BRITISH STANDARD

BS EN
1488:2000

Building valves — Expansion groups — Tests and requirements

The European Standard EN 1488:2000 has the status of a British Standard

ICS 91.140.60

National foreword

This British Standard is the official English language version of EN 1488:2000.

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

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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EUROPÄISCHES KOMITEE FÜR NORMUNG

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of an identical text or by endorsement, at the latest by September 2000, and conflicting national standards shall be withdrawn at the latest by September 2000.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

The product standards on check valves are currently being worked out within CEN/TC 164/WG 4. The requirements for the endurance tests that will be laid down for these products may cause the revision of the present standard for reasons of homogeneity.

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 expansion groups, 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).

Expansion groups 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.

Expansion groups limit pressure, in the water heater to which they are fitted, that is produced by thermal expansion of the water.

Expansion groups do not control temperature and alone do not constitute the protection required for storage water heaters.

> NOTE: The use of the device specified in this standard does not override the need to use controls (e.g. thermostats and thermal 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 alloy - Plumbing fittings - Part 2: Fittings with compression ends for use with copper tube.
EN 1982	Copper and copper alloys - Ingots and castings.
EN 12420	Copper and copper alloys - Forgings.
EN ISO 3822-1	Acoustics - Laboratory tests on noise emission from appliances and equipment used in water supply installations - Part 1: Method of measurement (ISO 3822-1:1999).
EN ISO 3822-3:1997	Acoustics - Laboratory tests on noise emission from appliances and equipment used in water supply installations - Part 3: Mounting and operating conditions for in-line valves and appliances (ISO 3822-3:1997).
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 thread - 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 expansion group controls and limits the increase in fluid pressure, due to the normal increase in volume when water is heated, contained in a hot water heater, prevents the backflow of the heated water into the circuit and the contamination of water contained in the water heater with discharged water.

An expansion group comprises, at least the following items in a single unit, in an upstream to downstream order as shown in table 1.

Table 1 - Components of expansion groups

	DN 15	DN 20	DN 25	DN 32	DN 40
an isolating valve	1	1	1	1	1
a test port for monitoring the check valve	1	1	1	1	1
a check valve	1	1	1	1	1
an isolating valve	1*	1*	1*	1*	1*
an expansion valve	1	1	1	1	1
a drain device	1*	1*	1*	1*	1*
an air break to drain	1	1	1	1	1
a pressure tapping	1*	1*	1*	1*	1*
* optional					

3.2 isolating valve allows the heated water produced to be isolated from the drinking water supply. If a second valve is to be fitted, it shall be between the check valve and the expansion valve.

3.3 check valve allows water to flow in the cold to hot direction when fitted to a water heater, and automatically prevents heated water returning to the cold water supply.

3.4 expansion valve limits the pressure of the water in the water heater to a predetermined value by discharging water to drain.

3.5 drain device allows the water heater to be drained without it having to be removed. The outlet connection is also used to discharge water from the expansion valve.

3.6 air gap prevents discharged water from returning to the expansion group and thus to the water heater.

3.7 pressure tapping allows pressure measuring equipment to be connected.

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

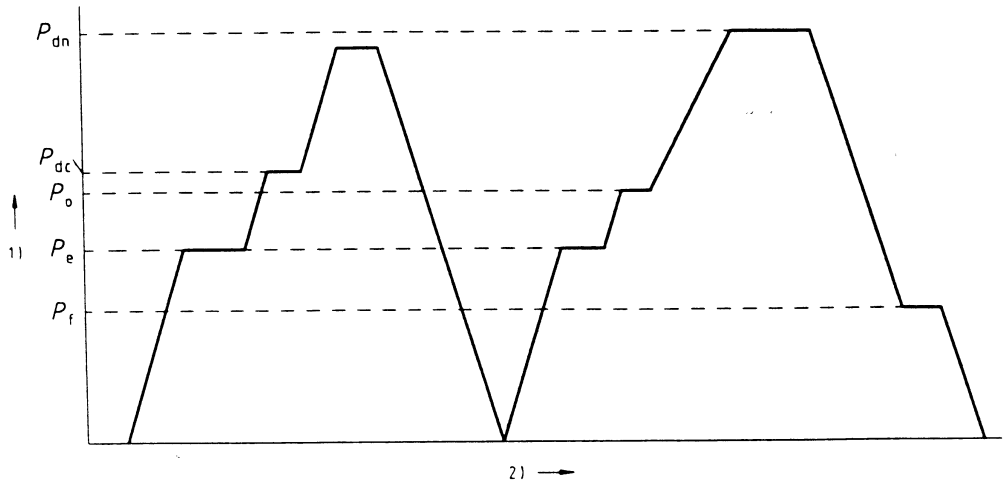
3.9 water tightness pressure (P_e) is the pressure up to which the expansion valve is closed (see figure 1).

3.10 initial opening pressure (P_{dc}) is the pressure at which the expansion valve opens for the first time, after a period of storage (see figure 1).

3.11 opening pressure (P_o) is the pressure at which a flow rate of 2,4 litres/hour of water is attained (see figure 1).

3.12 rating pressure (P_{dn}) is the pressure at which the water discharge capacity of the expansion valve corresponds to the rated flow (see figure 1 and table 7).

3.13 closing pressure (P_f) is the pressure at which the expansion 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,
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, and
e) the components making up the check valve shall be of a material resistant to scale formation.

4.2 Nature of materials

Examples of bronze and brass which may be used, without coating, for manufacturing purposes are given in table 2.

Table 2 - 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 the section "MARKING" (clause 12).

5 DESIGN AND DIMENSIONAL REQUIREMENTS

5.1 General guidance

a) The expansion 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 shall not be in contact with water.

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

e) The expansion valve shall be so designed 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 requirement of the test given in Section 9.6.1.

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

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

h) The body of the expansion group shall have two suitable flats to apply a spanner.

i) If there is only one direction for operation of rotary controls of an expansion valve it shall be anti-clockwise.

5.2 Dimensional characteristics

5.2.1 End connections

Examples of end connections are given in table 3.

5.2.2 Other connections (e.g. unions)

Connections, other than those specified in section 5.2.1, shall be tested in accordance with section 7.2.3.

5.3 Test port (see figure 2)

The test port, fitted with a plug, shall be positioned upstream of the seat of the check valve. It shall have the following dimensions:

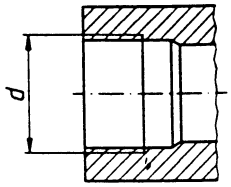
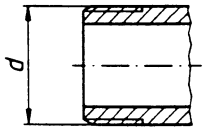
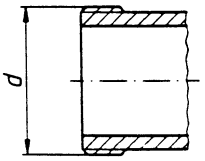
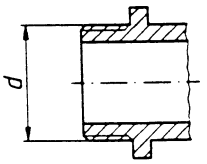
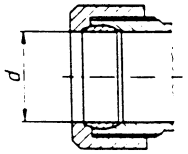
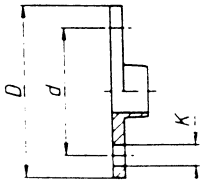
female thread diameter: G1/4,

depth of thread: $d > 6,5$ mm,

diameter $a > 6$ mm (or equivalent surface area), and

diameter b shall allow sufficient gasket bearing surface.

Table 3 - 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 ¾ B	G 1 B	G 1 ¼B	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						

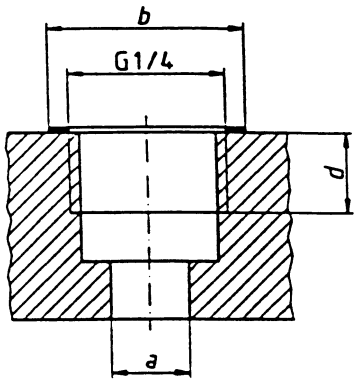


Figure 2 - Test port

5.4 Pressure tapping

When the expansion group is fitted with a pressure tapping for the connection of equipment to measure pressure, the dimensions of the tapping shall be as specified for the check valve test port (see section 5.3).

5.5 Expansion valve outlet connection to air gap

The expansion valve outlet connection to air gap shall have a minimum flow area of 78 mm^2. Each individual section shall be at least 25 mm^2 and the smallest dimension, used to calculate the cross-section, shall not be less than 4 mm.

5.6 Expansion valve discharge connection to drain device

The dimensions of the discharge connection downstream of the air gap shall be at least one nominal size greater than that of the expansion group for DN 15 and DN 20, and at least equal to the nominal size for larger expansion groups.

5.7 Other threads

Threads not included in this standard shall be determined by the manufacturer.

5.8 Exclusions

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

6 HYDRAULIC TESTS AND REQUIREMENTS

6.1 Tolerances

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

6.2 Flow rate test

Procedure:

The flow rate shall be determined at a pressure drop of 0,1 MPa (l bar) across the expansion group.

The pressure losses occurring in the test apparatus shall be taken into account when determining the flow characteristics of the expansion group.

Requirement:

The flow rate measured shall be at least equal to the appropriate flow rate in table 4.

Table 4 - Minimum flow rates

Nominal size DN (see table 11)	15	20	25	32	40
Flow rate l/h	1980	3996	5508	7992	11988

6.3 Tightness test

Subject the expansion group, at ambient temperature, to a cold water pressure to determine:

a) the tightness of the isolating valve, and

b) the tightness of the entire expansion group.

6.3.1 Tightness test for the isolating valve at a pressure of 1,6 MPa (16 bar)

Procedure:

Connect the expansion group to a test circuit, the expansion group's water heater connection being open and turned down. Close the expansion group's isolating valve and apply upstream of the seat a water pressure of 1,6 MPa (16 bar) for a period of 60 s.

Requirement:

There shall be no discharge or leakage.

6.3.2 Expansion group tightness test

6.3.2.1 Procedure where the isolating valve stem is not sealed by an 'O' ring

Procedure:

Connect the expansion group to a test circuit, close the expansion group's water heater connection, maintain the expansion valve disc closed and open the isolating valve. Apply a water pressure of 1,6 MPa (16 bar) to the inlet connection of the expansion group for a period of 60 s.

Requirement:

There shall be no leakage of the expansion group body.

6.3.2.2 Procedure where the isolating valve stem is sealed by an 'O' ring

Procedure:

Connect the expansion group to a test circuit, close the expansion group's water heater connection, maintain the expansion valve disc closed and open the isolating valve. Apply for 60 s a water

pressure of 0,02 MPa (0,2 bar) to the inlet connection of the expansion group and then a water pressure of 1,6 MPa (16 bar) for a period of 60 s.

Requirement:

There shall be no leakage from the expansion group body.

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 expansion group

Procedure:

Connect the expansion group to the test circuit by a water heater connection by the valve's inlet connection and blank off the valve's water heater connection. Open the isolating valve and maintain the expansion valve disc closed. Apply, by means of a test pump or a suitable hydraulic circuit, 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 expansion group shall not be fractured or permanently deformed.

NOTE: following this test, the expansion group shall not be the subject of further testing.

7.2.2 Bending moment test of the body of the expansion group

Procedure:

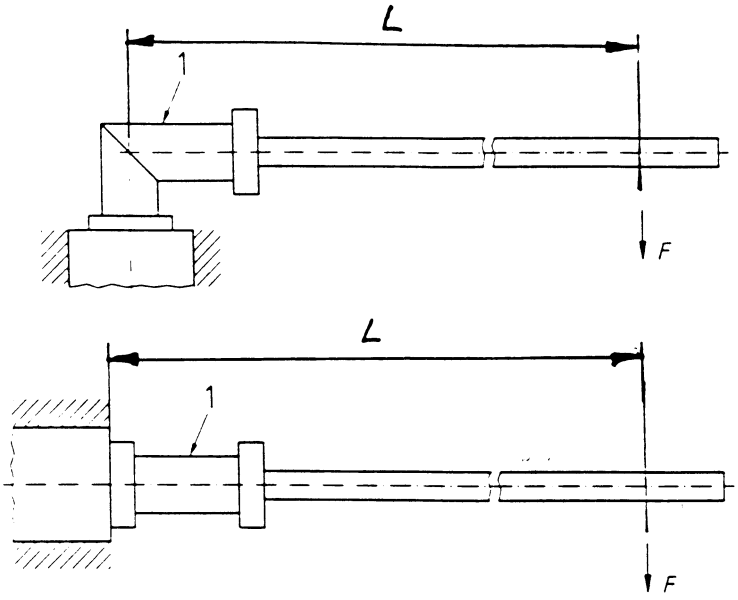
Attach the expansion group to be tested to the test apparatus by its inlet connection, as shown in figure 3, and apply for a period of (30 ± 3) s to its outlet connection the appropriate bending moment specified in table 5.

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 visible damage to the product (e.g. fractures, splits, or permanent deformation), including the point where the bending moment is applied (e.g. the piping).



Key

1 Test valve

Figure 3 - Bending moment test

7.2.3 Bending moment test for expansion groups with unions

Procedure:

Attach the expansion group to the test apparatus (figure 3) 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 of (85 ± 2) % of the nominal set pressure, P_{nr} for a period of (60 ± 5) s. Apply, for (60 ± 5) s, the appropriate bending moment given 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 for a period of (60 ± 5) s. Reduce the pressure to (0,02 ± 0,005) MPa ((0,2 ± 0,05) bar) and maintain for a period of (60 ± 5) s.

Requirement:

There shall be no leakage, visible damage or permanent deformation of the expansion group.

7.3 Mechanical strength of the easing gear of the expansion valve

Procedure:

Lock the expansion group'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

The noise generated by the cold water flow passages of the expansion group shall conform to the levels in table 6, when tested in accordance with EN ISO 3822-1 and EN ISO 3822-3:1997.

Table 6 - Acoustic groups

Acoustic group	Lap (dBA) at 0,3 MPa (3 bar)
I	≤ 20
II	20 < Lap ≤ 30
Unclassified	> 30

9 TESTS AND REQUIREMENTS OF THE COMPONENTS OF THE EXPANSION GROUP

9.1 Tolerances

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

9.2 Isolating valve

9.2.1 General requirements

The function of the isolating valve shall be independent from the function of the check valve, i.e. the two sealing functions shall be separate.

For expansion groups with components used in both functions, tests are to be performed in the following order:

a) endurance test for the isolating valve function, and

b) endurance test for the check valve function.

9.2.2 Test of manual operation

Procedure:

Determine the minimum couple for closing the isolating valve by applying a torque with two tangential forces not exceeding 40 N. Check that the valve is closed, afterwards apply a water pressure of 0,4 Mpa (4 bar) during (60 ± 5) s.

Requirement:

The isolating valve shall be watertight with a torque of 2 tangential forces not exceeding 40 N.

9.2.3 Endurance test

Procedure:

Connect the expansion group to a test circuit and apply a pressure of 0,4 MPa (4 bar) and subject it to the following procedures:

a) operate the isolating valve 1000 times, applying an operating torque equal to 1,2 times the tangential force determined in section 9.2.2,

b) store the expansion group at ambient temperature for a period between 30 and 45 days,

c) repeat the test described in a), and

d) at the end of this test, check the tightness of the expansion group in the closed position in accordance with the test in section 6.3.1.

Requirement:

The requirements of section 6.3.1 shall be met.

9.3 Check valve

9.3.1 General

A check valve or check valve cartridge complying with the future European Standard is deemed to satisfy the requirements of this standard. For other check valves or check valve cartridges, the tests specified in section 9.3.2 shall be carried out and the requirements specified shall be met.

9.3.2 Tests and requirements

9.3.2.1 Tightness test at low pressure

Procedure:

Apply a hydrostatic pressure of 0,003 MPa (0,03 bar) downstream of the check valve for a period of (180 ± 5) s.

Requirement:

There shall be no water passed in the direction downstream to upstream.

9.3.2.2 Tightness test at high pressure

Procedure:

Apply a hydrostatic pressure of 1,6 MPa (16 bar) downstream and zero pressure upstream for a period of (180 ± 5) s.

Requirement:

There shall be no water passed in the direction downstream to upstream.

9.3.2.3 Endurance test

Procedure:

Subject the check valve to 50000 cycles with water at 65 °C and pressures alternating between 1,0 MPa (10 bar) for a period of 7 s downstream and 0,2 MPa (2 bar) for a period of 7 s upstream.

When the cycles are complete subject the check valve to the tests given in sections 9.3.2.1 and 9.3.2.2.

Requirement:

The requirements of sections 9.3.2.1 and 9.3.2.2 shall be met.

9.3.2.4 Opening pressure test

Procedure:

Subject the check valve to a 1,0 MPa (10 bar) downstream pressure for a period of 300 s. Relieve the downstream pressure. Subject the check valve to a maximum upstream pressure of 0,02 MPa (0,2 bar).

Requirement:

The check valve shall open at a pressure ≤ 0,02 MPa (0,2 bar).

9.4 Expansion valve

9.4.1 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: an expansion group with a set pressure of 0,2 MPa (2 bar) shall have a rating pressure P_{dn} of 0,23 MPa (2,3 bar), see figure 1.

9.4.1.1 Nominal set pressure (P_{nr})

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

9.4.1.2 Water tightness pressure (P_e)

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

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

9.4.1.3 Rating pressure (P_{dn})

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

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

9.4.1.4 Closing pressure (P_f)

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

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

9.4.2 Cold water pressure tests

General:

The expansion group shall be stored in the closed position at ambient temperature, for a minimum of 8 days, before commencing testing.

Connect the expansion group by its water heater connection to a test apparatus having water at ambient temperature (maximum 25 °C).

9.4.2.1 Water tightness pressure (P_e) test

Procedure:

Increase the pressure until the expansion 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 expansion group shall be water tight for a period of 120 s.

9.4.2.2 Nominal flow opening 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}.

9.4.2.3 Nominal rating pressure (P_{dn}) test

Procedure:

Increase the flow rate to the appropriate value given in table 7 and measure the pressure.

Table 7 - Discharge flow rate values

Nominal size DN	15	20	25	32	40
Nominal set pressure (P_{nr})	Discharge flow rate in litres/hour				
0,1 MPa	25	50	101	151	248
0,2 MPa	25	76	151	201	349
0,3 MPa	50	101	176	248	425
0,4 MPa	50	126	202	299	500
0,5 MPa	50	126	227	324	551
0,6 MPa	76	151	248	349	601
0,7 MPa	76	151	274	374	652
0,8 MPa	76	176	299	400	702
0,9 MPa	76	176	324	425	752
1,0 MPa	76	176	324	450	799

Requirement:

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

9.4.2.4 Closing pressure (P_f) test

Procedure:

Decrease the pressure to 0,4 P_{nr}. Increase the pressure to 1,05 P_{nr} (opening pressure). Decrease the pressure to 0,75 P_{nr}.

Requirement:

There shall be no leakage or discharge from the expansion group for a period of 300 s.

9.4.2.5 Repeat tests

Procedure:

Repeat the tests in sections 9.4.2.1 to 9.4.2.4 using the same expansion group, to give a total of three determinations of each parameter.

Requirement:

Each determination shall meet the stated requirements in sections 9.4.2.1 to 9.4.2.4.

9.5 Endurance test

Procedure:

The expansion group shall be connected to test apparatus with a water supplied 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 expansion group to be tested.

a) subject the expansion group to 5 000 cycles, as follows:
   i) increase the pressure to obtain a flow rate of 2,4 litres/hour and maintain the pressure for 5 s, and
   ii) decrease the pressure to 0,8 times the pressure given in i) and maintain the pressure for 5 s.

b) store the expansion group for 28 days at ambient temperature.

c) repeat a) on the expansion group that has been stored.

At the end of the endurance test, carry out the nominal opening flow pressure test as specified in section 9.4.2.2.

Requirement:

The test result from section 9.4.2.2 shall be within ± 5 % of its original value.

9.6 Easing gear (manual control device)

9.6.1 Operating of the easing gear

Procedure:

Install the expansion group 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 expansion valve disc shall be lifted at least 1,5 mm.

9.6.2 Easing gear endurance test

Procedure:

Subject the expansion group to 100 opening operations as specified in section 9.6.1 with water at 80 °C and a pressure of 0,1 MPa (1 bar).

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

Requirement:

The requirement of section 9.6.1 shall be satisfied at the end of the tests.

9.7 Manual drainage device

If the manual drainage device function is separate from the manual control device of the expansion valve, it shall have an air break as specified in section 9.8.

9.7.1 Flow rate test

Procedure:

With a flow meter measure the flow rate at a pressure drop of 0,01 MPa (0,1 bar) across the manual drainage device.

Requirement:

The flow rate shall not be less than the value given in table 8, as appropriate.

Table 8 - Minimum flow rates for manual drain device

Nominal size DN	15	20	25	32	40
Minimum flow rate l/s	0,042	0,083	0,167	0,250	0,250

9.8 Air gap

9.8.1 The internal diameter (∅) of the outlet of air gap (or its equivalent for non-circular cross-section) shall be as given in table 9.

Table 9 - Internal diameter (∅) of the outlet of the air gap

Nominal size DN of the group	15	20	25	32	40
minimum ∅ mm	20	25	25	32	40

9.8.2 If the air gap is made of composite parts, no dimension shall be less than 20 mm vertical and 10 mm wide (see figure 4).

Dimensions in millimetres

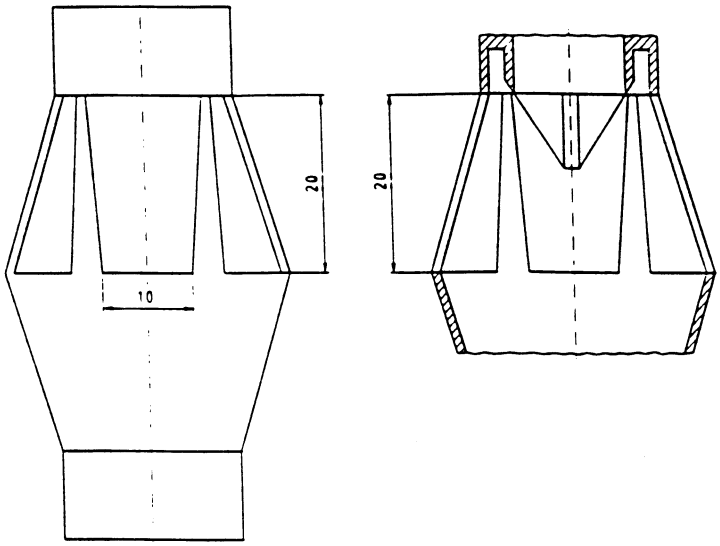


Figure 4: Tundish

9.8.3 The total cross-section of openings forming the air gap shall be appropriate for the nominal size of the expansion group and shall be such that the sum of the surface areas of the openings, measured inside the periphery of the device, shall be at least equal to the values given in table 10, as appropriate.

Table 10 - Values of the minimum cross section

Nominal size DN d mm	15	20	25	32	40
Minimum cross- section S mm^2	628	837	1047	1340	1675
S can be calculated from the formula: $S = 20 \times 2 \times \pi \times d/3$					

9.8.4 Any water flow passages associated with draining and normal operation of the expansion group shall be capable of taking the flow rate given in table 8, without giving rise to spillage.

9.8.5 No spillage of water shall occur during the tests specified in sections 9.4.2.2, 9.4.2.3 and 9.7.

10 CLASSIFICATION

Expansion groups shall be classified in accordance with the outlet diameter DN to a water heater, see table 11.

Table 11 - Classification of expansion group/water heater

Outlet diameter to water heater	Nominal size DN	Maximum power output of the water heater kW	Maximum volume of the water heater in litres
G ½	15	75	200
G ¾	20	150	1000
G 1	25	250	5000
G 1 ¼	32	350	-
G 1 ½	40	600	-

11 DESIGNATION

An expansion group shall be designated by:

a) its nominal size (table 11),

b) its nominal set pressure P_{nr} (see section 3.8),

c) its acoustic group (table 6), and

d) reference to this standard.

Example of designation of an expansion group of nominal size 15, a nominal set pressure 0,6 MPa (6 bar) and an acoustic group I:

Expansion group, DN 15, P_{nr} 0,6 MPa (6 bar), acoustic group I, EN 1488.

12 MARKING

The expansion group shall be legibly and permanently marked with:

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

b) the nominal size, DN (table 11),

c) the nominal set pressure, P_{nr} (see section 3.8),

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

e) markings 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 acoustic classification (table 6),

h) the model reference, and

i) - 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.

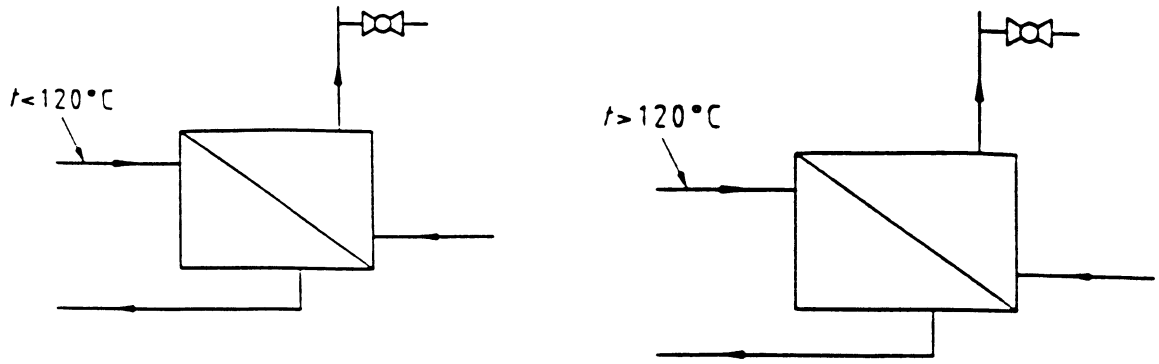
Table A.1 - Summary of temperature controls

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

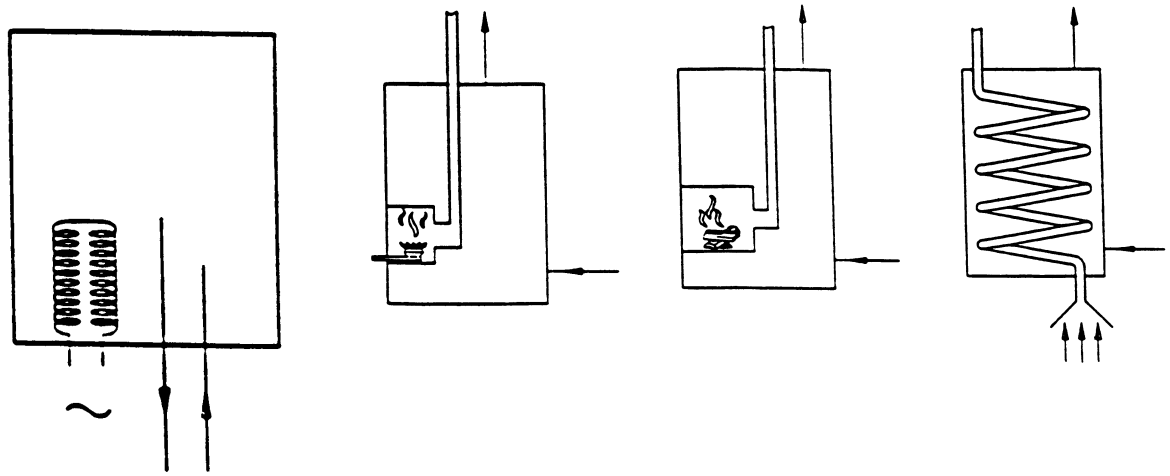
A.2.1 A Indirect heating



System: A1 A2

Figure A.2.1 - Indirect heating

A.2.2 B 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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