TECHNICAL DOCUMENT

SANITARY TAPWARE

Technical document 077-10

Stop valves installed:
- upstream of a sanitary tapware system
- on a flushing cistern
- to supply a washing machine

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MODIFICATION HISTORY

Revision no.	Application date	Modifications
18	**01/06/2017**	**Update to the document layout and reference.** Creation of the document.
01	**02/04/2019**	Cancels and replaces technical document 077-10_Rev 18 **Update of technical document according to the new frame:** *"Trame_doc_technique_VF_PC_DT_R3. "* **Content modifications:** –

TABLE OF CONTENTS

1 Rules for implementing this document and technical specifications and general rules applicable to stop valves installed upstream of a sanitary tapware system, on a flushing cistern or to supply a washing machine

1.1 Purpose

The purpose of this chapter is to define the technical and general performance requirements for stop valves installed upstream of a sanitary tapware system, a flushing cistern and/or a washing machine.

1.2 Field of application

This document specifies the requirements related to:

- rules for designing, designating and classifying stop valves;
- provisions for marking, technical documentation and presentation;
- the materials and state of visible surfaces;
- dimensional, hydraulic, mechanical, endurance and acoustic performance.

This document primarily applies to the following types of stop valves:

- Stop valves installed upstream of a sanitary tapware system;
- Stop valves installed on a flushing cistern;
- Stop valves to supply a washing machine.

Table 1 – Conditions of Use

Stop valve operating range / **Supply system**	**Usage limits**	**Recommended limits**
Dynamic pressure		1 bar ≤ P ≤ 5 bars, balanced pressure, hot water and cold water
Static pressure	< 1.0 MPa **or** < 10 bar	
Hot water (HW) temperature	T ≤ 90°C	T ≤ 65°C
Cold water (CW) temperature		T ≤ 30°C

1.3 References to standards

NF EN 228-1: 2003	Pipe threads where pressure-tight joints are not made on the threads - Part 1: Dimensions, tolerance and designation.
NF EN 248: 2002	Sanitary tapware - General specification for electrodeposited coatings of Ni-Cr.
NF EN ISO 3822-3: 2018	Acoustics - Laboratory tests on noise emission from appliances and equipment used in water supply installations - Part 3: Installation and operating conditions for inline tapware and hydraulic equipment.
NF EN 1254-4: 1998	Copper and copper alloys – Plumbing fittings - Part 4: fittings combining other end connections with capillary or compression end
NF EN 12449: 2016	Copper and copper alloy - Seamless round general-purpose pipes.
NF EN 12164:2016	Copper and copper alloys – Rod for free machining purposes
NF EN 12165:2016	Copper and copper alloys – Wrought and unwrought forging stock

1.4 Design

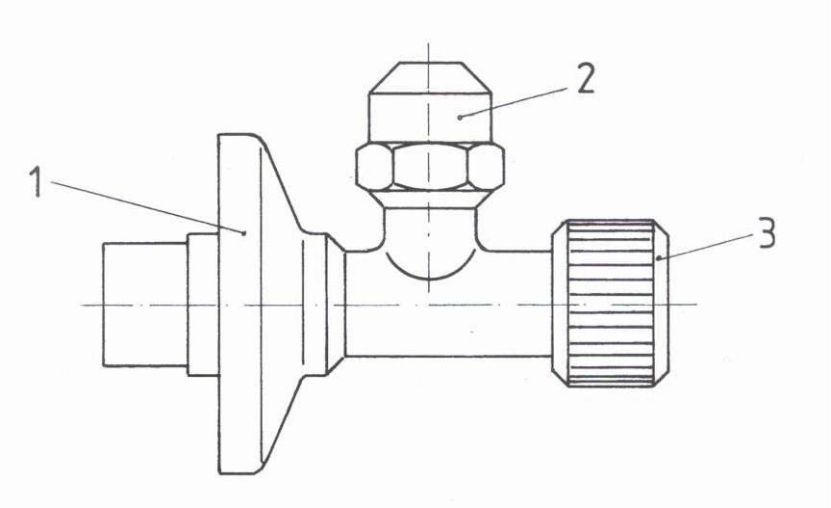

Figure 1 – Example of a straight stop valve

Legend

1. Connection side
2. Outflow side
3. Opening and closing device

Table 2 – Connection examples – Threading according to Standard EN ISO 228-1

Type of stop valve	Connection side	Outflow side
for sanitary tapware	G1/2	G3/8
	G1/2	G1/2
for flushing cisterns	G3/8	G3/8
	G1/2	G3/8
	G1/2	G1/2
to supply a washing machine	G1/2	G1/4

Stop valves installed upstream of sanitary tapware can:

- be equipped with a control device or not; if so, opening and closing must be made possible by simple tools.
- be straight or at an angle;
- be used in flow control, entirely or not at all.

1.5 Designation

Stop valves are designated according to:

- their shape of construction (straight or angle);
- their nominal diameter (DN);
- their end connections;
- their acoustic group.
- the reference to this document.

EXAMPLE:

Angle stop valve - DN10 - MM G1/2- acoustic group I - NF logo - compliant with Technical Document 077-10.

1.6 Marking

See also Appendix 2, Part 1, Chapter 1.1 of the NF 077 reference system.

Stop valves must be permanently and legibly marked and include:

- the name or initials of the manufacturer on the body of the valve;
- the acoustic group on the valve body;

EXAMPLE: for an angle stop valve: manufacturer's name or initials – I

1.7 Materials

1.7.1 Chemical and hygienic requirements

Materials and coatings that are likely to come into contact with drinking water, either normally or accidentally, must comply with applicable French regulations (decree of 29 May 1997: “Concerning materials and objects used in fixed installations for production, treatment and distribution of water intended for human consumption”).

1.7.2 State of visible surfaces and coating quality

When the stop valve is visible (stop valve visible under a sink, next to a cistern or next to a washing machine), chrome surfaces and Ni-Cr coatings must meet the requirements established under EN 248.

1.8 Dimensional characteristics

1.8.1 Stop valves installed upstream of a sanitary tapware system

The outflow side requirements must be established for the connection:

a) seamless copper pipes with an outer diameter of 8 mm, 10 mm or 12 mm, in accordance with Standard NF EN 12449; surface: raw or chrome.

If other types of pipes different from these are provided for, the connecting elements used must meet the requirements established in this document.

b) smooth tip for supply hoses.

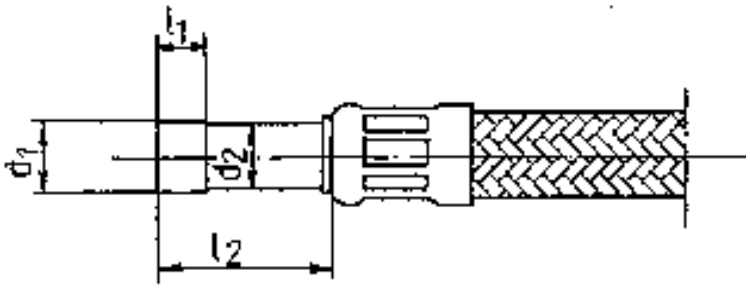

Figure 2 – Smooth hose connection tip

d_1: diameter

d_2: diameter

l_1: length

l_2: length

Table 3 – Dimensions of hose ends

d_1	**d_2 (+0.05/-0.1)**	**l_1 max7**	**l_2**
8 ± 0.1	7.7	10	25
10 ± 0.1	9.7	10	25
12 ± 0.1	11.7	10	25

1.8.2 Stop valves installed on a flushing cistern

The connections on the outflow side must be made in such a way that they can be disconnected after assembly without handling the pipe (rotating nut type)

For external or internal threads (swivel nut) on the outflow side of the stop valve, a flat surface must be provided to accommodate a flat-joint connection component.

The dimensional characteristics of the swivel captive nuts are provided in Table 4 below.

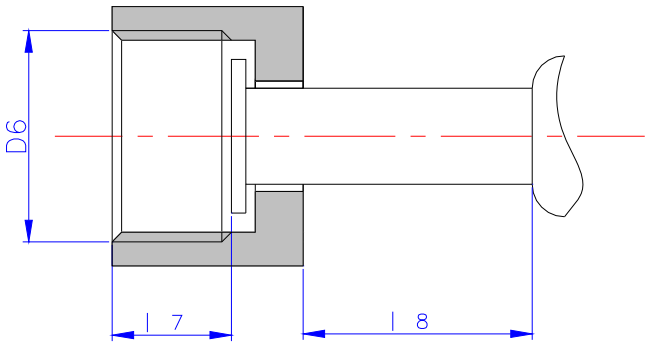

Figure 3 – Swivel nut

D_6: ISO 228-1 threading

l_7: **Usable** depth of the female threading of the nut

l_8: Length of clearance of the swivel captive nut

Table 4 – Dimensions of swivel nuts

D6	l_7 min.	l_7 max.	l_8
G3/8	6	7.5	must allow for the complete disengagement of the swivel captive nut
G1/2	8	9.8	
G3/4	8.5	11.3	

Dimensions expressed in mm

1.8.3 Stop valves to supply a washing machine

For the outflow side, the sizing of the end fittings must comply with the requirements of Standard NF EN 1254-4.

1.8.4 Special case

Dimensions other than those presented in Table 2, Table 3 and Table 4 are acceptable, but they must be presented to CSTB and studied on a case-by-case basis during an NF mark Specific Committee session.

1.9 Leaktightness characteristics

1.9.1 Test principle

The test consists of verifying the leaktightness of the following, under cold water pressure:

- the obturator;
- the entire device and tapware accessories;
- the connection components

1.9.2 Operating procedure

- assemble the valve on the test bench
- connect the valve to the test circuit
- subject the test device to a circulation of cold water at a temperature ≤ 30 °C.

1.9.2.1 Required characteristics

The tests to be performed are described in Table 5 as well as the requirements to be met by the components tested. The order of performance of the tests must be observed.

Table 5 – Summary of leaktightness tests

Leaktightness	**Cold water test upstream of the obturator**		**Test conditions**		
	Obturator position	Position of outlets	Pressure (bar)	Duration (second)	Requirement
1. Obturator	closed	open	16 ± 0.5	60 ± 5	no leak
2. Full stop valve	open	closed	16 ± 0.5	60 ± 5	no leak
3. Full stop valve [a]	open	closed	0.2 ± 0.02	60 ± 5	no leak
4. Stop valve + connection	/	closed	16 ± 0.5	60 ± 5	no leak
5. Stop valve + connection [a]	/	closed	0.2 ± 0.02	60 ± 5	no leak
[a] Complementary test when using O-ring for leaktightness					

1.10 Resistance to pressure

Test principle

The test is conducted to detect any deformations of the body of the valve that can occur under the action of cold water under pressure.

1.10.1 Operating procedure

- assemble the valve on the test bench with the obturator in the closed position
- subject the test device to a circulation of cold water at a temperature ≤ 30 °C.
- apply a static water pressure of (25 ± 0.5) bar for (60 ± 5) seconds

1.10.2 Required characteristics

The tests to be performed are described in Table 6 as well as the requirements to be met by the components tested.

Table 6 – Summary of pressure resistance tests

Cold water test upstream of the obturator		**Test conditions**		
Obturator position	Position of outlets	Pressure (bar)	Duration (second)	Requirement
closed	open	25 ± 0.5	60 ± 5	no visible deformation, breakage. no leak at the pipe seals

1.11 Mechanical tensile strength of connections

This test only applies to valves with a swivel nut.

1.11.1 Test principle

The test consists of subjecting the valve to increasing deformation from a tensile force applied at a constant speed until the tensile force reaches a predetermined value.

1.11.2 Operating procedure

- assemble the valve on the test device observing the recommended tightening torque
- apply the tensile force at a speed of 1 mm/min up to the value indicated in Table 7 with a force precision of (-5/0)%
- maintain the force for 30 (+10/0) seconds and then release

The test is carried out at an ambient temperature of (20 ± 5) °C and with an assembly adapted to the stop valve tested.

Table 7 – Tensile strength

Swivel captive nut Nut thread	Min. tightening torque of the nut for obtaining leaktightness (Nm)	Minimum tensile force (kN)
G3/8	30	8
G1/2	50	11

1.11.3 Required characteristics

During and after the test, there must be no breakage, visible deformation or visible cracks.

1.12 Resistance to alternating pressure stress

- Stop valves used in a sanitary installation are subject to considerable pressure variations due to the closing of installed devices - solenoid valves of washing machines, mixers, valves, etc.
- To ensure their resistance to such stress, it seemed advisable to use a test described in the T 54-094 Standard for the rating of supply hoses and piping components.

1.12.1 Test principle

Application during 100 cycles of a variable and defined internal hydraulic pressure at the mechanical mixer inlets, with the mechanical mixer in the closed position.

1.12.2 Equipment

The equipment essentially includes:

A pressure generator capable of generating variable pressure that can vary at constant frequency between a low limit and a high limit, establishing constant amplitude. The diagram of that variation takes the form of a generally rectangular signal (see Figure 4).

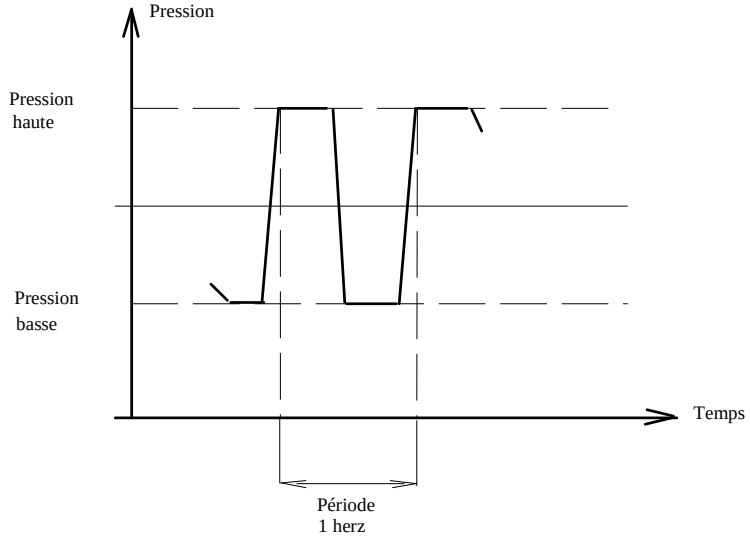

Figure 4 – Signal waveform – alternating pressures

- the time needed to shift from low pressure to high pressure and vice versa must be as short as possible and never longer than one-tenth of the period;
- the low and high pressure values must be obtained and checked to within ± 2% 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).

1.12.3 Operating procedure

- Assemble the stop valve in the open position and close the outlet;
- Apply 100 cycles to the closed tap (filled with water and cleared of air):
  - low pressure of (8 ± 1) bar;
  - high pressure of (50 ± 1) bar;
  - frequency of (1 ± 0.5) Hertz.

  1) on one of the inlets, (the other being in the open air);
  2) on the other inlet;

  Note: A “slight” leak is allowed during the test if it does not have an influence on the low and high pressures of the test.

After the alternating pressure test, perform the leak test in accordance with Article 1.9 of this document.

1.12.4 Required characteristics

During the leak test, no visible deterioration or leakage should be observed.

1.13 Mechanical resistance of control devices to torque.

1.13.1 Test principle

The test consists of submitting the operating device to a given torque in order to verify its resistance

1.13.2 Operating procedure

- assemble a connection adapter on the operating device
- gradually apply a torque of (2 ± 0.2) Nm on the stop element during
- maintain torque for (60 ± 5) seconds
- close the obturator
- gradually apply a torque of (2 ± 0.2) Nm on the stop element during
- maintain torque for (60 ± 5) seconds

The test device must not transmit any transverse force to the functional components, and the connection adapter must not damage the opening and closing component.

After the torque test, perform the leak test in accordance with Article 1.9 of this document.

1.13.3 Required characteristics

During and after the test, there must be no alteration of the stop valve operation or any visible deformation or visible cracks.

The obturator must not be able to be unscrewed.

1.14 Mechanical endurance characteristics

1.14.1 Test principle

The test involves subjecting the operating device to a number of opening and closing operations to observe the behaviour upon closure of the functional components.

1.14.2 Equipment

The test is carried out on an automatic test bench which ensures that the closing torque remains constant throughout the test.

The test device must not transmit any transverse force to the functional components and the connection adapter must not damage the operating device.

1.14.3 Operating procedure

The product is subjected to circulation of cold water at a temperature ≤ 30 °C except for stop valves installed upstream of a sanitary tapware system. In this case, the test is carried out with hot water, at a temperature of (60 ± 5) °C, at a static pressure at the inlet of the valve system of (0.4 ± 0.05) MPa or 4 ± 0.5 bar) and at a downstream flow rate of 4 to 6 L/min.

The opening and closing speed must be equal to:

- (10 ± 0.1) rpm if the obturator is composed of a sphere;
- (30 ± 0.1) rpm if the obturator is composed of a flap.

- assemble the valve on the test device in the “open” position.
- subject it to 2,000 opening and closing cycles, with each cycle including the following steps:
  - close the valve by applying a torque of (1.5 ± 0.15) Nm
  - hold the “closed” position for (5 ± 1) seconds
  - open the valve. The open position is equal to approximately (75 ± 2) % of the total opening.
  - hold the “open” position for (5 ± 1) seconds

After the endurance test, perform the leak test in accordance with Article 1.9 of this document

1.14.4 Required characteristics

After the test, no visible deterioration or leakage should be observed.

1.15 Hydraulic characteristic

1.15.1 Test principle

The purpose of the test is to determine, for the tested product, the value of the flow rate for a reference pressure 3 bar, which is constant on the cold water supply.

1.15.2 Operating procedure

- assemble the valve on the test bench in the fully open position;
- supply the valve with a dynamic pressure of 0.3 (+ 0.02/0) MPa or 3 (+ 0.2/0) bar and cold water temperature ≤ 30 °C;
- measure the valve flow rate.

1.15.3 Required characteristics

Flow rate according to the product

Type of product	Flow requirements in L/min
– valves installed upstream of a sanitary tapware system	≥ 20
– valves installed on flushing cisterns or to supply a washing machine	≥ 12

1.16 Acoustic characteristic

1.16.1 Operating procedure

The tests must be carried out in accordance with Standard NF EN ISO 3822-3 on 3 samples.

The stop valve sound level Lap, in dB (A), shall be measured at a flow pressure of (0.3 ± 0.02) MPa or (3.0 ± 0.2) bar.

The flow rate is limited to:

- 15 L/min for stop valves upstream of a sanitary tapware system.
- 12 L/min for stop valves installed on flushing cisterns or to supply a washing machine.

1.16.2 Required characteristics

The requirements for each group of tapware accessories are defined in accordance with Table 8.

Table 8 – Group of tapware devices

Group of tapware devices and accessories		Lap
Group I	Valves installed upstream of a sanitary tapware system [a]	Lap ≤ 15 dB(A)
	Valves installed on a flushing cistern [b]	
	Valves installed to supply a washing machine [b]	Lap ≤ 20 dB(A)
[a] downstream flow rate at 15 L/min [b] downstream flow rate at 12 L/min (0.2 l/s)		

1.17 Test sequence

Table 9 – Performance of the test

Sample Sequence	Order	Tests
Sample 1 Materials	1.	§1.7.2A State of visible surfaces and coating quality *(salt spray)*
Sample 2 Materials	1.	§1.7.2B State of visible surfaces and coating quality *(air thermal shock)*
Sample 3 Endurance	1.	§1.6 Marking
	2.	§1.10 Resistance to pressure
	3.	§1.9 Leaktightness
	4.	§1.14 Endurance
	5.	§1.9 Leaktightness
Sample 4 Tensile strength	1.	§1.6 Marking
	2.	§1.11 Tensile strength
Sample 5 Alternating pressures	1.	§1.6 Marking
	2.	§1.12 Resistance to alternating pressure
	3.	§1.9 Leaktightness
Sample 6 Torsion	1.	§1.6 Marking
	2.	§1.13 Torque
	3.	§1.9 Leaktightness
Sample 7 Hydraulic	1.	§1.6 Marking
	2.	§1.15 Flow rate
Sample 8-9-10 Acoustics	1.	§1.6 Marking
	2.	§1.16 Acoustics