possible to the inlet.

Circulate water past the thermal element at a rate not less than 0,02 litre/second and at a temperature of (80 ± 2) ºC. Steadily increase the water pressure until the combined temperature and pressure relief valve opens and flow through it reaches at least 40 litre/hour. Then reduce the pressure until the combined temperature and pressure relief valve closes. Repeat this test cycle until the combined temperature and pressure relief valve has opened and closed $5\,000\,^{+10}_{0}$ times.

b) Temperature

Adjust the water pressure to (0,02 ± 0,005) MPa [(0,2 ± 0,05) bar] and the water temperature to below 30 ºC. Steadily increase the water temperature to $(100\,^{0}_{-3})$ºC and then reduce it to below 30 ºC. Repeat this cycle with each temperature being maintained for (30 ± 1) s until the combined temperature and pressure relief valve has opened and closed $100\,^{+2}_{0}$ times.

Remove the combined temperature and pressure relief valve from the test rig and expose it to steam or superheated water at (120 ± 5) ºC for a period of 1 hour.

Storage:

Store the combined temperature and pressure relief valve for a period of $30\,^{0}_{-2}$ days at ambient temperatures.

Test 2

Repeat tests 1a) and 1b).

At the conclusion of test 2 subject the combined temperature and pressure relief valve, without any adjustment, to the opening and reseating temperature test described in section 6.2, the opening and reseating pressure test described in section 6.3 and measure the water discharge described in section 6.4 and the temperature discharge capacity described in section 6.5. The combined temperature and pressure relief valve shall meet the requirements of each test.

6.7 Endurance testing of the manual easing gear

Procedure:

This test is carried out on a combined temperature and pressure relief valves which has not been tested in the sections 6.2 to 6.6.

The combined temperature and pressure relief valve shall be supplied with water at (80 ± 2) ºC under a pressure of 0,1 MPa (1 bar) and the easing gear subjected to $100\,^{+1}_{0}$ operations. The closing force shall not be more than 1,2 times the operating force specified in section 7.3.

The test is repeated three times with intermediate storage periods of $30\,^{0}_{-2}$ days.

Requirement:

At the conclusion of the test, repeat the test given in section 7.3 and the requirements shall be met.

7 MECHANICAL TESTS AND REQUIREMENTS

7.1 Tolerances

Unless otherwise specified, all tolerances shall be ±5 %.

7.2 Mechanical strength

7.2.1 Back pressure test

Procedure:

Render inoperative any auxiliary pressure relief device in the discharge and any integral vacuum relief valve. With the inlet port sealed, apply a pressure of 0,07 MPa (0,7 bar) at ambient temperature to the discharge connection of the combined temperature and pressure relief valve.

Requirement:

The combined temperature and pressure relief valve shall not show any visible sign of leakage during the period of (120 ± 10) s.

7.2.2 Body strength test

Procedure:

Seal all apertures except the inlet connection and apply a pressure of (2,5 ± 0,1) MPa [(25 ± 1) bar].

Requirement:

The combined temperature and pressure relief valve body shall not show any visible sign of external leakage, permanent deformation or fracture during the period of (120 ± 10) s.

7.2.3 Bending moment test for the combined temperature and pressure relief valves

7.2.3.1 For connections given in section 5.3.1

Procedure:

Attach the combined temperature and pressure relief valve under test by its inlet connection to test equipment (see Figure 3) and apply for (30 ± 2) s to its outlet connection the appropriate bending moment specified in Table 8.

Requirement:

There shall be no leakage, visible damage or permanent deformation of the combined temperature and pressure relief valves.

7.2.3.2 For union connections given in section 5.3.2

Procedure:

Attach the combined pressure and temperature relief valve under test to a test apparatus representing a water heater connection. Apply a pressure of (0,02 ± 0,005) MPa [(0,2 ± 0,05) bar] for a period of (60 ± 5) s. Increase to a pressure equal to (85 ± 2) % of the nominal set pressure for a period of (60 ± 5) s. Apply for (60 ± 5) s, the appropriate bending moment, given in Table 8, by way of the other connection. Release the applied bending moment and retain the pressure at (85 ± 2) % of the nominal set pressure. Reduce the pressure to (0,02 ± 0,005) MPa [(0,2 ± 0,05) bar] and maintain for a period of (60 ± 5) s.

Table 8 - Bending moments

Nominal size, DN	15	20	25	32	40
Bending moment, Nm ($F \times L$)	75	95	150	190	220

Requirement:

There shall be no leakage, visible damage or permanent deformation of the combined temperature and pressure relief valves.

7.3 Mechanical strength test of the easing gear (manual control device)

Procedure:

Lock the combined temperature and pressure relief valve's operating mechanism in the closed position. For rotary controls, apply two tangential forces of 100 N at the periphery of the control device. For levers, apply a force of 75 N at the end of the lever.

Requirement:

There shall be no visible damage or permanent deformation of the easing gear.

7.4 Operation of the easing gear

Procedure:

Install the combined temperature and pressure relief valve by its water heater connection in a test apparatus and apply a pressure of 0,3 P_{nr} and, as appropriate, apply either:

a) a force of 30 N at the end of levers; or

b) a tangential force equal to a torque of 1,2 Nm at the outer edge of the easeing gear for rotary controls.

Requirement:

The combined temperature and pressure relief valve disc shall be lifted at least 1,5 mm.

8 ACOUSTIC TESTS AND REQUIREMENTS

Combined temperature and pressure relief valves are not subject to acoustic testing.

9 CLASSIFICATION

The combined temperature and pressure relief valves are sized according to the inlet connection and nominal power rating.

10 DESIGNATION

A combined temperature and pressure relief valve shall be designated by:

a) its nominal size (DN) as given (see section 10.1);

b) its nominal (water heater) power rating (kW) (Table 9);

c) its opening temperature – "90 - 95 ºC";

d) its nominal set pressure (P_{nr}); and

e) reference to this standard.

Example of designation of a combined temperature and pressure relief valve of nominal size 15 and a nominal set pressure of 0,6 MPa (6 bar):

Combined temperature and pressure relief valve, DN 15, P_{nr} 0,6 MPa (6 bar), EN 1490.

10.1 Nominal size

The nominal size of a combined temperature and pressure relief valve is related to the inlet connection as given in section 5.3 and its nominal power rating as given in Table 9.

Table 9 - Maximum (water heater) power output

Nominal size, DN	15	20	25	32	40
Nominal power rating, kW	10	25	50	75	100

11 MARKING

11.1 Flow marking

Each combined temperature and pressure relief valve shall be legibly and permanently marked to identify the discharge flow direction. This marking shall be stamped, etched or cast onto the body of the combined temperature and pressure relief valve.

11.2 Identification marking

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

a) the manufacturer's name, trade mark or identification mark;

b) the name or model number of the valve and its nominal size, DN (see section 10.1);

c) the nominal power rating in kW (Table 9);

d) the month and year of manufacture or code related to period of manufacture;

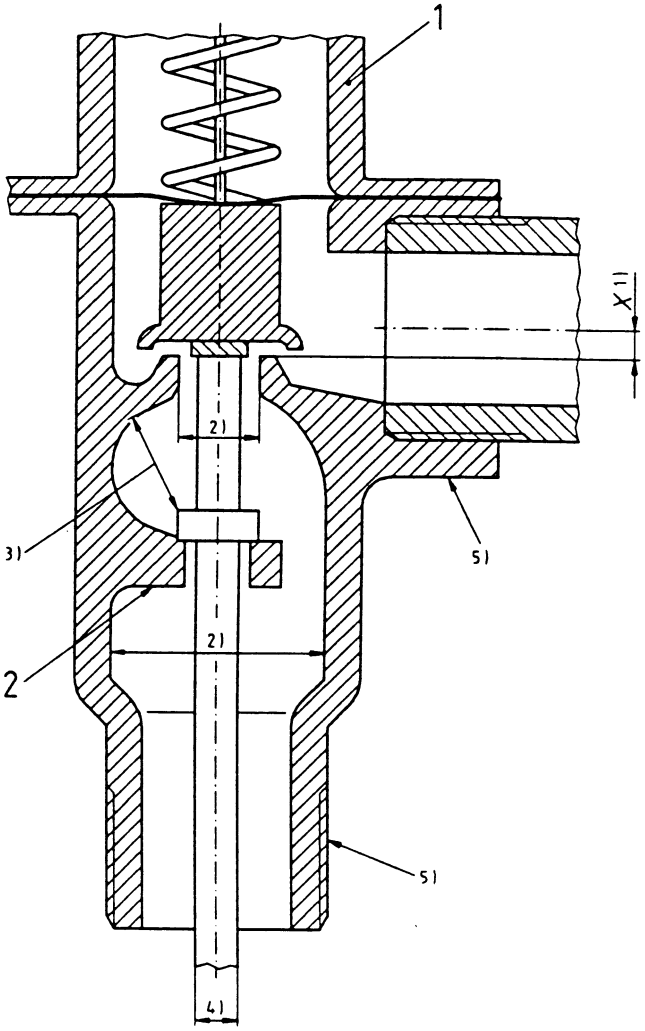
e) the nominal set pressure P_{nr} in MPa (bar);

f) the set temperature as "90 - 95 ºC"; and

g) in the countries where the use of products made of dezincification resistant materials is not required, the dezincification resistant products according to EN ISO 6905 as well as the products which do not contain zinc are allowed to be marked "DR". In the countries where the use of products made of dezincification resistant materials is required, the dezincification resistant products as well as the products which do not contain zinc shall be marked "DR".

12 INSTALLATION INSTRUCTIONS

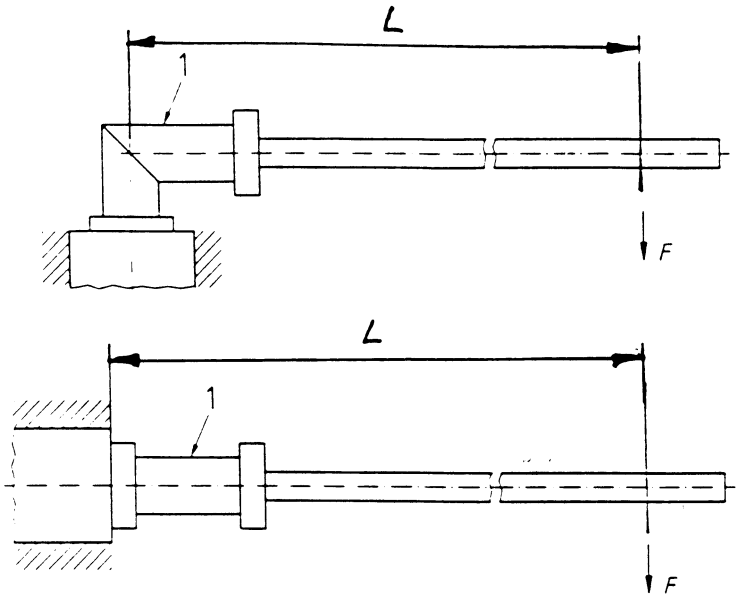
The length of pipework between the combined temperature and pressure relief valve and an air-gap shall not exceed 3 m. The nominal diameter of the pipework shall not be less than the nominal size, DN, of the combined temperature and pressure relief valve.



Key

1 Cover and space for spring, valve stem, etc.
2 Support for temperature element
1) *X* max, see 5.4.3 and Table 4
2) see Table 2, column 3
3) see Table 3, column 2
4) see Table 3, column 4
5) see 5.3

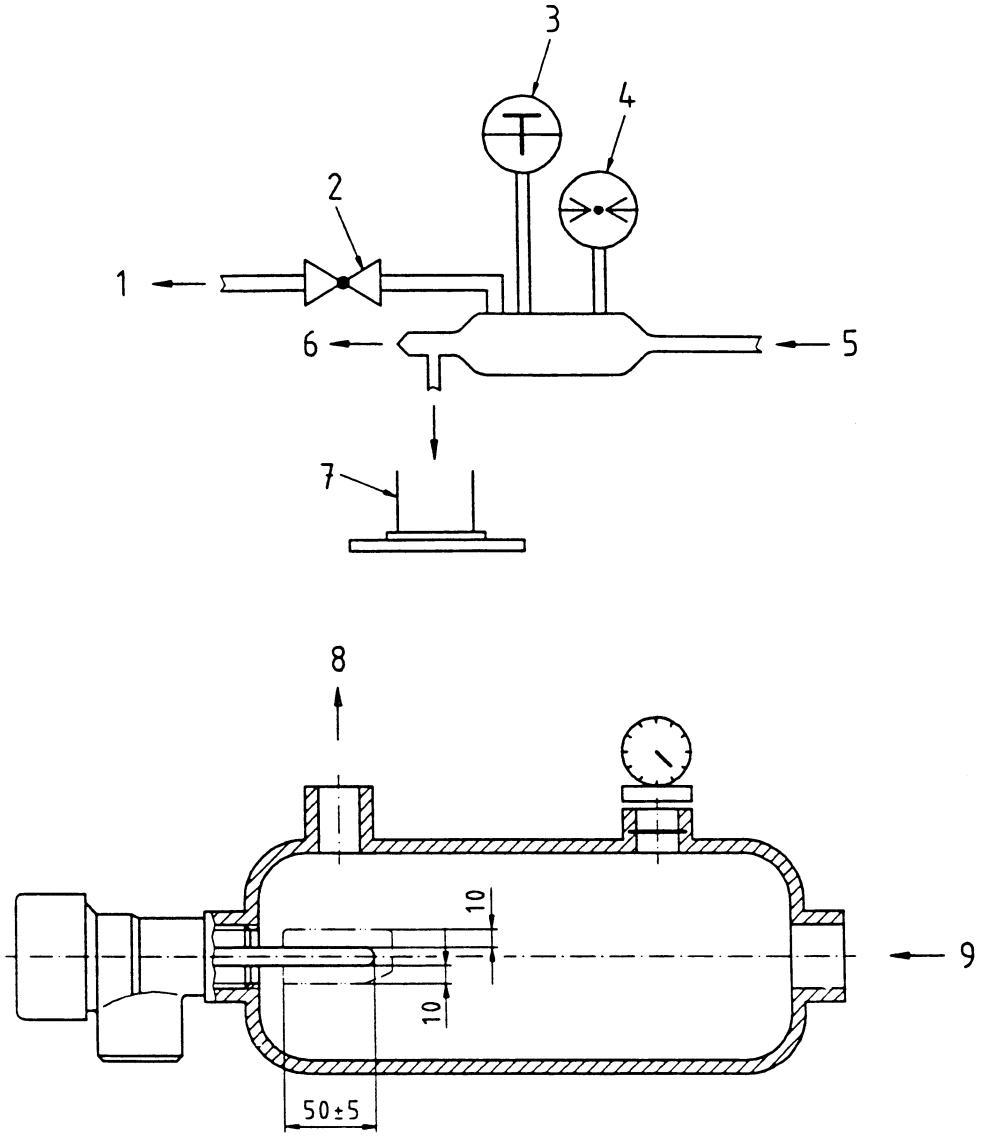
Figure 2 - Example of a combined temperature and pressure relief valve (for guidance only)



Key

1 Test valve

Figure 3 - Bending moment test

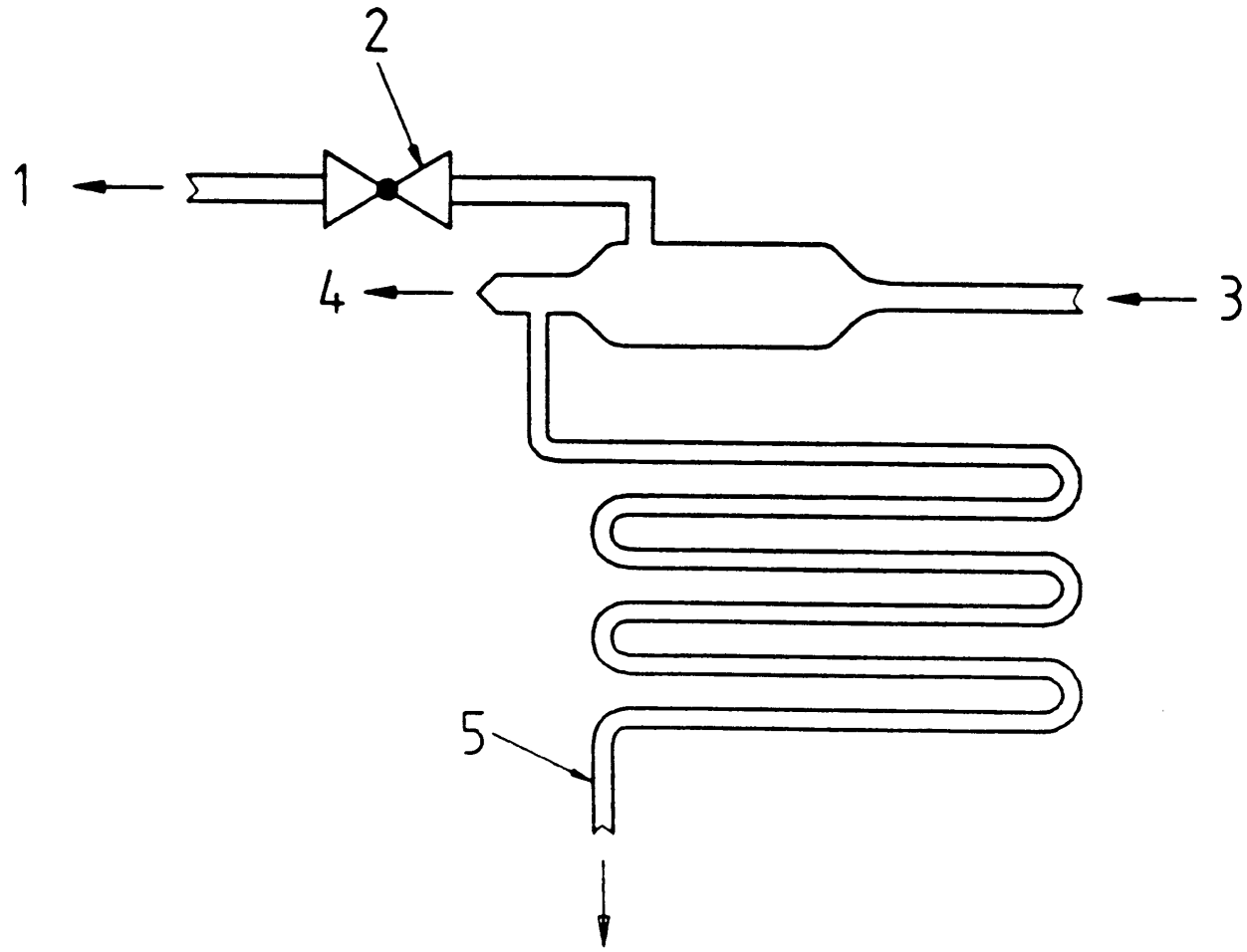


Key

1 Drain
2 By-pass control valve
3 Temperature measurement
4 Pressure measurement
5 Water supply (pressure, temperature and flow controllable)
6 Test valve
7 Container and weighing scales
8 Outlet
9 Inlet

The water temperature shall be measured at a point (50 ± 5) mm from the end of the temperature probe within 10 mm of the exterior wall of the probe tube

Figure 4 - Test arrangement for opening and reseating temperatures and pressures



Key

1 Drain
2 By-pass control valve
3 Supply of steam/hot water
4 Test valve
5 Piping to provide back pressure equivalent to that in 6.4

Figure 5 - Test arrangement for discharge capacity

ANNEX A (INFORMATIVE)

A.1 SAFETY EQUIPMENT FOR WATER HEATERS

The safe operation of water heater installations is ensured only if the safety devices fitted are appropriate, correctly located on the water vessel and operate in the correct sequence.

In addition to the control thermostat (TC), a non-self resetting thermal cut-out (TL or STL) and a device according to EN 1487:2000, EN 1488:2000, EN 1489:2000, EN 1490:2000 or EN 1491:2000, as appropriate in accordance with the rules and regulations of the country where the water heater is installed.

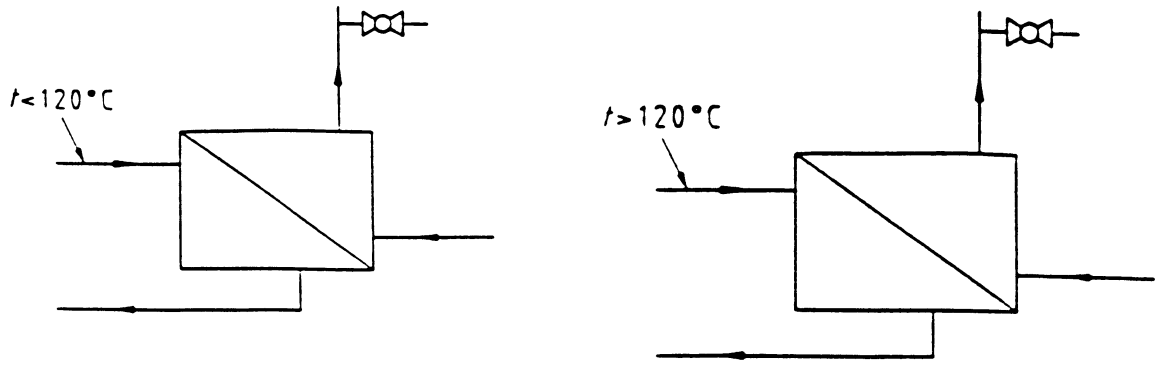
The following tables show some of the combinations of safety equipment, used in various countries, appropriate to the method of heating.

Table A.1 - Summary of temperature controls

Abbreviation	Definition	Function	Operation	Special characteristics	Means of adjustment
TC	Control thermostat	To operate at a temperature in a fixed range	Automatically reset	—	Manually or with a tool
TL	Thermal cut-out	Interruption of energy or fuel supply	Reset manually or with a tool	—	Factory set
STL	Thermal cut-out with special features	Interruption of energy or fuel supply	Reset manually or with a tool	Additional features[1)]	Factory set
[1)] The special feature allows a warning to be given if there is a fault with the component parts.					

A.2 Classification of water heaters according to heating method

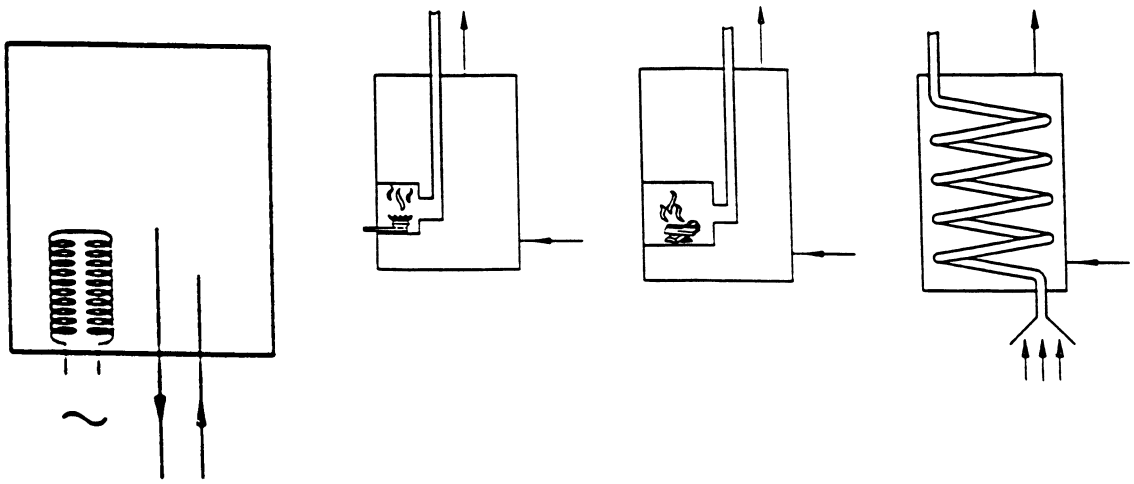
A 2.1 Indirect heating



System: A1 A2

Figure A.2.1 – Indirect heating

A.2.2 Direct heating



System	B1	B2	B3	B4
Energy	Electric power	Oil/gas	Solid fuels	Waste heat

Figure A.2.2 – Direct heating

Decision matrix for selection of safety devices

	Type of water heater	A1	A1, A2 B1, B2	A1, A2 B1, B2	B3, B4
Temperature operated switch	temperature control (thermostat) TC thermal cut-out TL thermal cut-out with special features STL				
Mechanical device	expansion group expansion valve hydraulic safety group[1)] pressure safety valve combined temperature and pressure relief valve				
Water valves and controls	isolating valve test port check valve pressure gauge tapping				

[1)] Only for maximum heating power up to 5 kW; installation at the cold water inlet.

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