BRITISH STANDARD

BS EN
15096:2008

Devices to prevent pollution by backflow of potable water — Hose Union anti-vacuum valves — DN 15 to DN 25 inclusive Family H, type B and type D — General technical specification

ICS 91.140.60

National foreword

This British Standard is the UK implementation of EN 15096:2008.

The UK participation in its preparation was entrusted by Technical Committee B/504, Water supply, to Subcommittee B/504/4, Backflow prevention.

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

The UK Committee would like to comment on the following:

1. According to Clause **6.2** it is obligatory that only certain markings should be visible on the devices in question. This would imply that the other markings listed are optional. The UK Committee would like to clarify that all the markings specified in Clause **6.2** are mandatory.
2. The use of differing inlet and outlet threads permitted by Clause **8.2** may not provide the expected security against disconnection of the device. It is the opinion of the UK Committee that other devices could still be attached to these threads using other methods (such as adaptors).
3. In the opinion of the UK Committee, the measurements given in Clause **10.1** a) and b) might not be met by using instruments with a permitted precision range of ±2%.
4. The measurement of "h" described in Clause **10.7.4.2** c) is defined differently in Figure 8. The UK Committee recommends that the measurement in Clause **10** is followed.

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

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 29 August 2008

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Devices to prevent pollution by backflow of potable water - Hose Union anti-vacuum valves - DN 15 to DN 25 inclusive Family H, type B and type D - General technical specification

Dispositifs de protection contre la pollution par retour de l'eau potable - Soupape anti-vide d'extrémité - DN 15 à DN 25 inclus famille H, type B et type D - Spécifications techniques générales

Sicherungseinrichtungen zum Schutz des Trinkwassers gegen Verschmutzung durch Rückfließen - Rohrbelüfter für Schlauchanschlüsse - DN 15 bis DN 25, Familie H, Typ B und Typ D - Allgemeine technische Bestimmungen

This European Standard was approved by CEN on 3 November 2007.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

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Foreword

This document (EN 15096:2008) 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 July 2008, and conflicting national standards shall be withdrawn at the latest by July 2008.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This standard has been developed in reference with EN 1717.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, 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 the 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 standard:

a) this standard provides no information as to whether the product may be used without restriction in any of the Member States of the EU or EFTA;

b) it should be noted that, 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:

a) the field of application;

b) the requirements of hose union anti vacuum valves;

c) dimensional and physio-chemical properties, and properties of general hydraulic, mechanical and acoustic design of hose union anti-vacuum valves of nominal sizes DN 15 up to and including DN 25;

d) marking and technical product information.

This standard specifies the characteristics of hose union anti-vacuum valves of nominal size DN 15 up to and including DN 25 that are suitable for use in drinking water systems at pressures up to and including 1 MPa (10 bar) and temperatures up to and including 65 °C and for 1 h at 90 °C.

HB protects against back siphonage only and should be installed in vertical downward flow position.

HB and HD anti-vacuum valves are for installation exclusively at the connecting point between stop valve and hose in vertical downward flow position.

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 1717, *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, *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)*

EN ISO 9227, *Corrosion tests in artificial atmospheres - Salt spray tests (ISO 9227:2006)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
hose union anti-vacuum valve HB

valve equipped with air inlet ports, which are closed at zero flow and when water flows in the intended direction above atmospheric pressure

NOTE The air inlets are opened if there is subatmospheric pressure at the water inlet and closed to be watertight again when the supply lines are back to at least atmospheric pressure.

3.2
hose union anti-vacuum valve HD

valve HB with integrated check valve EB located upstream (monoblock)

NOTE For the purpose of this standard, "hose union anti-vacuum valve(s)“ are hereafter referred to as "device(s)“.

4 Nominal size

The nominal size of the devices (DN designated) shall correspond to the nominal size of the threaded connection according to Table 1.

Table 1 — Thread size vs nominal size

Thread size according to EN ISO 228-1	G ½	G ¾	G 1
DN	15	20	25

5 Designation

The device is designated by:

a) name

b) family

c) type

d) nominal size

e) body material

f) reference to this document (EN 15096)

Example of designation

Hose union anti-vacuum valve family H type B, DN 20, gun metal, EN 15096

6 Marking and technical product information

6.1 General

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 countries where the use of dezincification resistant materials is required, the dezincification resistant products, as well as the products which do not contain zinc, shall be marked << DR >>.

6.2 Marking

The devices shall be permanently and visibly marked on the body or on a fixed identification plate.

This information shall be on the outside of the device. The marking has to be indelible and obtained by moulding, engraving or similar procedures.

The marking shall indicate

a) name, manufacturer's brand or logo;

b) arrow indicating direction of flow;

c) nominal size (DN);

d) acoustic group;

e) letters indicating family and type of device;

f) nominal pressure (PN);

g) conformance with this document (EN 15096);

h) maximum operating temperature °C.

Marking a), b), c), and e) are obligatory. In case there is no marking for d), the device has to be considered as not classified acoustically.

6.3 Technical product information

Each package and/or each batch and/or each catalogue of the supplier/manufacturer shall contain technical product information which shall be written in a commonly spoken language of the country in which the product is sold.

It shall provide the following information:

a) designation and purpose of the product;

b) installation instructions;

c) minimum installation height;

d) (brand) name and address of supplier/manufacturer;

e) instructions for maintenance, if any;

f) spare part list, if any;

g) nature of materials;

h) terminal/inline use.

7 Graphic symbol

In this document, the devices are expressed graphically by:

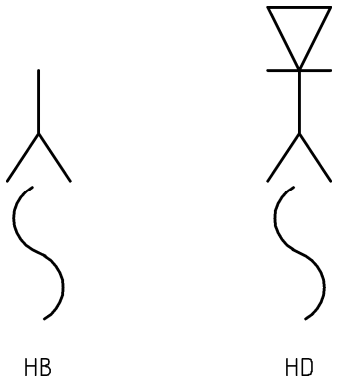


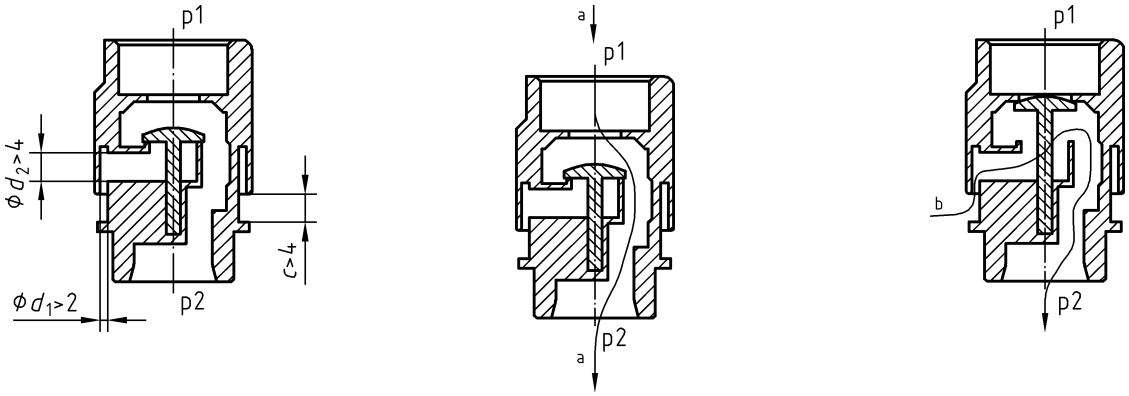
Figure 1 — Hose union anti-vacuum valve symbol

8 General design characteristics

8.1 Design principle

A typical design principle of HB and HD device is given in Figure 2 and Figure 3.

Dimensions in millimetres



Zero flow
$p_1 = p_2 = p_{atm}$

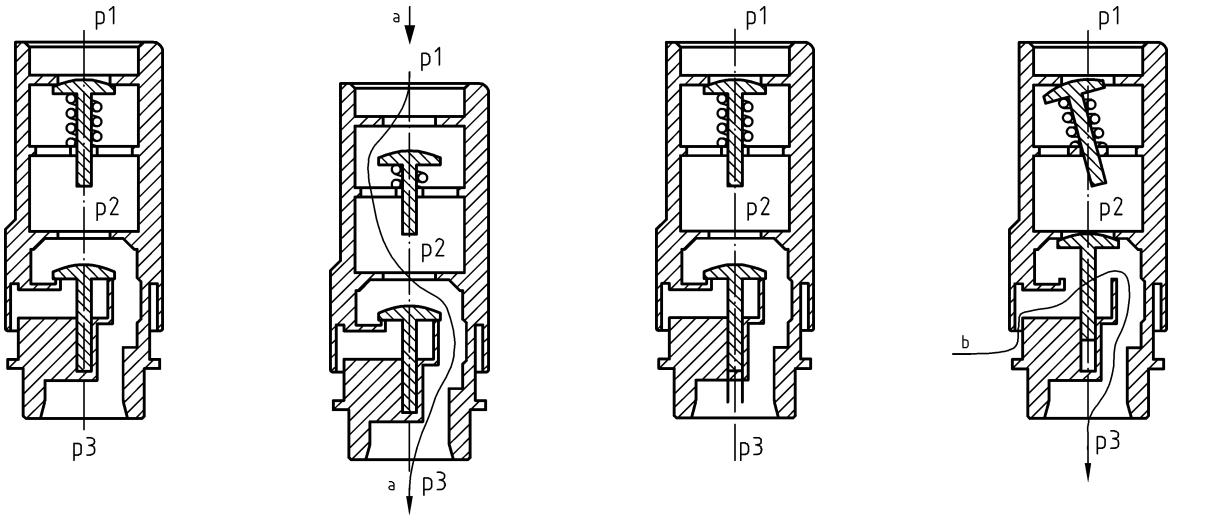
flow
$p_1 > p_2 > p_{atm}$

back siphonage
$p_1 < p_2 = p_{atm}$

Key

a water supply
b air inlet

Figure 2 — Design principle of HB device



zero flow
$p_1 > p_2 = p_3 = p_{atm}$

flow
$p_1 > p_2 > p_3 > p_{atm}$

back siphonage
$p_1 < p_2 = p_3 \leq p_{atm}$
check valve type EB leak-tight

back siphonage
$p_1 < p_2 < p_3 \leq p_{atm}$
check valve type EB leaks

Figure 3 — Design principle of HD device

8.2 Connections

Connections shall comply with EN ISO 228-1.

The device shall have a means to be fixed permanently to the point of use outlet such that after removal of the device a hose cannot be connected to the outlet of the point of use (e.g. irreversible damage of the connecting thread or different thread dimensions inlet /outlet) or a permanent visible leakage is created.

8.3 Check valve

The check valve of a HD has to comply with the requirements of EN 13959 for EB.

In case of subatmospheric pressure in the supply lines, the air inlets of an HD will only be opened if the EB is defective (leaks).

9 Physico-chemical characteristics

9.1 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 in accordance with EN ISO 9227;

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 distributed;
2) with the fluids or matter liable to come into contact with them;
3) with the products normally used for desinfection operations of the network: potassium permanganate and sodium hypochlorite.

9.2 Nature of 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 indication in Clause 6;

b) neither the materials nor 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 standards exist shall comply with the relevant recommendations or international standards.

10 Characteristics and tests

10.1 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 requirements.

The accuracy of measurements and used measuring instruments shall be applied.

a) In the absence of any particular specifications:

i) flow rate and pressure: ± 2 % of the value indicated;
ii) temperature: cold water ± 5 °K of the value indicated;
hot water ± 2 °K of the value indicated;
iii) time: $^{+10}_{0}$ % of the value indicated

b) Temperature measurements shall be accurate to ± 1 K

All the measuring instruments shall have a precision of ± 2 % of the measured value.

10.2 Test sequence

Four test specimen have to be submitted. The order of tests is recommended in Annex A.

Stage 1 Visual verification. See 10.3

Stage 2 Bending moment and tightness of HB element. See 10.4

Stage 3 Flow rate/pressure loss. See 10.5

Stage 4 Opening Pressure. See 10.6

Stage 5 Endurance. See 10.7

Stage 6 Vacuum. See 10.8

Stage 7 Tightness. See 10.9

For combined devices only the backflow related requirements of EN 1717 have to be performed. The combined devices e.g .draw off taps, valve combinations etc. shall also comply with the relevant recognised standard.

10.3 Visual verification (stage 1)

10.3.1 Procedure

Check by visual verification that:

a) Test specimen conform with the description and the appropriate drawings of the manufacturer;

b) Dimensional requirements of this document are met;

c) Air inlets are shrouded and directed downward and designed to ensure that they cannot easily be blocked by deposits.

10.3.2 Verification of the dimensional requirements of air inlets

a) if the shroud is not part of the body of the HB its openings shall have a clearance of at least 2 mm (d1, see Figure 2),

b) air passages relating to air inlets shall have a width (d2, see Figure 2) of not less than 4 mm at any point with the exception of annular slits (d1, see Figure 2), which must have a minimum width of 2 mm,

c) a clearance (c, see Figure 2) of at least 4 mm shall be maintained between the air intake orifice and any projections and shoulders and/or end threads.

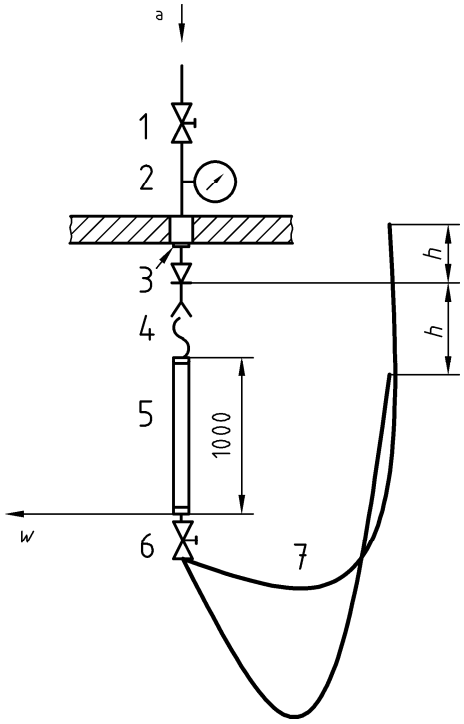
10.4 Bending moment and tightness test of HB element (stage 2)

10.4.1 Tightness test equipment

The test equipment used for testing the tightness at the limit of the positive/negative pressure region shall be as shown in Figure 4. The test device shall be mounted in the attitude recommended by the manufacturer.

The inner diameter of the hose shall be of the same nominal size as the test specimen. The hose may be replaced by an equivalent device.

Dimension in millimetres



Key

1 valve
2 pressure gauge
3 mounting contrivance for the test device
4 test device
5 steel pipe
6 valve
7 transparent hose
a water supply
W load

Figure 4 — Bending moment and tightness test equipment

For HD testing the check valve element shall either be blocked fully open or removed.

For combined devices HD the leak tightness between body and EB cartridge (if used) has to be tested according to EN 13959.

10.4.2 Bending moment, mechanical strength of the body and static high pressure leak tightness test

10.4.2.1 Procedure

The test equipment is shown in Figure 4;

a) Install the test specimen according to the manufacturer's instructions;

b) Purge the system of air;

c) Close valve 6;

d) Increase the supply pressure to 1,6 ± 0,05 MPa (16 ± 0,5 bar) at a rate not exceeding 100 kPa per 5 s;

e) During the test apply a load W to give a bending moment according to Table 2;

f) Wait for 10 min.

10.4.2.2 Requirements

There shall be no breakage, permanent deformation of the body or leakage out of the air inlets.

Table 2 — Nominal size vs bending moment

Nominal size — DN	15	20	25
Bending moment [Nm] (load W [N])	50	70	150

10.4.3 Static low pressure tightness test

10.4.3.1 Procedure

The test equipment is shown in Figure 4.

a) Install the test specimen according to the manufacturer's instructions;

b) Purge the system of air;

c) Raise the hose end about h = 500 mm above the moving element;

d) Close valve (1);

e) Wait 5 min.

10.4.3.2 Requirements

There shall be no leakage out of the air inlets.

10.4.4 Dynamic low pressure tightness test

10.4.4.1 Procedure

The test equipment is shown in Figure 4.

Adjust the flow of water such that the device allows air to enter when the end of the transparent hose is lowered to maximum 250 mm below the test specimen. The hose shall be raised and lowered 10 times to $h = \pm$ 250 mm in about 30 s.

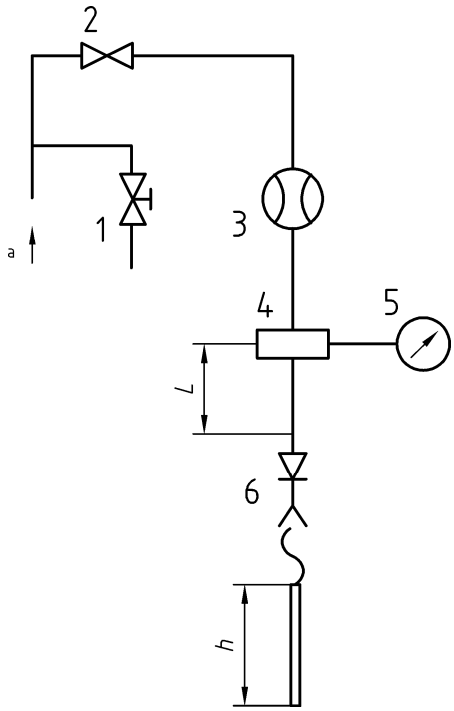
10.4.4.2 Requirement

No water shall leak from the air inlets during any of the 10 cycles.

10.5 Flow rate/pressure loss test (stage 3)

10.5.1 Flow rate/pressure loss testing equipment

Dimensions in millimetres



Key

1 needle type valves
2 valve
3 flow meter
4 pressure take off, according to EN ISO 5167-1
5 pressure gauge
6 test device
a water supply
h straight length of tube of the smallest size corresponding to the nominal size "DN" of the test device

Figure 5 — Flow rate/pressure loss testing equipment

10.5.2 Procedure

The test equipment is shown in Figure 4.

- Record the flow rate/pressure loss of the device over the full range from 0 to the flow rate given in Table 3. Verify if the value obtained corresponds to the requirement.
- If necessary the pressure loss in the piping length between the test specimen and the pressure tap should be accounted for.
- During the whole test, verify the leak tightness of the test specimen.

10.5.3 Requirement

The flow rate at a pressure differential of 0,05 MPa (0,5 bar) shall not be less than the values given in Table 3.

No leakage out of the air inlets shall be observed throughout the whole test.

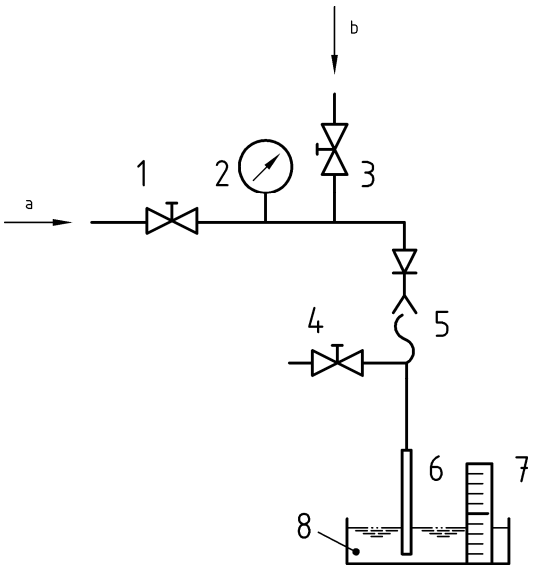
In case the HB/HD is integrated in combined devices the flow rate requirements of those devices shall be applicable.

Table 3 — Nominal size vs minimum flow rates

Nominal size — DN	15	20	25
Minimum flow rate — l/s	0,15	0,30	0,5

10.6 Opening pressure test (stage 4)

10.6.1 Test equipment



Key

1, 3, 4 valve
2 pressure gauge
5 test device
6 transparent tube
7 scale
8 water reservoir
a water supply
b vacuum supply

Figure 6 — Opening pressure test equipment

10.6.2 Procedure

The test equipment is shown in Figure 6.

a) The check valve shall be blocked fully open or be removed (HD only);

b) Install the test specimen according to the manufacturer's instructions;

c) Purge the system of air filling the container with water;

d) Close valve (1) and open valve (4);

e) Observe the water column;

f) Close valve (4);

g) Open valve (3) slowly;

h) Observe the water column in the tube.

10.6.3 Requirements

a) After step (d), the water column in the transparent tube shall fall to container water level rapidly.

b) After step (g), the water rise shall not exceed 100 mm.

10.7 Endurance test (stage 5)

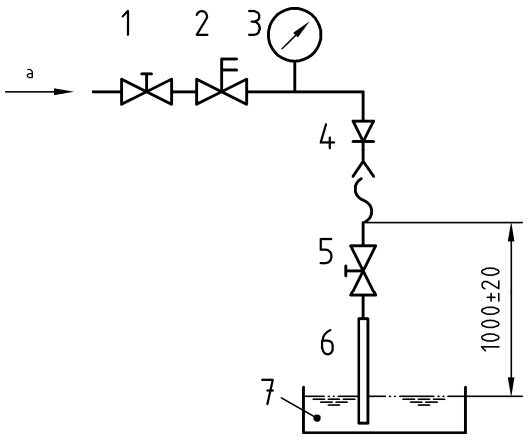
10.7.1 General

For this test, three new test specimens are required that have not undergone the tests described above.

In case of HD testing, the check valve has to be removed or blocked fully open.

10.7.2 Endurance test equipment

Dimensions in millimetres



Key

1	valve	5	valve
2	solenoid valve	6	transparent tube
3	pressure gauge	7	water reservoir
4	test device	a	water supply

Figure 7 — Endurance test rig for dynamic test

Opening of solenoid valve (2) shall not create pressure peaks bigger than 1 MPa (10 bar).

10.7.3 Dynamic test (specimen 1)

10.7.3.1 Procedure; dynamic test

The test equipment is shown in Figure 6.

a) Set up: With solenoid valve (2) open adjust valve (1) and (5) together to achieve (0,5 ± 0,05) MPa (5 ± 0,5 bar) at pressure gauge (3) at the inlet of the device.

b) Open (2) for (10 ± 1) s.

c) Close (2) and wait until the transparent sight tube is fully drained.

d) One test cycle includes the sequence b) and c). Change over to be accomplished in not more than 1 s.

e) Subject the valve to 5 000 cycles. For the first hour use water at 90 °C and then continue with water at 65 °C for the remainder of test.

f) Repeat e) four times with an idle period of 12 h between each 5 000 cycles.

g) Perform a leak tightness test 10.4.4.

10.7.3.2 Requirements for dynamic test

a) Throughout the test the valve shall fully drain down at each cycle.

b) There shall be no leakage during the test.

c) Any failure during the course of test is cause for rejection.

10.7.4 Endurance test; static, low pressure (specimen 2)

10.7.4.1 General

The test equipment is shown in Figure 8.

10.7.4.2 Procedure, static test, low pressure (specimen 2)

a) Install the test specimen according to the manufacturer's instructions.

b) Purge the system of air.

c) With the hose full of water raise the end (500 ± 20) mm above the outlet of the device.

d) Close valve 1.

e) Wait 14 days ± 10 h.

f) Open drain valve (3).

g) Lower the hose slowly into the water reservoir (8).

h) Close drain valve (3) and open valve (2) slowly.

i) Repeat opening pressure test (stage 4).

10.7.4.3 Requirements for static test

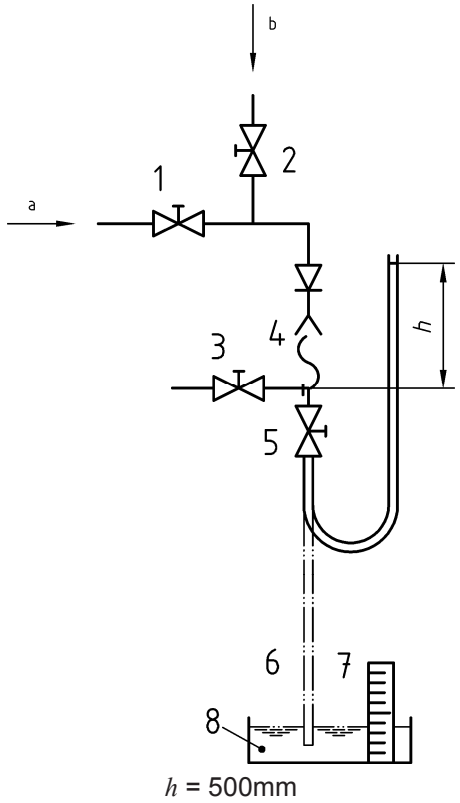
a) No leakage shall be observed throughout the test.

b) The requirements of the opening pressure test shall be fulfilled.

10.7.5 Endurance testing; 14 days (specimen 3)

10.7.5.1 Endurance testing equipment 14 days

Dimensions in millimetres



Key

1 valve
2 valve
3 drain valve
4 test device
5 valve
6 transparent hose
7 scale
8 water reservoir
a water supply
b vacuum supply
h vertical distance between the edge at the inlet of the device and the water level

Figure 8 — 14 days endurance test rig

10.7.5.2 Procedure static test; high pressure (specimen 3)

The test equipment is shown in Figure 8. Install the specimen 3 as device (4) according to the manufacturer's instructions.

a) Purge the test rig.

b) Close valves (2), (3), and (5). After raising the pressure to 0,5 MPa ± 0,1 MPa (5 ± 1 bar) close valve (1).

c) Specimen 3 as device (4) shall not to be operated for 14 days ± 10h. Pressure has to be held in the range given in b).

d) After 14 days reduce the pressure slowly to avoid pressure peaks.

e) Perform the opening pressure test (stage 4).

10.7.5.3 Requirement

The opening pressure test (stage 4) has to be passed again.

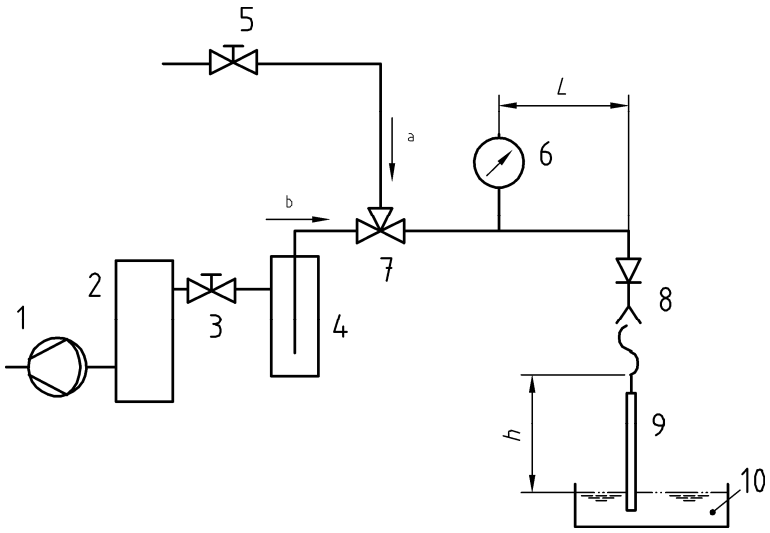
10.8 **Vacuum test** (stage 6)

10.8.1 General

For HD testing the check valve element shall either be blocked fully open or removed.

10.8.2 Backsyphonage test

10.8.2.1 Backsyphonage testing equipment



L: Straight length from the vacuum gauge to the test device $100 \leq L \leq 150$ mm
h: vertical distance between the lowest edge of the air inlet openings and the water level

Key

1 vacuum pump
2 vacuum vessel
3 stop valve
4 water trap
5 stop valve
6 pressure gauge
7 3 way valve
8 test device
9 transparent tube
10 water reservoir

a water supply
b vacuum supply

Figure 9 — Vacuum testing equipment

10.8.2.2 Procedure for backsyphonage test on HB

The test equipment is shown in Figure 8.

a) With 3 way valve (7) in position (a) establish a vacuum of 0,05 MPa (0,5 bar) at side (b) of this valve.

b) Establish a flow of water in circuit (a) to flush the device for at least 1 min. Ensure the transparent tube is filled with water.

c) Quickly stop the flow of water by turning valve (7) to vacuum position from circuit (b).

d) Observe the water column in the transparent tube.

10.8.2.3 Requirement

Water column shall drop to a level lower than 150 mm.

10.8.3 Efficiency of the air inlets

10.8.3.1 General

The test equipment is shown in Figure 8.

10.8.3.2 Test procedure

The obturator of the HB has to be removed. Install a throttle disc in the water inlet of the device. The diameter of the throttle disc opening is given in Table 4. Repeat the procedure as specified in 10.8.1.2

Table 4 — Correlation DN test specimen/throttle disc opening diameter

DN	15	20	25
Throttle disc opening ∅ [mm]	2	3	4

10.8.3.3 Requirement

Water column in the transparent tube is not allowed to exceed 150 mm.

10.9 Tightness test (stage 7)

For procedure and requirements, see 10.4.

11 Acoustic characteristics

11.1 General

This clause specifies the test method for classifying hose union anti-vacuum valves by acoustic group.

11.2 Procedure

11.2.1 Mounting and operating conditions

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

11.2.2 Test methods

The test shall be carried out in accordance with the requirements of EN ISO 3822-1 and EN ISO 3822-3.

11.3 Test criteria

11.3.1 Expression of the results

The results of the measurements carried out in accordance with EN ISO 3822-1 and EN ISO 3822-3 shall be expressed as appliance sound level pressures L_{AP} in dB(A).

11.3.2 Noise classification

The devices shall be classified in accordance with Table 5.

Table 5 — Acoustic groups

Acoustic group	L_{AP} db (A) at 0,3 MPa
I	< 20
II	$20 \leq L_{AP} \leq 30$
Not classified	> 30

Annex A
(informative)

Table A.1 — Tests and sampling

Number of specimens				
Test	Specimen 1	Specimen 2	Specimen 3	Specimen 4
Visual verification (10.3)	X	X		X
Bending Moment (10.4)	X			
Flow rate / Pressure Loss (10.5)		X		
Opening Pressure (10.6)		X		
Endurance test (10.7.3)		X		
Endurance test (10.7.4)			X	
Endurance test (10.7.5)				X
Vacuum Test (10.8.2)	X			
Efficiency of the air inlets (10.8.3)	X			
Opening pressure (10.9)	X			

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