

ICS 13.060.20; 23.060.50

English Version

Devices to prevent pollution by backflow of potable water -
Mechanical disconnecter, direct actuated - Family G, type A

Dispositifs de protection contre la pollution par retour de
l'eau potable - Disconnecteur mécanique à action directe -
Famille G, type A

Sicherungseinrichtungen zum Schutz des Trinkwassers
gegen Verschmutzung durch Rückfließen - Rohrtrenner,
nicht durchflussgesteuert - Familie G, Typ A

This European Standard was approved by CEN on 16 December 2005.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This European Standard (EN 13433:2006) 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of an identical text or by endorsement, at the latest by September 2006, and conflicting national standards shall be withdrawn at the latest by September 2006.

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

Introduction

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

- 1) this European Standard provides no information as to whether the product may be used without restriction in any of the Member state 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 European Standard specifies, the dimensional, the physico-chemical, the design, the hydraulic, the mechanical and the acoustic characteristics of mechanical disconnecter, direct actuated Family G, type A.

This European Standard is applicable to mechanical disconnecter direct actuated in nominal sizes DN 8 up to DN 250, intended to prevent the return of water having lost its original sanitary and drinking qualities (called "polluted water" in this European Standard), into the potable water distribution system whenever the pressure of the latter is temporarily lower than in the polluted circuit.

This European Standard covers the mechanical disconnecter direct actuated of PN 10 that are capable of working without modification or adjustment:

- at any pressure up to 1 MPa (10 bar);
- with any pressure variation up to 1 MPa (10 bar);
- in permanent duty at a limit temperature of 65 °C and 90 °C for 1 h maximum.

It specifies also the test methods and requirements for verifying these characteristics, the marking and the presentation at delivery.

2 Normative references

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

EN 806-1:2000, *Specifications for installations inside buildings conveying water for human consumption — Part 1: General*

EN 1092-1, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated — Part 1: Steel flanges*

EN 1092-2, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated — Part 2: Cast iron flanges*

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, *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 3822-3:1984)*

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 13433:2006 (E)

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 9227, *Corrosion tests in artificial atmospheres — Salt spray tests*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 1717:2000, EN 806-1:2000 and the following apply.

3.1

mechanical disconnector, hydraulic actuated — Family G, type A

specific characteristics of this device called “GA”, (see Figure 1) are as follows:

- two pressure zones in flow position: upstream and downstream;
- three zones in drain position (zero-flow): upstream, intermediate and downstream. The upstream spring loaded obturator with discharge system and the downstream check valve separate the intermediate zone from the upstream and downstream zone;
- flow position is achieved at a pressure $p_f \leq p_s + 50 \text{ kPa}$ (0,5 bar);
- the relief valve starts opening at the set pressure $p_s \geq p_{\text{stat}} + 50 \text{ kPa}$ (0,5 bar);
- drain position is achieved at a pressure $p_0 \geq p_s - 36 \text{ kPa}$ (0,36 bar);
- a determined relief flow rate;
- a drain position visible directly or by a position indicator

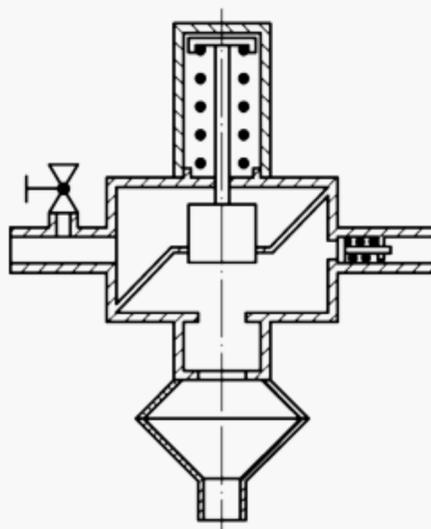


Figure 1 — Design principle

3.2

inlet pressure, p_1

pressure on the inlet side of the device

3.3**intermediate pressure, p_i**

pressure in the intermediate chamber of the device (in drain position $p_i = p_{\text{atmosph.}}$ and under flow condition $p_i = p_1$)

3.4**outlet pressure, p_2**

pressure on the outlet side of the device

3.5**differential pressure Δp**

differential pressure between the inlet pressure p_1 and the outlet pressure p_2

3.6**static pressure p_{stat}**

pressure equivalent to the height of the water column between the highest draw-off point and the horizontal axis of the installed disconnecter

3.7**set pressure p_s**

pressure at which the relief valve starts to open

3.8**opening pressure p_o**

pressure at which the disconnection distance of 20 mm is reached

3.9**closing pressure p_f**

pressure at which the relief valve is fully closed

3.10**disconnection distance**

minimal distance between the seat of the relief valve and the seat of the upstream obturator where the disconnection is operated

NOTE For the purposes of this standard «Mechanical disconnecter, direct actuated — Family G, type A» is hereafter referred to as «device».

4 Nominal size

The nominal size of the device is given in Table 1:

Table 1 — DN versus threads and flanges

Nominal size DN	8	10	15	20	25	32	40	50	65	80	100	125	150	200	250
Threads (designation in accordance with ISO 7-1)	G ¼	G ⅜	G ½	G ¾	G 1	G 1 ¼	G 1 ½	G 2							
Flanges (DN)							40	50	65	80	100	125	150	200	250

5 Designation

A mechanical disconnecter direct actuated Family G, Type A is designated by:

- name;
- reference to this European Standard, i.e. EN 13433;
- family and type
- nominal size (see Table 1);
- connection type;
- material of its body;
- surface finish (possible coatings);
- acoustic group (if applicable).

EXAMPLE of designation Mechanical disconnecter EN 13433, direct actuated Family G, Type A, DN 32, G 1¼ × G 1¼, cast iron, epoxy coated, I.

6 Symbolization

The graphic representation of the mechanical disconnecter direct actuated Family G, Type A is as follows (see Figure 2):

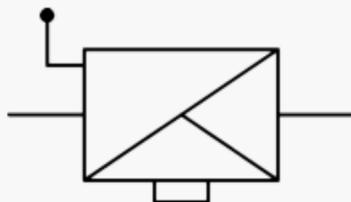


Figure 2 — Graphic symbol

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 EU regulations concerning water quality.

The materials and the coatings shall be:

- a) corrosion resistant;
- b) prone to the least scaling possible;
- c) in conformity with the European Standards and regulations;

- d) compatible among themselves and:
- 1) with the water supply;
 - 2) with the fluids or matter liable to come into contact with them;
 - 3) with the products normally used for disinfection of the water distribution system: potassium permanganate and sodium hypochlorite.

7.2 Nature of the materials

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

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 EN ISO 6509 and have to be marked in compliance with the indications in Clause 11;

NOTE This European Standard does not cover non-metallic materials for bodies.

- b) 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. The suitability of the water for human consumption is defined by national regulations;
- c) the manufacturer shall state in his technical and sales literature the nature of the materials and the coatings selected;
- d) the materials, and in particular copper alloys, for which recommendations or International Standard exists shall comply with the relevant recommendations or International Standards.

8 Design

8.1 General

- a) The internal components of the device shall be accessible for inspection, repair or replacement. By design, the 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.
- b) Additional control devices (electrical, pneumatic etc.) shall not influence the safety function.
- c) The settings of the springs shall be fixed and not adjustable.
- d) The device shall comprise one pressure tapping and a visible indication on the device when the obturator is in the drain position. The pressure tapping is located on the inlet of the device.
- e) Only the pressure of the water of the supply system at the inlet can operate the control of the internal components of the device.

8.2 Relief valve

Under normal service conditions $p_1 > p_s$ the relief valve is closed. At an inlet pressure $p_1 \leq p_s$ the relief valve starts opening and at a pressure $p_1 \leq p_0$ the relief valve is in drain position. There shall be a visible indication on the device, when the obturator is in the drain position.

In all the installation positions indicated by the manufacturer, any water retention shall not be possible within the intermediate zone.

EN 13433:2006 (E)

The cross-section of the passage orifices and of the pilot tube for operation of the relief device shall be equal to or greater than an area of $12,5 \text{ mm}^2$, except with $\text{DN} < 15$ for control drillings with a length of less than 20 mm which shall have a minimum internal diameter of 2 mm. In case of un-machined cross — sections the smallest dimension should be $\geq 4 \text{ mm}$. The outside pilot tube shall be made so as not to be vulnerable to any permanent deformation or rupture caused by external loading.

An air break to drain shall exist between any waste drain and any means of collecting the discharged water (floor, tundish, curb, sink).

The device with an air break to drain fitted shall evacuate the full relief flow rate as defined in 9.7.4 without spilling to the outside.

The air break to drain shall meet the dimensional requirements as specified in EN 1717.

This air break to drain shall be:

- either directly incorporated into the device;
- or factory fitted;
- or supplied with the device.

In the latter case, the relief orifice of the device shall permit, neither the fitting of a standardized threaded pipe, nor the connection of a standardized pipe or shape, be it by adhesive, welding or interlocking.

8.3 Disconnection distance

In drain position the obturator shall close the opening from upstream zone to the intermediate zone. The disconnection distance shall be at least 20 mm.

The drain port shall be closed, before flow condition is achieved. The passage orifice of the drain port shall be at least equal to the minimum cross-section of the outlet water way (downstream).

9 Characteristics and tests

9.1 General

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

If not specified all tests shall be performed with water at an ambient temperature.

9.2 General tolerances

9.2.1 Tolerance on set values

In the absence of any particular specifications given in this European Standard:

- flow rate and pressure: $\pm 2 \%$ of the value specified;
- temperature: cold water $\pm 5 \text{ }^\circ\text{C}$ of the value specified;
hot water $\pm 2 \text{ }^\circ\text{C}$ of the value specified;
- time: $+ \begin{smallmatrix} 10 \\ 0 \end{smallmatrix} \%$ of the value specified.

9.2.2 Accuracy of measuring instruments

Instruments for measuring temperature shall be accurate to 1 °C. All other measuring instruments shall have an error limit of $\pm 2\%$ 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 A for example.

9.4 Dimensional characteristics

9.4.1 Connections

The connections shall be in conformity with the following standards:

- EN ISO 228-1;
- ISO 7-1;
- EN 1092-1;
- EN 1092-2.

Devices with threaded connections shall be capable of removal without altering the pipework e.g. by means of a coupling nut or union.

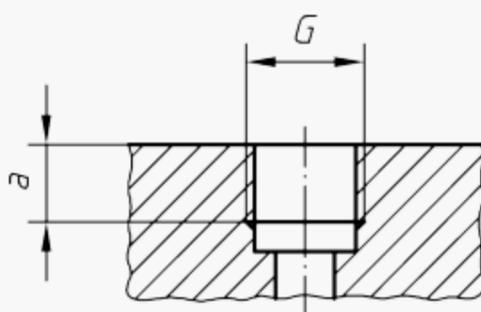
9.4.2 Pressure tapping

The device shall have a pressure tapping orifice in the upstream zone according to the indications as shown in Figure 3 and Table 2.

The bores for pressure tapping shall have over their full depth a minimum cross-section area of 12,56 mm². Their smallest dimension shall be 4 mm.

Table 2 — Dimension of thread and test parts

DN	Thread (designation in accordance with ISO 7-1)	a mm
≤ 10	G 1/8	≥ 6,5
10 < DN ≤ 50	G 1/4	≥ 6,5
> 50	G 1/2	≥ 13



Key

- G thread
- a test part

Figure 3 — Pressure tapping orifice

These pressure tappings shall be fitted with test cocks:

- DN 6 (G $\frac{1}{8}$ connection) female outlet for devices $DN \leq 10$;
- DN 8 (G $\frac{1}{4}$ connection) female outlet for devices $10 < DN \leq 50$;
- DN 15 (G $\frac{1}{2}$ connection) female outlet for device $DN > 50$.

9.5 Mechanical characteristics

9.5.1 General

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 requirement.

9.5.2 Mechanical resistance of the body under pressure

9.5.2.1 Requirement

No visual permanent deformation, nor rupture of the body or the internal parts of the device shall occur.

9.5.2.2 Procedure

- 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 equal to 2,5 times the PN rating, the value that equal 2,5 MPa (25 bar).
- Hold this pressure for 5 min. and observe the device and note any observations.

Verify that the device satisfies the requirement of 9.5.2.1.

9.5.3 Endurance

9.5.3.1 Requirement

- a) Without replacement of any component, the device shall be capable of meeting the remaining requirements of Clause 10;
- b) the device shall be disassembled, examined and any anomaly of the coating, elastomer parts and synthetic materials, shall be noted.

9.5.3.2 Procedures

Test 1 — Behaviour at temperature

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

Test 2 — Thermal shock

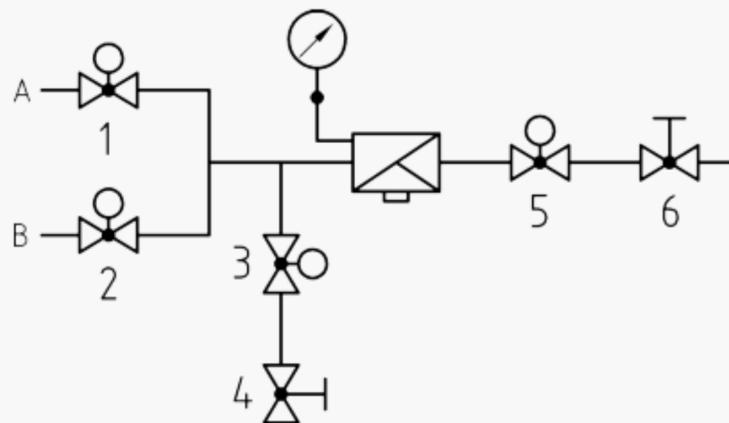
Following test 1, connect the device to a water supply with a temperature at 90 °C maximum. When the temperature at the outlet of the device reaches 85 °C, allow the flow to continue for 60 min and then supply the device with water at 15 °C for 10 min.

At the end of tests 1 and 2, verify that the device satisfies the requirement b) of 9.5.3.1.

Test 3 — Mechanical endurance

A Supply pressure: $(1 \pm 0,05)$ MPa ($10 \pm 0,5$) bar

B Supply pressure: $(0,3 \pm 0,03)$ MPa ($3 \pm 0,3$) bar



Key

1, 2, 3, 5 valve with time control of opening and closing
4, 6 adjusting valve

Figure 4 — Endurance testing equipment

Following the preceding tests 1 and 2, submit the device placed in the testing equipment (see Figure 4) to 5 000 cycles $^{+50}_0$ cycles at a temperature of 65 °C, each cycle comprising:

- stage 1: open valves 6 and 5 then 2, circulation at a flow rate as given in Table 3 at the value ± 5 % for (6 ± 2) s;
- stage 2: close valves 6 and 5;
- stage 3: valve 2 opened, static pressure of 0,3 MPa (3 bar) for (6 ± 2) s;
- stage 4: close valve 2, open valves 3 and 4. Upstream drain for 2 s;
- stage 5: close valves 3 and 4;
- stage 6: open valves 5 and 6; downstream drain to atmospheric pressure;
- stage 7: open valve 2, circulation at a flow rate given in Table 3 at the value ± 5 % for (6 ± 2) s;

- stage 8: close valves 5 and 6 then 2;
- stage 9: open valve 1. Static pressure at 1 MPa (10 bar) for (6 ± 2) s;
- stage 10: close valve 1, open valves 3 and 4. Upstream drain for 2 s;
- stage 11: close valves 3 and 4, open valves 5 and 6; downstream drain to atmospheric pressure.

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

- 1 250 cycles;
- the device is at rest for 14 h at ambient temperature;
- 1 250 cycles;
- the device is maintained under load at a static pressure of 1 MPa (10 bar) for 14 h at 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 ambient temperature;
- 1 250 cycles.

Table 3 — Nominal size versus endurance test flow rate

DN	8	10	15	20	25	32	40	50	65	80	100	125	150	200	250
Flow rate m ³ /h	0,4	0,6	1,3	2,2	3,5	5,8	9	14	24	35	56	56	56	56	56

At the end of test 3, verify that the device satisfies the requirements of 9.5.3.1.

9.5.4 Bending strength – Leaktightness of the body

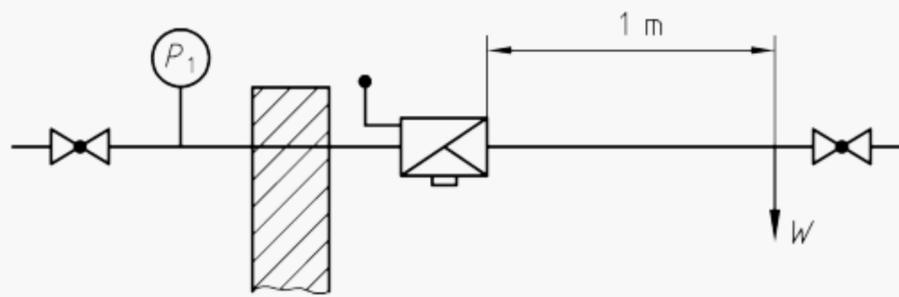
9.5.4.1 Requirement

There shall be no rupture, or permanent deformation or leakage from the body of the device. The test shall be carried out under the conditions defined in 9.5.4.2.

9.5.4.2 Procedure

Fasten the device onto the test bench with the supplied connections (special unions are not allowed). Apply a load W as shown in Figure 5 corresponding to the bending moment shown in Table 4, with a static pressure of 1,6 MPa (16 bar) applied in increments of 0,1 MPa (1 bar) per 5 s. Maintain the bending moment and the pressure for 10 min.

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



Key
 W load

Figure 5 — Bending moment testing equipment

Table 4 — Nominal size versus bending moment

DN	8	10	15	20	25	32	40	50	65	80	100	125	150	200	250
Bending moment Nm	30	40	80	150	300	400	500	600	750	950	1 300	1 800	2 400	3 800	5 500

Verify that the device satisfies the requirements of 9.5.4.1.

9.6 Leaktightness characteristics

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

9.6.1.1 Requirement

Under the test conditions described in 9.6.1.2, the device shall show no leakage, nor permanent deformation or deterioration.

9.6.1.2 Procedure

With the inlet of the device open to atmosphere apply a pressure of 1,6 MPa (16 bar) to the outlet. Raise the pressure in increments of 0,1 MPa (1 bar) per 5 s to 10 s using water at a temperature of 20 °C.

Maintain the pressure of 1,6 MPa (16 bar) at the outlet for a minimum of 2 min.

Isolate the outlet of the device from the pressure source and observe the device for a minimum of 10 min.

Verify that the device satisfies the requirements of 9.6.1.1.

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

9.6.2.1 Requirement

The closing pressure of the check valve shall be greater than 7 kPa (70 mbar). If a check valve EB conforming to EN 13959 is incorporated, the closing pressure shall be greater than 0,5 kPa (5 mbar).

9.6.2.2 Procedure

The verification is made with the device fixed in the flow position by measuring the difference in height between two levels (Figure 6).

The inside diameter of the level tubes shall be 10 _{-2}^0 mm. For devices > DN 80 the inside diameter of the level tubes shall be 20 _{-2}^0 mm.

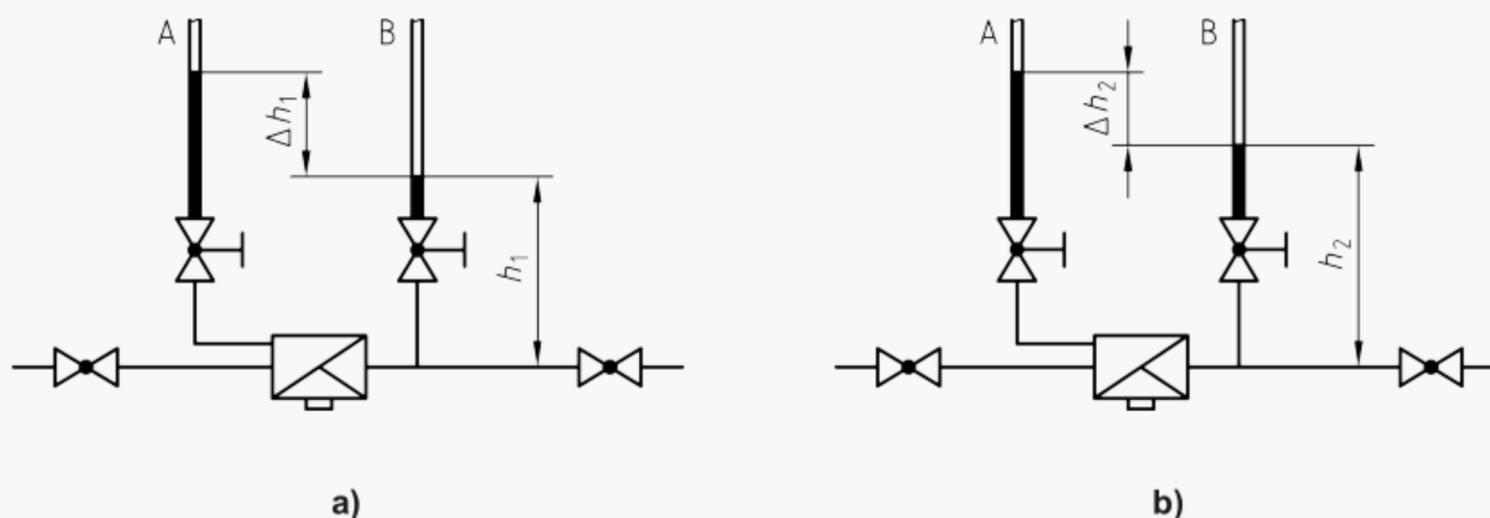


Figure 6 — Closing pressure testing equipment

Fix the device in flow position.

Admit water to the device and columns A and B, so that the height h_1 of the water column in tube B is obtained and sufficient to carry out the two tests.

Isolate the device for 15 min.

Note the height Δh_1 (Figure 6 a)).

Drain slightly downstream.

Isolate for 15 min.

Note the height Δh_2 .

Verify that the device satisfies the requirement of 9.6.2.1. The results can be expressed as a curve (see Figure A.1, for example). The leaktightness will be observed if Δh_1 and Δh_2 remain higher than 70 cm WC (7 kPa) (70 mbar) or 5 cm WC (5 kPa) (50 mbar) if a check valve EB is incorporated.

9.6.3 Verification of the leaktightness of the upstream spring loaded obturator in drain position at low pressure (in the opening direction)

9.6.3.1 Requirement

Under the test conditions, the leaktightness of the upstream spring loaded obturator shall be verified by the water level in the tube which shall be constant at each test stage.

No sagging of the water level in the tube shall be stated at each of the stages.

9.6.3.2 Procedure

Fill the device with water so that the water column has a height of (200 ± 50) mm in the tube (diameter inside $10 \begin{smallmatrix} 0 \\ -2 \end{smallmatrix}$ mm), as shown on Figure 7. For devices $> \text{DN } 80$ the inside diameter of the level tubes shall be $20 \begin{smallmatrix} 0 \\ -2 \end{smallmatrix}$ mm.

Isolate for $5 \text{ min} \pm 30 \text{ s}$.

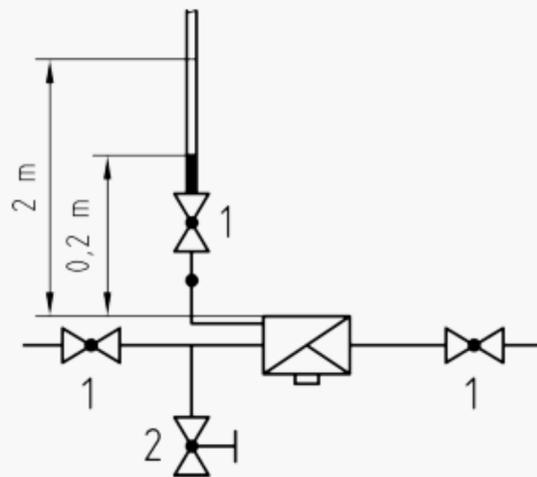
Raise the level in the tube to $(1\,000 \pm 50)$ mm.

Isolate for $5 \text{ min} \pm 30 \text{ s}$.

Raise the level in the tube to $(2\,000 \pm 50)$ mm.

Isolate for $5 \text{ min} \pm 30 \text{ s}$.

Verify that the device satisfies the requirement of 9.6.3.1.



Key

- 1 isolating valve
- 2 adjusting valve

Figure 7 — Leaktightness testing equipment (low pressure)

9.6.4 Verification of the leaktightness of the upstream spring loaded obturator under vacuum

9.6.4.1 Requirement

Under the test conditions, the downstream check valve being dismantled, no water shall be drawn through the device in the water trap.

9.6.4.2 Procedure

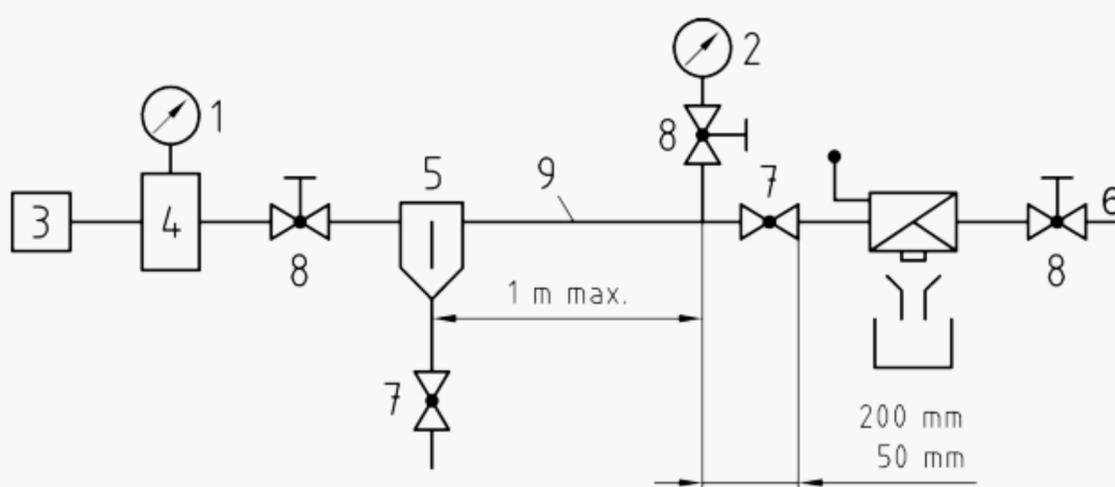
Place the device in the testing equipment (see Figure 8).

Adjust at the outlet the relief flow rate to the value indicated in Table 3.

Apply rapidly upstream of the device a vacuum of 0,05 MPa (0,5 bar) and hold the vacuum for 5 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).



Key

- | | | | |
|---|----------------|---|-----------------|
| 1 | vacuum gauge A | 6 | water supply |
| 2 | vacuum gauge B | 7 | isolating valve |
| 3 | vacuum pump | 8 | adjusting valve |
| 4 | vacuum vessel | 9 | 5 DN to 10 DN |
| 5 | water trap | | |

Figure 8 — Leaktightness testing equipment (vacuum)

9.7 Hydraulic characteristics

9.7.1 Test rig — General circuit

The set-up of the test equipment in Figure 9 is based upon horizontal installation (EN 1267). For other orientations the test rig shall be adjusted.

The inside diameter of the measurement line shall be approximately equal to the nominal diameter "D" of the device under test.

The identified pipe lengths shall have: $L \geq 15 D$, $L_2 \geq 10 D$ and $L_1 = 2 D$.

The circuit shall be dimensioned sufficiently to absorb pressure variations, otherwise pressure accumulation.

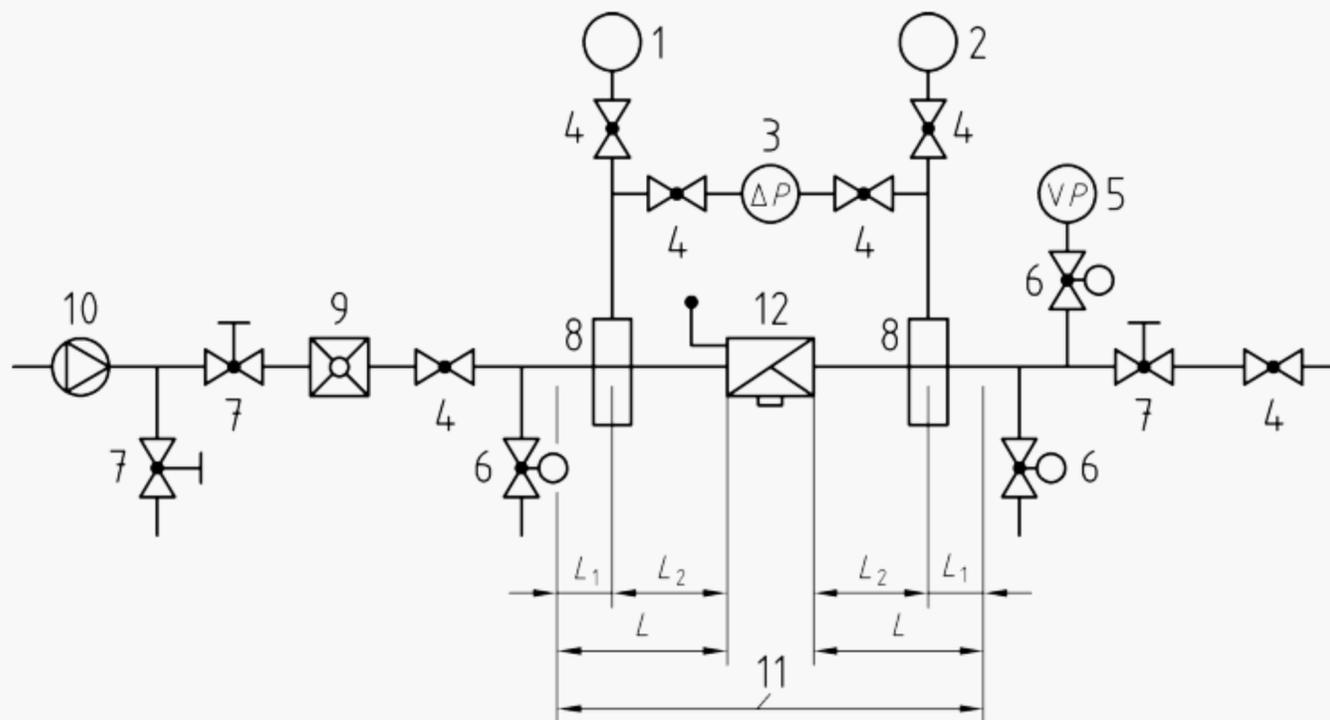
Vessels are to be provided.

The nature of the water used for the tests shall not impede the proper functioning of the devices being tested (provide for a filter if necessary).

The pressure gauges shall be of a convenient scale and datumed to the centre line of the measuring pipe.

Prior to any test, make sure the installation and the test circuit are well vented.

Wait for stabilization at each measuring point.

**Key**

- | | | | |
|---|--------------------------------|----|--|
| 1 | upstream pressure gauge | 7 | adjusting valve |
| 2 | downstream pressure gauge | 8 | standardized pressure take off tee (EN ISO 5167-1) |
| 3 | pressure gauge | 9 | flowmeter |
| 4 | ¼ turn stop valve full passage | 10 | pump |
| 5 | pressure accumulation vessel | 11 | measurement line |
| 6 | drain valve (fine adjustment) | 12 | device under test |

Figure 9 — Flow rate/pressure loss testing equipment**9.7.2 Verification of the pressure loss as a function of flow rate****9.7.2.1 Requirement**

For flow rate values measured from 0 to the flow rate given in Table 5, the pressure loss of 0,05 MPa (0,5 bar) shall not be exceeded, and the relief valve shall remain watertight. The test rig shall be in accordance with 9.7.1.

Table 5 — Nominal size versus flow rate

DN	8	10	15	20	25	32	40	50	65	80	100	125	150	200	250
Nominal flow rate m ³ /h	0,4	0,6	1,3	2,2	3,5	5,8	9	14	24	36	56	88	126	224	350

9.7.2.2 Procedure

Apply increasing pressure loss values across the device for the flow rates between the minimal and normal values given in Table 5. At each increase record the pressure loss value and measure the flow rate (see Figure A.2 for example).

Verify that the device satisfies the requirement of 9.7.2.1.

NOTE The pressure loss in the piping lengths between the device and the pressure tapping should be accounted for.

During the test for flow rate over pressure loss, verify the leaktightness of the relief valve during the whole test.

9.7.3 Verification of the opening and closing pressures of relief valve

9.7.3.1 Requirement

Under the following test conditions the relief valve shall:

- a) achieve its fully closed drain position (fully open throughflow) at a pressure $p_f \leq p_s + 0,05$ MPa (0,5 bar);
- b) start opening at a pressure $p_s \geq p_{stat} + 0,05$ MPa (0,5 bar);
- c) achieve its fully open drain position at a pressure $p_o \geq p_s - 0,036$ MPa (0,36 bar).

9.7.3.2 Procedure

9.7.3.2.1 General

The test has to be done with the set pressure p_s indicated on the device.

9.7.3.2.2 Start of opening of the relief valve

At the inlet of the device apply a pressure sufficient to ensure that the relief valve is fully closed (pressure p_f).

Slowly decrease the inlet pressure to 0 MPa (0 bar) and note the value of the pressure p_s at which the relief valve begins to open. Continue to decrease the inlet pressure and record the value of the pressure p_o at which the relief valve opens fully to the 20 mm disconnection distance.

Verify that the device satisfies the requirement b) and c) of 9.7.3.1.

9.7.3.3 Closing

Slowly increase the pressure p_1 to $p_s + 0,05$ MPa (0,5 bar).

Record the value of pressure p_f at which the relief valve closes fully.

Verify that the device satisfies the requirement a) of 9.7.3.1.

9.7.4 Verification of the relief valve flow rate

9.7.4.1 Requirement

The measured flow rate shall be not less than the corresponding value given in Table 3.

9.7.4.2 Procedure

Remove the downstream check valve element, or its moving parts. Apply a pressure of 0,05 MPa (0,5 bar) to the outlet of the device and measure and record the flow rate discharged from the relief valve port.

Verify that the device satisfies the requirements of 9.7.4.1.

NOTE The results can be expressed as a curve.

9.7.5 Compatibility with the products used for disinfection of water distribution systems

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 water distribution systems using potassium permanganate or sodium hypochlorite.

At the end of the procedures and without replacement of any component, the device shall satisfy all of the requirements in accordance with the remaining tests as listed in Clause 10.

9.7.5.2 Procedure

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 deionised water (conductivity $\leq 2,5 \mu\text{S/m}$);
- for 24 h into contact with a solution containing 0,10 g of sodium hypochlorite per litre of deionised water (conductivity $\leq 2,5 \mu\text{S/m}$).

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.

It shall be verified that the device satisfies the requirement of 9.7.5.1.

9.7.6 Resistance to corrosion — Salt spray fog test

9.7.6.1 General

This test only applies to devices having either a ferrous alloy body or a body with an internal coating.

9.7.6.2 Requirement

At the end of the test, the internal surfaces shall not exhibit any sign of corrosion, corrosion pitting, cracking or blowholes.

9.7.6.3 Procedure

With the inside of device exposed, either by dismantling or wedging of moving parts in the open position, apply the procedure described in ISO 9227 for a period of not less than 200 h.

Verify that the device satisfies the requirement of 9.7.6.2

9.7.7 Acoustic tests

9.7.7.1 General

This sub-clause specifies the procedure to measure the acoustic characteristics of the devices and to classify the devices by acoustic group.

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

9.7.7.2 Requirement

Under the following test conditions at a flow pressure of 0,3 MPa (3 bar), devices of acoustic groups I and II shall meet the sound pressure level for the appropriate acoustic group as given in Table 6.

9.7.7.3 Procedure

9.7.7.3.1 Mounting and operating conditions

Install the device in accordance with the conditions described in EN ISO 3822-3.

9.7.7.3.2 Method of measurement

Using the method described in EN ISO 3822-1 and 4.4 of EN ISO 3822-3:1997, measure the sound pressure level of the device.

9.7.7.4 Expression of the results

Record the appliance sound pressure level L_{ap} .

Table 6 — Noise classification of in line check valve

Acoustic group	L_{ap} dB (A)
I	< 20
II	$20 \leq L_{ap} \leq 30$
No classified	> 30

10 Order of testing

The conformity tests for the standard shall be performed according to the following order, and all tests executed on the same device:

1	Determination of the acoustic group	9.7.7
2	Verification of the pressure loss as a function of the flow rate	9.7.2
3	Verification of the opening and closing pressure of relief valve	9.7.3
4	Verification of the relief flow rate	9.7.4
5	Bending strength — Leaktightness of the body	9.5.4
6	Mechanical resistance of the body under pressure	9.5.2
7	Verification of the leaktightness of the downstream check valve (in the closing direction)	9.6.1
8	Verification of the leaktightness of the upstream spring loaded obturator in drain position at low pressure (in the opening direction)	9.6.3
9	Verification of the closing pressure of the downstream check valve and its leaktightness (opening direction)	9.6.2
10	Compatibility with the products used for disinfection of the networks	9.7.5
11	Resistance to corrosion — Salt spray fog test	9.7.6
12	Endurance	9.5.3
13	Verification of the leaktightness of the downstream check valve (in the closing direction)	9.6.1
14	Verification of the leaktightness of the upstream spring loaded obturator in drain position at low pressure (in the opening direction)	9.6.3
15	Verification of the leaktightness of the upstream spring loaded obturator under vacuum	9.6.4

11 Marking and technical documents

11.1 General

The specified marking and technical documents shall be in accordance with the recommendations of EN 1717.

11.2 Marking

Devices shall be marked permanently and visibly on the casing, or on a fixed identification plate.

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

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Marking shall indicate:

- a) name, manufacturer's brand or logo;
- b) arrow indicating the normal direction of flow;
- c) letter indicating family and type of device;
- d) nominal size DN;
- e) nominal pressure PN;
- f) set pressure p_s ;
- g) maximum service temperature in degrees Celsius ($^{\circ}\text{C}$);
- h) acoustic group (if applicable);
- i) reference of the manufacturer;
- j) individual identification number;
- k) reference to this European Standard, i.e. EN 13433;
- l) in 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».

11.3 Technical documents

These documents written at least in the language of the country in which the devices are distributed shall be supplied with, as a minimum, the following information:

- a) designation of the product;
- b) purpose of the device;
- c) field of application;
- d) installation instructions;
- e) use and maintenance instructions;
- f) device sub-assembly description;
- g) installation rules of the device, if different to d);
- h) flow rates with respect to the pressure losses (curve);
- i) list of spares;
- j) nature of the materials used.

12 Presentation at delivery

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

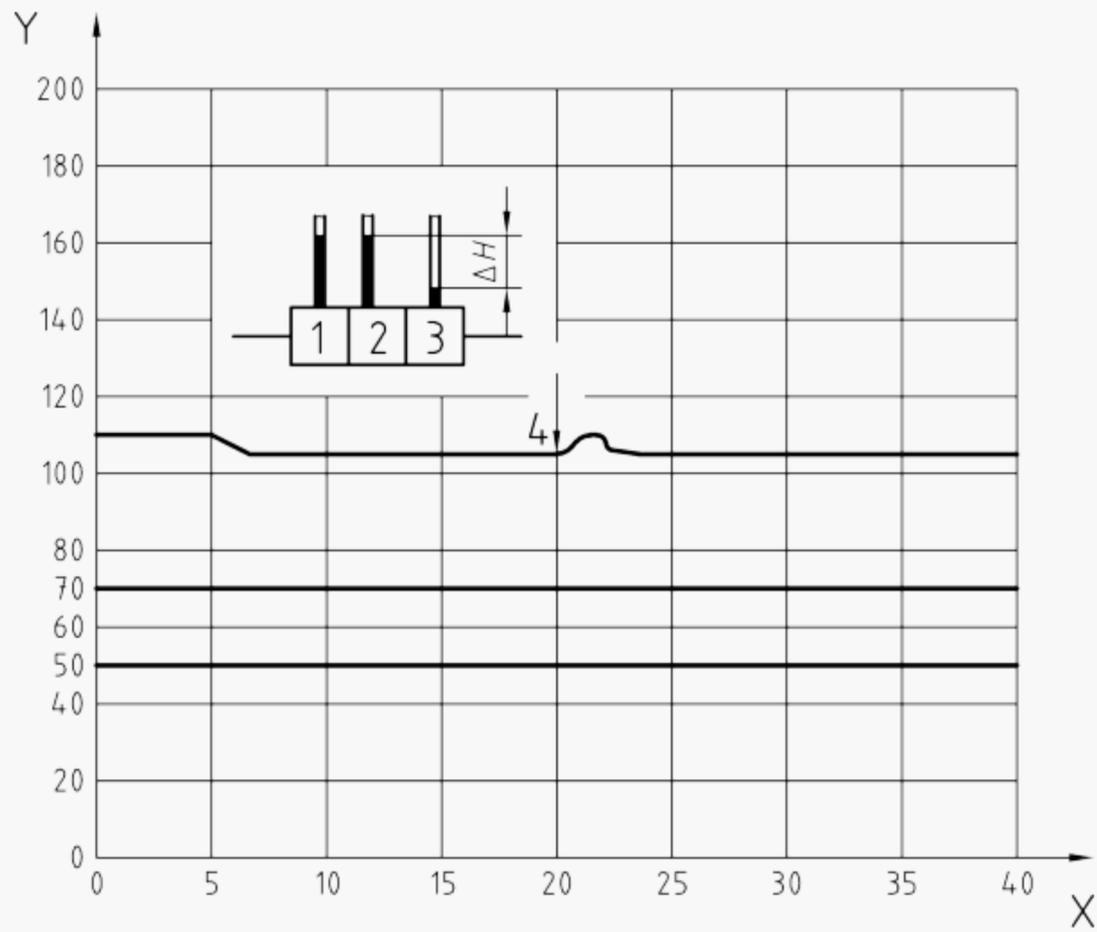
- a) damage to the threaded ends;
- b) external contamination:
 - 1) of inlet and outlet orifices;
 - 2) of orifices for the purpose of sanitary safety (relief valve, air inlets).

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

When not in use the means of protection shall remain attached to the device.

Annex A
(informative)

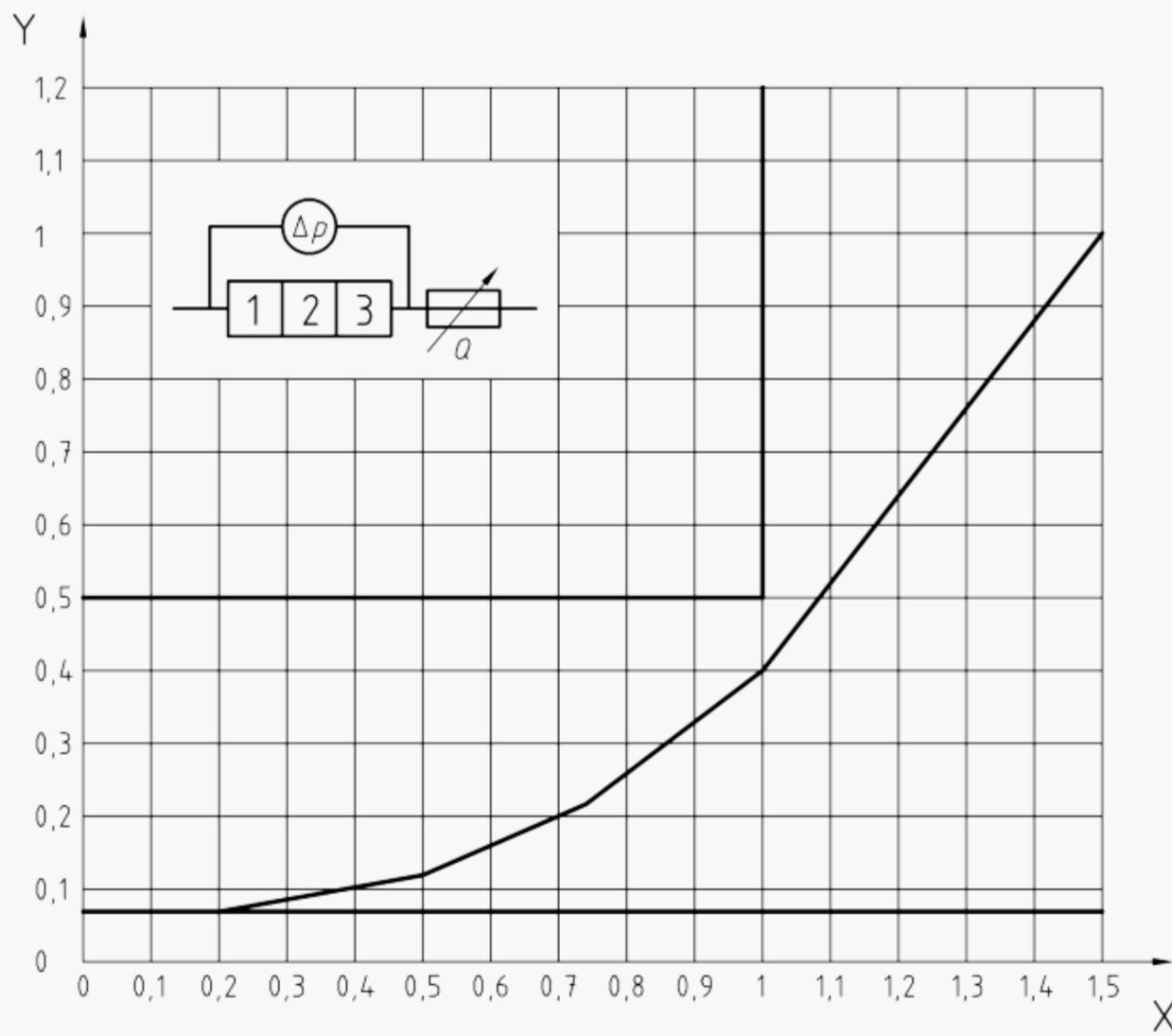
Examples of presentation of test results



Key

- Y Δp upstream/downstream (10^{-1} kPa)
- X time (min)
- 1 upstream
- 2 intermediate
- 3 downstream
- 4 vent downstream

Figure A.1 — Closing pressure of the downstream check valve

**Key**

- Y Δp upstream/downstream (10^{-1} MPa)
- X flow rate Q (m^3/h)
- 1 upstream
- 2 intermediate
- 3 downstream

Figure A.2 — Pressure loss v Flow rate $\Delta p = f(Q)$

Bibliography

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