BRITISH STANDARD

BS EN
1489:2000

Building valves — Pressure safety valves — Tests and requirements

The European Standard EN 1489:2000 has the status of a British Standard

ICS 91.140.60

National foreword

This British Standard is the official English language version of EN 1489:2000.

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

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 17 and a back cover.

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Building valves - Pressure safety valves - Tests and requirements

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This European Standard was approved by CEN on 3 February 2000.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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CONTENTS

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of an identical text or by endorsement, at the latest by September 2000, and conflicting national standards shall be withdrawn at the latest by September 2000.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 pressure safety 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).

Pressure safety valves are intended for fitting to the cold water supply of storage water heaters, having a maximum distribution temperature of 95 °C, for all energy sources.

Pressure safety valves do not control the temperature and alone do not constitute the protection required for storage water heaters. They are not intended to act as expansion valves under normal conditions.

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.

3 DEFINITIONS

For the purposes of this standard the following definitions apply:

3.1 pressure safety valve limits the pressure of the water in the water heater to a predetermined value by discharging water to drain. In case of temperature control failure, it will discharge the energy stored in the water as steam.

3.2 nominal set pressure (P_{nr}) is the pressure of the pressure safety valve which is set on production.

3.3 water-tightness pressure (P_e) is the pressure up to which the pressure safety valve is closed.

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

3.4 initial opening pressure (P_{dc}):

a) $P_{dc\ water}$ is the pressure at which the pressure safety valve opens for the first time, as indicated by the first droplet of water, after a period of storage.

b) $P_{dc\ steam}$ is the pressure at which the pressure safety valve opens for the first time, as indicated by the first appearance of steam at the discharge connection, after a period of storage (see figure 1).

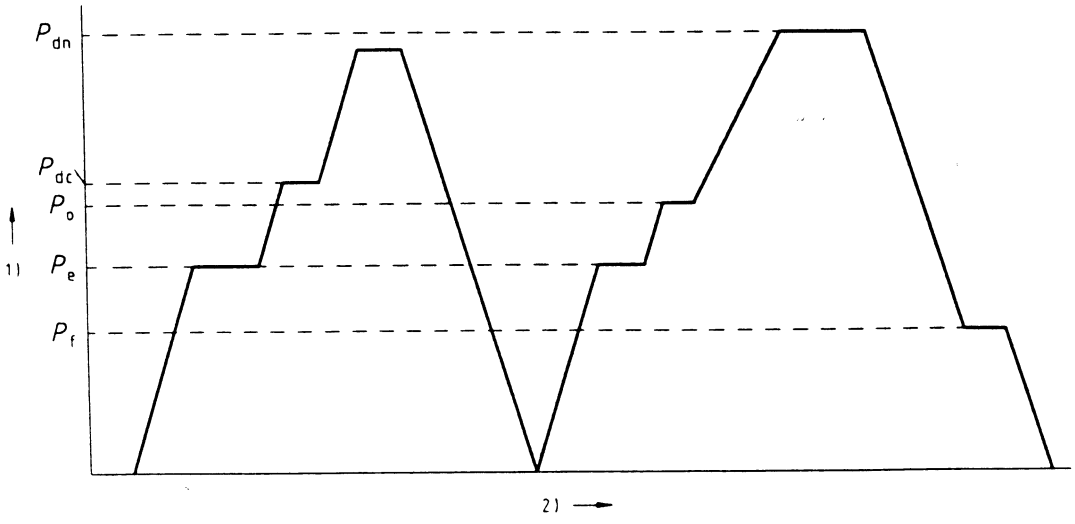
3.5 opening pressure (P_o):

a) $P_{o\ water}$ is the pressure at which a flow rate of 2,4 litres/hour of water is attained through the pressure safety valve (see figure 1).

b) $P_{o\ steam}$ is the pressure at which the pressure safety valve opens as indicated by the appearance of steam at the discharge connection of the pressure safety valve (see figure 1).

3.6 rating pressure (P_{dn}) is the pressure at which the water discharge capacity of the pressure safety valve corresponds to the rated flow (see figure 1).

3.7 closing pressure (P_f) is the pressure at which the pressure safety valve closes after having reached the rating pressure (see figure 1).



Key
1) Pressure
2) Time

Figure 1 - Pressures - see Section 3 Definitions

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) materials 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		EN 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 "MARKING" (point 11).

5 DESIGN AND DIMENSIONAL REQUIREMENTS

5.1 General guidance

a) The pressure safety valve shall be of the type where the spring is isolated from the water by a diaphragm or equivalent.

b) All sliding elements shall be designed to prevent any risk of seizure, scaling or sticking.

c) Sliding or rotating parts of the pressure safety valve shall not be in contact with water.

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

e) The pressure safety valve shall be designed so as to make the opening pressure no greater than 1,3 P_{nr}, and under this pressure, manual lift of the pressure safety valve shall be in conformity with the requirements of the tests given in section 6.5.1.

f) Wing or similar guides of the pressure safety valve shall not be used on the inlet side of the pressure safety valve.

g) The normal operation of the pressure safety valve shall not be influenced by external forces.

h) The body of the pressure safety valve shall have two suitable flats to apply a spanner.

i) If there is only one direction for operation of rotary controls of a pressure safety valve it shall be anticlockwise.

5.2 Pressures

General: 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 pressure safety 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_c)

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 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 pressure safety valve shall be at least equal to the inlet dimension.

5.3.1 End connections

Examples of end connections are 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.

5.3.3 Exclusions

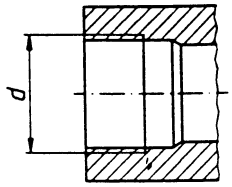
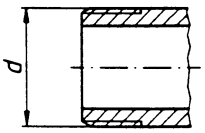
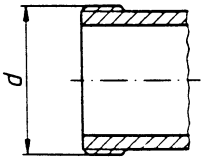
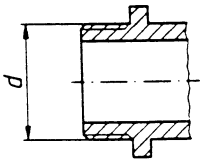
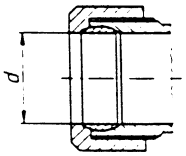
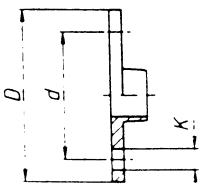
Connections requiring the use of heat to make or break the joint (e.g. capillary) are not permitted.

6 HYDRAULIC TESTS AND REQUIREMENTS

6.1 Tolerances

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

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 ½	Rp ¾	Rp 1	Rp 1 ¼	Rp 1 ½
 b) External taper thread to ISO 7-1:1994	d	R ½	R ¾	R 1	R 1 ¼	R 1 ½
 c) Flat faced external thread to ISO 228-1:1994	d	G ¾B	G 1 B	G 1 ¼ B	G 1 ½ B	G 1 ¾ B
 d) External thread with shoulder to ISO 228-1:1994	d	G ½ B	G ¾ B	G 1 B	G 1 ¼ B	G 1 ½ 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 dimension						

6.2 Cold water pressure tests

6.2.1 General

The pressure safety valve shall be stored, in the closed position, at ambient temperature for a minimum of 8 days before commencing tests.

Connect the pressure safety valve by its water heater connection to a test apparatus having water at ambient temperature (maximum 25 ºC).

6.2.2 Water tightness pressure test (P_e)

Procedure:

Increase the pressure until the pressure safety valve opens.

Requirement:

The opening pressure of the pressure safety valve 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) for a period of 120 s.

Requirement:

The pressure safety valve shall be water tight for a period of 120 s.

6.2.3 Nominal opening flow pressure (P_o) test

Procedure:

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

Requirement:

P_o shall not be greater than 1,05 P_{nr}.

6.2.4 Nominal rating pressure (P_{dn}) test

Procedure:

Increase the flow rate to the appropriate value given in table 3 and measure the pressure.

Requirement:

The pressure determined shall not be greater than 1,2 P_{nr}.

Table 3 - Discharge flow rate values

Nominal size DN	15	20	25	32	40
Nominal Set Pressure (P_{nr})	Discharge flow in litre/hour				
0,1 MPa	125	250	500	725	1225
0,2 MPa	175	350	700	1050	1750
0,3 MPa	200	425	850	1275	2125
0,4 MPa	225	475	975	1475	2450
0,5 MPa	275	550	1100	1650	2750
0,6 MPa	300	600	1200	1800	3000
0,7 MPa	325	650	1300	1950	3250
0,8 MPa	325	675	1400	2075	3475
0,9 MPa	350	725	1475	2200	3675
1,0 MPa	375	775	1550	2325	3875

6.2.5 Closing pressure (P_f) test

Procedure:

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

Increase the pressure to 1,1 P_{nr} (opening pressure).

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

Requirement:

There shall be no leakage or discharge from the pressure safety valve for a period of 300 s.

6.2.6 Repeat tests

Procedure:

Repeat the tests in sections 6.2.2 to 6.2.5 using the same pressure safety valve to give a total of three determinations of each parameter.

Requirement:

Each determination shall meet the stated requirements in sections 6.2.2 to 6.2.5.

6.3 Steam flow rate test

This is a destructive test. The pressure safety valve subjected to the test shall not be used in other tests.

Procedure:

1. Connect the pressure safety valve by its water heater connection to a test apparatus supplying saturated steam.

2. Raise the pressure until the pressure safety valve just opens. Requirement: the opening pressure shall be between P_e and 1,2 P_{nr}.

3. Reduce the pressure to 0 Mpa.

4. Raise the pressure to P_e (0,95 P_{nr}). Requirement: there shall be no leakage.

5. Raise the pressure until the pressure safety valve just opens. Requirement: the opening pressure shall be between 0,95 P_{nr} and 1,1 P_{nr}.

6. Raise the pressure to a maximum of 1,2 P_{nr} (nominal set pressure). Requirement: the flow rate shall be at least equal to the value shown in table 4.

Table 4 - Steam flow rate in kg/hour

Nominal size DN	15	20	25	32	40
Pressure MPa	Steam flow rate in kg/hour				
0,1	25	75	100	125	175
0,2	50	100	125	200	275
0,3	50	125	175	250	350
0,4	75	150	200	325	425
0,5	75	175	250	375	525
0,6	100	200	275	450	600
0,7	100	225	325	500	700
0,8	115	250	350	575	775
0,9	125	300	400	625	875
1,0	150	325	425	700	950

7. Reduce the pressure to 0,75 P_{nr}. Requirement: there shall be no leakage from the pressure safety valve.

8. Raise the pressure to obtain a flow rate of 0,9 of the value in table 4. Requirement: the flow rate shall be achieved at a pressure not exceeding 1,2 P_{nr}.

9. At the end of the steam flow rate test the control devices shall be able to be operated by carrying out the manual operation test procedure given in section 6.5.1 and the requirements specified in section 6.5.1 shall be met.

6.4 Endurance test

Procedure:

The pressure safety valve shall be connected to test apparatus capable of supplying water at (65 ± 2) °C, a minimum flow rate of 2,4 litres/hour, and a pressure greater than the rating pressure (P_{dn}) of the valve to be tested.

a) Subject the pressure safety valve to 5000 cycles, as follows:

i) increase the pressure to obtain a flow rate of 2,4 litres/hour and maintain the pressure for a period of 5 s, and
ii) decrease the pressure to 0,8 times the pressure in i) and maintain for a period of 5 s.

b) Store the pressure safety valve for 28 days at ambient temperature.

c) Repeat a) on the pressure safety valve that has been stored.

At the end of the endurance test, carry out the nominal opening flow pressure test as specified in section 6.2.3.

Requirement:

The test result from section 6.2.3 shall be within ±10 % of its original value.

6.5 Easing gear (manual control device)

6.5.1 Operation of the easing gear

Procedure:

Install the pressure safety valve in a test apparatus, apply a pressure of 0,3 P_{nr} and, as appropriate, apply either:

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

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

Requirement:

The pressure safety valve disc shall be lifted at least 1,5 mm.

6.5.2 Easing gear endurance test

Procedure:

Subject the pressure safety valve to 100 opening operations as specified in section 6.5.1 with water at 80 °C and a pressure of 0,1 MPa (1 bar).

The test shall be repeated three times, with a storage period of 28 days between tests.

Requirement:

The requirement of section 6.5.1 shall be satisfied at the end of the tests.

7 MECHANICAL TESTS AND REQUIREMENTS

7.1 Tolerances

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

7.2 Mechanical strength

7.2.1 Pressure test of the body of the pressure safety valve

Procedure:

Connect the pressure safety valve to the test circuit by the water heater connection. Maintain the pressure safety valve disc closed. Apply a static cold water pressure of 2,5 MPa (25 bar) and maintain this pressure for a period of 120 s.

Requirement:

The body of the pressure safety valve shall not be fractured or permanently deformed.

Following this test, the pressure safety valve shall not be the subject of further testing.

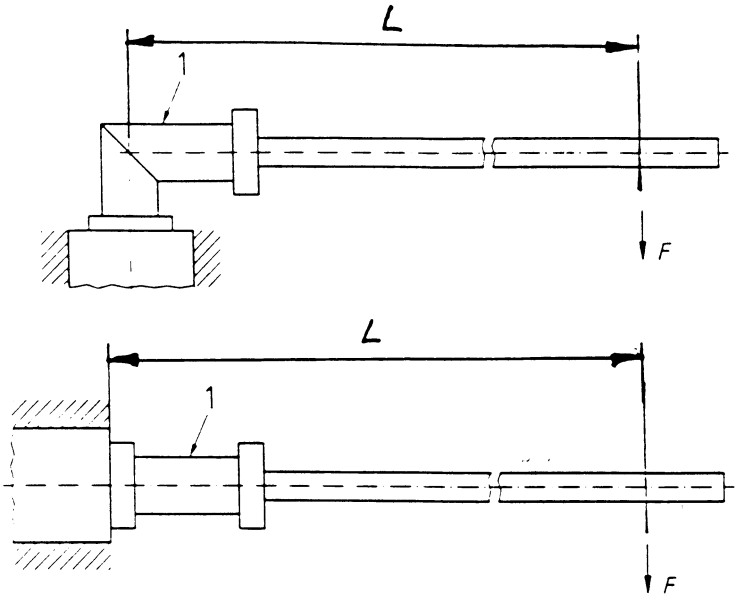
7.2.2 Bending moment test of the body of the pressure safety valve

Procedure:

Attach the pressure safety valve under test to a test apparatus by its inlet connection, as shown in figure 2, representing a water heater connection and apply to its outlet connection the appropriate bending moment specified in table 5 for a period of (30 ± 3) s.

Requirement:

There shall be no visible damage to the product (e.g. fractures, splits, or permanent deformation), including the point where the bending moment is applied (e.g. at the piping connection).



Key

1 Test valve

Figure 2 - Bending moment test

7.2.3 Bending moment test for pressure safety valves with unions

Procedure:

Attach the pressure safety valve under test to a test apparatus representing a water heater connection. Apply a hydrostatic 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, P_{nr}, for a period of (60 ± 5) s. Apply, for a period of (60 ± 5) s, the appropriate bending moment specified in table 5, 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 5 - Bending Moments

Nominal size DN	15	20	25	32	40
Bending moment (Nm) (*F* x *L*)	75	95	150	190	220

Requirement:

There shall be no leakage, visible damage or permanent deformation of the pressure safety valve.

7.3 Mechanical strength of the easing gear of the pressure safety valve

Procedure:

Lock the pressure safety 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.

8 ACOUSTIC TESTS AND REQUIREMENTS

Pressure safety valves are not subject to acoustic testing.

9 CLASSIFICATION

The pressure safety valve shall be classified in accordance with the outlet diameter (DN) to the water heater, see table 6.

Table 6 - Classification of pressure safety valves

Valve inlet connection from water heater	Nominal size DN	Maximum power of water heater, kW
G ½	15	4
G ¾	20	10
G 1	25	18
G 1 ¼	32	24
G 1 ½	40	32

10 DESIGNATION

A pressure safety valve shall be designated by:

a) its nominal size (table 6),

b) its nominal set pressure P_{nr} (see section 3.2), and

c) the reference to this standard.

Example of designation of a pressure safety valve of nominal size 15 and a nominal set pressure P_{nr} 0,3 MPa (3 bar):

Pressure safety valve, DN 15, P_{nr} 0,3 MPa (3 bar), EN 1489.

11 MARKING

The pressure safety valve shall be legibly and permanently marked with:

a) the manufacturer's name, trademark, or identification mark,

b) the nominal DN size (table 6),

c) the nominal set pressure P_{nr} (see section 3.2),

d) an arrow showing the direction of flow of the supply, on a least one face,

e) marking for the various operating positions of the control elements,

f) the month and year of manufacture or code relating to period of manufacture,

g) the model reference, and

h) - 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".

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 prEN 1487:1999, prEN 1488:1999, prEN 1489:1999, prEN 1490:1999 or prEN 1491:1999, as appropriate in accordance with the rules and regulations of the country where the water heater is installed.

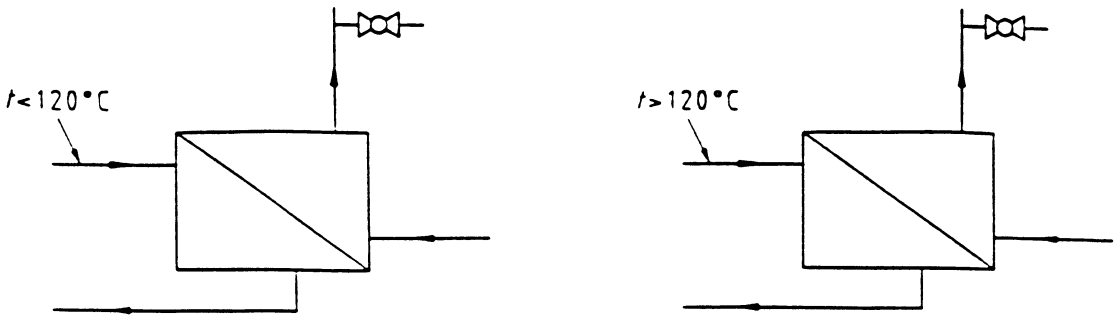
The following tables show some of the combinations of safety equipment, used in various countries, appropriate to the method of heating.

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

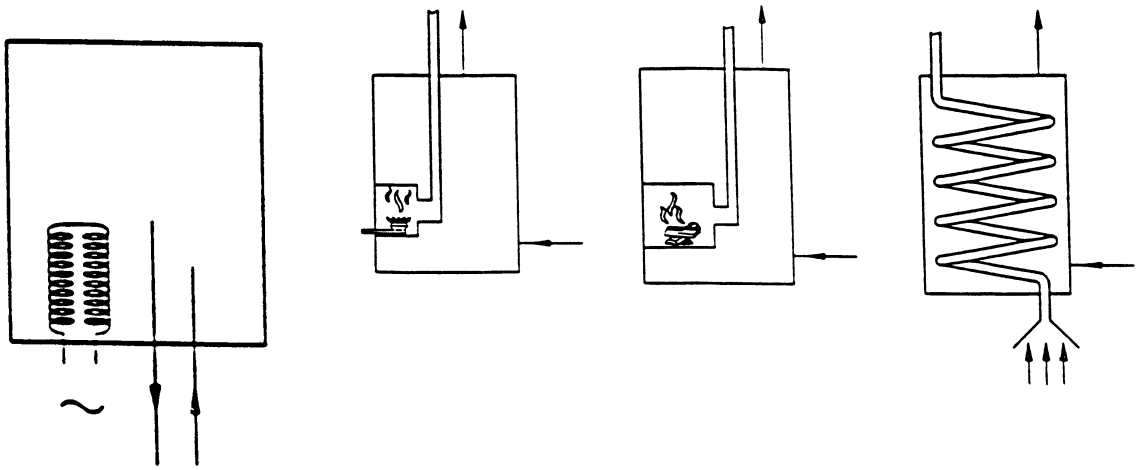
A.2.1 Indirect heating



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.

BSI — British Standards Institution

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