WATER

TECHNICAL DOCUMENT

CONTROL VALVES AND SAFETY VALVES

Technical document 079-09

Ball valves

Technical document 079-09 Rev01
27/04/2020

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MODIFICATION HISTORY

Revision no.	Application date	Modifications
00	**15/03/2019**	**Update to the document layout and reference.** **Content modifications:** **Part 1: Rules of application** – Article 3.3 End connections: added “crimp connection” type – Article 4 Designation: only the essential information has been retained – Article 5.1 Materials: reference to the 4MS list – Article 5.1.2: Compatibility with products used for disinfecting systems: added detail about the quality of the water that must be used; – Article 5.1.4 Corrosion resistance of iron alloy parts: exposure time 200 hrs – Article 5.2 End connections: o added a note on tracking for dimensional deviations for connections o added “crimp connection” type o threading dimension G 1/2 (male) modified – Article 5.6 Manoeuvrability: deleted and integrated contents into Article 5.3 – Article 5.8 Dimensions for standard valves: deleted and integrated contents into Article 5.9 – Article 5.10 Valve spindle (ejection): deleted, integrated contents into Article 6.5 – Article 5.11 Dimensions of valves intended to be fitted before and after water meter: deleted, integrated contents into Article 5.6 Valves intended to be fitted before and after water meter **Part 2 and Part 3 are moved into a Technical Management Appendix (Control methods)** **and** **Update to Tables “Inspection during production” and “Inspection of finished products”.**
01	**27/04/2020**	**Content modifications:** **Part 1: Application rules** – Addition of a DN12 denomination. That is the reason why the tables concerned were supplemented. – Article 5.5.1 Full-bore: The bore diameter for DN8 is set to 10.10 mm. Article 5.6.2 Dimensions for “Short series” – Table 9 Correction of the DN15 R2 and R3 dimensions: Reuse of the values in the version dating from 2013 (NF079 Rev.08).

Contents

PART 1. RULES FOR THE APPLICATION OF STANDARD NF EN 13828 AND COMPLEMENTARY SPECIFICATIONS

Foreword

The publication of the NF EN 13828 Standard in January 2004 required the addition of further detail and supplementary information to the new standard framework, considered incomplete for the definition of high-performance products.

For this reason, the decision was made within the context of this certification to prepare a technical document to define products that provide satisfaction to the user and to broaden the field of application of the standard.

Purpose

The purpose of this document is to add details and/or supplementary information to certain articles in Standard NF EN 13828, using the same numbering system as that of the standard.

The supplemented, modified and added articles are identified in the title.

1 Field of application (supplemented)

This document applies to copper-alloy and stainless steel ball valves:

- installed before or after meter,
- designed as equipment for any of the following: potable and non-potable water systems, and heating and air-conditioning systems,
- with minimal pressure rating PN 10,
- for the distribution of fluid at a continuous temperature of -5°C to 90°C with an occasional peak of 110°C for a maximal duration of one hour,
- designed as equipment for low-pressure compressed air systems (less than 10 bar), for valves of diameter strictly less than DN32.

This document does not apply to products installed on public water supply networks.

2 Normative references (completed)

The following reference documents are essential for the application of this document.

NF EN 12164:2011	Copper and copper alloys – Rod for free machining purposes
NF EN 12165: 2011	Copper and copper alloys – Wrought and unwrought forging stock
NF EN 12420: 1999	Copper and copper alloys – Forgings
NF EN 10088-1: 2005	Stainless steels - Part 1: list of stainless steels
NF EN ISO 5211: 2001	Industrial valves – Part-turn actuator attachments
NF EN ISO 9227: 2012	Corrosion tests in artificial atmospheres – Salt spray tests
NF EN ISO 4628-3: 2004	Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 3: Assessment of degree of rusting.

The reference to the ISO 7-1 Standard on page 18 of the NF EN 13828 Standard is replaced by the NF EN 10226-1 Standard.

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

3 Terms and definitions

3.1 Ball valves

Valves in which a ball, operated manually or via an actuator, rotates about an axis at right angles to the direction of flow and in which, in the "open" position, the flow passes through the ball in a straight or angled line, and with a **normal operating position** of either **fully "open" or fully "closed"**.

Ball valves **must** be opened or closed by a single turn through 90°.

This document covers the following types:

- Straight pattern ball valves (Figure 1),
- Angle pattern ball valves (Figure 2)
- Three-way ball valves (1 inlet, 2 outlets) (Figure 3)

NOTE:

The term "ball valve" may be referred to with the abbreviation "BV" in the remainder of this document.

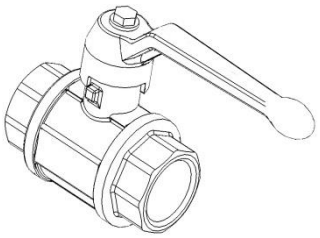


Figure 1: straight pattern (S)

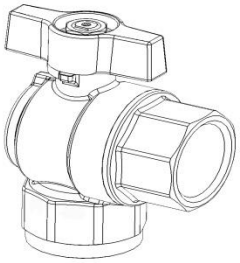


Figure 2: angle pattern (A)

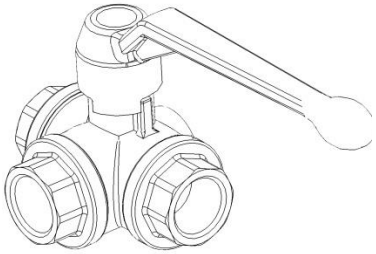


Figure 3: three-way

3.2 Nominal diameter (DN)

3.3 End connections (supplemented)

The article is supplemented as follows:

The **crimp connection** type is added to the traditional end connections defined in 5.2 (Table 3 of the NF EN 13828 Standard).

4 Designation (supplemented)

For practical reasons and ease of comprehension, it has been decided to keep the essential information defined in the standard:

- form of construction (straight or angle),
- nominal diameter;
- end connections;
- reference to the European Standard.

Added to this designation is the logo for this certification.

Minimum designation.

EXAMPLE:

Ball valve, straight (S), DN25, with Rp1 threading on both outlets, NF EN 13828, **NF**.

5 Design requirements

5.1 Materials (supplemented)

The article is supplemented as follows:

To comply with French regulations concerning materials in contact with potable water ("ACS" in French): refer to clause 2.2 of the body of the certification reference system for "Control valves and safety valves".

The use of materials other than those mentioned below will need to be justified in a technical file, and the file is to be submitted for review to the Specific Committee for this certification.

5.1.1 Materials of the body and of the ball

5.1.1.1 Copper alloys

NOTE:

The alloys referenced in the "4 MS" list are also authorised.

4 MS stands for 4 Member States. Declaration of intent signed in December 2010 by the competent authorities of each of the 4 MS:

www.sante.gouv.fr/IMG/pdf/4MS_Declaration_of_Intent_signedVF-4MS.pdf.

5.1.1.2 Dezincification resistance of copper alloy.

Refer to Table 1 of this document

Table 1: List of alloys to use depending on the production method

Production method	Alloy	Number	Normative Reference
hot die formed parts	all	all	NF EN 12165
	Copper-Zinc-Lead	CW617N CW602N*	
cast parts	Copper-Zinc (Brass)	CC754S or CB754S CB752S (*) or CC752S (*)	NF EN 1982
	Copper-Tin-Lead (Bronze)	CB499K or CC499K	
lathe-turned parts	Copper-Zinc-Lead	CW614N CW617N CW602N* CW603	NF EN 12164 (solid rod) NF EN 12168 (hollow rod)

(*) Dezincification-resistant copper alloys

5.1.1.3 Stainless steels

If stainless steel is used, select from the four grades indicated in Table 2 of this document.

Table 2: List of steel grades to use (EN/ANSI correspondence)

Number EN 10088 (09/2005)	Symbol EN 10088 (09/2005)	ANSI
1.4301	X5CrNi18 10	304
1.4307	X2CrNi18 9	304L
1.4401	X5CrNiMo17 12 2	316
1.4404	X2CrNiMo17 12 2	316L

5.1.1.4 Materials of the body and of the ball

5.1.1.5 Materials of forgings (added)

In addition to the recommendations above, the materials of parts produced by die-forming shall comply with Standard NF EN 12420.

5.1.2 Compatibility with products used for disinfecting systems (added)

5.1.2.1 Principle

All the product's constituent parts that are in contact with water, in particular parts made of elastomers, shall be compatible with water treated to disinfect systems with sodium hypochlorite.

5.1.2.2 Test method

For 24 hours, keep internal parts of the valve in contact with a solution containing 0.10 g of sodium hypochlorite per litre of "quality 3" water at a pressure of (3 ± 1) bar.

NOTE 1:

"Quality 3" water is defined as water that is appropriate for the preparation of solutions and for most chemical applications. It must be produced by single distillation, demineralisation or reverse osmosis.

NOTE 2:

The test is performed with the valve in the fully open position.

5.1.2.3 Requirements

At the end of the test, the product must be rinsed with mains water for at least one minute, then installed on the endurance bench. It must meet the specifications defined in article 7.6 Endurance *(modified)*.

5.1.3 Nature of the visible surfaces (added)

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

5.1.3.1 Surfaces without coating

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

- scaling,
- cracks,
- sand inclusions,
- traces of heating after machining,
- impact marks or clamp marks following tool use,
- pits or porosity: surface defects in the base metal,
- shrink holes: missing “supply” in casting or plastic injection,
- impact marks and scratches: scratches due to handling or impact marks during transportation,
- burns: rough surface and greyish appearance,
- levelling defects (orange peel effect).

5.1.3.2 Surfaces with coating

The surfaces of coated parts shall be free from visible defects such as:

- pits,
- scratches,
- clamp marks following tool use,
- lack of coating,
- scaling, lack of preparation and brittleness of the deposit.

5.1.4 Corrosion resistance of iron alloy parts (added)

This test applies to parts made of iron alloy and the coatings.

5.1.4.1 Principle

The purpose of the test is to check the corrosion resistance of iron alloy parts (nut, lever, etc.).

The test is carried out in neutral salt spray (NSS) under the conditions specified in Standard NF EN ISO 9227.

5.1.4.2 Test method

Subject the entire valve to spraying as follows:

- spray for (100 ± 2) hrs;
- stop spraying, continue heating of the tank and wait for (48 ± 1) hrs;
- spray for (100 ± 2) hrs;

Throughout the entire duration of the test:

- the tank shall be opened only to check and to maintain the conditions, with the maximum spray pause time being 30 min per day;
- heating shall never be stopped, and the specimens subjected to the test shall not be handled, washed or verified.

The product shall be positioned in the tank so as to limit liquid retention.

After treatment and before visual inspection, rinse the samples with water to free them of all saline residues.

5.1.4.3 Requirements

At the end of the test, visually inspect the surfaces at a distance of 300 mm with a naked eye, without magnifying device, with an indirect and non-glaring light with an intensity from 700 Lux to 1,000 Lux.

- For the valve body and the ball, the surfaces shall be free of:
    - yellow colour: little or no chromium on the nickel,
    - stains: defects under the nickel plating,
    - pits or porosities: surface defects in the base metal or gaseous release in the treatment baths,
    - blisters: bubbles or relief on the deposit,

- scaling: lack of “preparation” and brittleness of the deposit.

– For the valve’s manual control, the parts are inspected and evaluated according to Standard NF EN ISO 4628-3 for the assessment of the rusting.
  - The degree of surface rusting shall be ≤ Ri 4.

5.2 End connections (*supplemented*)

NOTE:

Dimensional deviations on the connections observed during checks at CSTB will be subject to follow-up at audits of manufacturing sites. This follow-up will be included in the audit reports and communicated to the committee.

Insertion of the pipe shall not under any circumstances disturb operation of the device (tube stop, etc.).

To ensure that the fitting can be removed without working on the pipework, the male end connection threads of the product must be **cylindrical**, in accordance with Standard NF EN ISO 228.

The dimensions of the end connections to the pipe must comply with the requirements in Table 4 for threaded male connections, and those in Table 5 for threaded female connections in this document.

Table 3 of the NF EN 13828 Standard has been supplemented with the crimping connector type.

Only NF- or QB-**certified** connections are permissible.

5.2.1 Seal surface dimension (added)

The seal surface of the male end connections shall be wide enough to prevent any cutting of the seal during assembly on the installation and shall comply with the requirements of Table 3.

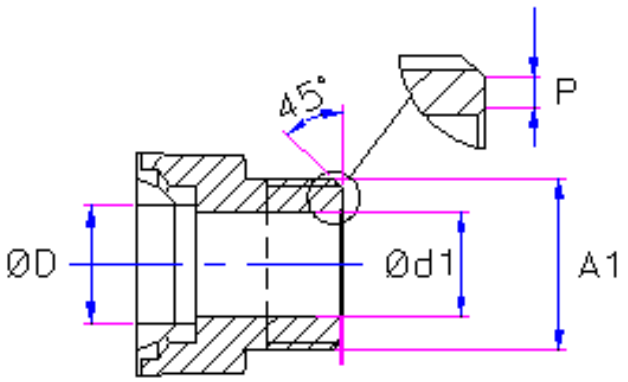


Figure 4: Seal surface

A1: Threading designation

P: Seal surface

Table 3: Seal surface dimension

Nominal diameter (DN)	A1	∅ D (mm)	∅ d1 (mm) (min.)	P (mm) (min.)
DN8	G 1/4	8	8.0	1.0
DN10	G 3/8 B	10	10.0	1.5
DN12	G 1/2 B	12	12.0	1.7
DN15	G 1/2 B	15	14.0	1.7
DN20	G 3/4 B	20	19.0	2.0
DN25	G 1 B	25	24.5	2.2
DN32	G 1 1/4 B	32	32.0	2.5
DN40	G 1 1/2 B	40	38.5	2.5
DN50	G 2 B	50	49.0	3.0

5.2.2 Dimension of connections (added)

5.2.2.1 Male connection

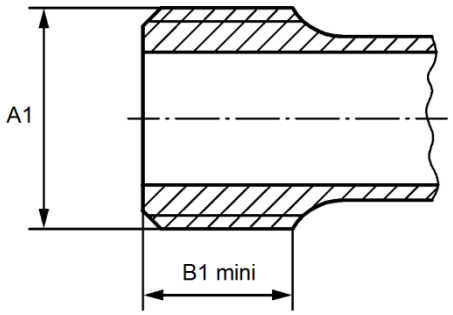


Figure 5: Male end connection

A1: Threading designation

B1: Usable thread length corresponding to a minimum of 4 interengaged threads, including chamfer

Table 4: Dimensions of male connection

Nominal diameter (DN)	A1	B1 (mm) (min.)
DN8	G 1/4	6.0
DN10	G 3/8 B	7.0
DN12	G 1/2 B	**7.2**
DN15	G 1/2 B	**7.2**
DN20	G 3/4 B	8.5
DN25	G 1 B	9.5
DN32	G 1 1/4 B	11.0
DN40	G 1 1/2 B	12.5
DN50	G 2 B	14.0

5.2.2.2 Female connection

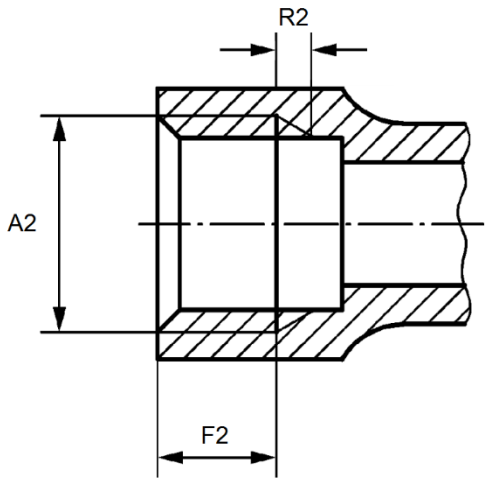


Figure 6: Female end connection

A2: Thread designation

F2: Depth of female thread

R2 (max.): clearance equivalent to 1 step

Table 5: Dimensions of female connection

Nominal diameter (DN)	A2	F2 (mm) (min.)*
DN8	G 1/4	8.0
DN10	G 3/8	8.5
DN12	G 1/2	10.5
DN15	G 1/2	10.5
DN20	G 3/4	12.0
DN25	G 1	13.5
DN32	G 1 1/4	15.5
DN40	G 1 1/2	15.5
DN50	G 2	19.0

(*) min. thread for leak-tightness by flat seal.

5.2.3 Dimension of the swivel captive nuts (added)

The dimensional characteristics of the swivel captive nuts are given in Table 6.

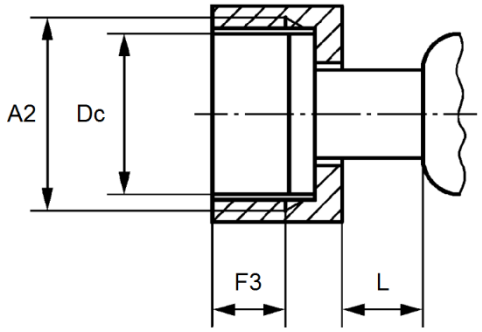


Figure 7: Swivel nut

A2: ISO 228-1 thread

Dc: Diameter of the collar

F3: **Usable** depth of the female threading of the nut

L: Length of clearance of the swivel captive nut

Table 6: Dimension of the swivel captive nuts

Nominal diameter (DN)	A2	Dc (mm) (min.)	F3 (mm) (min.)	F3 (mm) (max.)	L (mm)
DN12	G 1/2	18.0	8.0	9.8	must allow for the complete disengagement of the swivel captive nut
DN15	G 1/2	18.0	8.0	9.8	
DN20	G 3/4	23.5	8.5	11.3	
DN25	G 1	29.4	10.0	12.8	
DN32	G 1 1/4	37.9	11.0	14.3	
DN40	G 1 1/2	43.5	12.0	15.8	
DN50	G 2	54.8	14.0	17.3	

5.3 Operation (supplemented)

5.3.1 Operating accessories

This document covers only ball valves that can be operated manually.

5.3.2 Preventing the ball from seizing

In order to limit the risk that the ball will stick in place after a period of immobilisation, it is required that the sphere's material be made of:

- chrome-plated brass,
- Teflon-coated brass, where the coating thickness shall be from 25 to 35 microns,
- stainless steel, where the surface roughness (Ra) of the sphere shall be 0.02 µm (mirror finish).

Any solution different from those mentioned above will need to be corroborated in a technical file, and the file must be submitted for review to the Specific Committee for this certification.

5.4 Stops

5.5 Bore of the ball of the valve (supplemented)

The article is supplemented as follows:

Only full bore valves can be covered by this certification.

5.5.1 Full-bore (modified)

The article is modified as follows:

A valve is designated as full-bore when the bore diameter of the ball (Ø D, refer to Figure 4 in this document) complies with the values in Table 4 of the NF EN 13828 Standard, with a tolerance of ±1%.

Table 7: Bore diameter for full-bore valves

Nominal diameter (DN)	Bore diameter (mm) (min.)	Bore diameter (mm) (max.)
DN8	7.92	10.10
DN10	9.90	10.10
DN12	11.88	12.12
DN15	14.85	15.15
DN20	19.80	20.20
DN25	24.75	25.25
DN32	31.68	32.32
DN40	39.60	40.40
DN50	49.50	50.50
DN65	64.35	65.65
DN80	79.20	80.80
DN100	99.00	101.00

5.5.2 Reduced-bore

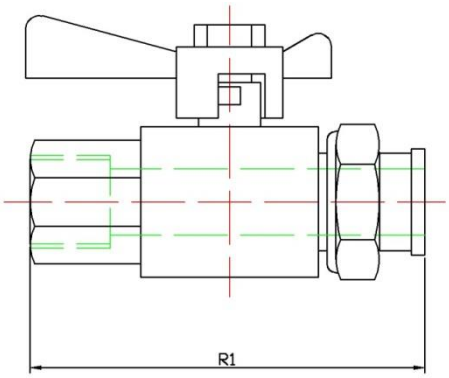
This article does not apply in the context of this certification.

5.6 Valves intended to be fitted before and after water meter (added)

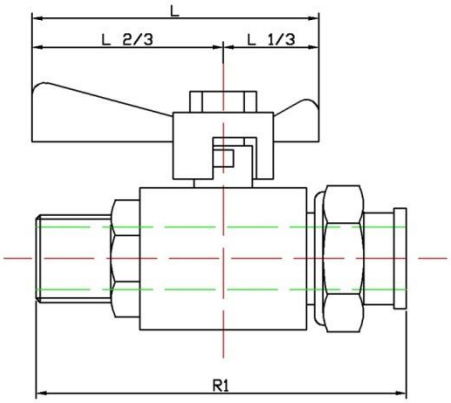
The dimensional requirements in Table 8 and Table 9 apply to ball valves installed:

- before water meter: M/swivel nut (MSN) or F/swivel nut (FSN);
- after water meter: swivel nut/M (SNM) or swivel nut/F (SNF)

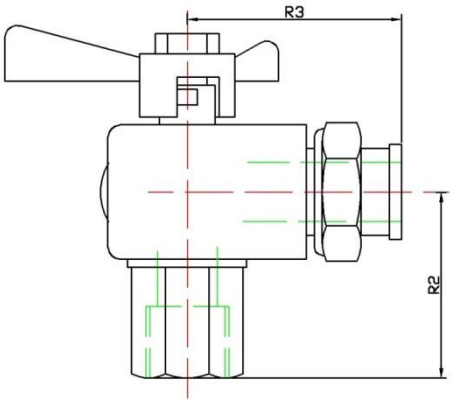
Straight pattern valve, female



Straight pattern valve, male



Angle pattern valve, female



Angle pattern valve, male

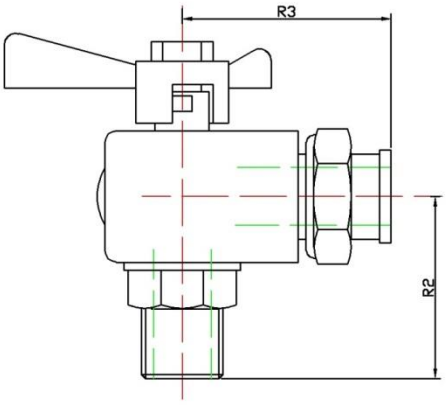


Figure 8: Type of ball valve before and after water meter

5.6.1 Dimensions for “Standard series”

Dimensioning for the standard series is defined in Table 8.

Table 8: Dimensions of standard valves for water meter

Nominal diameter (DN)	A2 (female thread) Swivel nut	A1 (male thread)	A2 (female thread)	R1 (mm)	R2 (mm)	R3 (mm)
DN12	G 1/2	G 1/2 B	G 1/2	62 ± 1	NA	NA
DN15	G 3/4	G 1/2 B or G 3/4 B or G 1 B	G 1/2 or G 3/4	80 ± 1	50 ± 1	57 ± 1
DN20	G 1	G 3/4 B or G 1 B	G 3/4 or G 1	80 ± 1	50 ± 1	57 ± 1
DN25	G 1 1/4	G 1 B or G 1 1/4 B	G 1 or G 1 1/4	110 ± 2	50 ± 1	62 ± 1
DN32	G 1 1/2	G 1 1/4 B or G 1 1/2 B	G 1 1/4 or G 1 1/2	110 ± 2	75 ± 2	82 ± 1
DN40	G 2	G 1 1/2 B or G 2 B	G1 1/2 or G 2	140 ± 2	75 ± 2	82 ± 1

5.6.2 Dimensions for “Short series”

Dimensioning for the short series is defined in Table 9.

Table 9: Dimensions of short series valves for water meter

Nominal diameter (DN)	A2 (female thread) Swivel nut	A1 (male thread)	A2 (female thread)	R1 (mm) M	R1 (mm) F	R2 (mm)	R3 (mm)
DN15	G 3/4	G 1/2 B or G 3/4 B	G 1/2 or G 3/4	69 ± 1	60 ± 1	32 ± 1	40 ± 1
DN20	(*)	(*)	(*)	(*)	(*)	(*)	(*)

NOTE:

(*) For the DN20, the requirements will be defined during the initial admission requests

5.7 Bleed (added)

The bleed opening bore shall present a minimum cross-section of 12.56 mm² along its entire length. Its smallest dimension (d) shall be 4 mm.

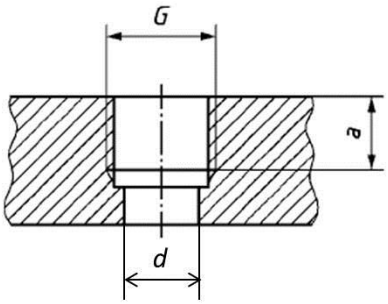


Figure 9: Bleed opening

Table 10: Bleed opening dimensions

Nominal diameter (DN)	A2 (female thread) (*)	a (mm)
DN ≤ 50	G1/8" or G1/4" or G 3/8"	> 6.5
DN ≥ 65	G3/8"	> 13

(*): The threading shall be ISO 228-1 compliant or NF EN 10226-1 compliant

5.7.1 Vent valve and bleed plug (brass or plastic)

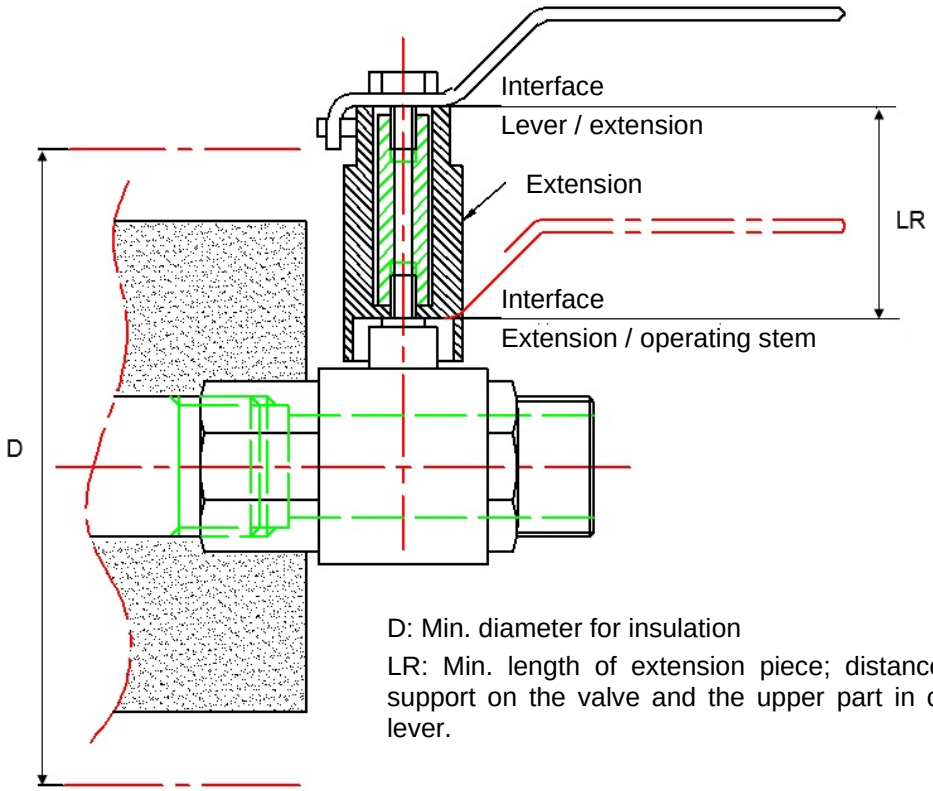
The vent valves and bleed plugs equipping the valves shall be subject to all of the tests performed on the products without revealing any damage or external leak, except for the ejection test (article 6.5 Hydraulic strength of the operating stem (added))

Following the various tests conducted, it shall be possible to manually operate the vent valves without additional effort and they must function as intended and maintain their leaktightness.

5.8 Extension piece (splice) (added)

Ball valves fitted with an extension piece or splice shall meet all of the requirements described in this technical document.

The minimum length of the extension piece (LX) shall conform to Table 11 of this document.



D: Min. diameter for insulation

LR: Min. length of extension piece; distance measured between the support on the valve and the upper part in contact with the operating lever.

Figure 10: Ball valve with extension

Table 11: Minimum length of extension piece

Nominal diameter (DN)	**LX (min.) (mm)**
15 ≤ DN ≤ 25	40
32 ≤ DN ≤ 50	50

NOTE:

Operating the valve with the extension piece shall not damage the lagging.

5.9 Operating mechanism (added)

5.9.1 Design (reversibility)

For products with Male/Female type end-connections, the lever shall be reversible, with the exception of valves intended to be installed before meter and which are fitted with a manual control locking system.

5.9.2 Colour

The colour must be: "**Green** – RAL 6029", including for valves before or after meter.

5.9.3 Length

The length of the operating mechanism shall equal the value given in Table 12 of this document.

Table 12: Minimum length of the operating mechanism (mm)

Nominal diameter (DN)	Lever from centre of axis to end	Butterfly control	Asymmetric butterfly control 2/3 – 1/3
DN8	68	45	NA
DN10	68	45	70
DN12	85	45	70
DN15	85	45	70
DN20	85	45	70
DN25	100	55	NA
DN32	100	(*)	NA
DN40	130	(*)	NA
DN50	130	(*)	NA
DN65	250	(*)	NA
DN80	250	(*)	NA
DN100	250	(*)	NA

NA: Not Applicable

NOTE
(*): For denominations over DN25, the requirements will be defined during the initial admission requests.

5.10 Retention chamber (added)

This article is to be defined later.

6 Performance requirements

6.1 Operating torque (supplemented)

The article is supplemented as follows:

The torque necessary to carry out the first cycle shall not be greater than:

- 1.5 x the operating torque for **DN ≤ DN25**
- 2.5 x the operating torque for **DN ≥ DN32**

The operating torque is given in Table 16 of this document.

It is specified that test compliance is given on the average of the 3 values.

6.2 Stops strength (supplemented)

The valve must be tested in accordance with 7.3 (Stops and stem – mechanical strength tests (modified)). No deformation, crack or defects shall be visible.

The article is supplemented as follows:

The valve must still be operable and the operating mechanism shall not become deformed.

6.3 Leaktightness

The accepted criteria shall be as specified below:

- if the test fluid is water, no visible leak is allowable,
- if the test fluid is air, the leak flow shall not exceed 20 cm^3/h.

6.4 Angular seal (modified)

Table 6 of Standard EN 13828 - Angular seal is modified as follows:

Table 13: Angular seal

Nominal diameter (DN)	Min. angle (°)
8 ≤ DN ≤ 25	**8**
32 ≤ DN ≤ 50	**7**
65 ≤ DN ≤ 100	**6**

6.5 Hydraulic strength of the operating stem (added)

The test is performed on products not equipped with a bleed.

6.5.1 Principle

The test concept consists of checking that the ball's operating stem resists hydraulic stress without being ejected.

6.5.2 Test method

The valve is subjected to an internal pressure equivalent to 6 x Nominal Pressure (PN) with a maximum of 160 bar for a period of 10 (+1/0) minutes. For this test, the ball is in half-open position.

The test is carried out with water at ambient temperature.

After bleeding off the air in the test circuit and in the test valve, gradually increase the water pressure until the maximal pressure defined above is obtained inside the valve, then maintain that pressure for a period of 10 (+1/0) minutes.

6.5.3 Requirements

The operating stem must remain in place throughout the test, and following the test, it must be possible to operate the ball by hand.

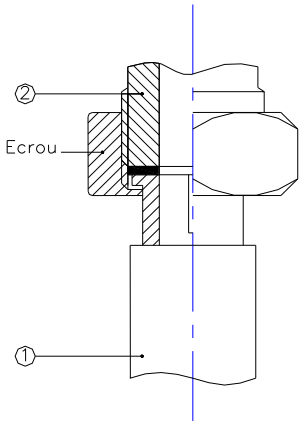
6.6 Mechanical tensile strength test (added)

6.6.1 Principle

The mechanical strength of the swivel captive nuts is checked by means of a tensile test.

The nut is tested without dismantling the device.

Produce the adapter part, part no. 2 of Figure 11 of this document, for mounting the unit on the tensile test machine.



①: product to be tested

②: test device

Figure 11: Configuration for tensile test

Table 14: Tightening torque of the nut on the test apparatus

Nominal diameter (DN)	A2	Min. tightening torque (Nm)	Tensile force (kN)
DN12	G 1/2	50	11.0
DN15	G 1/2	50	11.0
DN20	G 3/	70	15.0
DN25	G 1	90	17.5
DN32	G 1 1/4	110	20.0
DN40	G 1 1/2	120	22.5
DN50	G 2	150	25.0

6.6.2 Operating procedure

- Tighten the nut by applying the torque specified in the table above.
- Mount the unit to be tested with its adapter pieces between the jaws of a tensile test machine.
- Apply the tensile force at the speed of 1 mm/min up to the value indicated in Table 14 with a force precision of (-5/0)%.
- Maintain the force for 30 seconds, then release.

6.6.3 Requirements

The assembly (swivel captive nut) must bear the tensile loads indicated in Table 14 without visible deformation.

6.7 Resistance to alternating pressures (*added*)

The products are subjected to large pressure variations due to closure of the equipment installed: solenoid valves of washing machines, mixers, etc.

The alternating pressure resistance test is performed to ensure that the parts of the product resist this type of stress.

It follows the same principle as the tests performed on the mechanical filters used in potable water installations inside buildings.

6.7.1 Principle

This test involves applying variable hydraulic pressure downstream from the product at a specified frequency.

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

6.7.2 Test equipment

The equipment consists of a pressure generator capable of generating variable pressure that can oscillate with a constant period between 1 s and 2 s between a low limit and a high limit, establishing a constant amplitude.

The diagram of that variation takes the form of a generally rectangular signal (see Figure 12: Pressure variation).

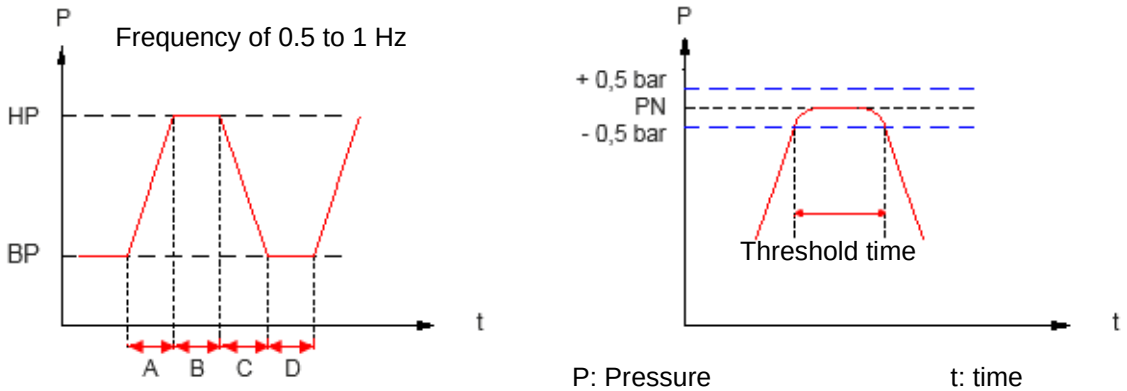


Figure 12: Pressure variation

- the time needed to go from low pressure to high pressure and vice versa 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).

6.7.3 Test method

- Connect one end of the valve to the test apparatus with the ball open, with the other extremity being blocked.
- Fill the valve with water and bleed the air from the entire test circuit.
- Apply the test conditions defined in Table 15 of this document (number of cycles and test pressures).

Table 15: Conditions for test of resistance to alternating pressure

Number of cycles / **Nominal diameter (DN)**	**Ball open**	**Ball closed**
DN ≤ 32	10,000	10,000
DN40	**7,500**	**2,500**
DN50	**7,500**	**2,500**
Pressure (bar) / **NP**	**Low pressure**	**High pressure**
PN10	10	30
PN16	10	48
PN ≥ 25	10	60

6.7.4 Requirements

Following the alternating-pressure test, compliance with the following tests is verified:

- operating torque according to Article 6.1
- leaktightness according to Article 6.3

7 Test Methods

7.1 Operating torque test (modified)

The article is modified as follows:

Table 7 of the NF EN 13828 Standard is modified as follows for DN15, DN20, DN25, DN40 and DN50.

Table 16: Operating torque (Nm)

Nominal diameter (DN)	Torque	Initial torque
DN8	4	6
DN10	5	7.5
DN12	**5**	7.5
DN15	**5**	7.5
DN20	**7**	10.5
DN25	**7**	10.5
DN32	**10**	25
DN40	**14**	35
DN50	**14**	35
DN65	35	87.5
DN80	45	112.5
DN100	65	162.5

7.2 Torque and bending test (supplemented)

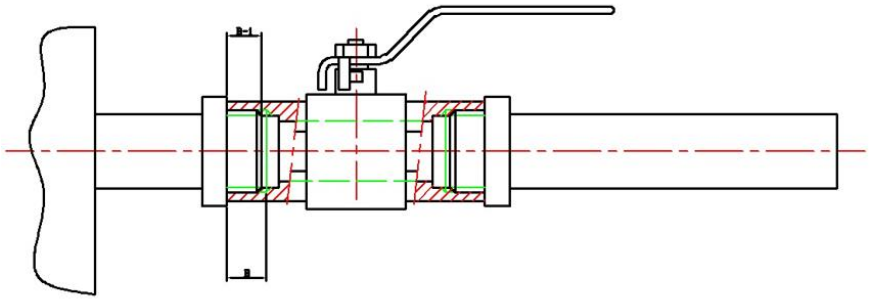
7.2.1 General

7.2.2 Sequences of valve bending and torque tests (supplemented)

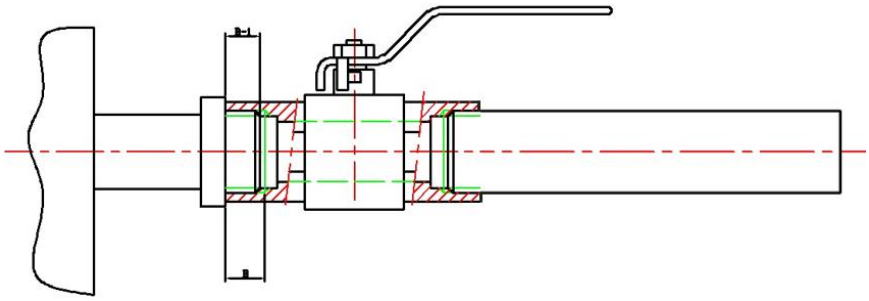
The article is supplemented as follows:

The bending test is performed after the torque test.

Female/male ball valve: test configuration diagram for cylindrical threading NF EN ISO 228



Female/female ball valve: test configuration diagram for conical threading NF EN 10226-1
(no bearing surface between the ball valve ends and the test tubes)



Male ball valve (supported by the seal surface)

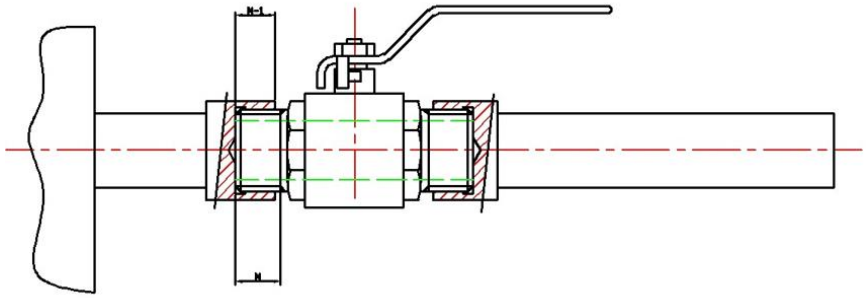


Figure 13: Configuration for torque – bending test

7.2.2.1 Torque (supplemented)

The article is supplemented as follows:
Torque test:

- applies to **all ball valves equipped with a threaded or tapped end**.
- does not apply to valves equipped with a “swivel nut” type end for PE compression crimping tubes.

7.2.2.1.1 Torque MT1

7.2.2.1.2 Torque MT2

7.2.2.2 Bending

Bending test:

- applies to **all ball valves equipped with a threaded/tapped end and swivel nut**.
- does not apply to valves equipped with an end for PE compression crimping tubes.

7.3 Stops and stem – mechanical strength tests (modified)

The article is modified as follows:

The force necessary to overcome the resistance of the stops must not be less than the values given in the table below.

Table 17: Stops strength torques

Nominal diameter (DN)	Resistance torque (Nm)
DN8	10
DN10	12
DN12	15
DN15	15
DN20	20
DN25	25
DN32	37
DN40	40
DN50	50
DN65	75
DN80	100
DN100	150

For extension pieces, the resistance torque values defined in Table 17 apply.

7.4 Hydraulic tests

7.4.1 Leaktightness test (supplemented)

Table 10 of the NF EN 13828 Standard is supplemented as follows:

Table 18: Leaktightness requirements – Test with water at ambient temperature

Test	Leaktightness	Ball	Outlet opening	NP	Pressure	Duration (+5/0)
1	Ball [a)] (internal leaktightness))	closed	open	PN 10	(16 ± 1) bar 0,2 (+0.02/0) bar	60 s
				other PN	1.5 x PN ± 1 bar 0,2 (+0.02/0) bar	
2	Assembled valve (external leaktightness)	partially open	closed	PN10	(16 ± 1) bar 0.2 (+0.02/0) bar [b)]	60 s
				other PN	(1.5 x PN ± 1) bar 0.2 (+0.02/0) [b)]	

a) If the flow direction is not stipulated, the test shall be carried out at both outlets.

b) Additional test without distinction for leaktightness system of the stem.

Table 19 – Leaktightness requirements – Air test

Test	Leaktightness	Ball	Outlet opening	Pressure	Allowable leak
1	Ball [a)] (internal leaktightness)	closed	open	(6 ± 0.2) bar and 0.2 (+0.05/0) bar	≤ 20cm³/h
2	Assembled valve (external leaktightness)	partially open	closed	(6 ± 0.2) bar and 0.2 (+0.05/0) bar [b)]	≤ 20cm³/h

a) If the flow direction is not stipulated, the test shall be carried out at both outlets.

b) Additional test without distinction for leaktightness system of the stem.

7.4.2 Hydraulic strength

7.4.2.1 Principle

7.4.2.2 Test

7.4.2.3 Requirement (modified)

The article is modified as follows:

The ball valve must not show any sign of permanent deformation, **visible** cracks or breaks at a **test pressure equal to 2.5x PN**.

7.5 Acoustic tests and requirements (modified)

The article is modified as follows:

The reader is reminded that the normal usage positions for these products are “fully open” or “fully closed”.

Under these normal usage conditions, for the **straight-pattern, full-bore ball valves** covered by this document, **the acoustic group is “I”.**

The acoustic tests apply to the other types of ball valves listed in Article 3.1.

Products with a “not rated” acoustic group cannot bear the NF mark.

7.6 Endurance (*modified*)

7.6.1 Principle

7.6.2 Test rig

7.6.3 Tests

7.6.3.1 Test conditions (modified)

The article is modified as follows:

For tests at the ambient temperature, the maximum torque values are given in the “Torque” column of Table 16 in this document.

For tests at specific temperatures, the maximum torque values are given in Table 7 of the NF EN 13828 Standard.

The test is carried out on a sample.

7.6.3.2 Operating procedure (modified)

The test is broken down into three phases:

a) Phase 1:

Before starting the endurance cycles, place the sample in situation of flow, as indicated in Table 20, for a period of **at least** 1 h, supplying it with water at (110 ± 3) °C. The dynamic supply pressure must be ≥ 1 bar.

b) Phase 2:

50% of the cycles are carried out with a fluid at (90 ± 3) °C.

c) Phase 3:

50% of the cycles are carried out with a fluid at -5 (+0/-3) °C, monopropylene glycol (MPG) content Class 3 for stability at -5°C.

- the operating mechanism shall be subjected to a cycle going from the completely closed position to the completely open position and back again;
- with the valve in the “closed” position, the static pressure upstream from the valve shall be set between 4 bar and 5 bar, with a differential pressure at the valve between 3 bar and 4 bar;
- Stop the movement at the open and closed positions without subjecting the stops to a torque exceeding the corresponding value in Table 7 of the standard, and the torque must not be maintained for more than 0.5 s at the stop;
- the rate of flow through the valve shall be set to the values given in Table 20;

Table 20: Rate of flow for endurance test

Nominal diameter (DN)	Flow rate (l/s)
8 ≤ DN ≤ 15	0.05 ≤ Q ≤ 0.15
20 ≤ DN ≤ 40	0.15 ≤ Q ≤ 0.50
50 ≤ DN ≤ 100	0.50 ≤ Q ≤ 0.80

- the number of opening/closing cycles that have to be applied during the endurance test is specified in Table 14 of the NF EN 13828 Standard;
- store the valve for at least one week at ambient temperature in the “**open**” position.

7.6.3.3 Acceptance criteria (modified)

The article is modified as follows:
1) The test must be stopped in case of a leak or defective operation;
2) One week after the end of the test, in storage conditions at ambient temperature and in the “open” position, the valve must satisfy the test criteria for leaktightness (7.4.1) and operating torque (7.1) as per Table 16 of this document.

7.7 Angular seal (modified)

The article is modified as follows:

- Install the entire valve on a test rig which allows the angle of rotation of the operating accessory to be measured (e.g. a graduated 360° dial and a needle mounted on the control lever or handle).
- Attach the valve’s inlet opening to a supply of compressed air at a pressure of (6 ± 1) bar.
- Attach the outlet opening to a flexible tube with an inside diameter of 2 to 4 mm, submerged in the water
- Open the valve very slowly until bubbles appear in the water
- Slowly close the valve again until there are no bubbles

- Measure the angle between the “no flow” position and the “closed” position

The test must be performed with the lever in both positions of the operating mechanism (Article 5.9.1, reversibility of the operating mechanism) only for valves of the male-female type.

The action is repeated three times. Compliance with the test is given by the average of the three angle measurements, and the angle must be compliant with the values given in Table 13.

8 Marking (supplemented)

The article is supplemented as follows:

8.1 Marking on the body (added)

- manufacturer’s name or mark;
- nominal diameter (DN) for full bore;
- arrow indicating normal direction of flow, if necessary;
- date of manufacture (at least the month or identification and the year; the identification must refer to the manufacturing date);
- DR for dezincification-resistant alloys;
- PN;
- logo for this certification.

8.2 Marking on the manual control

- the lever’s operating direction;
- logo for this certification;
- temperature of the fluid (*) carried (-5°C; 90°C);
- acoustic group (*), i.e. Group I or II.

(*): If this information is not shown on the manual control, it must be present on the body.

The independent extension parts shall be marked with the logo for the certification.

9 Technical documentation (added)

The product technical documentation shall contain the following information:

a) product name;
b) the application(s) for which it can be used;
c) assembly instructions, including the tightening torques on the installation, sealing products that can be used, etc.;
d) instructions for use and maintenance;
e) specific rules applicable at installation (e.g. use of oakum prohibited on potable water systems, etc.);
f) pressure/temperature diagram;
g) the theoretical Kv per DN, or remind the reader that the valve is of the “full bore” type;
h) the nature of the materials;
i) list the spare parts;
j) source of production.

If this information is not included in the technical documentation, it must appear on the packaging or directly on the product.

Technical documentation for a product must be written in the common language of the country where the product is sold.

The documentation may be made available in electronic form. In this case, the link (QR code, web address, etc.) must accompany the product and provide direct access to the product’s technical documents.

10 Additional specifications regarding service (added)

To meet the needs of system users in keeping their installation operational, the holder shall ensure a minimal service level.

10.1 Product lines

The holder shall offer, at a minimum, a range of ball valves in the DNs specified below:

Nominal diameter (DN)	DN15	DN20	DN25	DN32	DN40	DN50
Minimum range	X	X	X	X	X	X

10.2 Product availability

For each valve intended for installation in mainland France, the holder shall possess, either directly or through its distributors, a logistics system that allows for delivery in less than 48 hours on working days.

These deliveries shall be made from one or more warehouses located in mainland France, based on an overall minimal inventory of 50,000 ball valves from DN15 to DN50, 80% of which are to be DN15, DN20 and DN25.

11 Test sequence (added)

Where applicable, the tests set out in Table 21 shall be performed in the specified sequence.

The test sequence must be performed on the same specimen.

Table 21: Distribution of tests

Sequence	**Sequence name and order of the tests**
1.	**Dimensions** 5.1 materials except 5.1.2 disinfection test 5.2 End dimensions (5.2.1/5.2.2/5.2.2.2/5.2.3) 5.3 Operation 5.4 Stop 5.5 Bore of the ball of the valve 5.6 Water meter dimensions 5.7 Bleeding 5.8 Extension 7.7 Angular seal 7.3 Stops – Mechanical strength
2.	**Endurance / disinfection** 7.4.1 Leaktightness 7.1 Operating torque 5.1.2 Disinfection 7.6 Endurance 7.4.1 Leaktightness 7.1 Operating torque
3.	**Mechanical strength (Torque/Bending)** 7.4.1 Leaktightness 7.1 Operating torque 7.2.2.1 Torque

Sequence	Sequence name and order of the tests
	7.4.1 Leaktightness 7.1 Operating torque 7.2.2.2 Bending 7.4.1 Leaktightness 7.1 Operating torque
4.	**Hydraulic** 7.4.2 Hydraulic strength 6.5 Ejection
5.	**Alternating pressures** 7.4.1 Leaktightness 7.1 Operating torque 6.7 Alternating pressures 7.4.1 Leaktightness 7.1 Operating torque
6.	**Acoustic (7.5)**

The marking and appearance of exterior surfaces are verified on all products tested.
The technical documentation will be verified wherever it appears (packaging, data sheets, etc.)