WATER

TECHNICAL DOCUMENT

Sanitary Components

Technical document 076-03

Flushing mechanisms for WC flushing cisterns

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CENTRE SCIENTIFIQUE ET TECHNIQUE DU BATIMENT
84 avenue Jean Jaurès – Champs-sur-Marne – 77447 Marne-la-Vallée Cedex 2
Tel. +33 (0)1 64 68 82 82 – www.cstb.fr
MARNE-LA-VALLÉE / PARIS / GRENOBLE / NANTES / SOPHIA-ANTIPOLIS

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MODIFICATION HISTORY

Revision No.	Date	Modifications
10	**01/09/2018**	**Update to the document introduction and reference.**
11	**18/03/2021**	**Editorial update according to the structure in force following the creation of the Technical management appendix of the NF076 reference system rev. 12.**

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1 RULES FOR APPLICATION OF STANDARD NF EN 14055 AND COMPLEMENTARY SPECIFICATIONS

The following table contains the list of requirements set down in standard NF EN 14055 and identifies the clauses that have been modified and/or extended and are presented in this document, and are applicable to all mechanisms to which this standard is applicable.

Table 1: List of points to be verified

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Specifications clause in Standard NF EN 14055	Requirements	Clauses of this document
5.3.8	Test	1.13.2
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1.1 Purpose

The purpose of this document is to establish:

- The dimensional, safety, leakproofing, mechanical, physico-chemical characteristics to which the mechanisms for WC flushing cisterns are to conform.

  For the case of a special mechanism, the tests are done in the cistern in which the mechanism will be used. When the mechanism is intended for use on several cisterns, the tests will be performed in the cistern that is deemed to form the worst case.
- The technique of the tests to make it possible to verify these characteristics,
- Marking and presentation.

This document applies exclusively to the mechanisms. It does not prejudge compliance with the sanitary rules during its installation in the WC cistern.

1.2 Field of application

This document applies to flushing mechanisms used to flush the water out of flushing cisterns equipping WCs. In general, they are fitted inside the cisterns and are fixed to their bottoms.

1.3 Description

The design of flushing mechanisms depends on:

- their type:
  - Universal (designed to be fitted to the majority of commercially available cisterns),
  - Specific (designed to be fitted to a specific type of cistern).
- their type of overflow:
  - Adjustable (allows adjustment only for the cistern to be equipped),
  - Variable (allows variable adjustment for the cistern to be equipped),
  - Fixed (does not allow adjustment for the cistern to be equipped).
- the height of the residual level:

  Fixed: ≤ à 30 mm
  > à 30 mm

  Adjustable: adjustment range

- their cover zone:
  - H min and max of cisterns that can be fitted with this mechanism
  - H min, minimal operating dimension. This is mandatorily to appear in the manual
  - F- inside surface of the bottom of the cistern

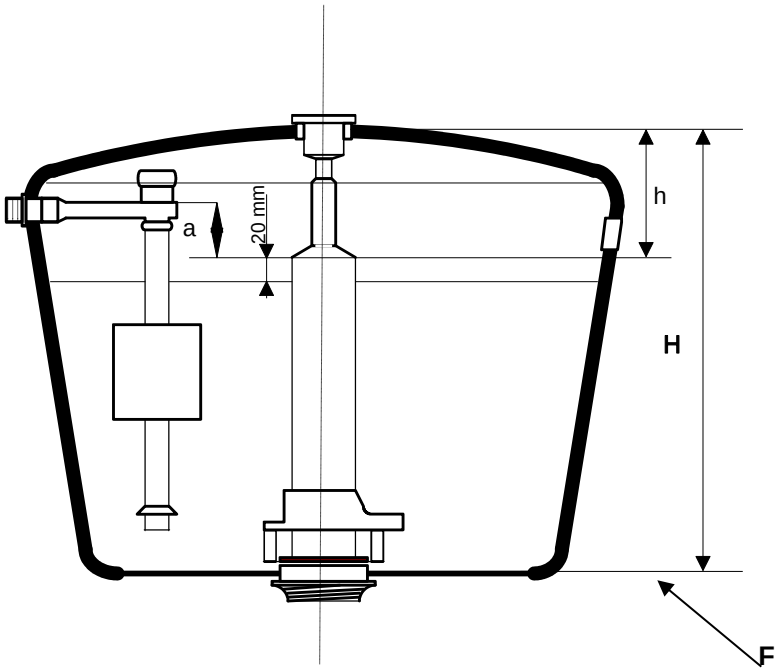


Figure 1

- their type of installation:
  - Cover holding
  - Non-cover holding
- their type of operation:
  - Single operation
  - Double operation

    and
  - By push-button
  - By pull handle
- The control transmission mode:
  - Direct type
  - Pneumatic type
  - Cable type
  - Other …
- the diameter of the drill hole in the cover when top operative.

Note:

In certain cases, the seats of specific mechanisms can be integral parts of the flushing cistern.

In every case of specific mechanisms, the manufacturer shall supply the list of cisterns for which those mechanisms are designed.

1.4 Definitions

Outlet valve:

A flushing mechanism is equipment installed inside the cistern, that releases a certain quantity of water contained in the cistern when activated by an external control.

The mechanism is composed of:

- A valve controlling leak tightness when holding water,
- A system for draining water from the cistern when controlled,
- An overflow device for evacuating supply water if a malfunction occurs.

It may support the cistern inlet valve.

Operating mechanism:
Device to open and possibly close the drain mechanism between the flush cistern and the WC bowl inlet.

Overflow:
Means of naturally evacuating excess water from a cistern when it reaches a predefined level.

Overflow level:
Water level at the top edge of the overflow or lower edge of the overflow notch if there is one.

Maximum water level:
Highest physical or piezometric level reached by the water after the flow has stabilised in the case of a continuous supply due to a failure of the inlet valve.

Critical water level:
Highest physical or piezometric level reached by the water in any part of the cistern whatsoever, 2 s after the water inlet has closed.

Residual water level:
Water level remaining in the cistern at the end of a full flush.

Adjustable residual water level:
Water level remaining in the cistern at the end of an uninterrupted full flush, when a mechanism can be adjusted at the residual level.

Meniscus level:
Water level resulting from the surface tension of water when the overflow is flowing.

Flush volume:
Water volume flowing from a flush cistern during a flush cycle.

Flush rate:
Water volume flowing out of a flushing cistern as a function of time.

Water-saving system:
Flush system to deliver part of the total flush volume.
(double acting (interruptible) or dual control (double flush) mechanism.

1.5 Designation

A WC flushing cistern mechanism is designated by:

- its type: Universal or Specific , ...
- the outside diameter of the bottom part (60 mm, …),
- its type of overflow, (fixed, variable or adjustable),
- the height of the residual level if > 30 mm or the adjustment range for adjustable levels,
- Its cover range (height of cisterns which can be fitted with this mechanism),
- Its type of installation,
- The diameter of the drill hole in the cover,
- Its type of control (direct, pneumatic, cable type, or other).

Example : universal flushing mechanism, 60 mm in diameter, with a 40 mm residual, with adjustable built-in overflow, covering heights from 350 to 450, with cover holding, 40 mm diameter of cover drill hole, single operation with push-button.

1.6 References

Standard identification No.	Designation
NF EN 1717	Protection against pollution of potable water in water installations and general requirements of devices to prevent pollution by backflow
NF EN 997	WC pans and WC suites with integral trap
NF EN 13078	Devices to prevent pollution by backflow of potable water — Air gap with submerged feed incorporating air inlet plus overflow — Family A, type C.
NF D 12-203	Equipped WC flushing cisterns for toilet bowl
NF EN 14124	Inlet valves for flushing cisterns with internal overflow.
NF ISO 1431-1	Rubber, vulcanized or thermoplastic - Resistance to ozone cracking - Part 1: Static and dynamic strain testing
NF EN 681-1/A3	Elastomeric seals — Material requirements for pipe joint seals used in water and drainage applications — Part 1: Vulcanized rubber
NF EN 681-2	Elastomeric seals — Materials requirements for pipe joint seals used in water and drainage applications — Part 2: Thermoplastic elastomers
NF EN 14055	WC and urinal flushing cisterns
NF017 certification rules – doc 14	Complementary specifications applicable to equipped flush cisterns

1.7 Materials, design and manufacture

All the materials used shall be compatible in terms of use.

The elastomers used for the check valve and the leaktightness on the flushing cistern shall have a sufficient service life, compatible with their use, a low water absorption and sufficient resistance to disinfecting products.

The valve elastomer shall satisfy:

- specifications 4.2.3, 4.2.4, 4.2.5, 4.2.8, 4.2.9 for the corresponding classes of table 2 in standard NF EN 681-1

or

- specifications 5.3, 5.4, 5.5, 5.8, 5.9 for the classes corresponding to table 2 in standard NF EN 681-2.

Silicones used for the valve and the seal on the cistern shall have a sufficiently long life, compatible with their use, low water absorption and sufficient resistance to disinfection products.

1.7.1 Design

The mechanism control, whenever it is designed to be installed on the cover, shall be compatible with the holes drilled in the cover.

The outlet connecting pipe shall be compatible with the hole made for flushing out the bottom of the cistern, according to NF017 certification rules document 14.

The backflow prevention function shall comply with the requirements of Standard NF EN 1717 and the product standard NF EN 13078.

1.7.2 Replacement of valves

Valves shall be easily removable without needing to remove the cistern.

1.8 Physico-chemical characteristics

1.8.1 Choice of materials

The choice of materials shall be technically justified by the manufacturer, bearing in mind all the characteristics related to their use.

1.9 Dimensional characteristics and verification

The dimensional characteristics shall comply with standard NF EN 14055 clause 5.1.5.

Dimensions affecting mechanisms shall be respected, depending on the use.

The nut that screws onto the bottom part shall be capable or resisting a tightening torque of 10 Nm without damage for 1 minute.

1.10 Interruptibility check

The test shall be done in compliance with section 5.2.2 in standard NF EN 14055.

1.11 Hydraulic characteristics and verification

1.11.1 Apparatus

- Apply the test in NF EN 14055 clause 5.3.3
  - The universal mechanism (test without flush tube)
  - The special mechanism when it is used on a specific cistern (test with the cistern and the flush tube if there is one)
- Standard cistern or, in certain cases, cistern to be fitted (note: Paragraph 12.3.2 below) fitted with its flush pipe.
- Pressure sensor.

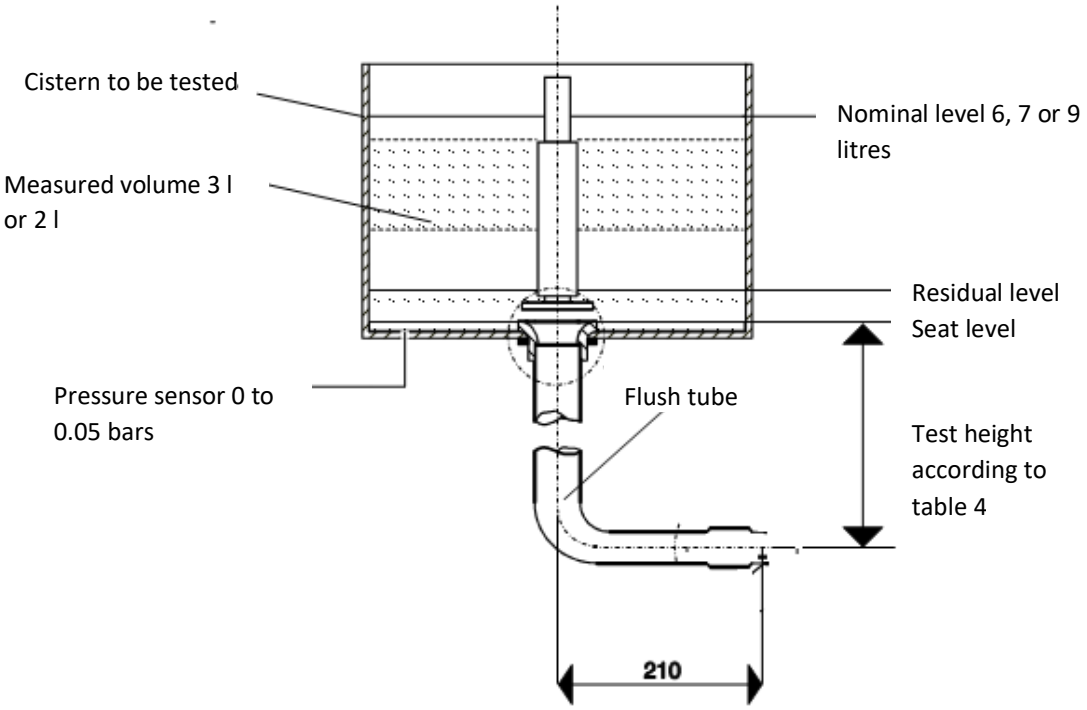


Figure 2

For the universal mechanisms, the test is carried out directly at the outlet from the mechanism.

Nominal level = Residual level + volume to be flushed away (for instance: 5 l, 6 l, 9 l, ...).

1.11.2 Residual level check

The test is repeated three times consecutively. During the tests, the residual shall not vary by more than± 3 mm from the average of the three tests.

The operation on the mechanism (pulling or pushing) shall range between 0.5 and 1 second.

- If the adjustment range is variable, the test shall be performed once at the minimum setting and once at the maximum setting.

Fixed residual: when the residual is more than 30 mm, the residual shall be marked on the packaging and secondarily on the instructions.

Adjustable residual: the identification on the packaging and secondarily on the product instructions shall clearly state the residual adjustment range.

1.11.3 Flow rate check for full flush

- Activate the mechanism to obtain the residual. Fix the adjustable residual to 30±5mm
- Add the water quantity necessary to reach V_N (nominal volume)
- Activate the mechanism
- Record the curve showing the loss of V (water depth) as a function of time
- Deduce the nominal flow determined between V_1 (V_N – 1l) and V_2 (V_N – 4l)
- The nominal flow shall comply with the specifications given in 1.11.6

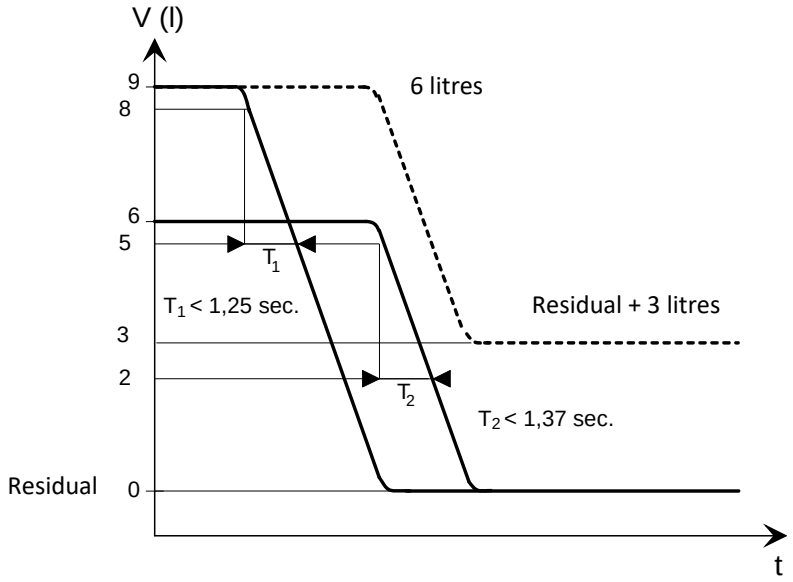


Figure 3

V_n: nominal volume

V_1: low volume

V_2: high volume

1.11.4 Flow rate check for short flush

To save water, the flushing system mechanisms are designed to release only part of the flush volume in the cistern.

A special control triggers a short flush.

The flushed volume shall be at least 3 litres and the maximum shall be 50% of the nominal volume or 4 litres (for Vn < 8 litres).

An adjustment shall be provided to adapt to the performances of the pan to be equipped, to save water.

A second control releases all the water contained in the cistern.

Requirement:

For the small flush, the water quantity necessary for replacing the water in the water seal of the siphon trap of the pan is a minimum of 3 liters.

1.11.5 Tests

The apparatus used will be the same as what was used for determining the nominal flow rate.

The water volumes will be adjusted accordingly, in other words the flow shall be checked on 2 litres, where:

V_1 : (V_N – 0.5l)

V_2 : (V_N – 2.5l)

The measurement starts after 1/2 liter is flushed out.

The quantity of water flushed out will be verified, with the cistern filled to each nominal volume specified by the manufacturer.

The test is repeated three times.

1.11.6 Specifications

Mechanisms shall be capable of handling the following flows, depending on the cistern in which they will be installed, and the pan:

Table 2

	Q l/sec
Universal mechanism full flush short flush	 2.2 min 2.0 min
Special mechanism Built-in Adjacent multi-pan	 2.2±0.2 2.0

Nominal flows are determined as follows:

5/3L	Full flush	Between 1L and 4L litres flushed therefore on 3 litres
	Short flush	Between 0.5L and 2.5L flushed therefore on 2 litres
4/3L	Full flush	Between 0.5L and 3.5L flushed therefore on 3 litres
	Short flush	Between 0.5L and 2.5L flushed therefore on 2 litres

Reminder:

6/3L	Full flush	Between 1L and 4L flushed therefore on 3 litres
	Short flush	Between 0.5L and 2.5L flushed therefore on 2 litres

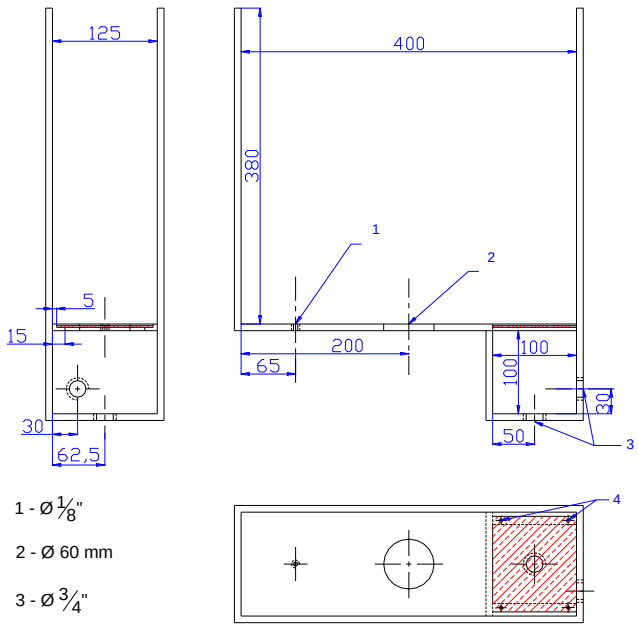
1.12 Hygiene and safety characteristics

If the built-in air gap is adjustable, it shall be possible to adjust it to 20 mm plus a 5 mm meniscus namely 25 mm minimum above the low point of the supply valve air intakes. When this adjustment has been made, it shall be impossible to increase the height of the overflow accidentally without human intervention.

Maximum level and critical level requirements in the test cistern shall be respected when it is supplied at a flow rate of 0.28 l/s.

Test cistern: the cistern defined below shall be used for the universal mechanism tests.

Cistern for the flush mechanism

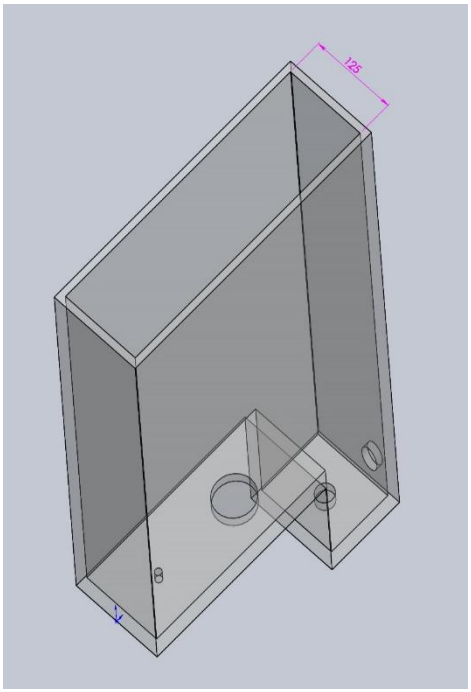


1 - Ø 1/8"

2 - Ø 60 mm

3 - Ø 3/4"

4 - Mesh attachment by screwing



Note: All given dimensions are inside dimensions given with a tolerance of ± 1 mm.

Figure 4

Dimensions that define the water volume shall be respected. Other dimensions are given for guidance.

1.12.1 Test method:

- Install the mechanism in the test cistern. The overflow level is the reference level TP0.
- Supply the cistern at a flow rate of 0.28 l/s for 60 s
- Note the equilibrium level (Maximum level)
- Close the supply at T_0
- Check the level 2 seconds after closing (Critical level): T0 + 2 sec
- Note the equilibrium level after stabilisation (Meniscus).

1.12.2 Specifications

Maximum level:	less than 15 mm
Critical level:	less than of equal to 5.5 mm
Meniscus:	less than of equal to 5 mm

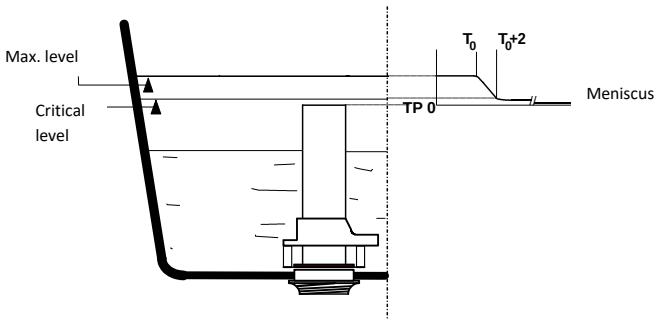


Figure 5

1.13 Leaktightness characteristics and verification

1.13.1 Required characteristics

The mechanism shall be leak tight under the selected water pressure (Nominal height).

1.13.2 Test

Full the typical cistern with the minimum nominal volume recommended by the manufacturer starting from the minimum residual volume.

Activate the filling mechanism and allow the flush cistern to fill once again.

Wait for two hours and wipe the outlet orifice to dry it.

Place a paper sheet under the flush cistern.

Allow to stand for 15 minutes, there shall not be a leak of more than 3 drops.

The test shall be repeated using the short flush mechanism for dual control mechanisms.

1.14 Mechanical characteristics and verification

1.14.1 Mechanical endurance

Before performing the endurance cycles, if need be, the device shall be submitted to the test assessing the compatibility with disinfection products for networks; to do this:

- Put the mechanism in a commercially available tank or cistern.
- Fill the tank with treated water until the mechanism is fully immersed.

Maintain the mechanism in the solution as long as is specified in article 3 of technical document 1 of the certification rules.

Under the test conditions described below, the mechanism is subjected to 200 000 cycles.

Every 50 000 cycles, the watertightness of the mechanism is verified.

Throughout the test, the residual level and the small flush volume level (if relevant) will be checked bearing in mind a variation to be defined depending on the test tank. This variation is calculated based on a variation of a water volume of +/- 250 ml.

Any anomaly during the test will be recorded.

NOTE: In case of a dual control system, 100 000 cycles are carried out on each action.

1.14.1.1 Apparatus

The test apparatus consists of:

- A cistern supplied by an outside valve. The temperature of the supply water shall range between 7°C and 25°C,
- An automatic system, making it possible to operate the flushing whenever the desired level is reached in the cistern,
- A system for verifying the levels of water in the cistern,
- A system for verifying the operating force.

1.14.1.2 Procedure

- Install the mechanism in the cistern for the universal flushing systems or in one of the cisterns in which it is planned to fit this mechanism for the specific ones
- Adjust the actuation point of the mechanism so that it will be actuated whenever le maximum level is reached in the cistern (2 cm below the air gap)
- Actuate the flush by applying a force not exceeding the force given in table 3
- Actuate the flush mechanism at a rate of 5 cm/s for between 0.5 s and 1 s
- Allow the mechanism to close
- Refill the cistern
- Perform the required number of cycles
- The force may be increased to 5 N above the maximum force given in table 3 during the test.

1.14.1.3 Specification

The mechanism shall be leak tight at the end of the test and shall function correctly.

.

1.14.2 Control force

It shall be possible to actuate the mechanism applying a force of:

Table 3

Press type	Maximum force
finger	20 N
hand or palm	30 N
foot	25 N

This test is done during the hydraulic and mechanical endurance tests for which a maximum control force of 25 N is accepted at the end of the cycle.

1.15 Presentation at delivery

If the mechanism is adjustable, a manual detailing the setting and compliance with the water system anti-pollution guidelines must accompany the product.

- As regards the cable-type mechanisms, the instructions for assembly shall be specified in the event of restrictions relative to proper functioning.

- The instructions shall contain at least the following information:

The following values shall be respected:

a	> 20 mm with relation to the critical level
c	filling setting: a minimum of 20 mm below the overflow

Dimension « a » is the difference between the overflow level and the lowest point of the filling valve air intake.

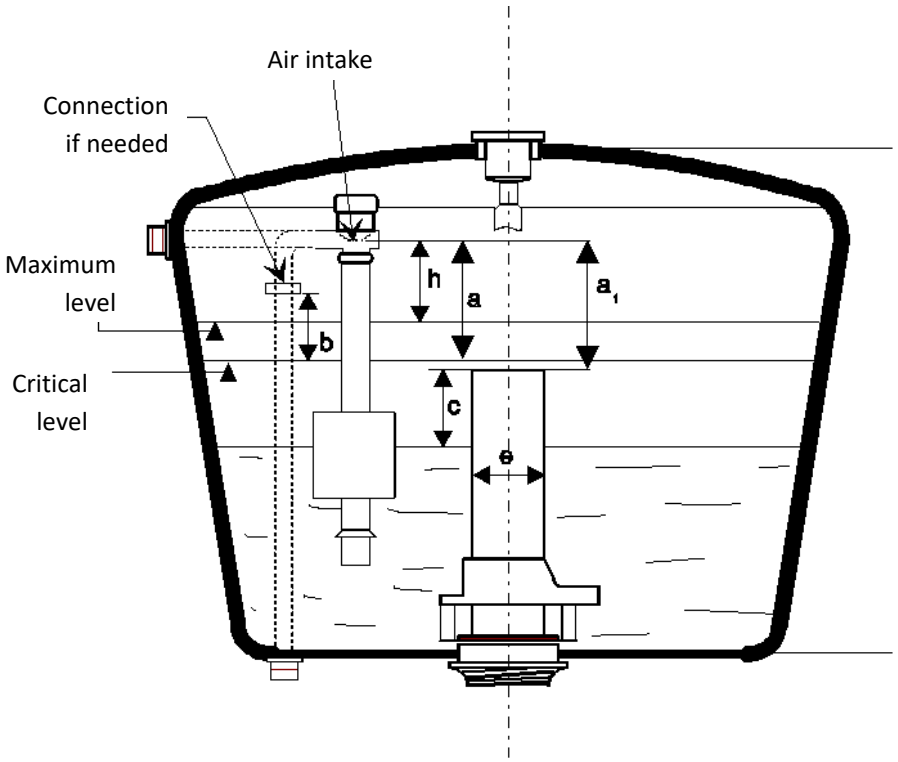


Figure 6

1.16 Technical documentation

Each packaging and/or each batch produced by the contractor shall contain product technical documentation that shall be written in the language of the country in which the product is sold. If the technical documentation is not provided, it shall be available on request.

The product technical documentation shall contain the following information:

a) indicate the product designation;

b) indicate its usage application(s);

c) comprise assembly instructions, including tightening torques, usable sealing products, etc.;

e) include user's and maintenance instructions;

f) hygiene and safety rules;

i) list spare parts (including at least the valve seal);

j) the fabrication origin on the packaging.