

English version

Devices to prevent pollution by backflow of potable water -
Pressurised air inlet valves DN 15 to DN 50 - Family L, type A
and type B

Dispositifs de protection contre la pollution de l'eau potable
par retour - Clapet d'entrée d'air sous pression DN 15 à DN
50 - Famille L, type A et type B

Sicherungseinrichtungen zum Schutz des Trinkwassers
gegen Verschmutzung durch Rückfließen -
Druckbeaufschlagte Rohrbelüfter in Durchflussform DN 15
bis DN 50 - Familie L, Typ A und Typ B

This European Standard was approved by CEN on 24 December 2004.

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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 Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document (EN 14455:2005) has been prepared by Technical Committee CEN/TC 164 "Water supply", the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2005, and conflicting national standards shall be withdrawn at the latest by November 2005.

This document has been developed with reference to EN 1717 "Protection against pollution of potable water in water installations and general requirements of devices to prevent pollution by backflow".

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, 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 document:

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

- a) field of application;
- b) requirements for pressurised air inlet valves;
- c) dimensional and the physico-chemical properties and the properties of general hydraulic, mechanical and acoustic design of pressurised air inlet valves DN 15 to DN 50;
- d) test procedure and requirements for verifying these properties;
- e) marking and presentation;
- f) acoustics.

This document specifies the characteristics of pressurised air inlet valves DN 15 to DN 50 that are suitable for use in drinking water systems at pressures up to 1 MPa (10 bar) and temperatures up to 65 °C and for 1 h at 90 °C.

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

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, *Acoustics — Laboratory tests on noise emission from appliances and equipment used in water supply installations — Part 3: Mounting and operating conditions for in-line valves and appliances (ISO 3822-3:1997)*

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

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

ISO 7-1, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Designation, dimensions and tolerances*

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

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.

3.1

pressurised air inlet valve "LA"

valve fitted with one or more air inlet ports which are normally closed, when the water is above or equal to the atmospheric pressure in the valve. The valve opens to admit air if there is a subatmospheric pressure at the water inlet, and closes to be watertight when the flow of water is resumed at normal pressure

NOTE LA protects against back siphonage.

3.2

pressurised air inlet valve combined with a check-valve located downstream "LB"

valve LA with integrated in-line check valve of family E, type EB, located downstream.

For the purpose of this document, “pressurised air inlet valve(s)” is (are) hereafter referred to as “device(s)”

4 Nominal size

The nominal size of the device shall correspond to the denomination of thread according to Table 1 and ISO 7-1.

Table 1 — Nominal size vs thread size

DN	15	20	25	32	40	50
Thread size	½	¾	1	1 ¼	1 ½	2

5 Designation

The devices are designated by:

- a) name;
- b) reference to this document (EN 14455);
- c) family, type;
- d) DN;
- e) body material;
- f) acoustic group (≤ DN 32 only).

Example of designation

Pressurised air inlet valve, EN 14455, family L, type A, DN 20, gun metal, I

6 Marking and technical documents

6.1 General

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, may 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 marked permanently and visibly on the body or on a fixed data plate.

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

The marking shall indicate:

- a) name, manufacturer's brand or logo;
- b) arrow indicating normal direction of flow;
- c) nominal size (DN);
- d) acoustic group (\leq DN 32 only);
- e) letters indicating family and type of device.

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

6.3 Technical documents

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.

7 Symbolisation

The graphic representation of the devices is according to EN 1717 (see Figure 1):

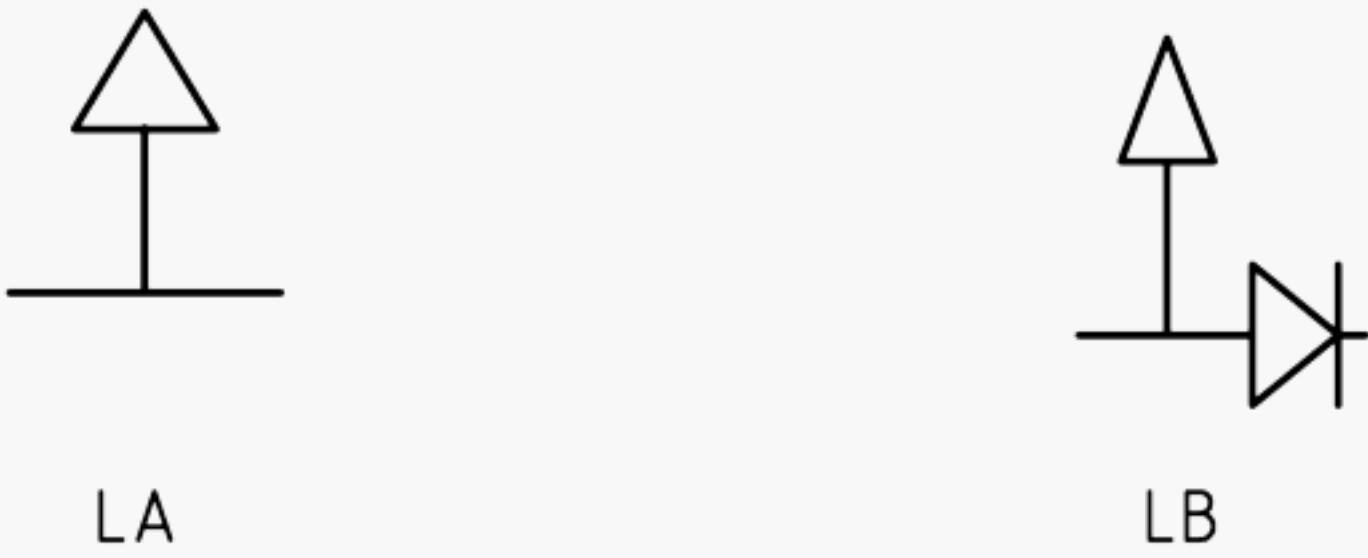
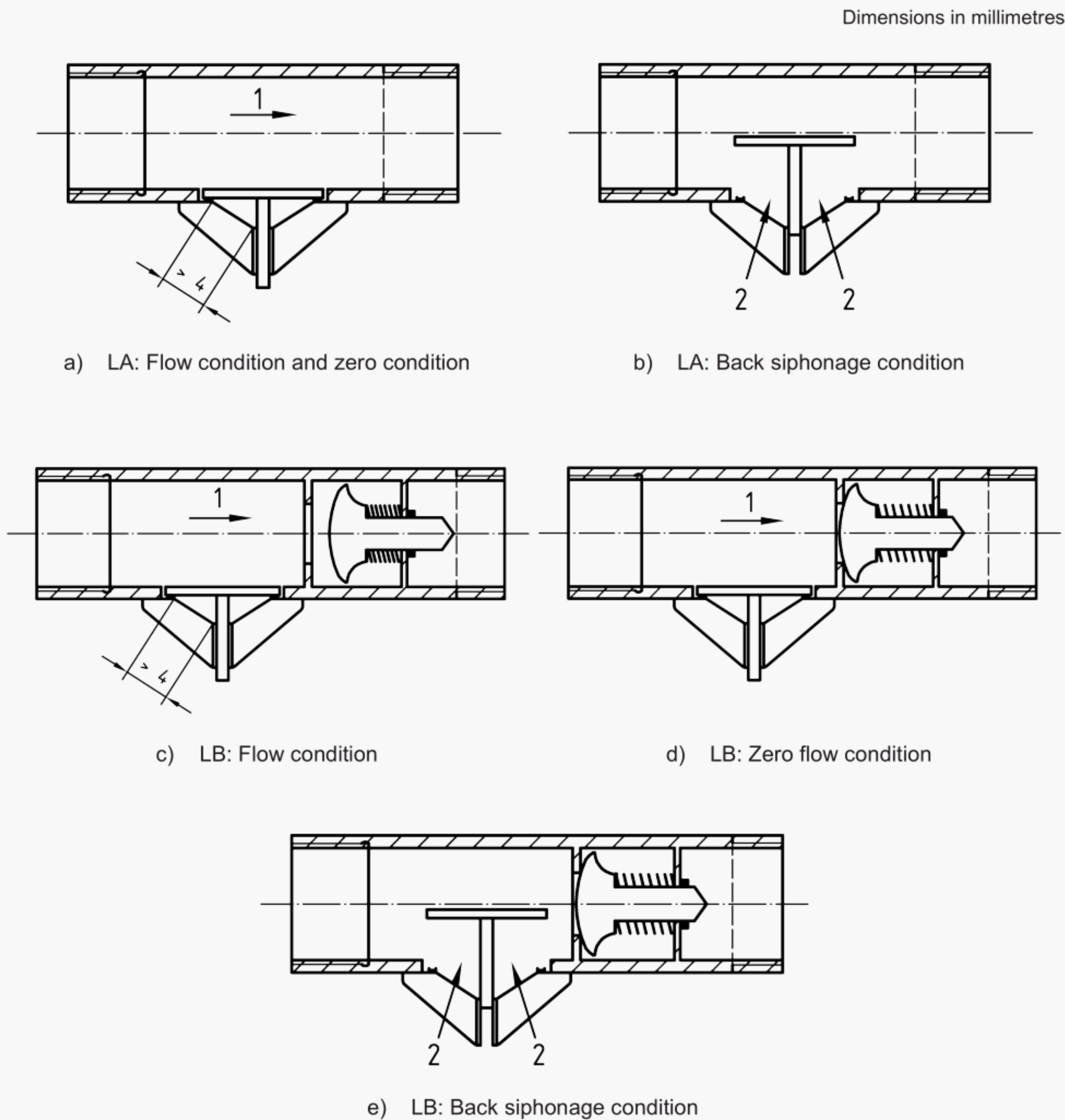


Figure 1 — Graphic symbol

8 General design characteristics

8.1 Design principle

A typical design principle of LA and LB is given in Figure 2.



Key
1 Water flow
2 Air

Figure 2 — Design principle

8.2 Connections

Connections shall comply with EN ISO 228-1 or ISO 7-1.

8.3 Air inlets

Air inlets shall be shrouded and designed to ensure that they cannot easily be blocked by deposits.

Dimensions of external air inlets shall be minimum 4 mm (see Figure 2).

8.4 Check valve

The check valve of an LB has to comply with all requirements of EN 13959.

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 ISO 9227;
- b) prone to the least scaling possible;
- c) in conformity with the associated standards and regulations;
- d) compatible among themselves and with:
 - water distributed;
 - fluids or matter liable to come into contact with them;
 - products normally used for disinfection operations of the network: potassium permanganate and sodium hypochlorite.

9.2 Nature of materials

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

- a) Copper-zinc alloys containing more than 10 % zinc are subject to denzincification when submitted to water capable of dezincification. In the countries where the use of products made of dezincification resistant materials is required, the products shall guarantee a dezincification depth less than 200 µm in any direction, they shall be tested in accordance with EN ISO 6509 and shall be marked in compliance with the indications 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 standards exist shall comply with the relevant recommendations or 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 devices can be tested in accordance with the requirements.

The accuracy of measurements and accuracy of measuring instruments shall not exceed the following:

a) Accuracy of measurements

In the absence of any particular specifications:

- flow rate and pressure: ± 2 % of the value indicated;
- temperature: cold water ± 5 °C of the value indicated; hot water ± 2 °C of the value indicated;
- time: $^{+10}_0$ % of the value indicated;

b) Accuracy of measuring instruments

Measuring instruments shall have a precision of ± 2 % of the measured value. Temperature measurements shall be accurate to 1 K.

10.2 Test sequence

Three samples shall be submitted. The test sequence is specified in Annex A.

- Stage 1: Visual verification. See 10.3;
- Stage 2: Mechanical strength of the body. See 10.4;
- Stage 3: Tightness. See 10.5;
- Stage 4: Flow rate/pressure loss. See 10.6;
- Stage 5: Vacuum, fast. See 10.7;
- Stage 6: Bending moment and leak tightness. See 10.8;
- Stage 7: Opening pressure. See 10.9;
- Stage 8: Endurance. See 10.10;
- Stage 9: Opening pressure. See 10.11;
- Stage 10: Vacuum, fast. See 10.12.

In case of a combined device with incorporated LA or LB the values as mentioned in stages 2, 4 and 6 have to comply with the values as given in the applicable standards of that combined device.

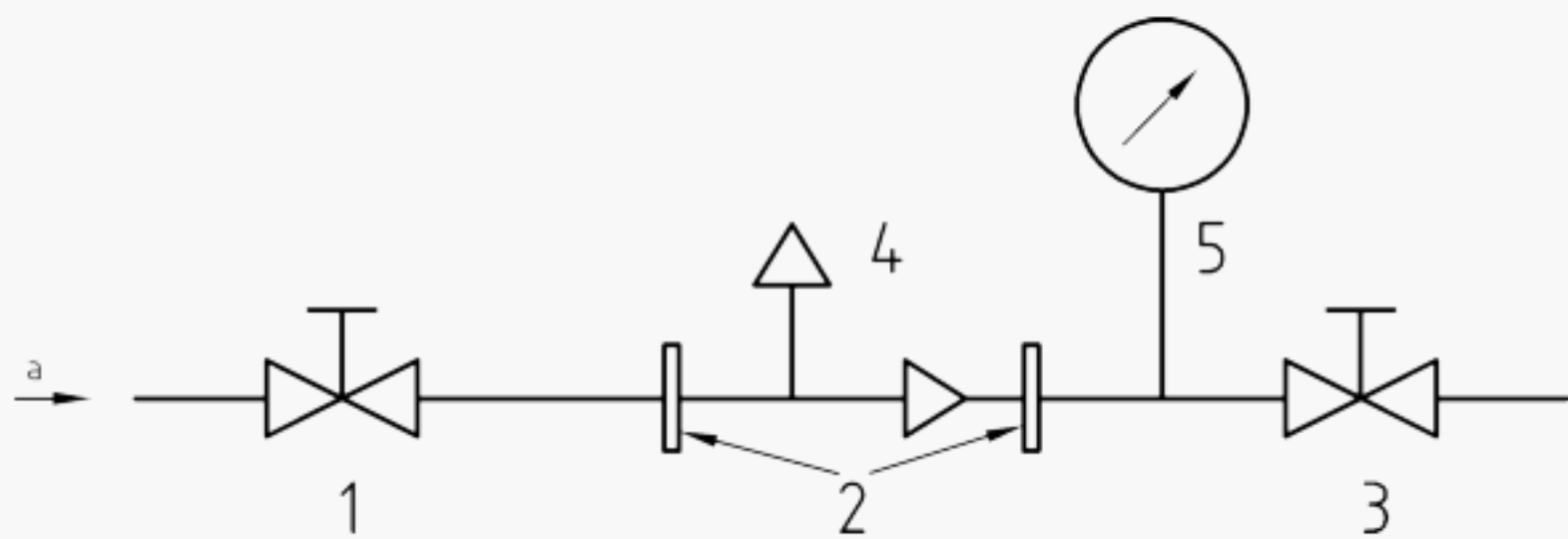
10.3 Visual verification (Stage 1)

Check by visual verification that:

- a) devices conform with the description and the appropriate drawings;
- b) dimensional requirements of this document are met.

10.4 Mechanical strength (Stage 2)

10.4.1 Test equipment



- Key**
- a Water supply
 - 1 Shut off valve
 - 2 Mounting fixture for the test device
 - 3 Shut-off valve
 - 4 Test device
 - 5 Pressure gauge

Figure 3 — Mechanical strength test equipment

10.4.2 Procedure

Install the test device in the test rig shown in Figure 3 using appropriate adapters if necessary.

Open valves (1) and (3), purge the air from the test rig by allowing water to pass through the rig.

Close valve (3) and gradually apply cold water pressure through the inlet of the test device not exceeding 0,1 MPa (1 bar) per 5 s up to a static pressure of 2,5 MPa ± 0,1 MPa (25 bar ± 1 bar) to the interior of the valve body for a period of 5 min.

First close valve (1). Open valve (3) slowly to reduce the pressure in the test device.

10.4.3 Requirements

There shall be no breakage or permanent deformation of the body of the test device.

10.5 Tightness (Stage 3)

10.5.1 General

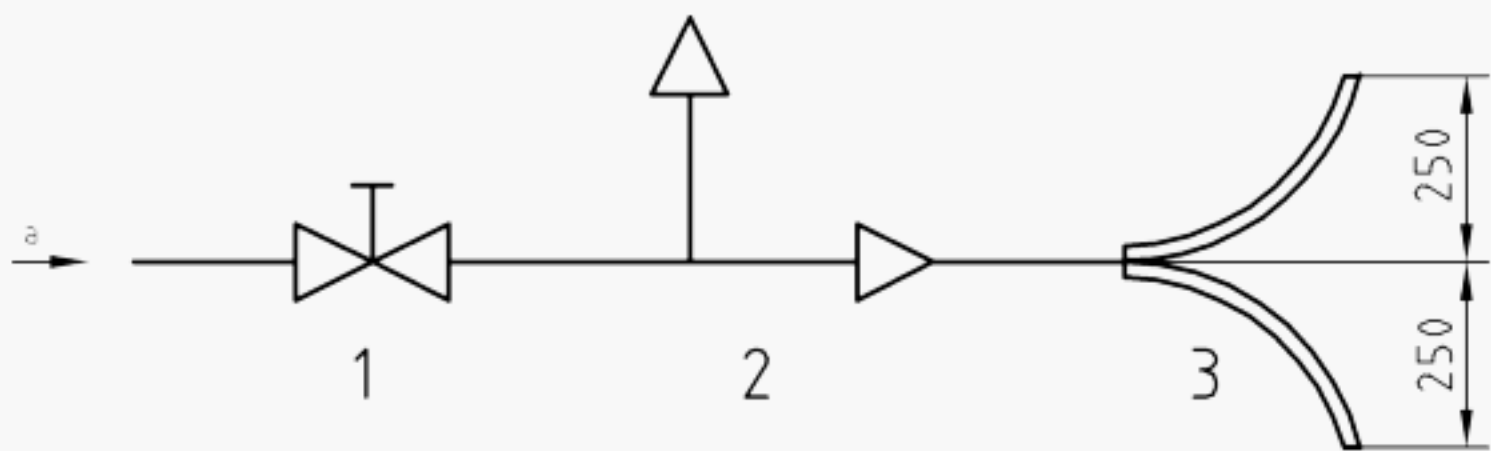
For LB testing the check valve element shall either be blocked fully open or removed.

10.5.2 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.

- a) The inside diameter of the hose is of the same dimension as the test device.
- b) The hose can be replaced by an adequate device.

Dimensions in millimetres



Key

- a Water supply
- 1 Shut off valve
- 2 Test device
- 3 Transparent hose

Figure 4 — Tightness test equipment

10.5.3 Procedure

See Figure 4.

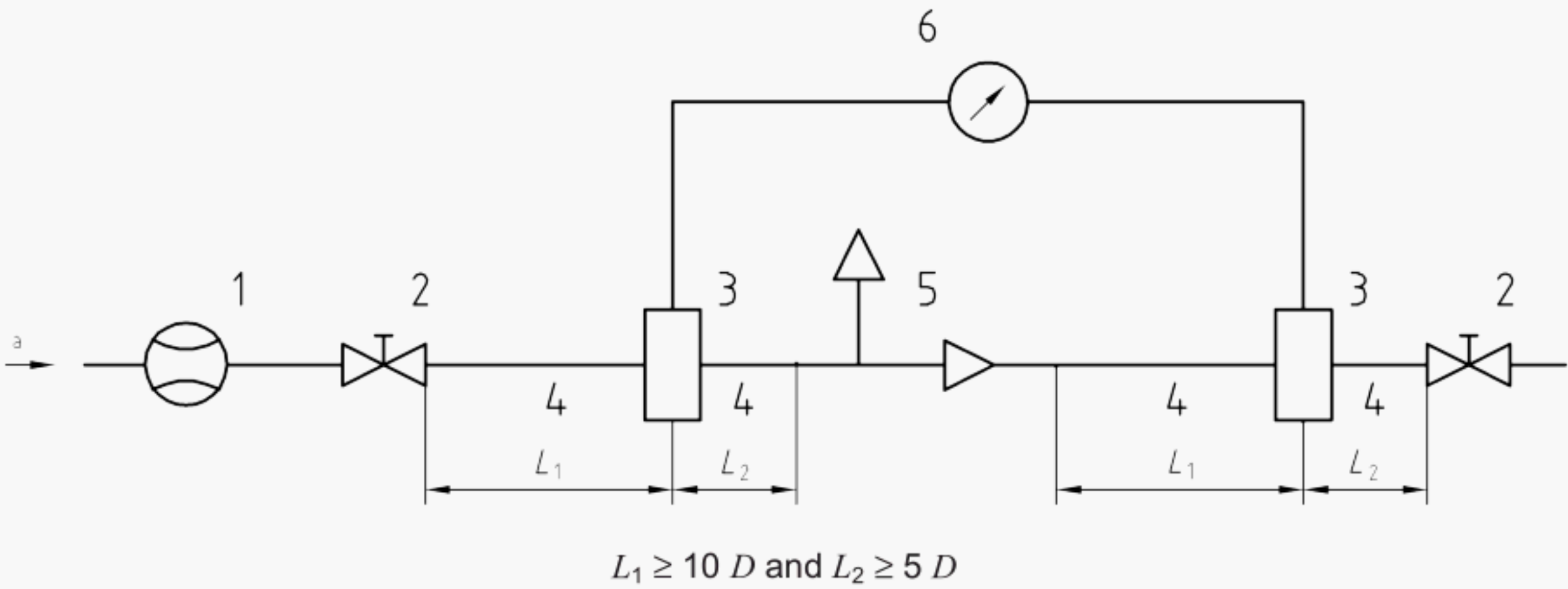
Adjust the flow of water so that the test device allows air to enter when the transparent hose is lowered. The hose shall be raised and lowered 10 times to ± 250 mm with a velocity of $0,25 \text{ m/s} \pm 0,1 \text{ m/s}$.

10.5.4 Requirement

No water shall leak out of the air inlet ports during any of the 10 cycles.

10.6 Flow rate/pressure loss (Stage 4)

10.6.1 Test equipment



Key

- a Water supply
- 1 Flow meter
- 2 Needle type valve
- 3 Standarized pressure take off, EN ISO 5167-1
- 4 Tubes
- 5 Test device
- 6 Differential pressure gauge

Figure 5 — Flow rate/pressure loss test equipment

The test rig is shown in Figure 5 for tests in horizontal position:

- a) The inside diameter of the metering piping shall be approximately equal to the nominal size DN of the test device.
- b) The straight lengths L_1 and L_2 shall be: $L_1 \geq 10 D$ and $L_2 \geq 5 D$ (D = inside diameter of the metering piping).
- c) The circuit shall be dimensioned sufficiently to absorb pressure variations, otherwise pressure accumulation vessels are to be provided.
- d) The nature of the water used for the tests shall not impede the proper functioning of the devices under test (provide for a filter if necessary).
- e) Pressure gauges, shall be of a convenient scale and datumed to level of the piping.
- f) Prior to any test, make sure the installation and the test circuit are well vented.
- g) Wait for stabilisation of each measuring point.

10.6.2 Procedure 1

See Figure 5.

- a) Record the flow rate over pressure loss of the device for the full range from 0 to the flow rate given in Table 2 Check that the flow rate values obtained correspond to the requirements.
- b) If necessary, the pressure loss in the piping lengths between the device and the pressure taps should be accounted for.
- c) Check the tightness during the whole test.

10.6.3 Requirements

The flow rate at a pressure differential of 0,015 MPa (0,15 bar) shall not be less than the values given in Table 2.

Table 2 — Nominal size vs minimum flow rate

DN	15	20	25	32	40	50
Minimum flow rate l/s	0,35	0,7	1,2	2,0	3,1	4,9

10.7 Vacuum, fast (Stage 5)

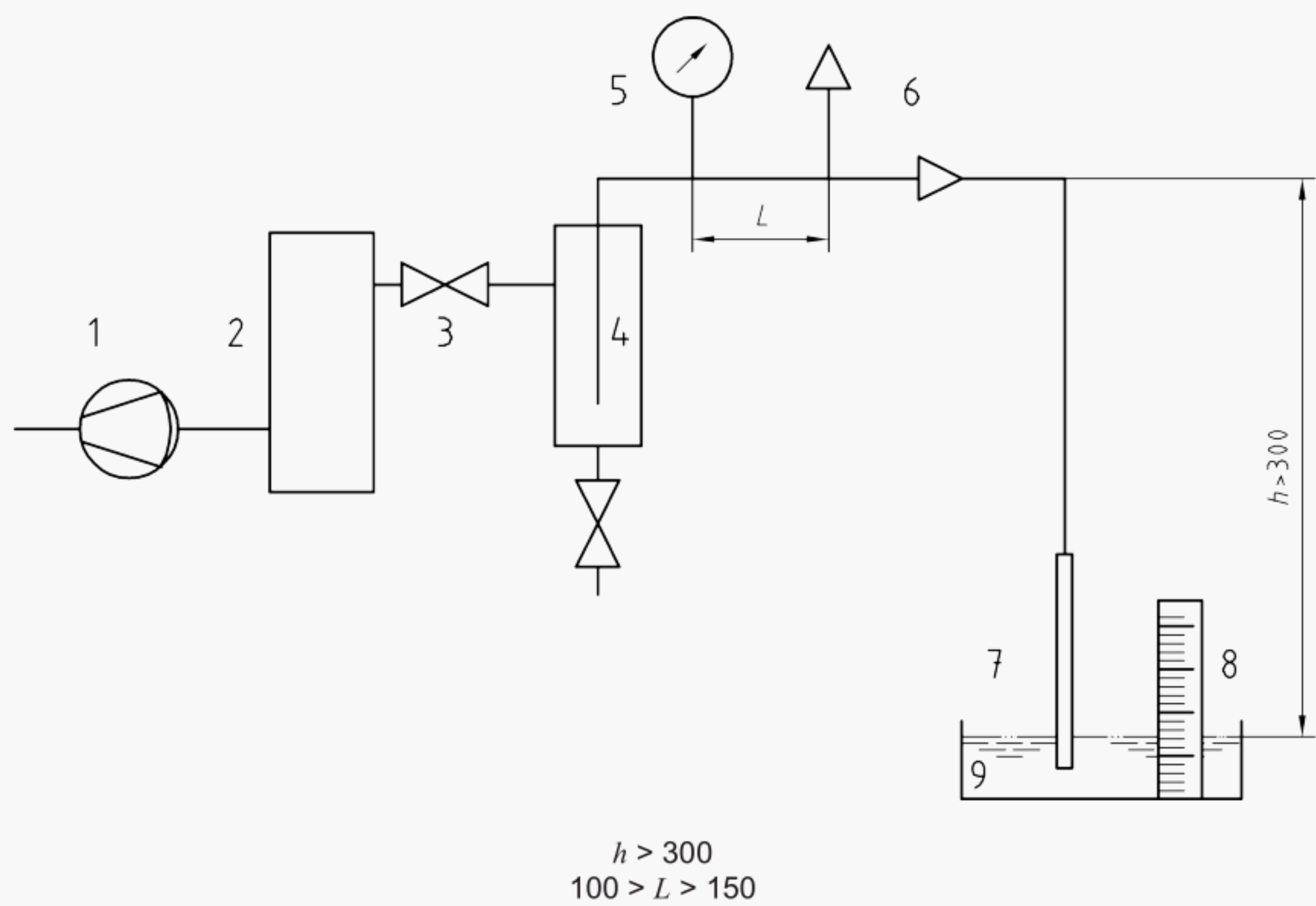
10.7.1 General

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

10.7.2 Testing equipment

The test apparatus shall be arranged and constructed as shown in Figure 6 such that the absolute pressure measured near the device under test on its supply side remains less than 0,05 MPa (0,5 bar) for at least 5 s.

Dimensions in millimetres



Key

- 1 Vacuum pump
- 2 Vacuum vessel
- 3 Full-way valve
- 4 Water trap
- 5 Vacuum gauge
- 6 Test device
- 7 Transparent tube
- 8 Ruler
- 9 Water reservoir
- h Vertical distance lower edge air inlet to water level
- L Distance between the vacuum gauge and the test device

Figure 6 — Arrangement of apparatus for vacuum, fast

10.7.3 Procedure

See Figure 6.

By opening of the full-way valve slowly in about 2 s; supply a vacuum to the device so that the absolute pressure as indicated by the vacuum gauge remains below 0,5 MPa (0,5 bar) for at least 5 s.

10.7.4 Requirement

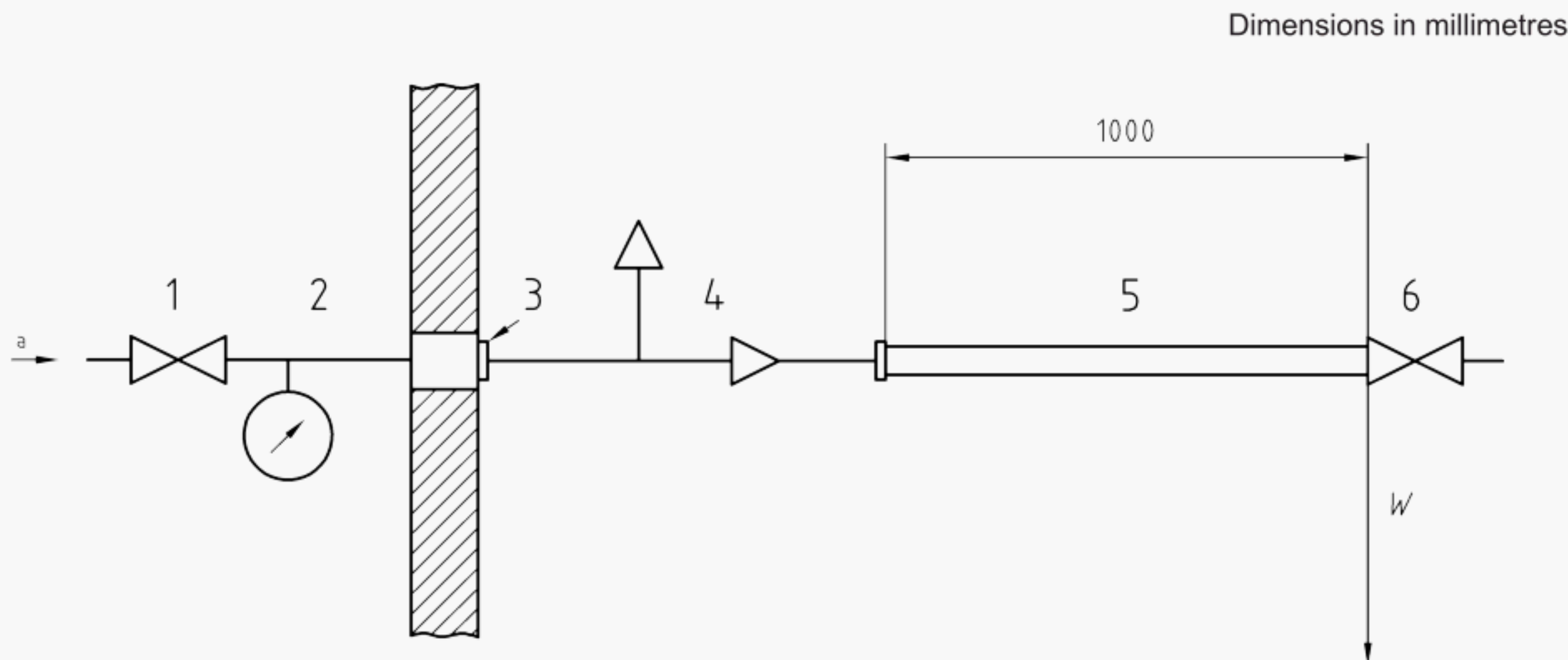
Water column in the transparent tube shall not be allowed to exceed 200 mm.

10.8 Bending moment and leak tightness (Stage 6)

10.8.1 General

The bending moment test shall be applied to each and every size and connection end design.

10.8.2 Test equipment



Key

- W* Applied load
- 1 Shut-off valve
- 2 Pressure gauge
- 3 Mounting contrivance for the test device
- 4 Test device
- 5 Steel pipe.¹
- 6 Shut-off valve

Figure 7 — Bending moment test equipment

10.8.3 Procedure

Install the test device (4) in the test rig (3) shown in Figure 7.

Purge the air by means of valve (6).

Apply a load *W* as shown in Figure 7 to produce the bending moment given in Table 3.

Gradually apply pressure up to 0,05 MPa ± 0,01 MPa (0,5 bar ± 0,1 bar).

Hold for 5 min.

Gradually apply pressure at a rate not exceeding 0,1 MPa (1 bar) per 5 s up to 1,6 MPa ± 0,05 MPa (16 bar ± 0,5 bar).

¹ The pipe is threaded at one end to be connected to the outlet of the pressurised air inlet valve under test without any intermediate parts. It has the same diameter as the test device

Hold for 5 min.

The bending moment is measured at the connection to the pipe. In calculating the bending moment, make due allowances for the mass of the pipework, valves and any loads imposed by the test equipment.

The bending moment test shall be applied to each and every size and connection and design.

10.8.4 Requirement

The test requirements shall be satisfied with the appropriate bending moment applied to the device, as given in Table 3. There shall be no breakage, permanent deformation or leakage of the body of the device or leakage of the air inlets.

In case of LB, the check valve element shall meet the requirements of EN 13959.

Table 3 — Nominal size vs bending moment

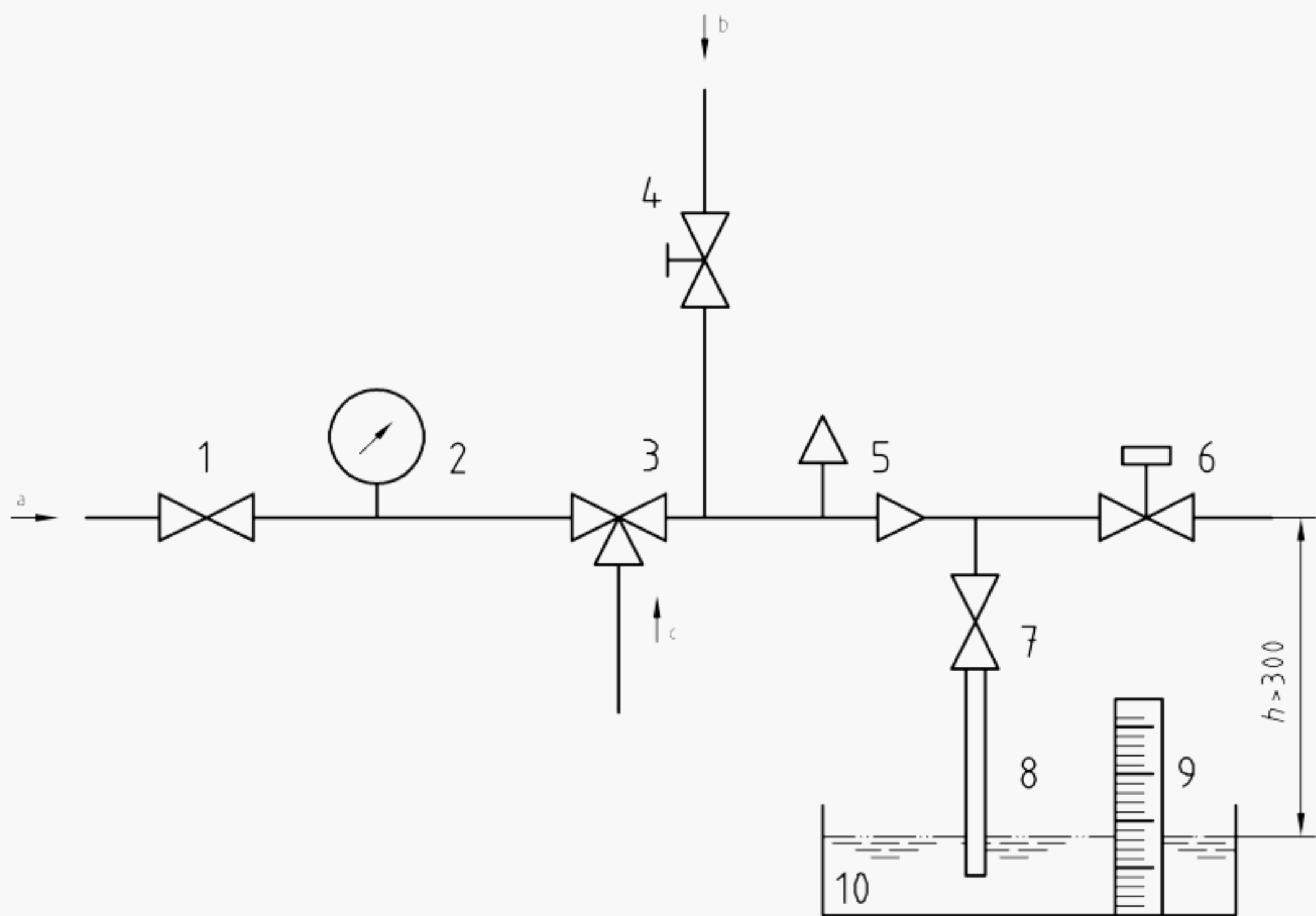
DN	15	20	25	32	40	50
Bending moment for thread ends, Nm	80	150	300	400	500	600
Bending moment for compression ends, Nm	50	85	125	160	200	300

10.9 Opening pressure test (Stage 7)

10.9.1 Opening pressure/Endurance test equipment

The test equipment used for testing the opening pressure shall be as shown in Figure 8. The test device shall be installed according to the manufacturer’s instructions.

Dimensions in millimetres



Key

- | | | | |
|------|----------------------------------------------------------|----------|--------------------------------------------------------------------------------------------|
| a | Water supply | 5 | Test device |
| b | Vacuum supply | 6 | Remote controlled valve, slow closing |
| c | Water supply (for water at a temperature of 65 °C/90 °C) | 8 | Transparent tube |
| 1, 7 | Shut-off valve | 9 | Ruler |
| 2 | Pressure gauge | 10 | Water reservoir |
| 3 | 3 way valve | <i>h</i> | distance between the lower edge of the air inlet opening of the device and the water level |
| 4 | Needle valve | | |

Figure 8 — Opening pressure test rig/Endurance test rig

10.9.2 Procedure

The test equipment is shown in Figure 8.

In case of LB the check valve shall be blocked fully open or removed. The needle valve (4) shall be opened with a gradient of about 0,001 MPa per 30 s.

10.9.3 Requirements

The opening pressure shall be less than 100 mm water column.

10.10 Endurance test (Stage 8)

10.10.1 Procedure

See Figure 8.

The required number of devices (5) is one.

The check valve element of a LB shall be blocked fully open or removed (as it comes from 10.8).

Mount the device (5) in a system capable of delivering hot water at 90 °C and cold water at ambient temperature and purge air from the system.

Circulate the hot water at 90 °C for 1 h at flow rate as specified in Table 4.

Let the system cool down to ambient temperature.

The device shall not be operated for 30 days and be kept under 0,3 MPa (3 bar) during this time.

Table 4 — Flow rates for endurance test in l/sec

DN	15	20	25	32	40	50
Endurance flow	0,17	0,17	0,17	0,2	0,3	0,5

10.10.2 Requirements

There shall be no leakage during the 60 days total test period.

10.11 Opening pressure test (Stage 9)

See 10.9.

This test has to be carried out at the end of the test described in 10.10. The device shall not be removed from the test rig to perform this test.

10.12 Vacuum, fast (Stage 10)

See 10.7.

This test has to be carried out at the end of the test described in 10.10. The device shall not be removed from the test rig to perform this test.

11 Acoustic characteristics

11.1 General

This Clause specifies the test method for classifying the devices by acoustic group for dimensions equal to or less than DN 32.

11.1.1 Procedure

11.1.2 Mounting and operating conditions

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

11.1.3 Test methods

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

11.2 Test criteria

11.2.1 Expression of the results

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

11.2.2 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
(normative)

Sampling and test sequence

Table A.1 — Test sequence on the samples submitted

Number of samples/tests			
Test	Sample 1	Sample 2	Sample 3
Visual verification 10.3	X	X	X
Mechanical strength 10.4	X		
Tightness 10.5	X		
Flow rate/pressure loss 10.6		X	
Vacuum, fast10.7			X
Bending moment and leak tightness 10.8			X
Opening pressure 10.9	X	X	X
Endurance 10.10	X		
Opening pressure 10.11	X		
Vacuum, fast 10.12	X		