BS EN 13433:2021

BSI Standards Publication

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

National foreword

This British Standard is the UK implementation of EN 13433:2021. It supersedes BS EN 13433:2007, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/504, Water supply.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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Devices to prevent pollution by backflow of potable water - Mechanical disconnector, 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

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 13433:2021) 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of an identical text or by endorsement, at the latest by June 2022, and conflicting national standards shall be withdrawn at the latest by June 2022.

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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 can 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 dimensional, physical-chemical, design, hydraulic, mechanical and acoustic characteristics of mechanical disconnectors, direct actuated Family G, Type A.

This document is applicable to mechanical disconnectors 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 document), into the potable water distribution system whenever the pressure of the latter is temporarily lower than in the polluted circuit.

This document covers the mechanical disconnectors of PN 10 that are capable of working without modification or adjustment:

— at any pressure up to 1,0 MPa (10 bar);

— with any pressure variation up to 1,0 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 documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 806-1, *Specifications for installations inside buildings conveying water for human consumption - Part 1: General*

EN 1329-1, *Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure - Unplasticized poly(vinyl chloride) (PVC-U) - Part 1: Specifications for pipes, fittings and the system*

EN 1453-1, *Plastics piping systems with structured-wall pipes for soil and waste discharge (low and high temperature) inside buildings - Unplasticized poly(vinyl chloride) (PVC-U) - Part 1: Specifications for pipes and the system*

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

EN 10310:2003, *Steel tubes and fittings for onshore and offshore pipelines - Internal and external polyamide powder based coatings*

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

EN 14901-1, *Ductile iron pipes, fittings and accessories - Requirements and test methods for organic coatings of ductile iron fittings and accessories - Part 1: Epoxy coating (heavy duty)*

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)*

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)*

EN ISO 3822-3:2018, *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 3822-3:2018)*

EN ISO 6509-1, *Corrosion of metals and alloys - Determination of dezincification resistance of copper alloys with zinc - Part 1: Test method (ISO 6509-1)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1717, EN 806-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
mechanical disconnector, direct actuated — Family G, Type A
device, also referred to as "GA", the characteristics of which are as follows:

— two pressure zones in flow position: upstream (zone 1) and downstream (zone 2);

— two pressure zones in zero flow position (static): upstream (zone 1) and downstream (zone 2), check valve closed;

— three pressure zones in drain position: upstream (zone 1) and downstream (zone 2) and intermediate zone (zone 3) at atmospheric pressure;

— the upstream spring loaded obturator with discharge system and the downstream (zone 2) check valve separate the intermediate zone (zone 3) from the upstream (zone 1) and downstream zone (zone 2);

— flow position is achieved at a pressure $p_f \geq p_s + 50$ kPa (0,5 bar);

— the relief valve starts opening at the set pressure $p_s \geq p_{stat} + 50$ kPa (0,5 bar);

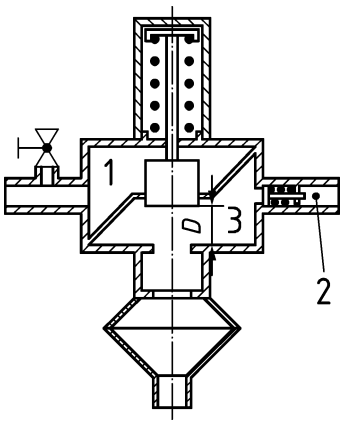
— drain position is achieved at a pressure $p_0 \geq p_s - 36$ kPa (0,36 bar);

— a determined relief flow rate;

— a drain position visible directly or by a position indicator

Note 1 to entry: See Figure 1.

Note 2 to entry: For the purposes of this document "Mechanical disconnector, direct actuated — Family G, Type A" are hereafter referred to as "device".



Key

1, 2, 3	pressure zones
D	disconnection distance

Figure 1 — Design principle of Mechanical disconnector, direct actuated – Family G, Type A

3.2
inlet pressure
p_1
pressure upstream (inlet side, zone 1) of the device

3.3
intermediate pressure
p_i
pressure in the intermediate zone of the device (in drain position $p_i = p_{atm.}$ and under flow condition $p_i = p_1$ (zone 3))

3.4
outlet pressure
p_2
pressure downstream (outlet side, zone 2) 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 disconnector

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
D
minimal vertical distance between the seat 1 of the relief valve and the seat 2 (see Figure 1) of the upstream zone

4 Denomination

For the purpose of this document for the devices the nominal sizes DN is a function of the minimum flow rate given in Table 5.

5 Designation

Mechanical disconnectors direct actuated Family G, Type A are designated by:

— name of the product;

— family and type;

— reference to this document, EN 13433;

— nominal size;

— connection type;

— material of its body;

— surface finish (possible coatings);

— acoustic group (if applicable).

EXAMPLE Mechanical disconnector direct actuated, Family G, Type A, EN 13433, DN 32, G 1 1/4 × G 1 1/4, CW617N, I.

6 Symbolization

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

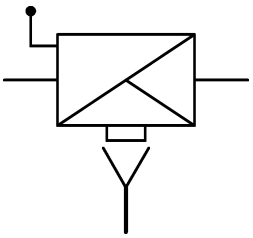


Figure 2 — Graphic symbol design principle of mechanical disconnector

7 Physical-chemical characteristics

7.1 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 potable water;

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 be suitable for the temperatures specified in the tests in this document;

e) the materials, and in particular copper alloys, for which recommendations or international standards exist, shall comply with the relevant European standards.

7.2 Materials

7.2.1 General

All materials coming into contact with water intended for human consumption shall present no health risk nor cause any change to the water in terms of quality, appearance, smell or taste.

NOTE While awaiting the adoption of verifiable European criteria for testing materials in contact with water intended for human consumption, existing national regulations concerning the use and/or the characteristics of these products remain in force.

7.2.2 Dezincification resistant copper alloy

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 materials used shall guarantee a dezincification depth less than 200 µm in any direction. For this purpose materials shall be tested in accordance with EN ISO 6509-1 and the product shall be marked in compliance with the indications according to Clause 11.

7.3 Surface of the body

7.3.1 General

The outside and inside surfaces of the device may or may not contain a coating. Such coating shall not impair the functional characteristics of the device.

The coating for protection of the basic material against corrosion can be either realized by epoxy coating or by polyamide powder based coating.

7.3.2 Epoxy Coating

Epoxy Coating shall fulfil the requirements of and be tested in accordance with Annex A, Table A.1.

7.3.3 Polyamide Powder based Coating

Polyamide powder shall fulfil the requirements of and be tested in accordance with Annex A, Table A.1.

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, and springs). A visible mark is not sufficient.

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

c) 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.

d) 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/Obturator

8.2.1 General

Any water retention shall not be possible within the intermediate zone.

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 9.6.4.

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, neither by adhesive, welding nor interlocking.

If applicable on the dimension “G” of the outlet of the air break to drain (see in EN 1717:2000, Clause 9), it shall be possible to fit a standardized drain pipe (Standard EN 1329-1 PVC compact or EN 1453-1 PVC with structured walls).

8.2.2 Mechanical Disconnector Family G, Type A

Under normal service conditions at $p_1 > p_s$ the relief valve is closed. At an inlet pressure of $p_1 \leq p_s$ the relief valve starts opening and at a pressure of $p_1 \leq p_o$ the relief valve is in drain position. There shall be a visible indication on the device, when the obturator is in the drain position, any water retention shall not be possible within the intermediate zone.

8.3 Disconnection distance

In drain position the obturator shall close the opening from upstream zone to the intermediate zone. The disconnection distance *D* shall be at least 20 mm (see Figure 1).

The relief valve shall be closed, before flow condition is achieved. The passage orifice of the relief valve 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 ambient temperature.

9.2 General tolerances

9.2.1 Tolerance of set parameters

In the absence of any particular specifications given in this document:

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

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

— hot water: ± 2 °C of the value specified;

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

9.2.2 Accuracy of measuring instruments

Instruments for measuring temperature shall be accurate to ±1 K. All other measuring instruments shall have an error limit of maximum ± 2 % of the measured value.

9.3 Dimensional characteristics

9.3.1 Connections

The connections shall be in accordance with the relevant European Standards.

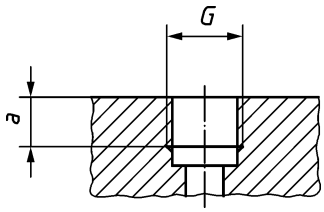
9.3.2 Pressure taps

The device shall have a pressure tapping orifice in the upstream zone according to the indications as shown in Figure 3 and Table 1.

The bores for pressure tapping shall have over their full depth a minimum cross-section area of 12,56 mm^2. Their smallest dimension shall be 4 mm.

Table 1 — Dimension of thread and test parts

DN	**Thread** (designation in accordance with EN ISO 228-1)	***a*** mm
≤ 15	G 1/8 or G 1/4	> 6,5
20 ≤ DN ≤ 50	G 1/4	> 6,5
> 50	G 1/2	> 13



Key

G	thread
a	minimum thread length of test par

Figure 3 — Pressure tapping orifice

These pressure tappings shall be fitted with isolating valves:

— DN 6 (G 1/8 connection or G 1/4 connection) female outlet for devices DN ≤ 15;

— DN 8 (G 1/4 connection) female outlet for devices 20 < DN ≤ 50;

— DN 15 (G 1/2 connection) female outlet for device DN > 50;

or other technical means for the verification of the device, e.g. fast couplings or removable plugs.

9.4 Mechanical characteristics

9.4.1 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.

If there is no other specification all tests shall be performed with water at maximum temperature 30 °C.

9.4.2 Mechanical resistance of the body under pressure

9.4.2.1 Requirement

There shall be no visual permanent deformation or rupture of the body or the internal parts of the device.

9.4.2.2 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 up to 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 9.4.2.1.

9.4.3 Endurance

9.4.3.1 Requirement

a) The endurance test shall be done with the same sample that has been tested according to 9.5.1, 9.5.2, 9.5.3, 9.6.3 and 9.6.5. After performing the test according to 9.4.3.2. The sample shall fulfil the requirements according to 9.5.1, 9.5.2, 9.5.3 and 9.6.3.

b) There shall be no visible damages or deformation of the coating, and of components.

9.4.3.2 Procedures

9.4.3.2.1 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 ± 10) %.

9.4.3.2.2 Test 2 — Thermal shock.

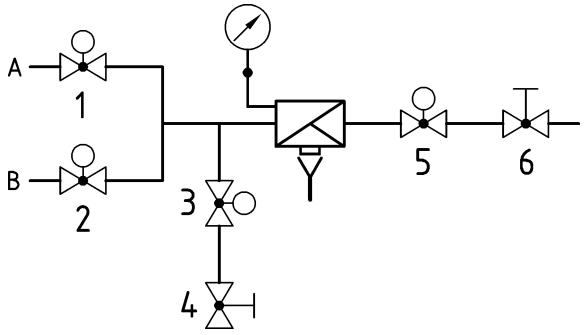
Following the preceding test, put the complete device at the flow rate as given in the Table 2, supplying it with water at 90 °C.

Once temperature reaches 85 °C at the outlet of the device, hold the flow rate for 60 min., and then supply for 10 min. with water at 15 °C.

9.4.3.2.3 Test 3 — Mechanical endurance

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

B Supply pressure: (1 ± 0,05) MPa (10 ± 0,5) 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 test 1 and test 2 submit the device placed in the test equipment (see Figure 4) to $5\,000\,\text{cycles}\,^{+50}_{0}$ cycles at a temperature of 65 °C with a flow rate given in Table 2 at the value ± 5 % (adjust with valve 6), each cycle comprising:

— stage 1: open valves 1 and 5; flow condition;

— stage 2: close valves 1 and 5;

— stage 3: open valve 1, static pressure of 0,3 MPa (3 bar) for (6 ± 2) s; static condition at 3 bar;

— stage 4: close valve 1, open valve 3; Upstream drain for 2 s; Disconnection;

— stage 5: close valve 3;

— stage 6: open valve 5; downstream drain to atmospheric pressure;

— stage 7: open valve 1; circulation at a flow rate given in Table 2 at the value ± 5 % for (6 ± 2) s;

— stage 8: close valve 5 and 1;

— stage 9: open valve 2, static pressure of 1 MPa (10 bar) for (6 ± 2) s;

— stage 10: close valve 2 and open valve 3, Upstream drain for 2 s; Disconnection;

— stage 11: close valve 3, open valve 5

— continue with stage 1 until $5\,000\,^{+50}_{0}$ cycles are achieved.

Table 2 — Nominal size versus endurance test flow rate

Type	DN	8	10	15	20	25	32	40	50	65	80	100	125	150	200	250
GA	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 9.4.3.1.

9.4.4 Torque test of Captive rotating Nuts and Bending Strength – Tightness of the Body

9.4.4.1 Requirement

a) After unscrewing, no visual damage of the nut shall be detected.

b) 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 9.4.4.2.

9.4.4.2 Test method

The device shall be fixed to the test rig into operating orientation as shown in Figure 5, captive rotating nut connection shall be tightened with the torque specified in Table 3. Gradually apply torque to the captive rotating nut/backnut until the tightening torque is reached and maintain it for a period of at least 1 min.

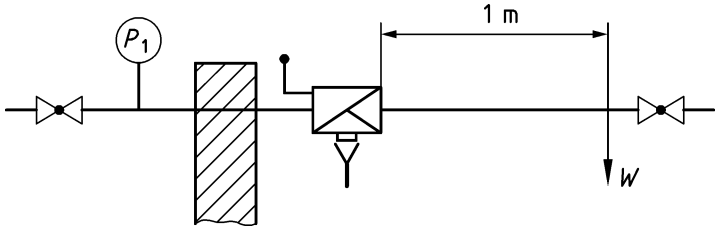
Once it is in water under pressure and without bending stress, the fitting shall be leaktight. In case it is not leaktight, the tightening torque can be increased.

Apply a load *W* as shown in Figure 5 corresponding to the bending moment shown in Table 4. Apply pressure up to 1,6 MPa (16 bar) with increments of 0,1 MPa (1 bar) per 5 s.

Maintain bending moment and pressure for 10 min. When calculating 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.

Table 3 — Tightening torque

Nominal size DN	**15**	**20**	**25**	**32**	**40**	**50**
Tightening torque (Nm)	60	75	100	125	150	150



Key

W load

Figure 5 — Bending moment testing equipment

Table 4 — Minimum bending moment according to nominal size

Nominal size DN	**8**	**10**	**15**	**20**	**25**	**32**	**40**	**50**	**65**	**80**	**100**	**125**	**150**	**200**	**250**
Bending Moment (Nm)	30	40	70	110	150	250	300	500	750	950	1300	1800	2400	3800	5500

Verify that the device satisfies the requirements of 9.4.4.

9.5 Leak tightness characteristics

9.5.1 Verification of the leak tightness of the downstream check valve in closing direction

9.5.1.1 Requirement

Under the test conditions described in 9.5.1.2, the device shall show no leakage, nor permanent deformation or deterioration.

9.5.1.2 Procedure

Downstream of the device, apply a pressure of 1,6 MPa (16 bar) with water at maximum 30 °C, the upstream zone and intermediate zone being at atmospheric pressure. The pressure is to be applied in increments of 0,1 MPa (1 bar) per 5 s until 1,6 MPa (16 bar) is reached.

Isolate the device from the supply system and hold the pressure for 10 min.

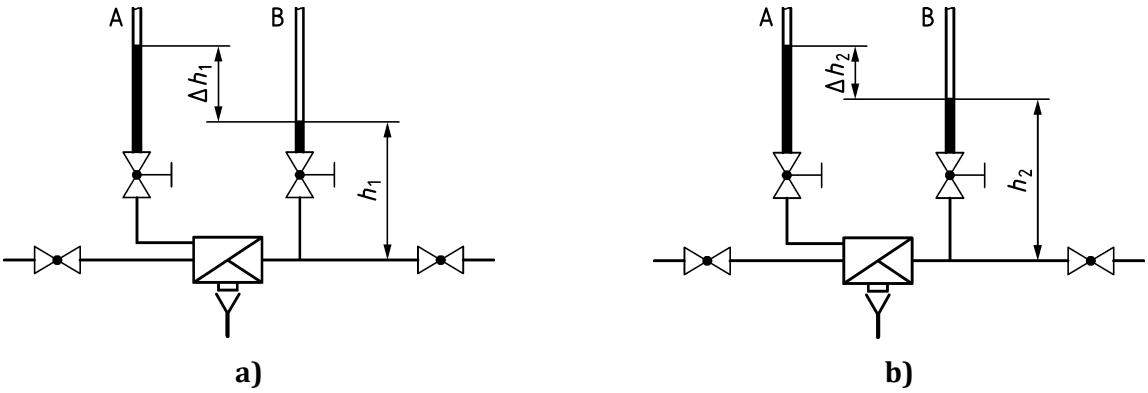
Verify that the device satisfies the requirements of 9.5.1.1.

9.5.2 Verification of the leak tightness of check valve device (opening direction)

9.5.2.1 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).

The differential pressure (Δh_1 and Δh_2) shall be constant for minimum of 5 min.



a) **b)**

Figure 6 — Test equipment for verifying closing pressure

9.5.2.2 Procedure

The verification is made with the device fixed in the flow position by measuring the differential pressure (Δh_1 and Δh_2) between the upstream and downstream zone (Figure 6).

Keep the obturator in flow position.

Admit water to the device and fix it in flow position.

Isolate the device for $300\ ^{+30}_{0}\ s$ from water supply.

Note the differential pressure of check valve (Figure 6).

Drain slightly downstream to atmosphere and wait $300\ ^{+30}_{0}\ s$.

Note the differential pressure of check valve (Figure 6).

Verify that the device satisfies the requirement of 9.5.2.1. The results can be expressed as a curve (see Figure A.1, for example). The leak tightness will be observed if differential pressures remain higher than 7 kPa (70 mbar) or 0,5 kPa (5 mbar) if a check valve EB is incorporated.

9.5.3 Verification of the leak tightness of the upstream spring loaded obturator in drain position at low pressure (in the opening direction)

9.5.3.1 Requirement

Under the test conditions, the leak tightness 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.

9.5.3.2 Procedure

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

Isolate for $300\ ^{+30}_{0}\ s$.

Raise the level in the tube to (1 000 ± 50) mm.

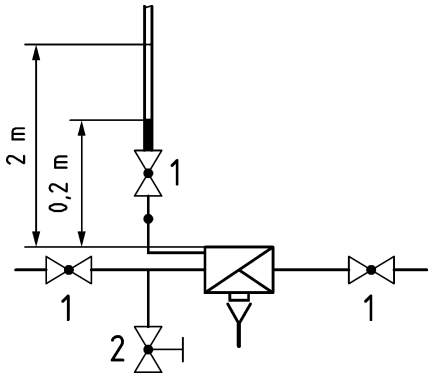
Isolate for $300\ ^{+30}_{0}\ s$.

Raise the level in the tube to (2 000 ± 50) mm.

Isolate for $300\ ^{+30}_{0}\ s$.

Verify that the device satisfies the requirement of 9.5.3.1.

Note the differential pressure of check valve (Figure 7).



Key

1	isolating valve
2	adjusting valve

Figure 7 — Leak tightness testing equipment (low pressure)

9.6 Hydraulic characteristics

9.6.1 Test rig – General circuit

The set-up of the test equipment in Figure 8 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: $L \geq 12\ D$, $L_2 \geq 10\ D$ and $L_1 = 2\ D$.

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

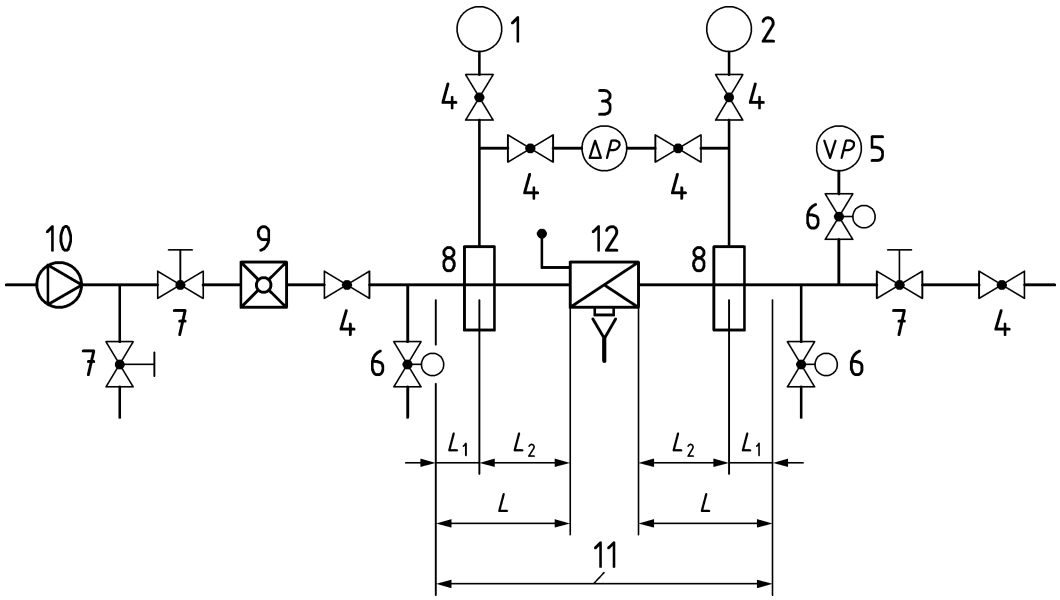
Vessels are to be provided.

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

The pressure gauges shall be of a convenient scale and positioned 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	1/4 turn stop valve full passage	10	pump
5	pressure accumulation vessel	11	measurement line
6	drain valve (fine adjustment)	12	device under test

Figure 8 — Flow rate/pressure loss testing equipment

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

9.6.2.1 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 9.6.1.

Table 5 — Nominal size versus flow rate

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

9.6.2.2 Procedure

Record the flow rate over pressure loss of the device for the full range from 0 to the flow rate given in Table 5.

Verify that the device satisfies the requirement of 9.6.2.1.

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 leak tightness of the relief valve during the whole test.

The results can be expressed as a curve (see Figure A.2, for example).

9.6.3 Verification of the opening and closing pressures of relief valve

9.6.3.1 Requirement

Under the following test conditions the relief valve shall:

a) achieve its fully closed drain position (fully open throughflow) at a pressure $p_f \geq p_s + 0{,}05$ MPa (0,5 bar);

b) start opening at a pressure $p_s \geq p_{stat} + 0{,}05$ MPa (0,5 bar). The pressure depends on the opening spring of the relief valves;

c) achieve its fully open drain position at a pressure $p_o \geq p_s - 0{,}036$ MPa (0,36 bar).

9.6.3.2 Procedure

9.6.3.2.1 General

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

9.6.3.2.2 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.

9.6.3.3 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 9.6.3.1.

9.6.4 Verification of the relief valve flow rate

9.6.4.1 Requirement

The measured flow rate shall be not less than the corresponding value given in Table 6.

9.6.4.2 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 9.6.4.1.

NOTE The results can be expressed as a curve.

Table 6 — Minimum relief flow rate according to nominal size

DN	**8 to 10**	**15**	**20**	**25**	**32**	**40**	**50**
Relief flow rate m^3/h	0,54	0,72	1,08	1,08	2,34	2,34	4,5
DN	**65**	**80**	**100**	**125**	**150**	**200**	**250**
Relief flow rate m^3/h	4,5	6,8	8,6	8,6	8,6	13,5	13,5

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

9.6.5.1 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 shock disinfection of the networks using sodium hypochlorite, hydrogen peroxide or chlorine dioxide.

9.6.5.2 Procedure

The compatibility is checked by exposing the internal parts of the device to the chemicals as defined in Table 7.

Table 7 — Test chemicals

Chemical formula	**Chemical solution**	**Contact time**	**Concentration**	**Temperature**
NaOCl	sodium hypochlorite	24 h	100 mg in 1 l demineralized water	ambient
H_2O_2	hydrogen peroxide	24 h	1 g in 1 l demineralized water	ambient
ClO_2	chlorine dioxide	12 h	6 mg in 1 l demineralized water	ambient

The pH of the water used for this test shall be 7 ± 0,5.

Each of the contacts being carried out under a static pressure of 0,3 MPa ± 0,1 MPa (3 bar ± 1 bar) measured upstream.

The test has shall carried out with at least one of the given chemicals as defined in Table 7.

Verify that the device satisfies the requirement of 9.6.5.1.

9.6.6 Acoustic tests

9.6.6.1 General

This subclause specifies the test method used 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 or equal to 32.

9.6.6.2 Procedure

9.6.6.2.1 Assembly of device in the test bench

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

9.6.6.2.2 Test method

The tests shall be carried out in accordance with the specifications of EN ISO 3822-1 and EN ISO 3822-3:2018, 4.4.

9.6.6.2.3 Determination of the group

The device can be classified into the following groups (see Table 8) in accordance with the *L* values obtained:

Table 8 — Noise classification of devices

Acoustic Group	*L* dB (A)	**Marking on the product**
I	< 20	l
II	$20 \leq L \leq 30$	II
Not classified	> 30	

If acoustic tests have not been performed, devices are not classified.

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:

No. of Test	**Description**	**Clause**
1	Acoustic test	9.6.6
2	Mechanical resistance of the body under pressure	9.4.2
3	Torque test of Captive rotating Nuts and Bending Strength – Tightness of the Body	9.4.4
4	Verification of the pressure loss as a function of the flow rate	9.6.2
5	Verification of the opening and closing pressure of relief valve	9.6.3
6	Verification of the relief valve flow rate	9.6.4
7	Verification of the leak tightness of the downstream check valve in closing direction	9.5.1
8	Verification of the leak tightness of the upstream spring loaded obturator in drain position at low pressure (in the opening direction)	9.5.3
9	Verification of the closing pressure of the downstream check valve and its leak tightness (opening direction)	9.5.2
10	Compatibility with the products used for disinfection of water distribution systems	9.6.5
11	Endurance	9.4.3
12	Verification of the leak tightness of the downstream check valve in closing direction	9.5.1
13	Verification of the closing pressure of the downstream check valve and its leak tightness (opening direction)	9.5.2

No. of Test	Description	Clause
14	Verification of the leak tightness of the upstream spring loaded obturator in drain position at low pressure (in the opening direction)	9.5.3
15	Verification of the opening and closing pressure of relief valve	9.6.3

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. 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 (°C);

h) acoustic group (if applicable);

i) reference of the manufacturer;

j) individual identification number;

k) 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 6509-1 as well as the products which do not contain zinc are allowed to be marked "DR".

11.3 Technical documents

The technical documentation shall be delivered with the product and/or available electronically, shall be written at least in the language(s) of the country in which the products are distributed giving all the necessary information for their installation and use, and shall include:

a) the designation of the product;

b) the reference to the present standard (EN 13433);

c) maximum operating temperature in degrees Celsius, °C and maximum pressure, MPa (bar);

d) the device's purpose;

e) its area(s) of use; installation and maintenance instructions;

f) an indication if the downstream check valve is a check valve EB conforming to EN 13959 the closing pressure can be 0,5 kPa (5 mbar);

g) specific applicable rules for installation as protection unit in accordance with EN 1717;

h) specific applicable rules for installation including the protection unit with the air break to drain in accordance with the specifications EN 1717;

i) flow rates and pressure drops (curve);

j) a list of spare parts for its constituent subassemblies;

k) the nature of materials.

12 Presentation at delivery

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

— damage to threaded ends;

— external contamination:

  — of inlet and outlet orifices;

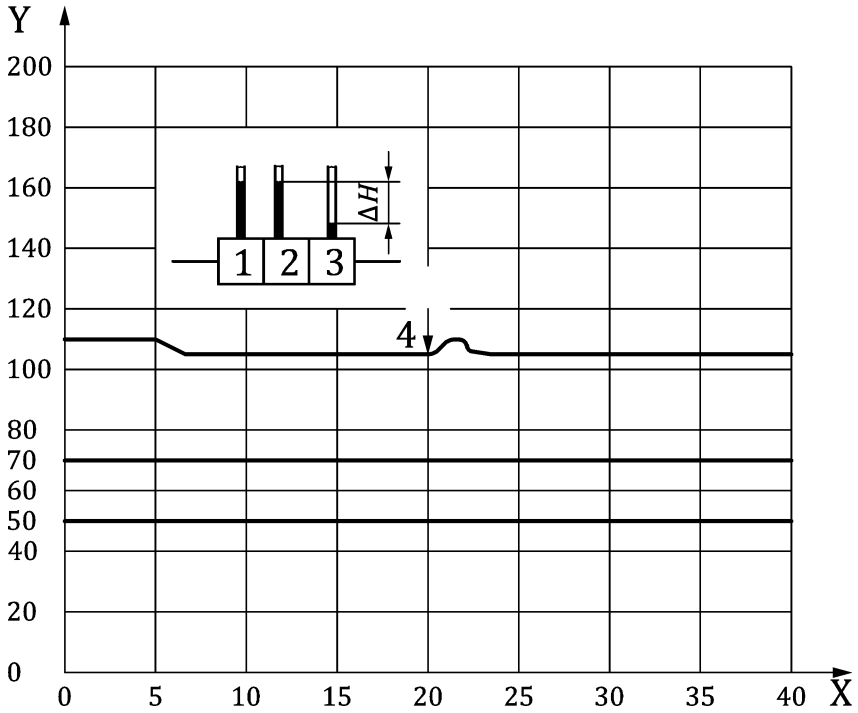
  — of orifices for the purpose of sanitary safety (discharge valve, air inlets, etc.).

These points are fulfilled if the product is protected by a cardboard box.

The test orifices shall be fitted with a means of protection when not in use, i.e. attached to the device.

Annex A
(informative)

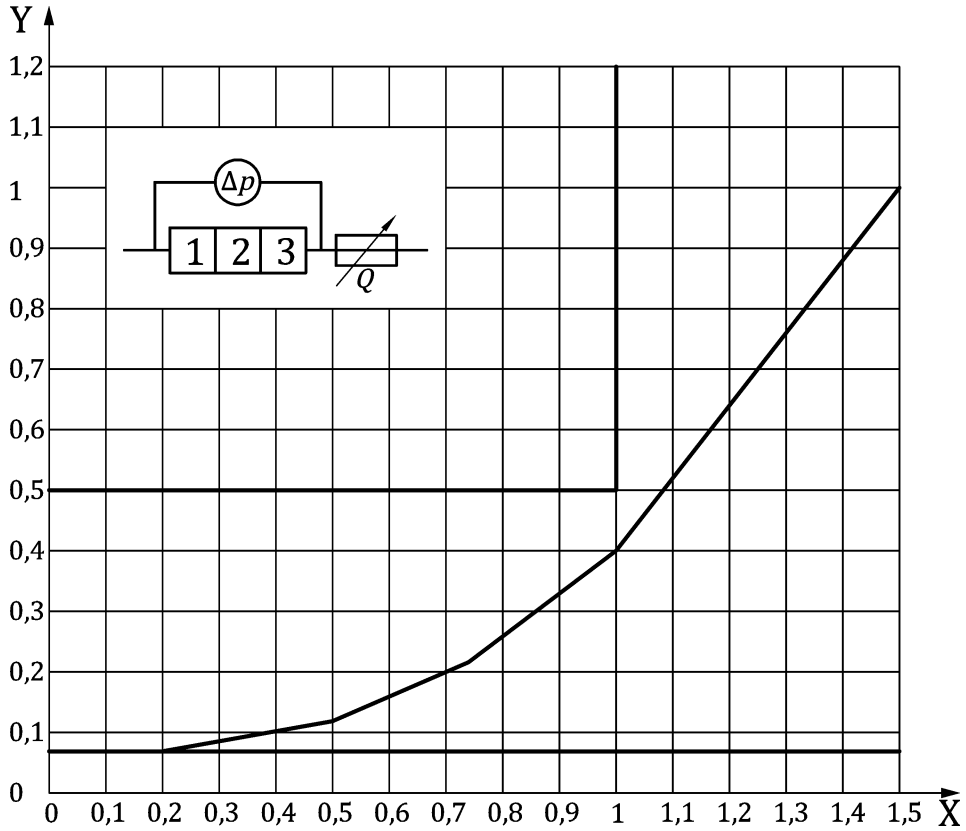
Examples of presentation of test results



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 vs. flow rate $\Delta p = f(Q)$

Table A.1 — Table of the requirements function of the type of coating

Criteria	EN 14901-1, Epoxy coating		EN 10310, Polyamide powder coating	
	Requirement	Used standard	Requirement	Used standard
Preparation of surface	Sa 2 1/2	EN ISO 8501 (all parts)	Sa 2 1/2 Rz 40 to 90 µm	EN ISO 8501 (all parts) EN ISO 4287
Ground coat	(not defined)	(not defined)	(see Table 1 in EN 10310:2003)	
Appearance of coating	uniformity of whole surface		uniformity of whole surface	
Covering thickness	not lower than defined by manufacturer	EN ISO 2808	> 200 µm edges < r 3 mm 150 µm	EN ISO 2808
Impact strength	no cracking or unsticking using a weight of 1 kg	EN ISO 6272-1,	no porous after testing	EN ISO 6272-1
Adhesion of the film	< 250 µm ≤ 250 µm	EN ISO 2409 and EN ISO 4624	Annex B of EN 10310:2003	
Degree of polymerisation	Level 1 or 2	EN ISO 11357-1	not applicable	
Corrosion resistance of coating	Degree of rusting < Ri 2 degree of blistering < S2	EN ISO 4628-2 EN ISO 2409 EN ISO 4624 EN ISO 4628-3	not tested	
Salt spray test	Degree of rusting < Ri 2 degree of blistering < S2	ISO 9227 EN ISO 4628-2 EN ISO 4628-3 EN ISO 2409 EN 4624	after 1 000 h adhesion degree 3	EN ISO 7253
Cut back length	not defined		definition by Manufacturer	
Indentation resistance	not defined		depth max 0,05 mm at 23 °C depth max 0,1 mm at 60 °C	
Electrical insulation resistance	not defined		10^8 (Ω× m^2)	

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EN ISO 7253, *Paints and varnishes - Determination of resistance to neutral salt spray (fog) (ISO 7253:1996)*

EN ISO 8501, *Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness (ISO 8501)*

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