BRITISH STANDARD

BS EN
14367:2005

Non controllable backflow preventer with different pressure zones — Family C, type A

The European Standard EN 14367:2005 has the status of a British Standard

ICS 91.140.60

BSI
British Standards

National foreword

This British Standard was published by BSI. It is the UK implementation of EN 14367:2005.

The UK participation in its preparation was entrusted by Technical Committee B/504, Water supply, to Subcommittee B/504/14, Backflow prevention.

A list of organizations represented on B/504/14 can be obtained on request to its secretary.

The UK Committee would like to comment on the following:

1. clause **9.2.2** specifies that all measuring instruments shall have an accuracy of ±2 %, but this can be too wide compared with the tolerance for the temperature of the test water;
2. in Figure 3 the correct orientation of the test sample on the test rig is not given, it is assumed that the inlet end of the device is to the left hand side of the figure;
3. two figures have been labelled Figure 4;
4. contradictory information is given in clause **9.6.2.1**, it may be assumed that a certified check valve EB conforming to EN 13959 having a closing pressure of 0,5 KPa will take precedence over any other check valve.

The reader is advised to take these statements of B/504 into account when applying this standard.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with British Standard cannot confer immunity from legal obligations.

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EN 14367

June 2005

ICS 91.140.60

English Version

Non controllable backflow preventer with different pressure zones - Family C, type A

Disconnecteur à zones de pression différentes non contrôlables - Famille C - type A

Systemtrenner mit unterschiedlichen nicht kontrollierbaren Druckzonen - Familie C, Typ A

This European Standard was approved by CEN on 3 February 2005.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 14367:2005) 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 December 2005, and conflicting national standards shall be withdrawn at the latest by December 2005.

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Introduction

In respect of potential adverse effects on the quality of water intended for human consumption, caused by the product covered by this document:

1) This document provides no information as to whether the product may be used without restriction in any of the Member States of the EU or EFTA;

2) It should be noted that, while 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 document specifies the:

field of application;

the dimensional, the physico-chemical, the design, the hydraulic, the mechanical and the acoustic characteristics of non-controllable backflow preventer with different pressure zones, family C, type A, nominal sizes DN 6 to DN 50, nominal pressure PN 10.

It is applicable to:

— Family C, type A, class "a" for general use: devices of class "a" shall be capable of working:

at any pressure up to 1 MPa (10 bar);

with any pressure variation up to 1 MPa (10 bar);

at a supply temperature limit of 65 °C and 90 °C for 1 h;

— Family C, type A, class "b" for specific use: devices of class "b" shall be capable of working:

at any downstream pressure up to 0,3 MPa (3 bar);

with any downstream pressure variation up to 0,3 MPa (3 bar);

The devices of class "b" having specific hydraulic and no acoustic requirements and are meant for equipped filling devices built-in one or two functions boilers (heating only or heating and production of sanitation hot water).It concerns boilers with a 70 kW maximum power and maximum temperature of 110°C.

It specifies also:

— test methods and requirements for verifying these characteristics;

— marking;

— presentation and the delivery.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references the latest edition of the referenced document (including any amendments) applies.

EN 1254-4, *Copper and copper alloys — Plumbing fittings — Part 4: Fittings combining other end connections with capillary or compression ends.*

EN 1267:1999, *Valves-Test of flow resistance using water as test fluid.*

EN 1717:2000, *Protection against pollution of potable water in water installations and general requirements of devices to prevent pollution by backflow.*

EN 13959, *Anti-pollution check valves - DN 6 to DN 250 inclusive Family E, Type A, B, C and D.*

EN ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads - Part 1: Dimensions, tolerances and designation (ISO 228-1:2000).*

EN ISO 3822-1:1999, *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 .*

EN ISO 5167-1, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 1: General principles and requirements (ISO 5167-1:2003).*

EN ISO 6509, *Corrosion of metals and alloys — Determination of dezincification resistance of brass (ISO 6509:1981).*

ISO 7-1, *Pipe threads where pressure-tight joints are made on the threads -- Part 1: Dimensions, tolerances and designation.*

ISO 965-1, *ISO general-purpose metric screw threads -- Tolerances -- Part 1: Principles and basic data.*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1717:2000 and the following apply.

3.1
non controllable backflow preventer with different pressure zones — Family C — Type A
the specific characteristics of this device called “CA”, are as follows:

The device is divided into three zones:

— one upstream zone p_1;

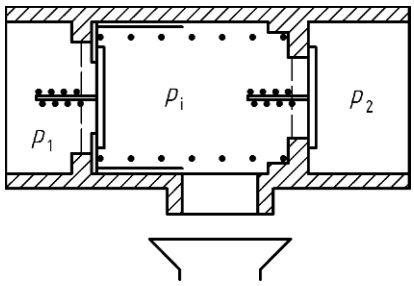
— one intermediate zone (p_i not measurable) vented to the atmosphere;

— one downstream zone p_2.

The device provides disconnection by venting the intermediate pressure zone to the atmosphere when the difference of pressure between the intermediate zone and the upstream zone is less than 10 % of the upstream pressure ($p_i - p_1 < 10\ \%\ p_1$).

It ensures a discharge (backflow rate) through the intermediate zone, at least equal to the given discharge flow rate.

Means for the control of the protection device are not included.



Key

1 upstream zone p_1

2 intermediate zone p_i

3 downstream zone p_2

Figure 1 — Design principle

For the purposes of this standard “Non controllable backflow preventer with different pressure zones — Family C — Type A” is hereafter referred to as «device».

3.2 Specific use

Specific use is related to use the backflow protection device at the filling point of domestic sealed heating systems.

4 Nominal size (denomination)

4.1 Class a device

The denomination of the device is given in Table 1:

Table 1 — DN versus threads of Class a device

Denomination DN	6	8	10	15	20	25	32	40	50
Threads of tailpieces	G1/8	G1/4	G3/8	G1/2	G3/4	G1	G1 1/4	G1 1/2	G2

4.2 Class b device

The denomination of this device is not related to the size of connection. All Class b devices shall comply with the same performances requirements.

5 Designation

A non controllable backflow preventer with different pressure zones family C, type A is designated by:

— family, its type and class;

— denomination (see Table 1) except class b device;

— connection type;

— material of its body;

— surface finish (possible coating);

— acoustic group (for DN ≤ 32) except class b device;

— reference to the present standard.

EXAMPLE for a designation:

class a:

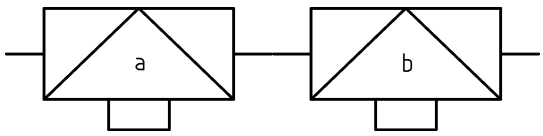
— Non controllable backflow preventer with different pressure zones, EN 14367, family C, type A, class a, DN 20, G3/4 × G3/4, bronze, I,

class b:

— Non controllable backflow preventer with different pressure zones, EN 14367, family C, type A, class b, M10 × 1, brass,

6 Symbolization

The graphic representation of the non controllable backflow preventer with different pressure zones — family C, type A is as follows:



2 a) Class a 2 b) Class b

Figure 2 — Graphic symbol

7 Physico-chemical characteristics

7.1 Materials

The materials and the coatings used, liable to come normally or accidentally in contact with potable water, shall satisfy the EC regulations concerning water quality.

And therefore, they:

— shall be corrosion resistant;

— shall be prone to the least scaling possible;

— shall be in conformity with the European Standards and regulations;

— shall be compatible among themselves; and

with the water distributed;

with the fluids or matter liable to come into contact with them;

with the products normally used for disinfection operations of the network: potassium permanganate and sodium hypochlorite.

7.2 Nature of the materials

a) The choice of materials is left to the discretion of the manufacturer.

b) 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 clause «Marking»;

c) neither the materials nor the coatings used shall, by normal or accidental contact with drinking water, cause any risk of affecting or modifying the water up to a temperature of 90 °C (see also clause 1). The suitability of the water for human consumption is defined by national regulations;

d) the manufacturer shall state in his technical and sales literature the nature of the materials and the coatings selected;

e) the materials, and in particular copper alloys, for which recommendations or international standard exists shall comply with the relevant recommendations or international standards;

f) the devices whose whole body or part of it is made of plastic shall, in addition to the tests referred to in this standard, be submitted to complementary tests described in annex A.

8 Design

8.1 General

a) Only the pressure of the water (upstream and/or downstream): shall have an affect of the function of components of the device;

b) the settings of the springs shall be fixed and not adjustable;

c) as regards devices designed in such a way that the access to the internal parts is possible (for inspection, repair or replacement), these components shall be able to be refitted at their initial place without ambiguity (impossibility of reversal, interchange of obturators, diaphragms, springs, …). A visible mark is not sufficient.

8.2 Relief valve

If the relief valve system operates by means of pilot tube then the cross section of the pilot tube shall be equal to or greater than 45 mm^2 for devices DN > 15 or 12,5 mm^2 for devices DN ≤ 15 no dimension being less than 4 mm.

The water passage through the discharge orifice shall have a cross-section of minimal 12,5 mm^2.

The smallest dimension used to calculate this cross-section shall not be inferior to 4 mm for non-moving part.

The control of the relief valve shall be of positive safety, i.e. in case of rupture or leakage, the relief shall be open.

This will be checked by examination of the behaviour of the device, after dismantling the control system of the relief valve (diaphragm, piston seal …).

An air break to drain shall be placed at the discharge outlet. An air gap shall exist between any waste drain and any means to collect the discharged water (floor, tundish, curb, sink …).

The device shall be capable, by design, evacuating the full relief flow rate as defined in 9.6.4 without spilling to the outside of the air break to drain.

Class a device shall be equipped with:

The air break to drain shall meet the dimensional requirements of chapter 9 of EN 1717:2000.

This air break to drain shall be:

— either directly incorporated into the device;

— or factory fitted;

— or supplied with the device.

In the last two cases, the relief valve outlet of the device shall permit neither fitting of a standardized threaded pipe, nor the connection by the inside of a standardized pipe or shape, be it by glue, welding or interlocking.

Class b device shall be equipped with:

— At least two air inlets openings with each a minimum cross-section of 12,5 mm^2 upstream of the relief piping shall be incorporated.

The smallest dimension used to calculate this cross-section shall not be less than 4 mm.

— A discharge construction allowing fitting of a standardized threaded or plain pipe without disturbing the working of the relief valve system and without obturating, even partially, the air inlets opening.

9 Characteristics and test methods

9.1 General

Performance tests shall be carried out on the device as installed in accordance with the manufacturer's technical documents.

9.2 General tolerances

9.2.1 Accuracy of measurements

In the absence of any particular specifications:

— flow rate and pressure : ± 2 % of the value specified;

— temperature : cold water ± 5 K of the value specified;

hot water ± 2 K of the value specified;

— time: $^{+10}_{0}$ % of the value specified.

9.2.2 Accuracy of measuring instruments

All the measuring instruments shall have an accuracy of ± 2 % of the measured value.

9.3 Expression of the results

The measured values shall be registered. These results can be expressed as a curve. See annex B for example.

9.4 End connections

9.4.1 Threaded end connections

Devices with threaded connections shall be able to be dismounted without any damage to the piping. Example: coupling nut, union.

9.4.1.1 Class a device

The connections shall be in conformity with EN 1254-4, EN ISO 228-1 and ISO 7-1.

9.4.1.2 Class b device

The connections of the device for separate installation and for integrated purposes shall be M10 × 1 (in accordance with ISO 965-1). For integrated purposes other connections are also permitted.

9.5 Mechanical characteristics

Examples shown in the figures are for guidance only. Laboratory equipment shall be designed to ensure that the device can be tested in accordance with the requirements.

9.5.1 Mechanical resistance of the body under pressure

9.5.1.1 Requirement

No visual permanent deformation or rupture of the body or the internal parts of the device shall occur.

The test shall be carried out under the conditions defined in 9.5.1.2.

9.5.1.2 Test method

— Apply at the inlet of the device, in increments of 0,1 MPa (1 bar) per 5 s, an increase of the static water pressure up to 2,5 times the PN value, this equals 2,5 MPa (25 bar);

— Hold this pressure for 5 min. Observe the device and note any observations.

— Verify that the device satisfies the requirement of 9.5.1.1.

9.5.2 Bending strength — Tightness of the body

9.5.2.1 Requirement

There shall be no rupture nor permanent deformation or leakage on the body of the device. The test shall be carried out under the conditions defined in 9.5.2.2.

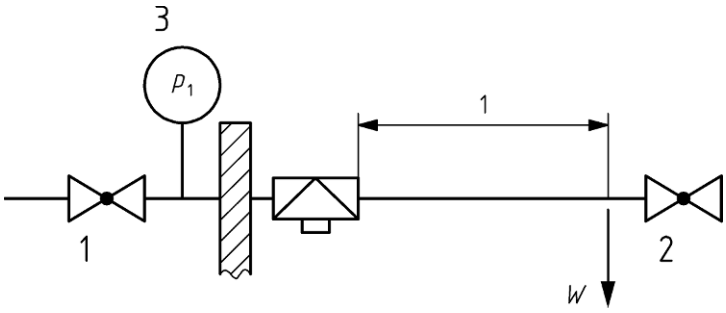
9.5.2.2 Test method

Fasten the device onto the test bench with the supplied connections (special unions are not allowed). Apply a load W as shown in Figure 3 corresponding to the bending moment shown in Table 2 (in this particular case class b device shall satisfy the DN 6 requirements), with a pressure of 1,6 MPa (16 bar) applied in increments 0,1 MPa (1 bar) per 5 s. Maintain the bending moment and the pressure for 10 min.

When calculating the load W corresponding to the bending moment, loads introduced by the piping and taps and any loads coming from the test apparatus shall be accounted for.

Verify that the device satisfies the requirement of 9.5.2.1.

Dimensions in metres



Key

1,2 Isolating valve

3 W Load

Figure 3 — Bending moment testing equipment

Table 2 — Nominal size versus bending moment

DN	6	8	10	15	20	25	32	40	50
Bending moment Nm	10	30	40	80	150	300	400	500	600

9.5.3 Endurance

9.5.3.1 Requirement

a) No leakage through the relief valve shall be observed throughout the test.

b) The device shall not show any particular defects (coating, …), whilst visually inspecting without any dismantling operation

c) Without replacement of any component, the device shall be in good working condition to be verified by the remaining tests (clause 10).

9.5.3.2 Test method

The tests 1 and 2 apply to the both class a and class b devices. Test 3a applies to class a device only, test 3b applies to class b device only;

Test 1 Behaviour at temperature

Place the complete device for 72 h in an environment at a temperature of 65 °C and at a relative humidity of (50 ± 5) %.

Test 2 Thermal shock

Following the preceding test, put the complete device in flow condition, supplying it with water at 90 °C. Once the temperature reaches 85 °C at the outlet of the device, hold the flow rate, in accordance with table 3 (in this particular case this class b device shall satisfy the DN 6 requirements), for 60 min, and then supply with the same flow rate for 10 min with a water at 15 °C.

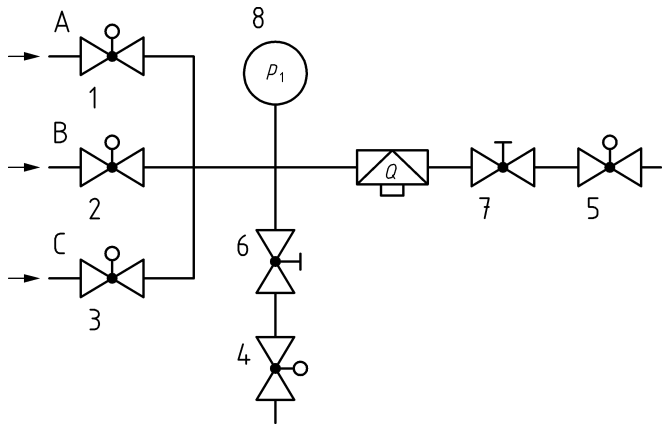
Test 3 a Mechanical endurance

In the situation described below (Figure 4).

A — Supply flow: maximum pressure of 0,3 MPa (3 bar) at zero flow.

B — Supply pressure: 1 ± 0,05 MPa (10 bar ± 0,5 bar)

C — Supply pressure: 0,3 ± 0,03 MPa (3 bar ± 0,3 bar)



Key
1, 2, 3, 4, 5 Isolating valve
6, 7 Adjusting valve
8 Pressure gauge

Figure 4 — Endurance testing equipment

Table 3 — Nominal size versus endurance test flow rate

DN	6	8	10	15	20	25	32	40	50
Nominal flow rate (m^3/h)	0,14	0,25	0,4	1,4	2,2	3,8	6	9,5	14,7

Following the preceding tests 1 and 2, submit the device placed in the testing equipment (see Figure 4) to 5 000 cycles at a temperature of 65 °C, each cycle comprising:

— Stage 1: Open valves 5 then 1, circulation at a flow rate as given in Table 3 at the value ± 5 % for (6 ± 2) s;

— Stage 2: Close valves 5 then 1;

— Stage 3: Open valve 3, static pressure at 0,3 MPa (3 bar) for (6 ± 2) s;

— Stage 4: Close valve 3, open valve 4 for (6 ± 2) s (Upstream drain): resulting in the opening of the relief valve;

— Stage 5: Close valve 4;

— Stage 6: Open valves 5 then 1, circulation at a flow rate as given in Table 3 at the value ± 5 % for (6 ± 2) s;

— Stage 7: Close valves 5 then 1;

— Stage 8: Open valve 2, static pressure at 1 MPa (10 bar) for (6 ± 2) s;

— Stage 9: Close valve 2, open valve 4 for (6 ± 2) s (Upstream drain): resulting in the opening of the relief valve;

— Stage 10: Close valve 4.

The 5 000 cycles are broken down into seven periods as follows:

— 1 250 cycles;

— the device is at rest for 14 h at the ambient temperature;

— 1 250 cycles;

— the device is maintained under load at a static pressure of 1 MPa (10 bar) for 14 h at the ambient temperature;

— 1 250 cycles;

— the device is submitted for 14 h to an upstream pressure of 0,3 MPa (3 bar) and to a downstream pressure of 1 MPa (10 bar) at the ambient temperature;

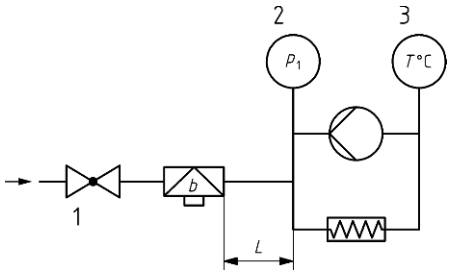
— 1 250 cycles;

At the end of the three tests, verify that the device satisfies the requirements of 9.5.3.1.

9.5.4 Test 3b, reliability characteristics

The water used for the tests shall be not additionally treated potable water.

The water hardness shall be noted.



Key
1 Isolating valve
2 Pressure gauge
3 Temperature gauge
L_{max}: 100 mm with rigid tube of a diameter related to the connection size

Figure 4 — Reliability testing equipment

— Install the device into the test bench as shown in Figure 5.

— Fill the device with water at a pressure of 0,3 MPa (3 bar).

— Isolate the device using valve 1.

— Subject it to a downstream pressure equal to 0,3 ± 0,05 MPa (3 ± 0,5 bar).

— Hold this pressure for three months with water at 65 °C.

Verify that the device satisfies the requirements of 9.5.3.1.

9.6 Tightness characteristics

9.6.1 Verification of the tightness of the downstream check valve (in the closing direction)

9.6.1.1 Requirement

Under the test conditions described below, no leakage nor permanent deformation or deterioration of the downstream check valve shall occur.

9.6.1.2 Test methods

a) For class a device:

Downstream of the device, apply a pressure of 1,6 MPa (16 bar) with water at 20 °C, the upstream zone being at atmospheric pressure. The pressure to be applied in increments 0,1 MPa (1 bar) per 5 s;

Hold the pressure for 2 min;

Isolate the device from the supply system for 10 min.

Verify that the device satisfies the requirement of 9.6.1.1 (note any pressure drop);

b) for class b device:

Downstream of the device, apply a pressure of 0,6 MPa (6 bar) with water at 20 °C, the upstream zone being at atmospheric pressure. The pressure to be applied in increments 0,1 MPa (1 bar) per 5 s;

Hold the pressure for 2 min;

Isolate the device from the supply system for 10 min.

Verify that the device satisfies the requirement of 9.6.1.1 (note any pressure drop)

9.6.2 Verification of the closing pressure of the downstream check valve and its tightness (opening direction)

9.6.2.1 Requirement

The closing pressure of the downstream check valve shall be greater than 1 kPa (10 mbar). If a certified check valve EB complying with EN 13959 is incorporated, the closing pressure shall be greater than 0,5 kPa (5 mbar).

9.6.2.2 Test method

The verification is made by measuring the difference in height between two water levels (Figure 6). The inside diameter of the level tubes shall be $10\,^{0}_{-2}$ mm .

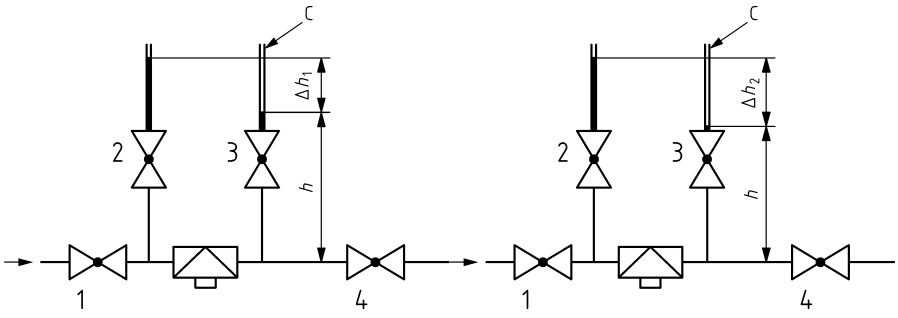


Figure 6a **Figure 6b**

Key

1,2,3,4 : isolating valve

C Transparent tube

Figure 5 — Closing pressure testing equipment

Remove the upstream check valve and ensure that the relief valve is watertight.

— Admit water to the device, so that the height h of the water column in the tube C is obtained and sufficient to carry out two tests;

— Close the valves 1 and 4;

— isolate the device for 15 min;

— note the height Δh_1 (Figure 6 a);

— drain slightly downstream with the valve 4;

— isolate for 15 min;

— note the height Δh_2 (Figure 6 b).

Verify that the device satisfies the requirement of 9.6.2.1. The results can be expressed as a curve (see Figure B.1 for example). The tightness will be observed if Δh_1 and Δh_2 remain higher than 10 cm WC or 5 cm WC if a certified check valve EB (comply with EN 13959) is incorporated.

9.6.3 Verification of the tightness of the upstream check valve at low pressure

9.6.3.1 Requirement

Under the test conditions, the tightness of the upstream check valve shall be verified. No sagging of the water level in the tube shall be stated at each of the stages.

9.6.3.2 Test method

— Fill the device with water so that the water column has a height of 10^{+5}_{+0} cm in the tube (diameter inside 10^{+0}_{-2} mm), as shown on Figure 7.

— Close valve 1.

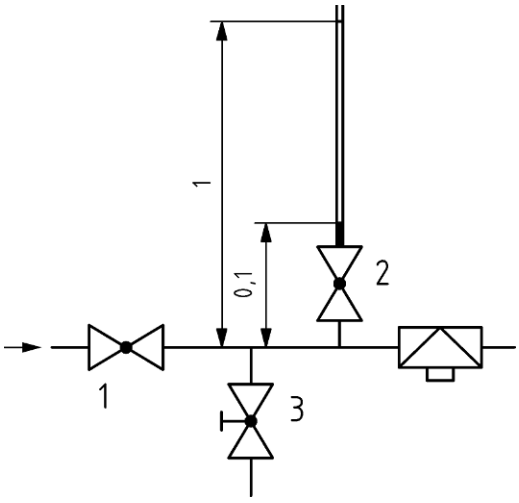
— Raise the level to (1 ± 0,05) m with the valve 3.

— Isolate for 5 min ± 30 s.

— Do the same test at the following stages: 0.75, 0.5, 0, 25 and 0, 1 m water column.

— Maintain the position 5 min per stage.

Verify that the device satisfies the requirement of 9.6.3.1



Key

1, 2 : isolating valve

3 : adjusting valve

Figure 6 — Tightness testing equipment

9.6.4 Verification of the tightness of the upstream check valve under vacuum

9.6.4.1 Requirement

The downstream check valve being dismantled, no water shall pass through the device, as verified by water not collected in the water trap.

9.6.4.2 Test method

— Fasten the device into the test rig as shown in Figure 8;

— Adjust the relief flow rate to the value of the flow rate indicated in Table 4;

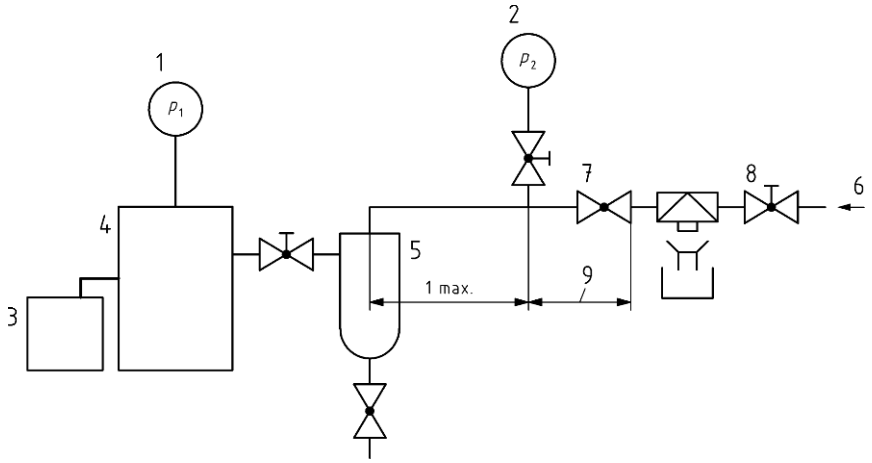
— Apply rapidly upstream of the device a vacuum of 50 kPa (0,5 bar);

— Maintain 1 min.

Verify that the device satisfies the requirement of 9.6.4.1;

— Repeat the test with a vacuum of 6,5 kPa (65 mbar).

Verify that the device satisfies the requirement of 9.6.4.1.



Key

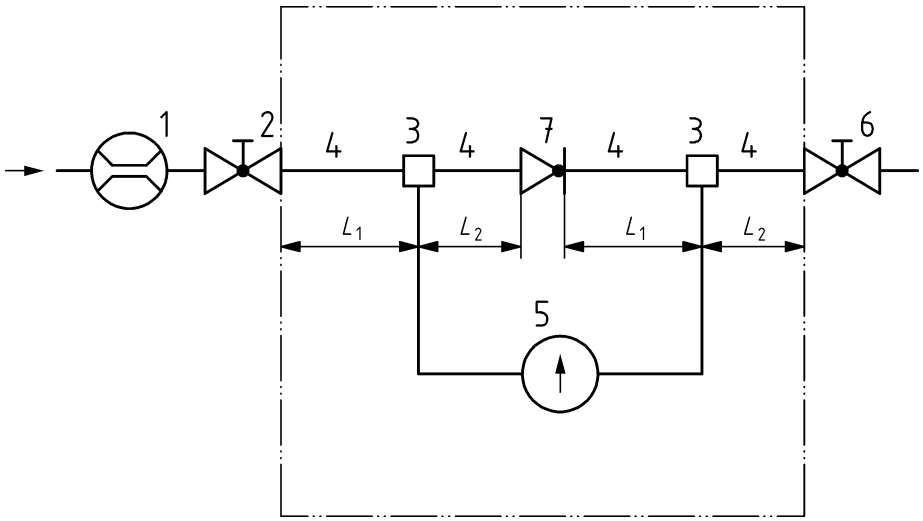
1 Vacuum gauge
2 Vacuum gauge
3 Vacuum pump
4 Vacuum vessel
5 Water trap
6 Water supply
7 Isolating valve
8 Adjusting valve
9 5 DN to 10 DN

Figure 7 — Tightness testing equipment (vacuum)

9.7 Hydraulic characteristics

9.7.1 Test rig — General circuit

The test installation shall be in accordance with figure 9 (reference: EN 1267). The laboratory shall choose The position of the components outside the indicated box.



Key
1 Flow meter
2, 6 Control valve
3 Pressure take-off tee
4 Tube
5 Differential pressure measuring device
7 Test device
8 Water supply

Figure 8 — Flow rate/pressure loss testing equipment

The test rig consists of:

— Flow meter (1) suitable for the flow rate given in table 4 for the test device.

— Control valve (2) capable of fine regulation.

— Pressure take-off tee (3) according to ISO 5167-1.

— Straight lengths of tubes of the smallest size corresponding to the nominal size of the test device. Length of tubes (4):

  — $L_1 \geq 10 \times$ DN of the test device.
  — L_2 is $\geq 2 \times$ DN of the test device.

— Differential pressure measuring device (5).

— Control valve (6) capable of fine regulation.

— Test device (7).

9.7.2 Verification of the pressure loss as a function of the flow rate

9.7.2.1 Requirement

For flow rate values measured from 0 to the flow rate given in Table 4 (in this particular case this class b device shall satisfy the DN 6 requirements), the reference pressure loss shall not be exceeded.

Table 4 — Nominal size versus minimum flow rate

DN	6	8	10	15	20	25	32	40	50
Nominal flow rate (m^3/h)	0,2	0,36	0,56	2	3,2	5,4	8,6	13,6	21
Pressure loss (MPa)	0,1	0,1	0,1	0,17	0,17	0,17	0,17	0,17	0,17

9.7.2.2 Test method

Record the flow rate over pressure loss of the device for the full range from 0 to the flow rate given in Table 4 (see Figure B.2 for example).

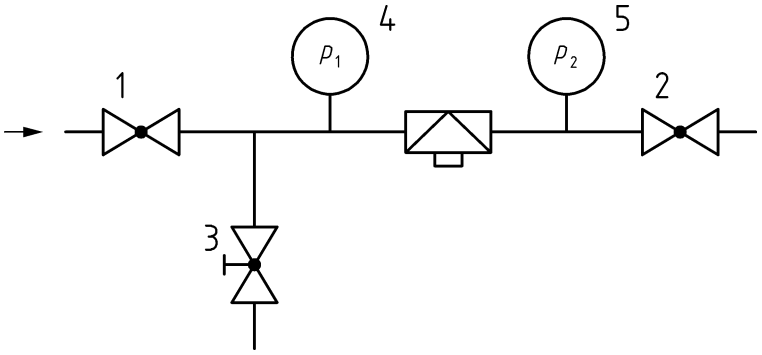
Verify that the device satisfies the requirement of 9.7.2.1.

9.7.3 Verification of the opening (disconnection) and closing (tightness) of the relief valve

9.7.3.1 Requirement

Under the test conditions as defined hereafter, the relief valve shall start opening before the downstream pressure is by 10 % higher than the upstream pressure, and close again in an absolute tight manner.

9.7.3.2 Test methods



Key
1, 2 Isolating valve
3 Adjusting valve
4, 5 Pressure gauge

Figure 9 — Testing equipment

Remove the movable parts from the downstream obturator

a) For device class a:

supply the device with water and purge (See figure 10);
isolate the device at an inlet pressure of 1 MPa (10 bar);
drop the upstream pressure slowly;
record the value of the upstream and downstream pressures as soon as the first drop appears at the relief valve outlet.

Repeat the test with start values equal to 0,6 MPa, 0,4 MPa, 0,2 MPa and 0,1 MPa (6 bar, 4 bar, 2 bar and 1 bar) measured upstream.

b) For device class b:

- supply the device with water and purge (See figure 10);
- isolate the device at an inlet pressure of 0,5 MPa (5 bar);
- drop the upstream pressure slowly;
- put the device in a static condition at a pressure of 0,5 MPa (5 bar);
- make the upstream pressure drop slowly;
- record the value of the upstream and downstream pressures as soon as the first drop appears at the relief valve outlet.

Repeat the test with values equal to 0,2 MPa and 0,1 MPa (2 bar and 1 bar) measured upstream.

The pressure values at the inlet and outlet are noted at the moment the first discharge from the relief valve is shown

- In two cases, verify that the device satisfies the requirement of 9.7.3.1;

- after each test, check that the relief valve is closed in an absolute tight manner.

The results can be expressed as a curve (see Figure B.4a and Figure B.4b, for example).

9.7.4 Verification of the relief flow rate

9.7.4.1 Requirement

Class a device shall comply with:

For reverse flow values measured from 0 to the flow rate given (specified in Table 4), the downstream pressure shall be lower than or equal to the Δp.

Class b device shall comply with:

For reverse flow values measured from 0 to 0,4 m^3/h, the downstream pressure shall be lower than or equal to 0,1 MPa (1 Bar).

9.7.4.2 Test method

The movable parts of the downstream check valve being removed, record the flow rate over downstream pressure corresponding to the flow rate specified.

Verify that the device satisfies the requirement of 9.7.4.1.

The results can be expressed as a curve (see Figure B.3, for example).

9.7.5 Compatibility with the products used for disinfection of the networks

9.7.5.1 Requirement

All the constituent parts of the device, and in particular those made of elastomer, shall be compatible with the treated water used for the disinfection of the networks using potassium permanganate or sodium hypochlorite.

At the end of the test and without any intervention, the device shall pass the remaining tests indicated in clause 10.

9.7.5.2 Test method

This compatibility is checked by bringing the internal parts of the device:

— for 96 h into contact with a solution containing 0,30 g of potassium permanganate per litre of deionized water (conductivity ≤ 2,5 μ S/m);

— for 24 h into contact with a solution containing 0,10 g of sodium hypochlorite per litre of deionized water (conductivity ≤ 2,5 μ S/m).

Each of these contacts being carried out under a static pressure of 0,8 MPa (8 bar) measured upstream, at a temperature of 20 °C.

Verify that the device satisfies the requirement of 9.7.5.1.

9.7.6 Acoustic tests

9.7.6.1 General

This clause specifies the test method to measure the acoustic characteristics of the device class a and to classify the devices by acoustic group. This test method does not apply to the device class b.

The acoustic tests shall be performed on devices with DN lower or equal to 32.

9.7.6.2 Procedure

9.7.6.2.1 Assembly of the devices

This is carried out in accordance with the requirements of EN ISO 3822-3.

9.7.6.2.2 Test method

The tests are carried out in accordance with the requirements of EN ISO 3822-1:1999 and EN ISO 3822-3:1997, subclause 4.4.

9.7.6.3 Determination of the groups

The device can be classified into the following groups in accordance with the L values obtained.

Table 5 — Noise classification of in-line device class a

Acoustic group	L dB (A)
I	< 20
II	$20 \leq L \leq 30$
Unclassified	> 30

10 Order of testing

The conformity tests for the standard shall be performed according to the sequence below on the sample of each device presented.

a)	Determination of the acoustic group	9.7.6
b)	Bending strength — Tightness of the body	9.5.2
c)	Mechanical resistance of the body under pressure	9.5.1
d)	Verification of the tightness of the downstream check valve (in the closing direction)	9.6.1
e)	Verification of the closing pressure of the downstream check valve and its tightness (opening direction)	9.6.2
f)	Verification of the tightness of the upstream check valve at low pressure	9.6.3
g)	Verification of the head loss as a function of the flow rate	9.7.2
h)	Verification of the opening (disconnection) and closing (tightness) of the relief valve	9.7.3
i)	Verification of the relief flow rate	9.7.4
j)	Compatibility with the products used for disinfection of the networks	9.7.5
k)	Endurance	9.5.3
l)	Reliability characteristics	9.5.4
m)	Verification of the tightness of the downstream check valve (in the closing direction)	9.6.1
n)	Verification of the closing pressure of the downstream check valve and its tightness (opening direction)	9.6.2
o)	Verification of the opening (disconnection) and closing (tightness) of the relief valve	9.7.3
p)	Verification of the tightness of the upstream check valve under vacuum	9.6.4

11 Marking and technical documents

11.1 Marking

Device shall be permanently marked and visibly on the casing, or on a fixed data plate.

This information shall be on the upper side, or on each lateral side of the device. The indications are to be indelible and obtained by moulding, engraving or similar procedures.

Marking shall indicate:

a) name, manufacturer’s brand or logo;

b) arrow indicating normal direction of flow;

c) letter indicating family, type and the class of the device;

d) denomination (DN) except device CA Class b;

e) nominal pressure (PN);

f) maximum operating temperature in degrees Celsius (°C);

g) acoustic group (up to DN 32 inclusive only);

h) manufacturer's reference;

i) individual identification number;

j) reference to the present standard.

k) In the countries where the use of products made of dezincification resistant materials is not required, the dezincification resistant products according to EN ISO 6509 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 which do not contain zinc shall be marked «DR».

For all devices marking a), b), c) and d) are obligatory. Where space permits the other information shall be marked in the following order: f) to j).

11.2 Technical documents

The technical documents written at least in the language of the country in which the products are distributed, shall:

a) indicate the designation of the product;

b) specify the device's purpose;

c) indicate its area(s) of use;

d) include instructions for assembly;

e) include instructions for utilisation and maintenance;

f) list its constituent subassemblies;

g) include specific applicable rules for installation;

h) indicate flow rates and pressure drops (curve);

i) list of spare parts; precisely indicate the finishing of the device;

j) indicate the nature of materials.

12 Presentation at delivery

The device shall be protected from the time of manufacture to the time of installation against:

— damage to threaded ends;

— outside contamination;

- of inlet and outlet orifices;
- of orifices for the purpose of sanitary safety (discharge valve, air inlets, …).

Devices packed in watertight packaging material can be considered as protected.

Annex A
(normative)

Complementary test methods on backflow preventers CA class b with a plastic body

A.1 General

These test methods shall be carried out as follows:

— on two samples already submitted to the tests specified in the standard;

— the internal parts removed; and

— the relief orifice closed for tests A.2, A.3 and A.4.

A.2 Verification of the resistance to pressure under thermal stress

A.2.1 Requirement

Under the test conditions described below, no leakage or permanent deformation shall be observed on the body of the device.

A.2.2 Test method

Place the device in an oven with the internal parts removed and the relief valve opening closed

(See figure A1);

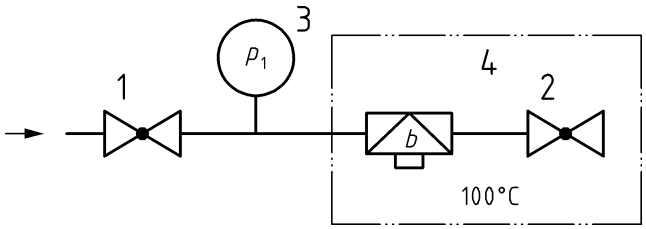
— adjust the temperature in the oven to 100 °C;

— submit the device to a static water pressure

1) of 1,6 MPa (16 bar), the increase in pressure in increments;
2) of 0,1 MPa (1 bar) per 5 s;

— hold this for 1 h;

— during and after the test, verify that the device satisfies the requirements of A.2.1.



Key
1, 2 Isolating valve
3 Pressure gauge
4 Oven

Figure A.1 — Testing equipment

A.3 Verification of the mechanical resistance to cyclic pressure variation

A.3.1 Requirement

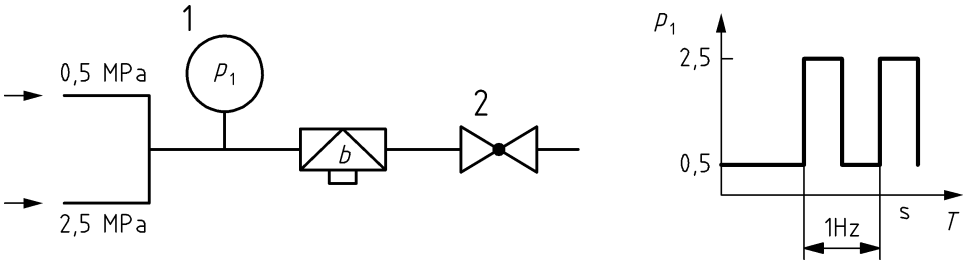
Throughout and after the test described below, no leakage or permanent deformation shall be observed on the body of the device.

A.3.2 Test method

Place the device in test ring with alternately to a static water pressure alternately of 0,5 MPa (5 bar), and 2,5 MPa (25 bar), at a frequency of 1 Hz at the ambient temperature.

Repeat the test 20 times.

Verify that the device satisfies the requirements of A.3.1.



Key
1 Pressure gauge
2 Isolating valve

Figure A.2 — Testing equipment

A.4 Verification of the resistance to thermal stress

A.4.1 Requirement

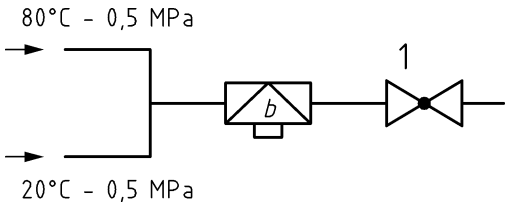
During the test as described below, no leakage shall be observed on the body of the device.

A.4.2 Test method

Submit the device to water circulation at a flow rate ± 10 % as given in table 3 ,at a pressure of 0,5 MPa (5 bar) and at a temperature of 80 °C for 30 min, then at a temperature of 20 °C for 15 min.

Repeat the cycle during a period of 120 h.

During and after the test, verify that the device satisfies the requirements of A.4.1.



Key
1 Adjusting valve

Figure A.3 — Testing equipment

A.5 Check of the stability in hot and humid atmosphere

A.5.1 Requirement

At the end of the test described below, the water absorption shall be less than 2 %.

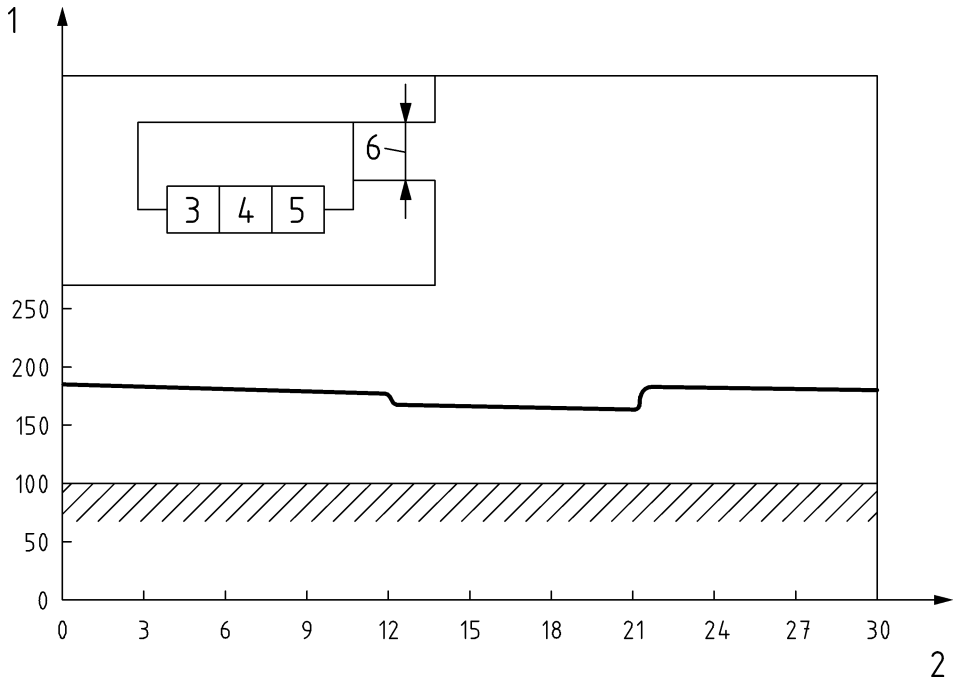
A.5.2 Test method

Place the body (or part of the body) made of plastic in a receptacle containing water maintained at a temperature of 100 °C for 24 h.

By weighing before and after the test, verify that the device satisfies the requirements of A.5.1.

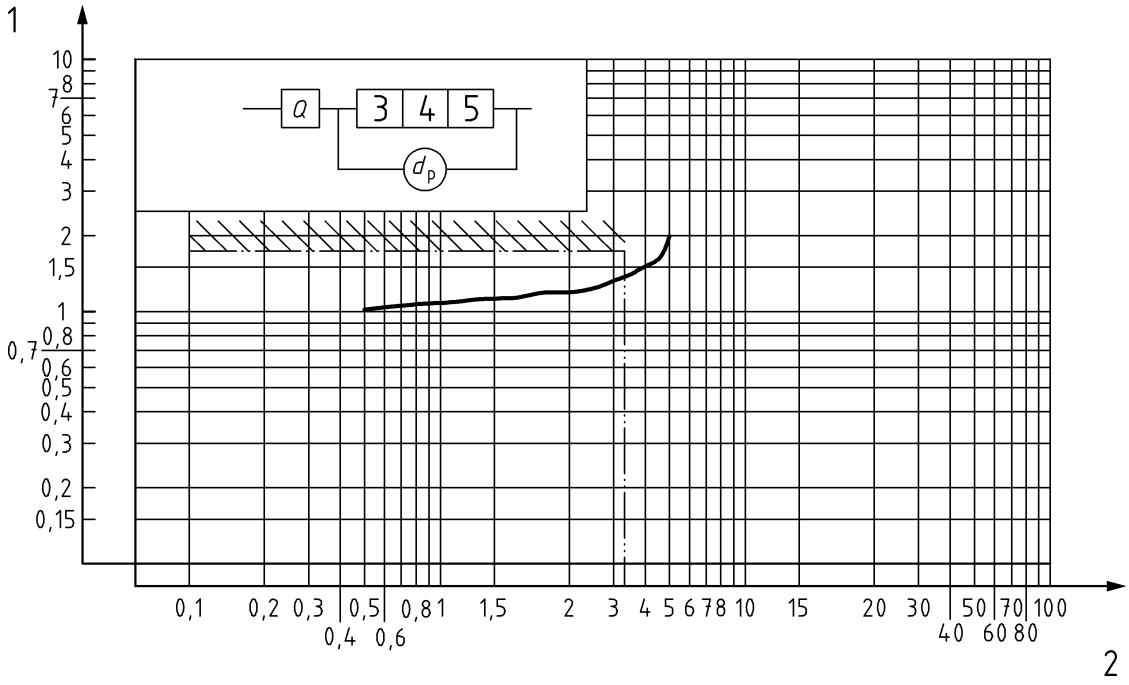
Annex B
(informative)

Examples of presentation of test results



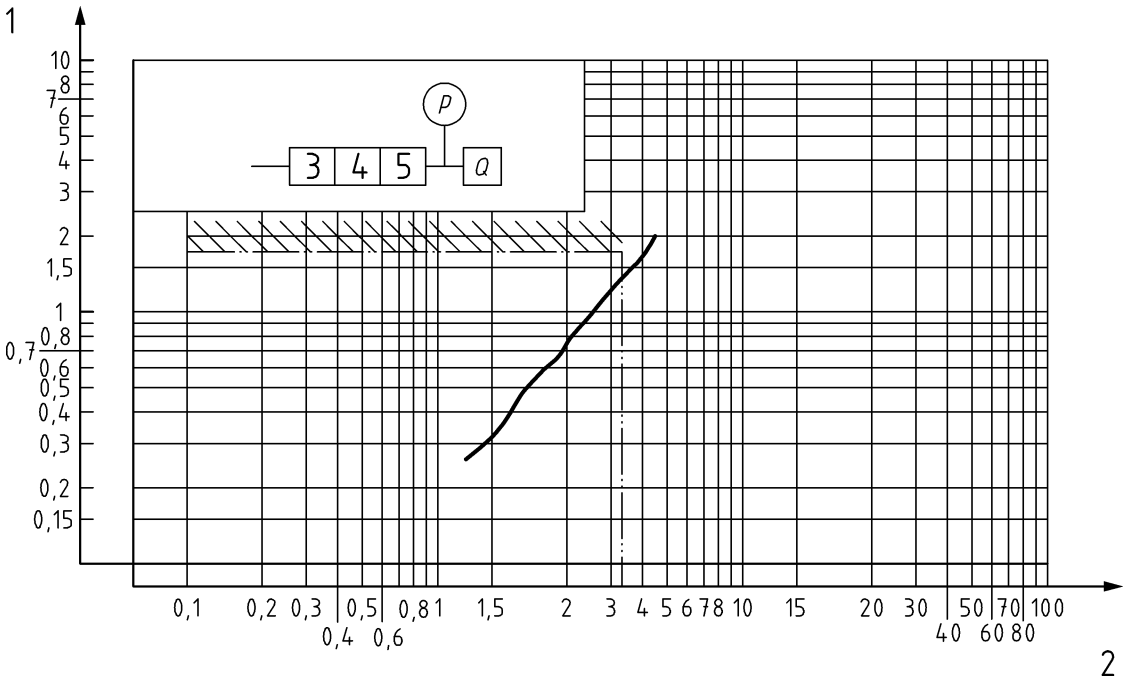
Key
1 d_P intermediate/downstream (10^{-1} kPa)
2 Time (min)
3 Upstream
4 Intermediate
5 Downstream
6 d_p

Figure B.1 — Closing pressure of the downstream backflow prevention device



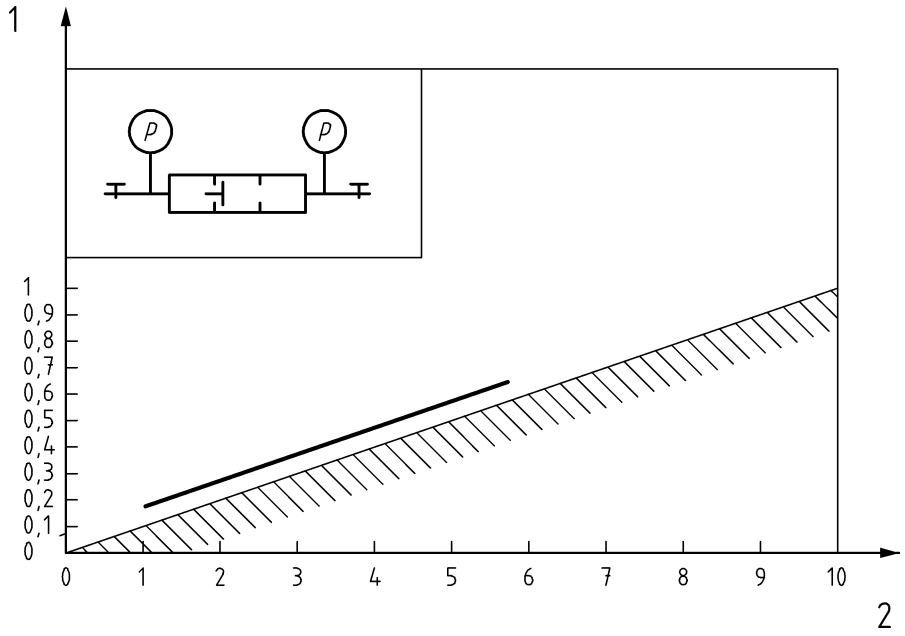
Key
1 Head loss (10^{-1} MPa)
2 Flow rate (m^3/h)
3 Upstream
4 Intermediate
5 Downstream

Figure B.2 — Flow rate: $d\,p = f\,(Q)$



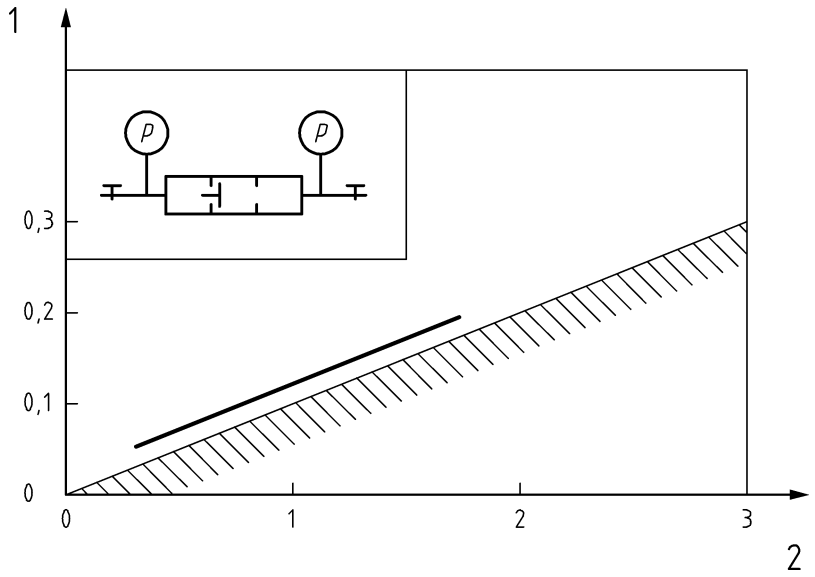
Key
1 Pressure (10^{-1} MPa)
2 Flow rate (m^3/h)
3 Upstream
4 Intermediate
5 Downstream

Figure B.3 — Reverse flow rate: p upstream = $f(Q)$



Key
1 p upstream increasing (10^{-1} MPa)
2 p upstream (10^{-1} MPa)

Figure B.4 a— Opening and closing of the relief valve: $d\,p = f\,(p$ upstream) (CAa)



Key
1 p upstream increasing (10^{-1} MPa)
2 p upstream (10^{-1} MPa)

Figure B.4 b— Opening and closing of the relief valve: $dp = f$ (p upstream) (CAb)

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