

## Antipollution of water installations

# Technical document 045-03

Controllable backflow preventers –  
Family B, Type A

Technical document 045-03 rev. 16  
25/07/2022

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## Modification history

Revision No.	Date	Modifications
15	01/07/2017	<p><b>Update to the document introduction and reference.</b></p> <p><b>Basic modifications:</b></p> <ul style="list-style-type: none"> <li>- Chapter 2: the standard references have been supplemented and updated</li> <li>- Paragraph 7.5: Recommendation added</li> <li>- Paragraph 9.4.1: Reference to the NF EN 1092-3 standard added</li> <li>- Paragraph 9.7.8: Extra details on the operating procedure added</li> <li>- Chapter 10: Test order modified</li> <li>- Part 2 Table 2: tests on finished products simplified, note on the tensile test added, note on incorporating the tests during production removed and sub-paragraph on ISO 9001 sites removed</li> <li>- Part 3 Inspection procedures employed by the CSTB: following chapters removed (types of products, inspection operations following admission and reduced inspection operations).</li> </ul>
16	25/07/2022	<ul style="list-style-type: none"> <li>- Paragraph 9.4.1: Clarifications made on flanged connections and addition of a tolerance table on dimension D.</li> <li>- Paragraph 9.5.2: Modification made to the requirement and details regarding the operating procedure for test 1 for DN higher than 150.</li> <li>- Paragraph 9.6.1: Modification made to the operating procedure.</li> <li>- Paragraphs 9.6.2 and 9.6.3: Addition of a tolerance value regarding the tubes' inner diameter.</li> <li>- Paragraph 9.7.2: Modification made to both the requirement and the test operating method.</li> <li>- Paragraph 9.7.6: Modification made to the test operating method.</li> <li>- Paragraph 9.7.7: Details given regarding the test</li> <li>- Editorial update according to the structure in force following the creation of the Technical Management Appendix of the NF045 reference system rev.17.</li> </ul>

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# 1 TECHNICAL SPECIFICATIONS

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Standard NF EN 12729 was formally approved on 20 March 2003.

This standard is used as a technical reference.

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

## Purpose

The purpose of this chapter is to add detail to certain paragraphs of Standard NF EN 12729 using the same paragraph numbers, and to supplement this European reference system using criteria deemed fundamental.

## 1 Field of application

The field of application of Standard NF EN 12729 is extended to devices of DN 6.

## 2 Standard references

NF EN 1254-1 :2021, *Copper and copper alloys - Plumbing fittings - Part 1 : capillary fittings for soldering or brazing to copper tubes*

NF EN 1254-2 :2021, *Copper and copper alloys - Plumbing fittings - Part 2 : compression fittings for use with copper tubes*

NF EN 1254-3 :2021, *Copper and copper alloys - Plumbing fittings - Part 3 : compression fittings for use with plastics and multilayer pipes*

NF EN 1254-5 :2021, *Copper and copper alloys - Plumbing fittings - Part 5 : capillary fittings with short ends for brazing to copper tubes*

NF EN 1254-6 :2021, *Copper and copper alloys - Plumbing fittings - Part 6 : push-fit fittings for use with metallic tubes, plastics and multilayer pipes*

NF EN 1254-7 :2021, *Copper and copper alloys - Plumbing fittings - Part 7 : press fittings for use with metallic tubes*

NF EN 1254-8 :2021, *Copper and copper alloys - Plumbing fittings - Part 8 : press fittings for use with plastics and multilayer pipes*

NF EN 1254-20 :2021, *Copper and copper alloys - Plumbing fittings - Part 20 : definitions, thread dimensions, test methods, reference data and supporting information*

NF EN 1329-1:2014, *Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure - Unplasticised poly(vinyl chloride) (PVC-U) - Part 1: Specifications for pipes, fittings and the system*

NF EN 1453-1:2000, *Plastics piping systems with structured-wall pipes for soil and waste discharge (low and high temperature) inside buildings - Unplasticised poly(vinyl chloride) (PVC-U) - Part 1: Specifications for pipes and the system.*

NF EN 1092-3:2004, *Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, PN designated - Part 3: Copper alloy flanges*

## 3 Terms and definitions

No modifications.

## 4 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 12729**.

### 7.1 Materials

No modifications.

### 7.2 Nature of the materials

No modifications.

### 7.3 Nature of the visible surfaces

Depending on which materials the devices are made of, the outer and inner 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 8.2 of Standard NF EN 12729**.

### 8.1 General

No modifications.

### 8.2 Relief valve

If the pressure relief valve is installed vertically with a downward flow, it is permissible for water to be admitted onto the downstream check valve if the device satisfies the requirements of test 9.6.4 in that installation position.

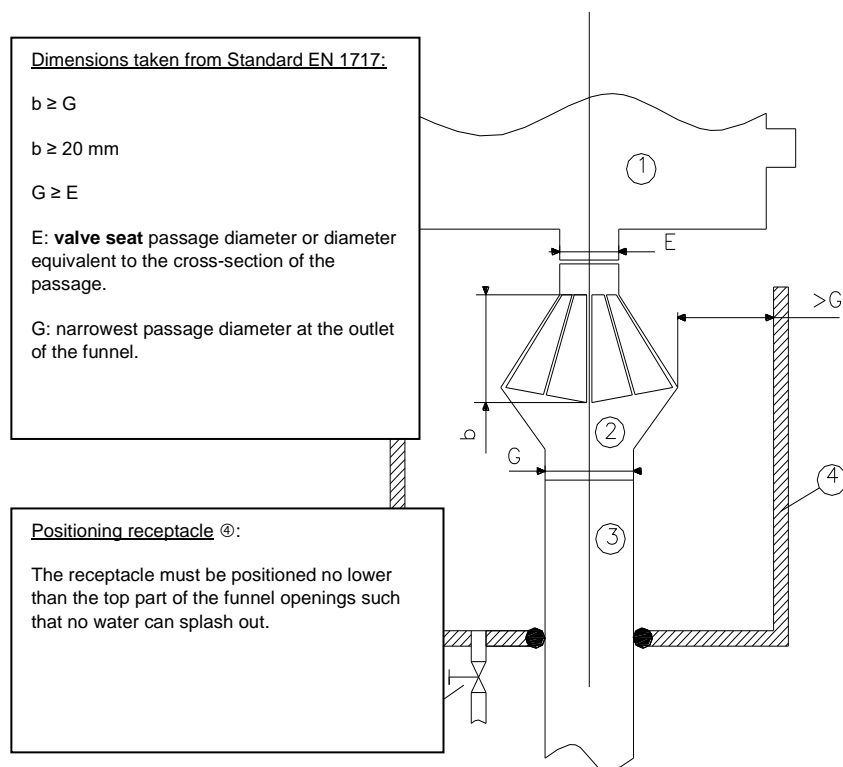
### 8.3 Efficiency of the drain water recovery system

This Article defines a test method for determining discharge flow recovery system efficiency. It applies to all backflow preventers equipped with an air break.

### 8.3.1 Test

This test involves verifying the capacity of the funnel to drain off the discharge flow in accordance with the specifications in paragraph 8.3.1.2.

#### 8.3.1.1. Testing apparatus:



① = backflow preventer

② = funnel

③ = drain pipe, minimum length 500mm

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

⑤ = valve

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).

#### 8.3.1.2 Operating procedure:

- with valve ⑤ in the open position
- establish the discharge as described in Paragraph 9.7.7 of Standard NF EN 12729
- close the valve ⑤
- maintain the discharge flow for 15 minutes
- shut off the water flow
- open relief 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 tests

### 9.1 General

No modifications.

### 9.2 General tolerances

No modifications.

### 9.3 Expression of the results

No modifications.

### 9.4 Dimensional characteristics

**Note:** This article supplements the specifications of **Article 9.4.1 of Standard NF EN 12729**.

#### 9.4.1 Fittings

Flanged copper alloy fittings shall comply with Standard NF EN 1092-3 as regards dimensions K and L. Dimension N<sub>3</sub> is not verified. Dimension C<sub>1</sub> shall be at least equivalent to the nominal value and dimension d shall comply with the minimum tolerance value.

Cast iron flange connections must comply with standard NF EN 1092-2 for dimensions K, L, C-f, and d. A tolerance is added for dimension D according to table 1 below :

DN	PN	D	Tolérance (mm)
50	PN10/16	165	+/- 2
65	PN10/16	185	+/- 2
80	PN10/16	200	+/- 2
100	PN10/16	220	+/- 2
125	PN10/16	250	+/- 2
150	PN10/16	285	+/- 2,2
200	PN10	340	+/- 4,5
200	PN16	340	+/- 4,5
250	PN10	395	+10/- 4,5
250	PN16	405	+/- 5
300	PN10	445	+15/- 5
300	PN16	460	+/- 5

**Table 1 : Tolerances of dimension "D" of flanges according to NF EN 1092-2**

Multi-drilling and oblong holes are permitted.

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.

Once in place, the devices must be removable without damaging the pipe.

Connections that allow the device to be dismantled without damaging the pipe must be supplied with the device.

The interlocking of the pipe must in no case be able to disturb the operation of the device (tube stop, etc.).

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

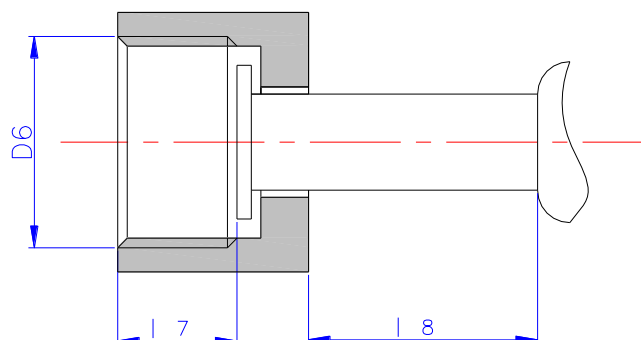
For any other type of connection, the device must comply with the specifications of standards NF EN 1254-1, 2, 3, 5, 6, 7 or 8.

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

The captive swivel nut fittings shall comply with Table 2 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 2: Dimensional characteristics of the swivel nuts**



#### 9.4.2 Pressure taps

No modifications.

#### 9.4.3 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).

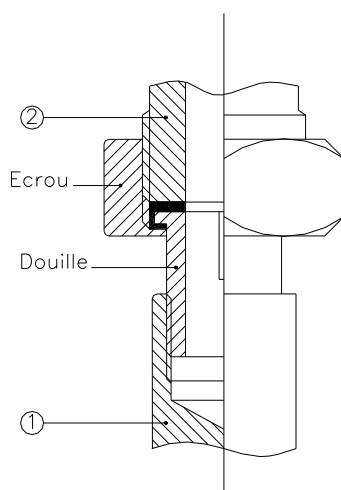


Figure Y

**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 Figure 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  $\begin{smallmatrix} 0 \\ -500 \end{smallmatrix}$  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 3 below without deformation:

Regarding threaded ends with sleeves and nuts	Regarding captive swivel nuts	Minimum tightening torque of the nut to achieve a seal	Tension
Sleeve fitting thread	Nut thread	in Nm	Force (kN)
G 1/8	G 1/4	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 3: Tensile strength tests**

**9.4.4 Pressure tap valves**

**Note:** This article has been added

This article defines the requirements and test methods for verifying the reliability of the valves fitted to the pressure taps.

#### 9.4.4.1 General:

The isolating valves fitted to the pressure taps shall be easy to operate.

Flanged valves shall be fitted with hand-operated controls.

From DN 20 upwards, the open and closed positions shall be mechanically identified (e.g. end stops).

#### 9.4.4.2 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.

#### 9.4.4.3 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.

### 9.5 Mechanical characteristics

#### 9.5.1 Mechanical strength of the body under pressure

No modifications.

#### 9.5.2 Endurance

### 9.5.2.1 Requirements:

The requirement is modified as follows:

At the end of tests 1, 2 and 3, make sure that the device complies with requirements a and b.

### 9.5.2.2 Testing:

Test 1: Behaviour with temperature.

As regards backflow preventers whose DN is higher than or equal to 150, the test is to be conducted on the backflow preventer's sensitive components (upstream and downstream check valve assembly and relief valve assembly). The components are to be examined at the end of this test. If there is no visible defect, they are to be reassembled to continue the endurance test.

Test 2: The last paragraph of the article is to be deleted.

Table 4 is supplemented as follows:

**Table 4 – Nominal size in relation to endurance test flow rate**

DN	6	8	10	15	20	25	32	40	50	65	80	≥ 100
Flow m <sup>3</sup> /h	0.25	0.4	0.6	1.3	2.2	3.5	5.8	9	14	24	36	56

### 9.5.3 Bending strength

**Note:** This article supplements the specifications of **Article 9.5.3.2 of Standard NF EN 12729**.

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 4 of Standard NF EN 12729.

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.

Table 5 is supplemented as follows:

**Table 5 – Nominal dimension in relation to bending moment**

DN	6	8	10	15	20	25	32	40	50	other DN's
Bending moment	20	30	40	80	150	300	400	500	600	See table 4 of Standard NF EN 12729

## 9.6 Leaktightness characteristics

### 9.6.1 Downstream check valve leaktightness inspection operation

The operating procedure of article 9.6.1.2 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.

### 9.6.2 Downstream check valve closing pressure and leaktightness inspection operation

**Note:** This article supplements **Article 9.6.2.1 of Standard NF EN 12729**.

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 70 mbar closing pressure requirement, the check valve must be NF mark approved.

### **9.6.3 Upstream check valve leaktightness at low pressure inspection operation**

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

### **9.6.4 Upstream check valve leaktightness under negative pressure inspection operation**

No modifications.

## **9.7 Hydraulic characteristics**

No modifications.

### **9.7.1 Test circuit**

No modifications.

### **9.7.2 Pressure loss as a function of flow rate inspection operation**

#### *9.7.2.1 Requirements:*

The requirement is modified as follows:

Regarding the flow rate range set out in Table 5, the reference pressure loss shall not be exceeded. As regards the flow rate values below those mentioned in Table 5, the pressure loss shall not exceed 0.1 MPa.

Table 6 is supplemented as follows:

**Table 6 – Nominal size in relation to flow rate**

DN	Flow m <sup>3</sup> /h	Pressure loss MPa	Flow m <sup>3</sup> /h	Pressure loss MPa
<b>6</b>	<b>0.320</b>	<b>0.1</b>	<b>0.480</b>	<b>0.15</b>
<b>For the other denominations, see Table 5 of Standard NF EN 12729</b>				

#### *9.7.2.2 Tests:*

The test is modified as follows:

Record the flow rates/pressure losses corresponding to the device starting from a flow rate value of approximately 20% of the minimum value up to the maximum flow rate set in Table 5.

### **9.7.3 Inspection to check the pressure difference between the upstream and intermediate zones**

No modifications.

### **9.7.4 Inspection to check that the device's intermediate zone goes to atmospheric pressure when the upstream pressure collapses**

No modifications.

### 9.7.5 Inspection to check when the relief valve starts to open and when it closes

No modifications.

### 9.7.6 Inspection to check relief valve leaktightness when the upstream pressure fluctuates

#### 9.7.6.2 Tests:

The operating procedure is specified below:

Within 10 seconds, make this pressure vary between +/- 10 kPa (+/- 100 mbar).

### 9.7.7 Inspection to check the pressure in the intermediate zone to obtain a set discharge flow rate under reverse flow

Table 7 is supplemented as follows:

**Table 7 – Nominal size in relation to minimum flow rate**

DN	6	8 to 10	15	20 to 25	32 to 40	50 to 65	other DN's
Discharge flow rate in m <sup>3</sup> /h	<b>0.320</b>	0.54	0.72	1.08	2.34	4.5	<b>See table 6 of Standard NF EN 12729</b>

**Note:** This article supplements the specifications of **Article 9.7.7 of Standard NF EN 12729**.

#### Specification

As a minimum requirement, the pressure in the intermediate zone shall be lower than the upstream pressure by at least 35 mbar up to the discharge flow rate specified in Table 6.

#### Tests

The test is conducted using backflow preventer BA fitted with its air break to drain.

Set a constant upstream pressure  $\geq 140$  mbar.

Establish the pressure discharge flow rate curve until you reach the value set out in Table 6 of Standard NF EN 12729 as a minimum. Check that the valve is fully open.

Verify that the pressure in the intermediate zone resulting from the curve complies with the specification (see curve 7).

During this test, any splashes at the air break to drain (funnel) shall be observed. Should there be heavy splashes, the test described in article 8.3 will then have to be performed.

### 9.7.8 Compatibility with products used for disinfecting systems

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.

### 9.7.9 Corrosion resistance

Technical document 045-01 supplements Article 9.7.9 of Standard NF EN 12729.

### 9.10 Acoustic tests

No modifications.

## 10 Test order

The table below sets out the test order and distribution by sample.

Samples	Tests to carry out: (the numbering used below replicates the system defined in Article 10 of Standard NF EN 12729)
Sample No. 1	Dimensional aspects→4→ 5→ 6→ 7→ 8→ 9→ 10 →11→ 12→13→ 15→ 2→ 3→ 16→ 17→ 18→ 19→ 20→tension
Sample Nos. 2 to 4	1 (where relevant)
New part of the device (body, bonnet, etc.)	14 (where relevant)

## 12 Presentation at delivery and packaging

**Note:** This article supplements **Article 12 of Standard NF EN 12729**.

Identification and verification: Since the backflow preventers are subject to periodic inspection, a stamped identification plate shall be attached to each.