WATER

TECHNICAL DOCUMENT

SANITARY TAPWARE

Technical document 077-14

Flow controllers

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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 077-14_Rev 18 **Update of technical document according to the new frame:** *"Trame_doc_technique_VF_PC_DT_R3. "*

TABLE OF CONTENTS

1 Rules for implementing this document and technical specifications and general rules applicable to flow controllers.

1.1 Purpose

The purpose of this chapter is to define the technical and general performance requirements for flow controllers.

1.2 Field of application

This document specifies the requirements related to:

- rules for designing, designating and classifying flow controllers;
- 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 flow controllers:

- Flow controller integrated into an aerator referred to as a “flow controller”;
- Flow controller integrated into a shower accessory (Handspray or hose) referred to as “flow rate lenses”;

Note: This document does not apply to flow controllers integrated into a check valve referred to as “check valve with controlled flow rate”. Refer to technical document No. 06 of Standard NF045 (complementary technical document of Standard NF EN 13959).

Table 1 – Conditions of Use

Stop valve operating range / **Supply system**	**Usage limits**	**Recommended limits**
Dynamic pressure	≥ 0.05 MPa – ≥ 0.5 bar	1 bar ≤ P ≤ 5 bar
Static pressure	< 1.0 MPa – < 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 246: 2003	Sanitary tapware - General specifications for flow rate regulators.
NF EN 248: 2002	Sanitary tapware - General specification for electrodeposited coatings of Ni-Cr.
EN ISO 5167-1 :2003	Measurement of fluid flow by means of pressure differential devices - Part 1: Diaphragms, nozzles and Venturi tubes inserted into full ducts with circular section
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

1.4 Design

Flow controllers are accessories that regulate flow over a defined pressure range. They must be accessible in order to facilitate product maintainability.

1.5 Designation

Flow controllers are designated by:

- their type;
- their dimensions
- their nominal flow rate in L/min or in GPM;
- their acoustic group.
- the reference to this document.

EXAMPLE:

Flow controller - M24X1 - 5 L/min - I - according to Technical Document 077-14.

1.6 Marking

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

The flow controllers must be permanently and legibly marked and include:

- the name or initials of the manufacturer on the flow controller;
- the nominal flow rate or a colour on the flow controller;

EXAMPLE:

for flow controllers: **Manufacturer's initials – 5**

Note: If it is small in size, it is not mandatory for the marking to appear on the product. Instead, it must appear on the packaging.

1.7 Materials

1.7.1 Chemical and hygienic requirements

Flow controllers must comply with the decree of 29 May 1997: "Concerning materials and objects used in fixed installations for production, treatment and distribution of water intended for human consumption" (Attestation of Sanitary Conformity).

1.7.2 State of visible surfaces and coating quality

If the flow controllers are equipped with chrome-plated visible parts (e.g. collar), the chrome-plated surfaces and Ni-Cr coatings must meet the requirements set out in the EN 248 Standard.

1.8 Dimensional characteristics

For jet regulators with controlled flow rate, connecting threads must comply with the following table.

Table 2 – Flow controller connection dimensions

Symbol	Connection for internal threads	Connection for external threads	Connection for external threads
M	M22x1 – 6h	M24x1 – 6g	M28x1 – 6g
X	14 ≤ X ≤ 17	14 ≤ X ≤ 17	15 ≤ X ≤ 19
T	3.5 ≤ T ≤ 4.3	4.4 ≤ T ≤ 4.6	6.9 ≤ T ≤ 7.1
R	/	≥ 9	≥ 14
U	/	1 ≤ U ≤ 1.5	1 ≤ U ≤ 1.5
L	/	23.8 ≤ L ≤ 24	27.8 ≤ L ≤ 28
V	/	V = 0.8	V = 0.8
Y	≥ 4.5	/	/
J	≥ 2	≥ 2	≥ 2.5

Other dimensions 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 Hydraulic operating characteristics

1.9.1 Test principle

The test consists of verifying the hydraulic performance of the tested flow controller by determining the flow rate value for the reference pressures, from 1 bar to 5.5 bar, constantly, on the cold water supply.

This test must be completed prior to the mechanical endurance test.

1.9.2 Equipment

See Article 8.2.1.1 Assembly under Standard NF EN 246.

1.9.3 Operating procedure

The test is conducted on five new flow controllers.

- install the flow controller as shown in Figure 5 of Standard NF EN 246

Note: For flow controllers integrated into a shower accessory, the test is conducted with a connection that is suitable for the flow controller

- Supply the flow controller at a dynamic pressure of 3 (+ 0.2/0) bar and a water temperature ≤ 30 °C and maintain the flow for (30 ± 2) seconds
- close the water supply network;
- open the water supply circuit at a dynamic pressure of 1 (+ 0.2/0) bar and maintain flow for (30 ± 2) seconds;
- measure and record the average flow value for 3 (+1 / 0) seconds;
- increase the dynamic pressure by 0.5 bar in less than 2 seconds to obtain a pressure of 1.5 (+ 0.1/0) bar;
- maintain the flow for (30 ± 2) seconds to stabilise the flow controller;
- measure and record the average flow value for 3 (+1 / 0) seconds;
- repeat the increase in dynamic pressure from 0.5 bar to a pressure of 5.5 bar;
- maintain flow for (30 ± 2) seconds to stabilise the flow controller for each pressure level;
- perform 5 measurements at each pressure level and calculate the average.

1.9.4 Required characteristics

Flow controllers are classified according to their nominal flow rate (q) indicated by the manufacturer (q_{FAB}) under a dynamic pressure of 3 bar.

Table 3 – Summary of flow rate values

Nominal flow rate	**Before endurance testing**	**After endurance testing or after mechanical resistance testing**
q < 6 L/min	q_{m1} = (q_{FAB} ± 0.6) L/min	q_{m2} = (q_{m1} ± 0.9) L/min
q ≥ 6 L/min	q_{m1} = (q_{FAB} ± 10%) L/min	q_{m2} = (q_{m1}± 15%) L/min

q: nominal flow rate

q_{FAB}: nominal flow rate value indicated by the manufacturer

q_{m1}: average of 5 measured flow rate values before endurance testing

q_{m2}: average of 5 measured flow rate values after endurance testing

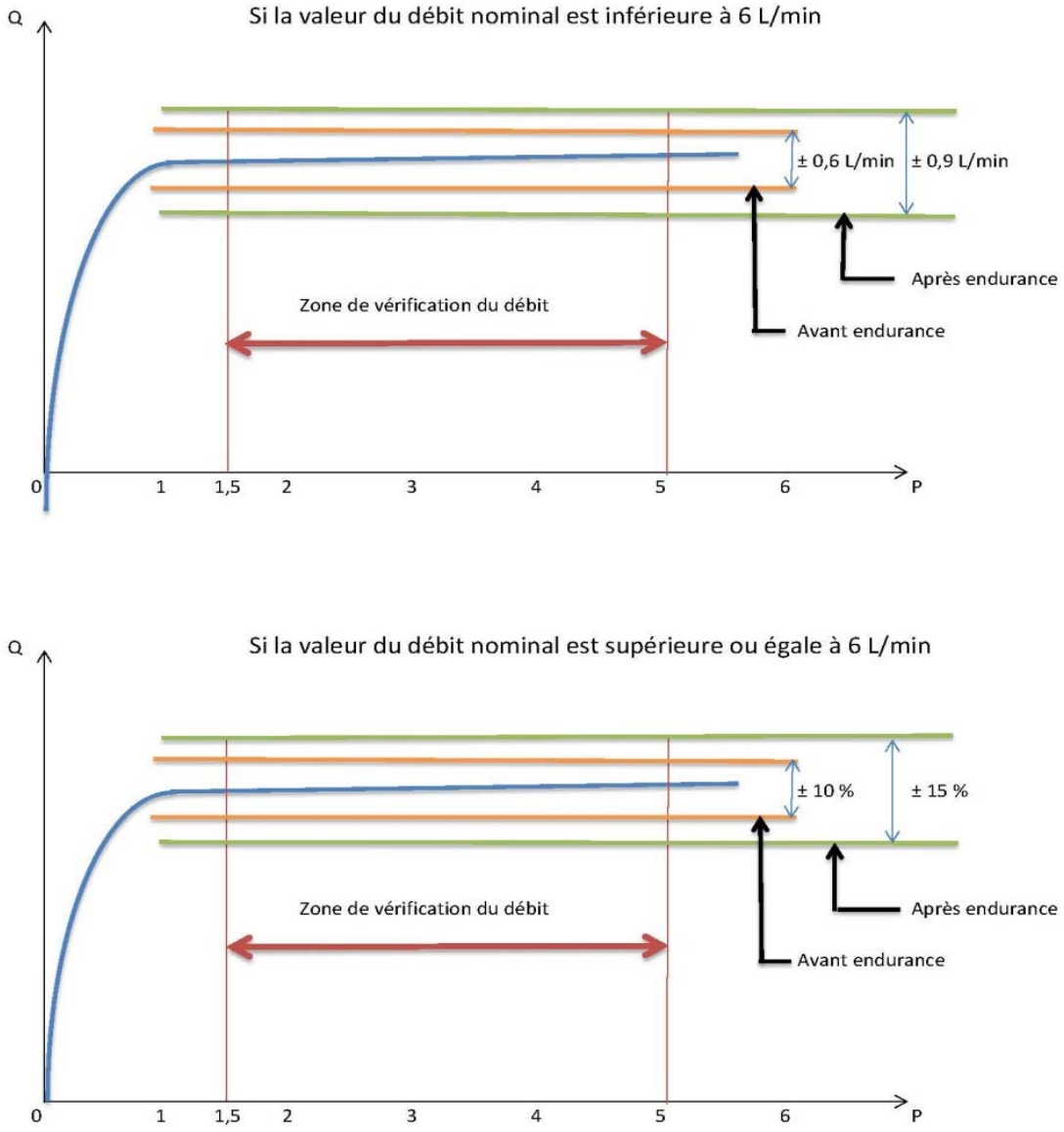

Figure 1 – Flow rate curves

1.10 Mechanical behaviour characteristics

1.10.1 Resistance to thermal shocks

1.10.1.1 Test principle

The test consists of subjecting the flow controller to temperature cycles with hot and cold water, alternately, in order to verify that there is no resulting deformation and that it is/remains easy to assemble and disassemble by hand.

1.10.1.2 Operating procedure

- assemble the flow controller on the test bench;
- subject the controller to 5 water circulation cycles, at a dynamic pressure set at (1.0 ± 0.2) bar, with each cycle comprising:
    - (15 ± 1) min. of water flow at (93 ± 2) °C;
    - (10 ± 1) min. of water flow at (20 ± 5) °C.
    - Alternative circulation between cold water and hot water must be performed in less than three seconds

1.10.1.3 Required characteristics

After the test, no visible deformation of the flow controller, whether or not it is integrated into a shower accessory, should be noted.

Check that the flow controller can be easily and manually reassembled and reconnected to the tap spout.

1.10.2 Resistance to high temperature under pressure

1.10.2.1 Test principle

The test consists of subjecting the flow controller to high pressure to check that there is no resulting deformation and that it is/remains easy to assemble and disassemble by hand.

1.10.2.2 Operating procedure

- assemble the flow controller on the test bench;
- subject the controller to water circulation, at a dynamic pressure of (0.8 ± 0.02) MPa or (8 ± 0.2) bar, for:
    - 1 min. of water flow at (65 ± 2) °C;
    - 1 min. of water flow at (20 ± 5) °C.
    - Alternative circulation between cold water and hot water must be performed in less than three seconds

1.10.2.3 Required characteristics

After the test, no visible deformation of the flow controller, whether or not it is integrated into a shower accessory, should be noted.

Check that the flow controller can be easily and manually reassembled and reconnected to the tap spout.

1.11 Endurance characteristics

1.11.1 Test principle

The test involves subjecting two flow controllers to endurance cycles

1.11.2 Equipment

The bench must be equipped with a water supply system at static pressure:

- with the cold water (0.4 ± 0.05) MPa [(4 ± 0.5) bar] at a temperature ≤ 30 °C and
- with the hot water (0.4 ± 0.05) MPa [(4 ± 0.5) bar] at a temperature of (65 +2; -5) °C;
- 2 solenoid valves with an opening/closing function.

1.11.3 Operating procedure

- Fit the two flow controllers to a universal body (see Figure 2) and install the body on the test bench;
- Subject the flow controller to 70,000 cycles, with each cycle consisting of one opening, one flow period, one closing and one pause;
- Alternately supply the flow controller, for the entire duration of the test, through its two cold water inlets for (15 ± 1) minutes and then with hot water for (15 ± 1) minutes (switch between the two supply circuits in less than 5 seconds);
    - Open the solenoid valve of the cold water supply circuit in less than 2 seconds
    - Maintain the flow of water for (15 ± 2) seconds;
    - Close the solenoid valve in less than 2 s;
    - Maintain in the closed position for (5 ± 1) seconds;
    - Reopen the solenoid valve of the cold water supply circuit in less than 2 seconds.
- After the test, determine the hydraulic operating characteristics of the flow controller in accordance with Article 1.9 of this document.

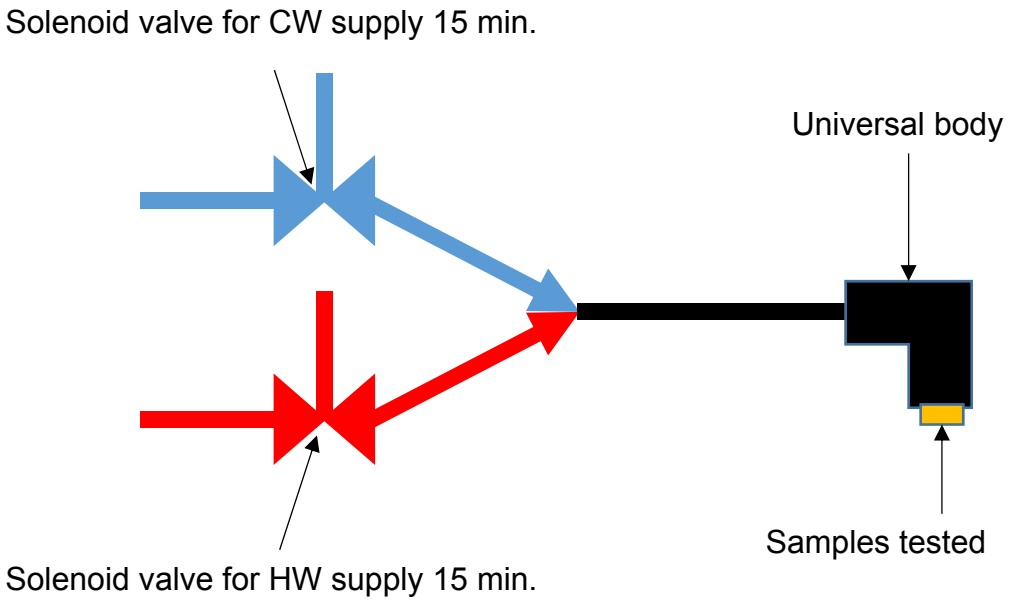

Figure 2 – Diagram of the endurance testing bench

1.11.4 Required characteristics

During the endurance test, there must be no visible breakages or leaks.

After the test, flow rate variation must be within a range of ± 0.9 L/min, if the flow controllers have a nominal flow rate of less than 6 L/min, or within a range of ± 15% of the value of the declared nominal flow rate of the flow controller (see Table 3) if flow controllers have a nominal flow rate greater than or equal to 6 L/min.

1.12 Acoustic characteristics

1.12.1 Operating procedure

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

The flow controller sound level Lap, in dB (A), shall be measured at a flow pressure of (0.3 ± 0.02) MPa or (3 ± 0.2) bar.

1.12.2 Required characteristics

The requirements for each group of tapware accessories are defined in accordance with Table 4.

Table 4 – Group of tapware devices

Group of tapware devices and accessories		**Lap**
Group I	Flow controller q < at 6 L/min [a]	Lap ≤ 17 dB(A)
	Flow controller integrated into a shower accessory (Shower or hose) referred to as “flow rate lenses”	Lap ≤ 17 dB(A)
[a] Flow controller q ≥ 6 L/min: No acoustic test; the test is performed on the product in which it is installed.		

1.13 Test sequence

Tests must be carried out in compliance with the instructions.

Table 5 – 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 3-4-5-6-7 Hydraulic		**Sample 3**	**Sample 4**	**Sample 5**	**Sample 6**	**Sample 7**
	1.	§1.6 Marking	§1.6 Marking	§1.6 Marking	§1.6 Marking	§1.6 Marking
	2.	§1.8 Dimensional	§1.8 Dimensional	§1.8 Dimensional	§1.8 Dimensional	§1.8 Dimensional
	3.	§1.9 Flow rate	§1.9 Flow rate	§1.9 Flow rate	§1.9 Flow rate	§1.9 Flow rate
	4.	§1.11 Endurance	§1.11 Endurance			
	5.	§1.9 Flow rate	§1.9 Flow rate			
Sample 8 Mechanical behaviour		**Sample 8A for metal controller**		**Sample 8B for plastic controller**		
	1.	§1.6 Marking		§1.6 Marking		
	2.	§1.10.1 Resistance to thermal shocks		§1.10.1 Resistance to thermal shocks		
	3.			§1.10.2 Resistance to high temperature under pressure		
Sample 9-10-11 Acoustics	1.	§1.6 Marking				
	2.	§1.12 Acoustics				