

Antipollution of water installations

Technical document 045-04

Non-controllable backflow preventers –
Family C, Type A, Classes a and b

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The CSTB (Centre Scientifique et Technique du Bâtiment), a public establishment supporting innovation in construction, has four key activities: research, expertise and the assessment and dissemination of knowledge, organised to meet the challenges of ecological and energy transition in the construction sector. Its field of competence covers construction materials, buildings and their integration into districts and towns.

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Modification history

Revision No.	Date	Modifications
15	01/07/2017	<p>Update to the document introduction and reference.</p> <p>Basic modifications:</p> <p>Paragraph 7.5: Recommendation added</p> <p>Paragraph 9.7.3b: Step added at 3 bar.</p> <p>Chapter 10: Test order modified</p> <p>Appendix A: Chapter A1 of the Standard modified</p> <p>Part II "Manufacturer's production quality requirements": certain CAa and CAb tests removed from the table, sub-paragraph concerning ISO 9001 sites removed</p> <p>Part III "Inspection procedures employed by the CSTB": extra details on admission and follow-up inspection sampling added, following paragraphs removed (types of products, inspection operations following admission and reduced inspection operations).</p>
16	25/07/2022	<ul style="list-style-type: none"> - Paragraph 9.5.1: Modification made to the operating procedure. - Paragraph 9.5.2: Modification made to the operating procedure. - Paragraph 9.6.1: Modification made to the operating procedure. - Paragraphs 9.6.2 & 9.6.3: Addition of a tolerance value regarding the tubes' inner diameter. - Paragraph 9.7.2: Modification made to both the requirement and the operating method. - Paragraph 9.7.4: Modification made to both the requirement and the operating method. - Chapter 10: Addition of a test following endurance in both tables. - Editorial update according to the structure in force following the creation of the Technical Management Appendix of the NF045 reference system. rev.17.

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1 TECHNICAL SPECIFICATIONS

Standard NF EN 14367 was formally approved on 20 November 2005.

This standard is used as a technical reference.

It replaces the approved Standards NF P 43-009 and **NF P 43-011**.

To preserve the performance level of the products, it has been decided to add detail to and/or supplement certain chapters of this standard.

Purpose

The purpose of this chapter is to add detail to certain paragraphs of Standard NF EN 14367 using the same paragraph numbers, and to supplement this European reference system using criteria deemed fundamental.

1 Field of application

No modifications.

2 Nominative references

NF EN 1254-1 : 2021, Copper and copper alloys – Fitting – Part 1 : Capillary brazing fitting for copper tubes

NF EN 1254-2 : 2021, Copper and copper alloys – Fitting – Part 2 : Compression fitting for copper tubes

NF EN 1254-3 : 2021, Copper and copper alloys – Fitting – Part 3 : Compression fitting for plastic and multilayer pipes

NF EN 1254-5 : 2021, Copper and copper alloys – Fitting – Part 5 : Short socket fitting for capillary solder for copper tubes

NF EN 1254-6 : 2021, Copper and copper alloys – Fitting – Part 6 : Push6in fitting for metal, plastic and multilayer pipes

NF EN 1254-8 : 2021, Copper and copper alloys – Fitting – Part 8 : Crimp fitting for plastic and multilayer pipes

NF EN 1254-20 : 2021, Copper and copper alloys – Fitting – Part 20 : Definitions, thread dimensions, test methods, reference data and additional information

NF EN 1329-1 : 2014, Plastics piping systems for the evacuation of sewage and waste water (at low and high temperature) inside the structure of buildings – Poly (vinyl chloride) no plasticized (PVC-U) – Part : 1 : Specifications for pipes, fitting and the system

NF EN 1453-1 : 2000, Plastics piping systems with structured6wall pipes for the evacuation of sewage and waste water (at low and high temperature) inside buildings – Poly (chloride of vinyl) unplasticized (PVC-U) – Part 1 : specifications for pipes and the system.

3 Terms and definitions

3.1 Non controllable backflow preventer with different pressure zones – Family C – Type A

No modifications.

3.2 Specific use

Note: This article supplements the specifications of **Article 3.2 of Standard NF EN 14367**.

If there is a risk of contact with water over 65°C, an isolating valve, preferably fitted with an upstream drain (between the backflow preventer and the valve) shall be installed downstream of the backflow preventer. This valve will limit the temperature rise by conduction.

This **recommendation** shall appear in the product's technical documentation.

4 Nominal diameter (denomination)

No modifications.

5 Designation

No modifications.

6 Symbols

No modifications.

7 Physical and chemical characteristics

Note: This article supplements the specifications of **Article 7 of Standard NF EN 14367**.

7.1 Materials

For backflow preventers – Family C - Type A - Class a:

The devices shall carry an “ACS” (Health compliance certificate).

For backflow preventers – Family C - Type A - Class b:

Materials in permanent contact with potable water shall carry an ACS.

This applies to the entire upstream chamber as a minimum requirement.

7.2 Nature of the materials

No modifications.

7.3 Nature of the visible surfaces

Depending on which materials the check valves are made of, the outside and inside surfaces may or may not be coated. Any such coating shall not impair the functional characteristics of the device.

7.4 Uncoated surface

The finish of the surfaces shall be free of visible defects such as:

- scabs,
- cracks,
- sand inclusions,
- machining “heat marks”,
- impact marks, tool marks
- large scratches, etc.

7.5 Coated surface

It is strongly recommended not to use “decorative” coatings on this kind of product (Ni, Ni-Cr, etc.). Any use thereof will need to be justified by the holder.

The coated surfaces shall meet the requirements of **Technical Document 045-01**.

8 Design

Note: This article supplements the specifications of **Article 8 of Standard NF EN 14367**.

8.1 General

➤ Backflow preventer – Family C - Type A - Class a:

The backflow preventer includes an integrated filter located upstream of the upstream check valve.

This filter shall be easily removed for cleaning.

➤ Backflow preventer – Family C - Type A - Class b:

This forms part of a protection assembly containing integrated or discrete upstream and downstream isolating devices in addition to the backflow preventer.

The (CAb) device shall not be removable.

8.2 Relief valve

This Article defines a test method for determining discharge flow recovery system efficiency.

8.2.1 Test

This test involves verifying the capacity of the funnel to drain off the discharge flow in accordance with the operating procedure described below.

(The operating procedure for this test is provided in the interim while Standard EN 14367 on the discharge flow specification is being revised).

8.2.1.1. Testing apparatus:

Dimensions taken from Standard EN 1717:

$$b \geq G$$

$$b \geq 20 \text{ mm}$$

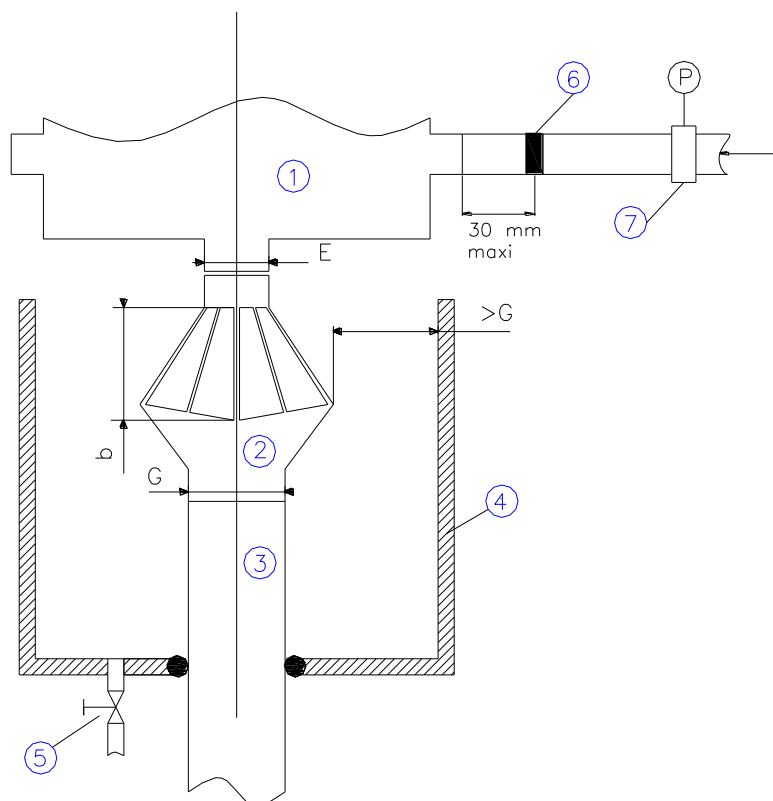
$$G \geq E$$

E: **valve seat** passage diameter or diameter equivalent to the cross-section of the passage.

G: narrowest passage diameter at the outlet of the funnel:

Positioning receptacle ④:

The receptacle must be positioned no lower than the top part of the funnel openings such that no water can splash out.



① = backflow preventer

② = funnel

③ = drain pipe, minimum length 500mm

④ = receptacle which must be designed to catch all the splashes

⑤ = valve

⑥ = passage setting disk

⑦ = pressure test point

DN of the device	6	8	10	15	20	25	32	40	50
Diameter of the passage setting disk⑥ (mm)	2	3	4	5	6	7.5	9	12	15

CAa: The funnel outlet shall take a standardised PVC drain hose (Standard NF EN 1329-1 compact PVC hose and NF EN 1453-1 structured wall PVC hose).

8.2.1.2 Operating procedure:

The check valve downstream of the device (or the former's moving parts) must be removed.

Install a passage setting disk on the downstream supply pipework no further than 30 mm from the end of the device. The diameter of the passage setting disk depends on the denomination of the device specified in the table above.

- with valve ⑤ in the open position,
- establish the discharge flow at a supply pressure of 0.1 MPa for the $DN \leq 10s$ and 0.17 MPa for the $DN \geq 15s$
- close the valve ⑤
- maintain the discharge flow for 15 minutes
- shut off the water flow
- open valve 5 and measure the volume of water in receptacle 4

8.3.2 Specification

After 15 minutes, the quantity of water collected in the receptacle shall not exceed 50 ml (corresponding to a flow rate of 200 ml/h).

9 Characteristics and test methods

9.1 General

No modifications.

9.2 General tolerances

No modifications.

9.3 Expression of the results

No modifications.

9.4 End connections

Note: This article supplements the specifications of **Article 9.4 of Standard NF EN 14367**.

9.4.1 Threaded end connections

The removability of the integrated devices shall be examined in the context of the appliances into which they are integrated.

9.4.1.1 Class a devices

The threaded ends of the body of the backflow preventer shall have seal seating surfaces large enough to provide a leakproof seal under pressure and to prevent damage to the seals.

Fittings that allow the device to be removed without damaging the pipework shall be supplied with the device.

Under no circumstances should the pipe sleeve impair device operation (pipe grip, etc.).

The sizing of threaded connections on the pipeline must comply with the dimensional specifications of standard NF EN 1254-20.

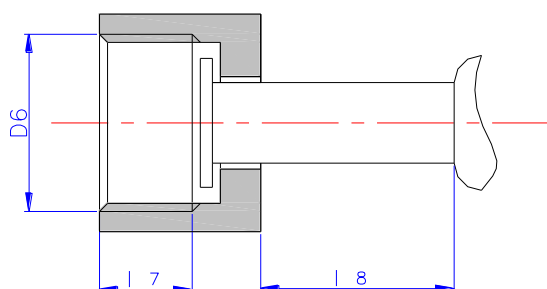
For any other type of connection, the device must comply with the specifications of standards NF EN 1254-1, 2, 3, 5, 6, 7 or 8.

In the event of a brazing connection, the fitting must be independent of the body of the device.

The captive swivel nut fittings shall comply with Table 1 below:

D6 (ISO 228-1)	G 1/2	G 3/4	G 1	G 1 1/4	G 1 1/2	G 2
17 mm (min)	8	8.5	10	11	12	14
17 mm (max)	9.8	11.3	12.8	14.3	15.8	17.3
18 mm	shall allow complete disengagement of the swivel nut					

Table 1: Dimensional characteristics of the swivel nuts



9.4.1.2 Class b device

No modifications.

9.5 Mechanical characteristics

9.5.1 Mechanical strength

9.5.1.2 Operating procedure

The operating procedure is modified as follows:

The increase in pressure from 0 to 25 bar shall be carried out gradually over a minimum duration of 2 minutes.

9.5.2 Bending strength

Note: This article supplements the specifications of **Article 9.5.2 of Standard NF EN 14367**.

9.5.2.2 Test method

The operating procedure is modified as follows:

The increase in pressure from 0 to 16 bar shall be carried out gradually over a minimum duration of 1 minute.

As the tolerance pertaining to the load to be applied is not defined in the standard, it is set to (+0/-2)% of the value specified in Table 2 of Standard NF EN 14367.

Before installing the device on the test rig, the fitting sleeve nut must be tightened down to the torque specified in Table 2.

For devices fitted with a 'swivel nut' fitting, the nut must be tightened down to the torque specified in Table 2 on the test rig.

When filled with pressurised water and in the absence of bending stress, the connection shall not leak. If it does leak, the tightening torque can be increased.

➤ Backflow preventer – Family C- Type A- Class b:

The bending strength of the integrated devices shall be examined in the context of the equipment into which they are integrated – See Technical document 045-09.

9.5.3 Endurance

No modifications.

9.5.4 Reliability characteristics

No modifications.

9.5.5 Tensile strength test

Note: This article has been added

Regarding devices fitted with threaded ends with sleeves and nuts: The sleeves and nuts are tested separately from the device. Build the test rig depicted in Figure Y using machined parts in place of the pipework (component 1) and the device body (component 2).

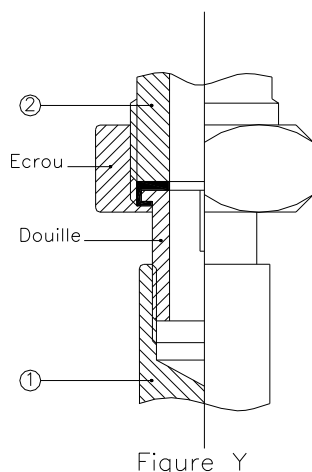


Figure Y

Regarding devices fitted with a captive swivel nut: The nut is tested without removing the device. Make the adapter component (as per component 2 in Fig. Y) for fitting the assembly to the tensile strength testing machine.

Operating procedure:

- Tighten the nut down to the torque specified in the table below
- Attach the assembly to test, complete with adaptor components, between the jaws of a tensile strength test machine
- Apply the tensile force at a speed of 1 mm/min until the figure indicated in the table below, accurate to ± 500 N, is reached
- Apply the force for 30 seconds, then release.

Required characteristics

The assembly (sleeve/nut or captive swivel nut) shall withstand the tensile loads given in Table 2 below without deformation:

Regarding threaded ends with sleeves and nuts Sleeve fitting thread	Regarding captive swivel nuts Nut thread	Minimum tightening torque of the nut to achieve a seal in Nm	Tension Force (kN)
G 1/8 (or CAb)	G 1/4(or CAb)	15	5
G 1/4	G 3/8	30	8
G 3/8	G 1/2	50	11
G 1/2	G 3/4	70	15
G 3/4	G 1	90	17.5
G 1	G 1 1/4	110	20
G 1 1/4	G 1 1/2	120	22.5
G 1 1/2	G 2	150	25
G 2	G 2 1/2	167	27.5

Table 2: Tensile strength tests

9.6 Leaktightness characteristics

9.6.1 Verification of the tightness of the downstream check valve

9.6.1.2 Test method

The operating procedure is modified as follows:

The increase in pressure shall be carried out gradually over a minimum duration of 1 minute.

9.6.2 Verification of the closing pressure of the downstream check valve and its tightness

The tolerance regarding level gauges' inner diameter is modified as follows: 10 +/- 2 mm.

If a Family E Type B check valve is built in that does not comply with the 10 mbar closing pressure requirement, the check valve must be covered by the NF mark.

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

The tolerance regarding level gauges' inner diameter is modified as follows: 10 +/- 2 mm.

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

No modifications.

9.7 Hydraulic characteristics

9.7.1 Test ring – general circuit

No modifications.

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

9.7.2.1 Requirements:

The requirement is modified as follows:

The reference pressure loss shall not be exceeded over the whole flow rate range measured up to the flow rate given in Table 4.

9.7.2.2 Tests:

The test is modified as follows:

At the beginning of any flow rate, record the flow rates/pressure losses regarding the device up to at least the value given in Table 4.

9.7.3 Verification of the opening (disco

nnection) and closing (tightness) of the relief valve

9.7.3b: Increment added at 3 bar

Note: Increments 3, 2 and 1 are the determining steps when assessing product compliance.

9.7.4 Verification of the relief flow rate

9.7.4.1 Requirements:

The requirement is modified as follows:

The reference pressure loss shall not be exceeded over the whole flow rate range measured up to the flow rate given in Table 4.

9.7.4.2 Tests:

The test is modified as follows:

At the beginning of any flow rate, record the flow rates/pressure losses regarding the device up to at least the value given in Table 4 (or 0.4 m³/h for class b).

9.7.5 Compatibility with products used for disinfection of the networks

During admission of a product, the tests shall be performed successively on a single test specimen.

Exposure to permanganate, rinsing, exposure to sodium hypochlorite, rinsing.

The sodium hypochlorite test alone is performed during the follow-up.

9.7.6 Acoustic tests

Only class I or II products are eligible for the NF mark.

9.8 Isolating valves

Note: This article has been added

This article defines the requirements and test methods for verifying the reliability of the isolating valves likely to be built into CAa or CAb backflow preventers.

9.8.1 General

The (upstream and/or downstream) isolating valves built into the backflow preventer shall be easy to operate.

The open and closed positions shall be mechanically identified (e.g. end stops).

9.8.2 Operability

Operating procedure:

Measure the maximum torque required to go from the completely closed position to the fully open position and back again to the completely closed position.

The C → O → C cycle is repeated three times.

Specification:

The torque needed for the first operating cycle shall be no greater than twice the maximum permitted value.

The operating torque shall be equal to or less than:

- 2 Nm for valves not fitted with a hand control (e.g. operable using a screwdriver) or valves fitted with a hand control under 5 cm in length
- 4 Nm for valves fitted with a hand control no less than 5 cm in length.

The valves are checked for leaks at a water pressure of 16 bar for a period of 5 mins before the endurance test. No leaks shall be detected.

9.8.3 Reliability

Operating procedure:

Connect the device or valve to a testing circuit and apply cold water at a pressure of 2 to 4 bar and a maximum flow through the valve of 4 l/min,

- a) operate the isolating valve 500 times using no more than 2.2 or 4.4 Nm of torque, depending on the length of the valve's hand control,
- b) store the device for 30 to 45 days,
- c) repeat the test described in Point a)

Specification:

At the end of the test,

- the isolating valve shall remain watertight for 5 mins at a pressure of 16 bar,
- the valve operating torque shall be no greater than 2.2 or 4.4 Nm, depending on the length of the valve's hand control,
- the stops, if any, shall remain operational.

10 Test order

The table below sets out the test order by product class.

CAa backflow preventers:

Samples	Tests to carry out: (the coding system used below replicates the system defined in Article 10 of Standard NF EN 14367).
Sample No. 1	d→ e→ f→ g→ j→ k→ m→ n →b→ c→f→ o→ p
Sample No. 2 (without downstream check valve)	h→ i (sample without downstream check valve or sample with downstream check valve whose moving parts have been removed)
Sample No. 3	Dimensional and tensile aspects
Sample Nos. 4 to 6	a

CAb backflow preventers:

Regarding backflow preventers with removable bodies:

Samples	Tests to carry out: (the coding system used below replicates the system defined in Article 10 of Standard NF EN 14367).
Sample No. 1 (complete)	d→ e→ f→ g→ j→ k → l→ m→ n→ b→ c→f
Sample No. 2 (without downstream check valve)	h→ i→ j→ k → l→ o→ p (sample without downstream check valve or sample with downstream check valve whose moving parts have been removed)
Sample No. 3	Dimensional aspects

Regarding backflow preventers with non-removable bodies:

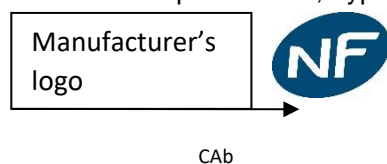
Samples	Tests to carry out: (the coding system used below replicates the system defined in Article 10 of Standard NF EN 14367).
Sample No. 1 (complete)	Dimensional aspects→ d→ f→ g→ j→ k → l→ m→ b→ c→f
Sample No. 2 (without downstream check valve)	h→ i→ j→ k → l→ o→ p (sample without downstream check valve or sample with downstream check valve whose moving parts have been removed)
Sample No. 3 (without upstream check valve)	e→ j→ k → l→ m→ n

11 Marking and technical documents

11.1 Marking

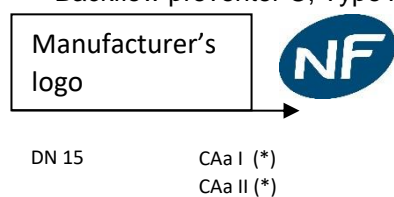
All the information below shall be displayed on the backflow preventer body.

- Backflow preventer C, Type A, class b



Date of manufacture (optional)

- Backflow preventer C, Type A, class a



(*) := Backflow preventer, acoustic class I or II

Date of manufacture or serial number

Manufacturer's reference

11.2 Technical documents

Reminder of the installation requirements

- For Class a backflow preventers, the filter must be checked and cleaned at suitable intervals for the use to which they are put.
- If there is a risk of contact with water over 65°C, an isolating valve fitted with an upstream drain (between the backflow preventer and the valve) shall be installed downstream of the backflow preventer. This valve will limit the temperature rise by conduction.

12 Presentation at delivery

No modifications.

Appendix A

Chapter A1 has been modified as follows:

The tests should be conducted in the following way:

- on two samples that have already been subjected to the reliability test
- in the case of tests A.2, A.3 and A.4, the relief valve orifice should be closed if necessary.