TECHNICAL DOCUMENT

WATER

Antipollution of water installations

Technical document 045-06

Anti-pollution check valves – Family E, Types A, B, C and D

Technical document 045-06 rev. 16
01/08/2020

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MODIFICATION HISTORY

Revision No.	Application date	Modifications
15	**01/07/2017**	**Update to the document introduction and reference.** **Basic modifications:** - Chapter 2: Standard references updated - Chapter 6: Marking requirements modified - Paragraph 9.3.3: Recommendation added - Paragraph 11.8: Extra details on the operating procedure added - Chapter 13: Specification concerning the date of manufacture added. - Chapter 14: field of application and operating procedure modified - Paragraph 16.2.2: operating procedure modified Part 2 “Manufacturer’s production quality requirements”: Tests during production and tests on finished product requirements modified. Sub-paragraph concerning ISO 9001 sites removed. Note on incorporating the tests during production removed Part 3 “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).
16	**01/08/2020**	**Basic modifications:** - Chapter 3: Withdrawal of paragraph 3.3 - Chapter 8.1.2: modification of the display of the tables and added possibility of specifying certain dimensions for future admission. - Chapter 8.2.2: Removal of the dimensional requirement on “Bmax”. - Chapter 8.2.5: Addition of a new step to the operating procedure - Chapter 8.3: Addition of a requirement pertaining to flanged products. - Chapter 10: Definition of a test order. - Chapter 11.3: Reformulation of a requirement. - Chapter 11.4: Clarification regarding the test apparatus and reformulation of a requirement and of a test recommendation. - Chapter 11.6: Reformulation of the test procedure. - Chapter 11.7: Reformulation of the test procedure and the specifications. - Chapter 16.2.1: Correction of table numbers and modification of data.

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PART 1. TECHNICAL SPECIFICATIONS

Standard NF EN 13959 was formally approved on 20 January 2004.

This standard is used as a technical reference system and replaces French Standards NF P 43-007, NF P 43-008 and NF P 43-017.

To preserve the performance level of the products, it has been decided to add detail to and/or supplement certain chapters of Standard NF EN 13959.

Purpose

The purpose of this chapter is to add detail to certain paragraphs of Standard NF EN 13959 using the same paragraph numbers, and to supplement this European reference system using criteria deemed fundamental.

1 Field of application

This document applies to PN 10 and PN 16 check valves.

For flanged check valves, **the valve body shall be PN 16** while the flanges can either be ISO PN 10 or ISO PN 16.

Installation conditions for check valves whose DN>50: If an assessment application is made for any position other than horizontal, the check valve shall be tested in the position deemed to be least favourable.

2 Standard references

NF EN 1254-1:1998, *Copper and copper alloys - Plumbing fittings - Part 1: Fittings with ends for capillary soldering or capillary brazing to copper tubes*

NF EN 1254-2:1998, *Copper and copper alloys - Plumbing fittings - Part 2: Fittings with compression ends for use with copper tubes*

NF EN 1254-3:1998, *Copper and copper alloys - Plumbing fittings - Part 3: Fittings with compression ends for use with plastics pipes*

NF EN 1254-4:1998, *Copper and copper alloys - Plumbing fittings - Part 4: Fittings combining other end connections with capillary or compression ends*

NF EN ISO 228-1:2003, *Pipe threads where pressure-tight joints are not made on the threads - Part 1: Dimensions, tolerances and designation*

For information, the standards referenced below are based on the ISO 7 Standards. It has been agreed that these may be used as a technical reference system to replace the ISO 7 Standards.

NF EN 10226-1:2004, *Pipe threads where pressure tight joints are made on the threads – Part 1: Taper external threads and parallel internal threads - dimensions, tolerances and designation*

NF EN 10226-2:2005, *Pipe threads where pressure tight joints are made on the threads – Part 2: Taper external threads and taper internal threads - dimensions, tolerances and designation*

NF EN 10226-3:2005, *Pipe threads where pressure tight joints are made on the threads – Part 3: Verification by means of limit gauges.*

3 Terms and definitions

Paragraph 3.2 – Flanged anti-pollution check valves – Class a and Class b

Only those check valves (Class a) that are equipped with an inspection port are eligible for NF mark certification.

4 Nominal size

Readers are reminded that the European Standard covers check valves whose nominal dimensions range from DN 6 to DN 250.

5 Designation

No modifications.

6 Marking and technical documents (modified)

All the required data shall be displayed on the device body.

Family	Type	DN	Marking
E	A & C, B & D excluding cartridge types	15≤DN≤50	NF & manufacturer's logos, DN, family and type letters, direction of flow and acoustic class
E	A & C, B & D excluding cartridge types	<15	NF & manufacturer's logos, DN and direction of flow
E	A & C, flanged	≥40	NF & manufacturer's logos, DN, family and type letters, direction of flow and Serial number
E	Cartridge types	15≤DN≤50	NF & manufacturer's logos, direction of flow and DN.
E	Cartridge types	<15	Manufacturer's logo & NF logo or CSTB code

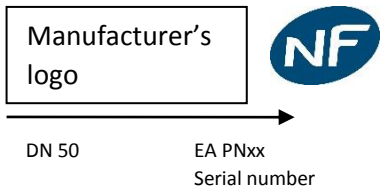
All the required data shall be displayed on the device body.

- Family E types A & C and B & *D check valves with threaded end connections (15≤DN≤50)*,

(*) EA check valve, acoustic class I or II

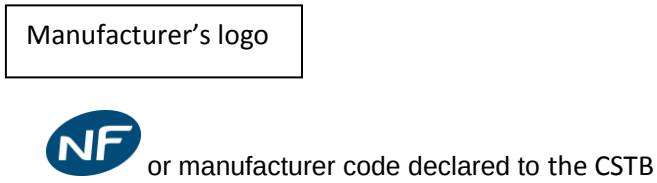
- Family E types A & C and B & *D check valves with threaded end connections (DN<15),*

- Flanged check valves, Family E Type A (and Type C), DN ≥40



- Cartridge check valves, Family E Type B, (15≤DN≤50),

- Check valves, Family E Type B (and Type D), DN < 15



7 Symbols

No modifications.

8 General design characteristics

The dimensions below are given for check valves designed to be directly fitted to water distribution systems.

The dimensioning of the check valves used in other configurations is covered in Chapter 16 of this document (e.g. check valves designed to be fitted to specific sub-assemblies such as supply enclosures, water meter box chambers, etc.).

8.1 Overall length and diameters of the check valves

8.1.1 General

No modification.

8.1.2 Check valves with threaded or compression ends

The overall lengths of the check valves with the following types of end connections are given in the tables below:

- male/male type check valves (threaded exterior ends)

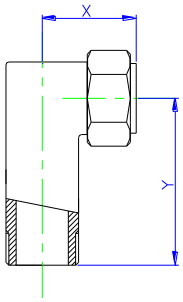
Denomination	DN 15	DN 20	DN 25	DN 32
Long series: Length (mm)	65 +3/-0	74 +3/-0	90 +3/-0	110 +3/-0
Short series: Length (mm)	/	/	79 +3/-0	88 +3/-0

- straight male/swivel nut type check valves

Denomination	DN 10	DN 15	DN 20	DN 25	DN 32
Long series: Length (mm)	**(*)**	77 +3/-0	80 +3/-0	98 +3/-0	/
Short series: Length (mm)	/	58 +2/-0	/	88 +3/-0	98 +3/-0

- elbowed male/swivel nut type check valves

Denomination	DN 10	DN 15	DN 20
Length X	**(*)**	27 +3/-0	33 +3/-0
(mm) Y		50 +3/-0	52 +3/-0



(*): Awaiting admission application, dimensions yet to be defined

8.1.3 Flanged check valves

No modifications.

8.1.4 Cartridge check valves

Dimension *h* given in Table 3 of Standard NF EN 13959 represents the width of the collar whose diameter is equal to D_2. See also Chapter 16.

Dimension $L_{(max)}$ is modified as follows:

DN	**15**	**20**	**25**
$L_{(max)}$	19	25	38

Check valves integrated into the sanitary tapware.

The dimensions of the cartridge check valves for sanitary tapware are given in Chapter 16 of this document – diagram 1.

8.2 End connections

8.2.1 General

No modifications.

8.2.2 Threaded end connections

Under no circumstances shall the pipe end connection impair device operation (pipe lock, etc.).

Dimensioning of the end connections to the pipework shall comply with the requirements of Standard NF EN 1254-4.

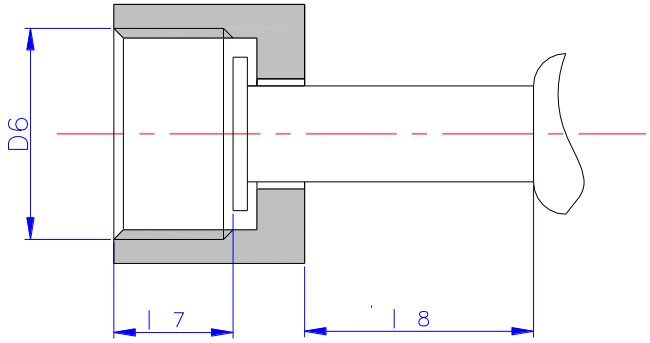
To ensure the fitting can be removed without working on the pipework, the male end connection threads of the check valve shall be **tapered** in accordance with Standard NF EN ISO 228-1.

Male threaded fittings without flanges shall comply with all the dimensions given in Table 6 of Standard EN 1254-4, except for dimensions “C”, “R” and “Bmax”.

The dimensional characteristics of the captive swivel nuts are given in Table 1.

Table 1: Dimensional characteristics of the swivel nuts

D6 (ISO 228-1)	G 1/2	G 3/4	G 1	G 11/4	G 11/2	G 2
I7 mm (min)	8	8.5	10	11	12	14
I7 mm (max)	9.8	11.3	12.8	14.3	15.8	17.3
I8 mm	shall allow complete disengagement of the swivel nut					



8.2.3 Flanged end connections

No modifications.

8.2.4 Other connections

Fittings with compression ends shall comply with Standards NF EN 1254-2 and NF EN 1254-3.

Brazed fittings shall comply with Standard NF EN 1254-1. Such fittings shall be independent of the check valve body.

8.2.5 Tensile strength test

Note: <u>This article has been added</u>

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).

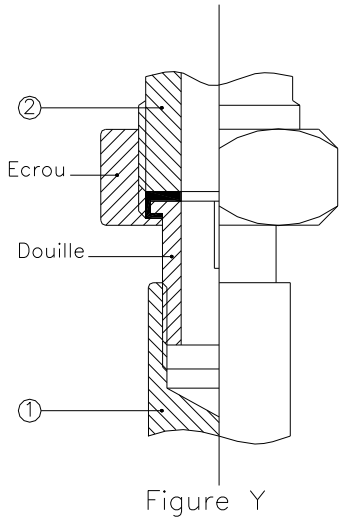


Figure Y

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:

- Attach a metal gasket between the nut and part 2
- Tighten the nut, applying 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 $^{0}_{-500}$ N, is reached.
- Apply the force for 30 seconds, then release.

Required characteristics

The assembly (sleeve/nut) shall withstand, without deformation, the tensile loads given in Table 2.

Table 2: Tensile strength tests

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 ½	G ¾	70	15
G ¾	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

8.3 Test and drain ports

As regards flanged check valves, a quarter-turn valve shall be fitted upstream and downstream.

8.4 Other characteristics

Readers are reminded that only **"class a"** flanged check valves are eligible for NF mark certification.

9 Physical and chemical characteristics

9.1 Materials

The corrosion resistance of coated devices is specified in Technical document 045-01.

9.2 Nature of the materials

No modifications.

9.3 Visible surfaces

Note: This article supplements the specifications of **Article 9 of Standard NF EN 13959.**

9.3.1 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.

9.3.2 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.

9.3.3 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**.

10 Testing conditions

The table below specifies the order of testing set out in Article 10.1 of Standard NF EN 13959 according to products:

Check valves EA, and EB with body and double check valves EC and ED:

Samples	Tests to be performed: *(the numbering below takes up the stages defined in Article 10 of Standard NF EN 13959*).
Sample no. 1	In order according to the following testing sequence:stages 3, 4, 6, 7, 8, 9, 10, 11, 12
Sample no. 2	In order according to the following testing sequence: stages 1 and 2

Cartridge check valves EB:

Samples	Tests to be performed: *(the numbering below takes up the stages defined in Article 10 of Standard NF EN 13959*).
Sample no. 1	In order according to the following testing sequence: stages 5, 6, 7, 8, 9, 10, 11, 12
Sample no. 2	In order according to the following testing sequence: stages 1 and 2

11 Hydraulic and mechanical characteristics

11.1 High velocity flow

No modifications.

11.2 Flow rate and pressure loss

For a pressure loss of 0.15 bar, the check valve shall be completely open.

Full opening shall be verified by checking the flow rate until a pressure loss of 0.4 bar is achieved and the flow rate shall comply with the requirements of the table below.

A coefficient of 0.85 is used for elbow check valves as specified in Table 3.

Table 3: Flow rate and pressure loss

DN	6	8	10	15	20	25	32
Flow rate (l/s) under 0.15 bar	0.07	0.13	0.2	0.45	0.8	1.4	2.2
Flow rate (l/s) under 0.4 bar	**0.11**	**0.21**	**0.32**	**0.73**	**1.3**	**2.3**	**3.6**
Flow rate Elbow check valve	**The flow rates specified above are reduced by a coefficient of 0.85**						

DN	40	50	65	80	100	125	150	200	250
Flow rate (l/s) under 0.15 bar	3.5	5.4	12	18	27	43	62	110	172
Flow rate (l/s) under 0.4 bar	**5.7**	**8.8**	**19**	**29**	**44.5**	**70**	**100**	**180**	**280**
Flow rate Elbow check valve	**The flow rates specified above are reduced by a coefficient of 0.85**								

11.3 Mechanical strength of the body

The requirement in Article 11.3.3 is modified as follows:

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

11.4 Bending moment

The test equipment described in Figure 7 and 8are given for information purposes.

As the tolerance regarding the load to be applied is not specified in the standard, it is set at (+0/-2)% of the value specified in Table 7 of Standard NF EN13959.

Note: The point below details the operating procedure described in Article 11.4.2.1.

For check valves with male/swivel nut fittings, the nut is 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.

The procedure in Article 11.4.3.5 is modified as follows:

The pressure shall be gradually increased from 0 to 16 bar over a minimum duration of 1 minute.

The requirement in Article 11.4.3.8 is modified as follows:

During the first test, there shall be no breakage, visible permanent deformation or leakage of the body of the test device. The assessment of the deformation shall be carried out visually after dismantling the product.

11.5 Pressure tightness under a low reverse pressure differential

No modifications.

11.6 Pressure tightness under a high reverse pressure and verification that the check valve has not jammed

The procedure in Article 11.6.4.2 is modified as follows:

The pressure shall be gradually increased from 0 to 16 bar over a minimum duration of 1 minute.

11.7 Pressure differential at which the check valve closes

Article 11.7.2.4 is modified as follows: Open valve (6) slowly until it is fully open.

Article 11.7.2.5 is modified as follows: After opening the valve, measure for 10 minutes the positive pressure differential at which the test device has closed by determining the difference in water levels in tubes (11) and (14).

Article 11.7.3 is modified as follows: After 10 minutes, the positive pressure differential at which the test device has closed shall be higher than500 Pa (50 mm of water column) and shall be stable.

11.8 Compatibility with products used for disinfection of 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.

11.9 Endurance

Article 11.9.2.3: In the case of PN 16 flanged check valves, the back pressure applied shall be **16±1 bar.**
Article 11.9.3.1: Cycle duration for DN 40 and 50 flanged devices.
The cycle count is 25000 **at a back pressure of 16 bar**.

12 General working characteristics

12.1 Resistance to corrosion

No modifications.

12.2 Acoustic characteristics

This test concerns products up to and including DN 32.

The devices are tested using the flow rate specified in **Table 1** of Standard NF EN ISO 3822-3.

The acoustic classes accepted under the NF mark are: I & II.

13 Presentation at delivery

No modifications.

In the case of check valves (excluding flanged check valves), the date of manufacture must be shown on the packaging.

14 Resistance to alternating pressures

Note: <u>This article has been added.</u>

These devices are subject to large pressure variations due to installed devices such as washing machine solenoid valves, mixer taps, etc. closing.

To ensure that the test and drain orifice closure mechanisms are strong enough, the test described below is carried out. The test employs the same principle as that used in the tests on the supply hoses and pipework elements.

This article is not applicable to flanged check valves.

14.1 Testing principle

This test involves applying variable hydraulic pressure downstream of the product at a defined frequency.

The product used for this test must not be used for any other tests.

14.2 Apparatus

The apparatus includes a pressure generator capable of generating variable pressure and oscillating at a constant frequency of 1 to 2 s between a low limit and a high limit and describing a constant amplitude.

These variations are represented by a signal waveform that is substantially rectangular (see Figure 1 of this document).

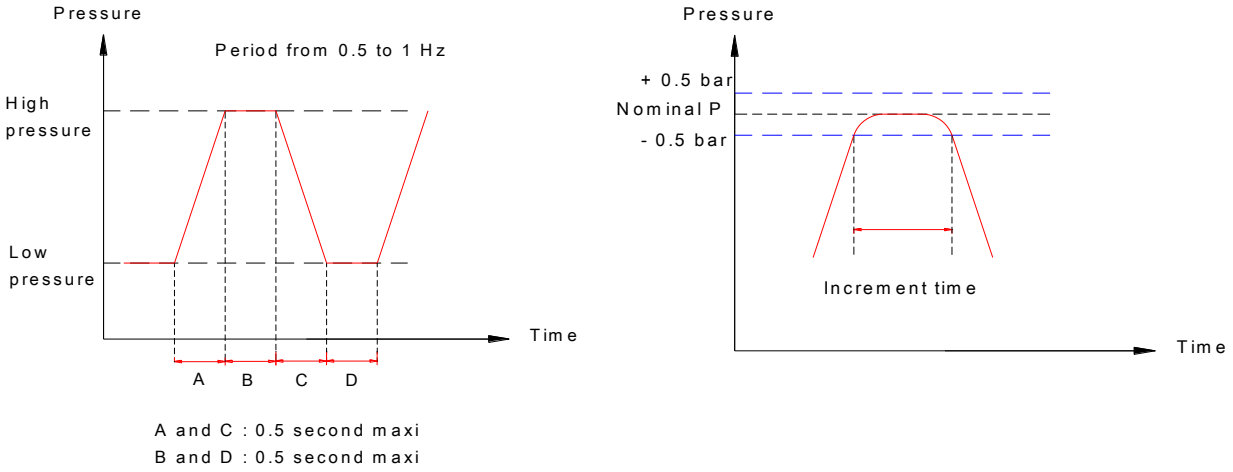


Figure 1: Pressure variation

- the time needed to go from low pressure to high pressure and back again shall be as short as possible and never longer than 0.5 s;
- the low and high pressure values shall be obtained and checked to within ±0.5 bar of the desired values;
- to check the waveform of the signal representing the pressure variation, the generator must be combined with a device that can verify the pressure changes in the test specimen (low inertia pressure sensor and graphic data recorder or oscilloscope).

14.3 Test

14.3.1 Operating procedure

- Connect the device outlet to the testing apparatus and leave the inlet of the device open to the air
- Fill with water and bleed the entire test circuit
- Apply the test conditions set out in Table 4 of this document (test pressures and cycle count)

Table 4: Resistance to alternating pressure test conditions

DN	Cycle count
DN < 32	200,000
32 ≤ DN ≤ 50	20,000

Pressure condition (bar)

Low pressure	High pressure
PN	3xPN

14.3.2 Specifications

Following the alternating pressure test and during the ensuing leaktightness check, no damage or leakage shall be detected.

The leaktightness test of the body under 16 bar is carried out as defined in Article 11.4.3 of Standard NF EN 13959 without bending stress.

Check that the shut-off system is still in place.

15 Valves fitted to the test and drain ports

Note: <u>This article has been added</u>

This article defines the requirements and test methods to verify the reliability of the taps fitted to the test and drain ports. These tests are carried out at admission and whenever a modification is made or a supplier changed.

15.1 General

The isolating valves fitted to the test and drain ports shall be easy to operate.

Flanged check valve taps shall be fitted with hand controls.

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

15.2 Operability

15.2.1 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.

15.2.2 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.

15.3 Reliability

15.3.1 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)

15.3.2 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.

16 Specific case of "WM" and "ST" EB check valves

Note: <u>This article has been added</u>

16.1 Designation

EB check valves for integration into appliances are designated by:

- the name of the device,
- its family,
- its type,
- integrated or integration type identification letter (ST, WM),
- its denomination or flow rate in the case of check valves with flow limiters,
- the materials the device is made of (not applicable to EB cartridge check valves),
- its acoustic class,
- the reference to the product standard and to this document (Technical Document 045-06).

<u>E.g. EB integrated check valve for sanitary tapware:</u>
- non-controllable anti-pollution check valve, Family E, Type B, ST10, DN 8, acoustic class I, EN 13959 &Technical Document 045-06.

<u>E.g. EB integrated check valve with flow limiter for sanitary tapware:</u>
- non-controllable anti-pollution check valve, Family E, Type B, ST10, 6 l/min, acoustic class I, EN 13959 &Technical Document 045-06.

16.2 Characteristics and tests

16.2.1 Overall dimensions

In order to maintain sanitation protection, the protection devices must be replaced at set intervals and to that end, dimensional characteristics for check valves intended for the following have been defined:

- sanitary tapware **(ST)** dimensioned in accordance with Table 5 below:

Diagram 1

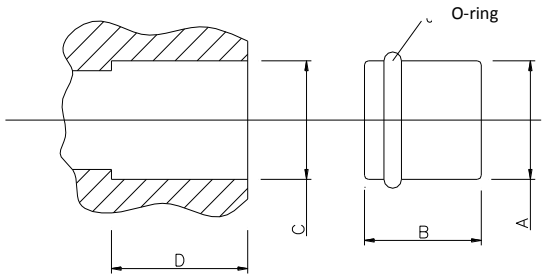


Table 5

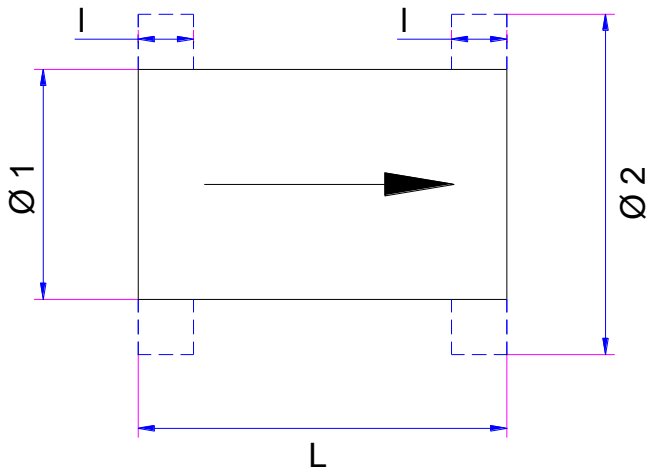
	A Maxi mm	**B Maxi** mm	**C (*)** mm	**D (*)** mm
ST 10 (DN6)	10	11	$10^{+0,15}_{-0}$	$11^{+0,5}_{-0}$
ST 10 (DN8)	10	11	$10^{+0,15}_{-0}$	$11^{+0,5}_{-0}$
ST 14 (DN10)	14	16,5	$14^{+0,15}_{-0}$	$16,5^{+0,5}_{-0}$
ST 15 (DN10)	15	16,5	$15^{+0,15}_{-0}$	$16,5^{+0,5}_{-0}$
ST 20 (DN15)	20	18	$20^{+0,15}_{-0}$	$18^{+0,5}_{-0}$

The check valves that comply with the above-mentioned dimensions are the only ones entitled to bear the ST marking on the body so as to facilitate maintenance.

(*): Those dimensions are specified to define the size of the body used for the tests. They come from Technical Document DT077-01C_rev01.

- Water meters **(WM)**, dimensioned in accordance with Table 6 below:

Diagram 2



Flange, if any, at the inlet or outlet of dimensions l and dia. 2

Table 6

	Cartridge check valves intended for water meters			
	Ø 1 max (mm)	L max (mm)	Ø 2 (mm)	h (mm)
WM10 (DN10)	15	17	$16,5^{0}_{-0,1}$	2,5 +/– 0,1
WM15 (DN15)	18,3	19.5	$20^{0}_{-0,15}$	3 +/– 0,1
WM20 (DN20)	22,1	25.5	$25^{0}_{-0,15}$	7 +/– 0,1
WM25 (DN25)	28,5	38.5	$32^{0}_{-0,2}$	8 +/– 0,1

16.2.2 "ST" cartridge check valves with flow limiter

Standard NF EN 13959 Articles that apply however the device is used:

- 11.5 Pressure tightness under a low reverse pressure differential
- 11.6 Pressure tightness under a high reverse pressure and verification that the check valve has not jammed
- 11.7 Pressure differential at which the check valve closes
- 11.9 Endurance

The flow characteristics of these devices shall be verified in accordance with the data supplied by the manufacturer and the requirements set out below.

In the case of new check valves that limit flow to less than 6 l/min, the compliance of the flow rate given by the manufacturer shall be verified against the nominal value for an upstream pressure ranging from 1.5 to 5.5 bar within a tolerance range of ± 0.6 l/min.

For all other flow rates, the flow rate given by the manufacturer shall comply within a tolerance range of ± 10%.

At the end of the endurance test, the flow test is repeated under the same conditions to a tolerance of ± 1 l/min for check valves that limit flow to less than 6 l/min, and a tolerance of ± 20% of the value specified by the manufacturer for all the check valves.
Note: It is essential that the manufacturer specify the field of application for this type of check valve in their documentation.
(Operating procedure: Begin the test by circulating water at 3 bar for 15 s, then start recording the flow rate at a supply pressure of varying between 1 and 5.5 bar using stepped pressure changes and stabilisation periods between the steps).

PART 2. MANUFACTURER'S PRODUCTION QUALITY REQUIREMENTS

2.1 Nature and frequency of the inspections

2.1.1 Verification during production

The manufacturer shall ensure that the functions described in Standard NF EN 13959 and in Article 1 of this document are performed. Nevertheless, procedures and apparatus other than those described in the standards may be used.

The inspections during production and their frequencies are specified in the table below. These can be performed on the components or during product assembly.

2.1.1.1 For EA and EC flanged check valves

Inspections	Inspection frequency
Materials	100% or material compliance certificate
Visible surfaces	100%
Standardised dimensions	Quality documentation or inspection range
Leaktightness of the product (when assembled)	100%
Leaktightness under low downstream pressure	100%
Leaktightness under high downstream pressure	100%
Verification that the check valve has not jammed	100%
Closing pressure differential	100%
Marking	100%
Presentation	100%

2.1.1.2 For EA, EB, EC and ED check valves with threaded ends

Inspections	Inspection frequency
Materials	100% or material compliance certificate
Visible surfaces	100%
Standardised dimensions	Quality documentation or inspection range
Bending strength of the body with swivel nut	Quality documentation or inspection range
Leaktightness of the product (when assembled)	100%
Leaktightness under low downstream pressure	100%
Leaktightness under high downstream pressure	100%
Marking	100%
Presentation	100%

2.1.1.3 For EB cartridge devices

Inspections	Inspection frequency
Materials	100% or material compliance certificate
Visible surfaces	100%
Standardised dimensions	Quality documentation or inspection range
Leaktightness under low downstream pressure	100%
Leaktightness under high downstream pressure	100%
Marking	100%
Presentation	100%

2.1.2 Finished product inspection

The testing apparatus and inspection procedures used to inspect finished products in the factory's laboratory shall comply with the requirements of Article 1 of this document and the corresponding product standards.

However, with the CSTB's approval, different procedures and apparatus from those described in the standards may be used as long as the results are equivalent.

The products to check are sampled at the end of the assembly lines (after packaging) or as they come into the warehouse.

The finished product inspection types and sampling procedures are set out in the Tables below.

2.1.2.1 For EA and EC flanged check valves

Inspection operations/Tests	**Sampling:** **Sampling plans accepted by the CSTB**
Marking (§6)	Yes
Materials (§9)	Yes
Nature of the surfaces (Technical Document 045-06)	Yes
Design and dimensional characteristics (§8 and Technical Document 045-06)	Yes
Hydraulic characteristics – High speed and flow rate/Δp (§11.1, §11.2 and Technical Document 045-06)	Yes
Mechanical strength of the body (§11.3)	Yes
Leaktightness under high Δp without jamming (§11.6)	Yes
Anticipation (§11.7)	Yes
Presentation (§13)	Yes

2.1.2.2 For EA, EB, EC and ED threaded check valves

Inspection operations/Tests	Sampling: Sampling plans accepted by the CSTB
Marking (§6)	Yes
Materials (§9)	Yes
Nature of the surfaces (Technical Document 045-06)	Yes
Design; dimensional characteristics (§8 and Technical Document 045-06)	Yes
Hydraulic characteristics – High speed and flow rate/Δp(§11.1, §11.2 and Technical Document 045-06)	Yes
Mechanical strength of the body (§11.3)	Yes
Bending (§11.4)	Yes
Leaktightness under high Δp without jamming (§11.6)	Yes
Anticipation (§11.7)	Yes
Presentation (§13)	Yes

2.1.2.3 For EB cartridge devices

Inspection operations/Tests	Sampling: Sampling plans accepted by the CSTB
Marking (§6)	Yes
Materials (§9)	Yes
Nature of the surfaces (Technical Document 045-06)	Yes
Design and dimensional characteristics (§8 and Technical Document 045-06)	Yes
Hydraulic characteristics – High speed and flow rate/Δp (§11.1, §11.2 and Technical Document 045-06)	Yes
Leaktightness under low Δp (§11.5)	Yes
Leaktightness under high Δp without jamming (§11.6)	Yes
Anticipation (§11.7)	Yes
Presentation (§13)	Yes

PART 3. PROCEDURES FOR THE QUALITY ASSURANCE OPERATIONS CARRIED OUT BY CSTB

3.1 Nature of the inspection operations and tests

The inspections and tests shall be carried out in accordance with the requirements in this document and with Standard NF EN 13959.

3.2 Sampling

3.2.1 Regarding admission

All testing shall be carried out in the laboratory(ies) of the mark, or under its(their) responsibility.

TYPE OF DEVICE	SAMPLING
Check valves	Threaded or cartridge check valves: 3 check valves of each denomination for the whole range. EA flanged check valves: 1 check valve of each denomination for the whole range. 1 check valve or check valve part for carrying out the coating tests 3 check valves for denominations ≤ 32 for carrying out the acoustic tests

3.2.2 Regarding follow-up inspections

All testing shall be carried out under the responsibility of the laboratory(ies) of the mark.
The samples needed for the tests are taken once every six months from the manufacturer's stock of finished products during the follow-up audits or purchased commercially or submitted by the manufacturer at the request of the laboratory.

Each mechanism (obturator) shall be sampled at least once a year.
A sample is comprised of all the DNs of the given mechanism; the mandated body ensures that all the configurations are tested on a regular basis.
The tensile strength tests, alternating pressure tests and coating quality tests shall be conducted once every 2 years.
The acoustic tests shall be carried out once every 5 years.
The tests on the pressure test point valves shall also be conducted once every 5 years and whenever the materials, suppliers or manufacturing process change.
If a disparity is detected, the mark's laboratory can request the holder to remit new samples for testing directly to it.

3.2.3 Regarding additional inspection operations

If an additional inspection is carried out as part of a sanction, the holder shall provide the necessary test specimens to have the sanction lifted.