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**Sanitary ware - Gravity water flushing devices and
supports**

卫生洁具 便器用重力式冲水装置及洁具机架

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Table of Contents

Foreword.....	3
1 Scope.....	4
2 Normative references.....	4
3 Terms and definitions	5
4 Materials	8
5 Technical requirements	8
6 Test method	17
7 Inspection rules.....	28
8 Markings and identifications.....	31
9 Packaging, transportation, storage	31
Appendix A (Normative) Connection size between support and wall-mounted toilet	33
Appendix B (Normative) Test method of torque and tensile strength	35
Appendix C (Normative) Test of anti-siphon function of fill valve.....	37
Appendix D (Normative) Test method of water hammer	40
Appendix E (Normative) Test method of durability	42
Appendix F (Normative) Test method of forward thrust of external flush tank	44
Appendix G (Normative) Test method of safety load of sanitary ware's support	45
References	48

Sanitary ware - Gravity water flushing devices and supports

1 Scope

This standard specifies the terms and definitions, technical requirements, test methods, inspection rules, markings and identifications, packaging, transportation, storage of gravity water flushing devices for toilet AND supports of sanitary ware.

This standard is applicable to the flushing devices that are installed on cold water supply pipelines, which has a static pressure of not greater than 0.6 MPa AND functions by the gravity of the water, for various toilets, as well as the supports for wall-mounted sanitary ware.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) are applicable to this standard.

GB/T 3768 Acoustics - Determination of sound power levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane

GB/T 6461-2002 Methods for corrosion testing of metallic and other inorganic coatings on metallic substrates - Rating of test specimens and manufactured articles subjected to corrosion tests

GB 6952 Sanitary wares

GB/T 7307 Pipe threads with 55 degree thread angle where pressure-tight joints are not made on the threads

GB/T 9195 Classification and terms of building and sanitary ceramics

GB/T 10125-1997 Corrosion tests in artificial atmospheres - Salt spray tests

GB/T 17219 Standard for safety evaluation of equipment and protective mater

set in a ceramic flush tank, OR a flush tank installed in other furniture in a hidden manner.

3.6

Hidden cistern

The integral flush tank installed inside the concealed work. When matched with the wall-mounted toilet, it is composed of the integral flush tank and the mounting support.

[GB/T 9195-2011, definition 3.4.15]

3.7

Support

A support which is fixed in a concealed work, to bear the wall-mounted sanitary ware; it includes corresponding pipe fittings and connectors.

3.8

Front plane surface of support

The plane formed by the front surface of the support, which mainly bears the load and supports the parts of the sanitary ware.

3.9

Actuating plate

The interface for the hidden cistern to accept changes in external actions AND drive the corresponding mechanism to complete the drainage function.

3.10

Static pressure

When the fill valve is completely closed, the stable pressure value in the water supply pipeline.

Note: Rewrite GB/T 26750-2011, definition 3.5.

3.11

Dynamic pressure

When the fill valve is fully opened, the stable pressure value in the pipeline in front of the fill valve.

3.17

None sealed water level

The lowest water level that can overflow the flush tank, under the status that the flush valve is closed and the overflow port is blocked, which is abbreviated as NL.

3.18

Water hammer

When water flows normally in the pipeline, the instantaneous pressure rise in the pipeline, which is caused by the closing of the valve.

[GB/T 26750-2011, definition 3.9]

4 Materials

4.1 For all materials in the flushing device that are in direct contact with drinking water, they shall meet the requirements of GB/T 17219. Other materials shall meet the requirements of product performance.

4.2 When the toilet uses seawater, reclaimed water, rainwater or other water containing chemical components, the materials and seals used in the gravity flushing device for the toilet shall meet the corresponding requirements for use. The technical requirements and test methods may be agreed between the supplier and the buyer.

5 Technical requirements

5.1 General technical requirements

5.1.1 Surface quality

5.1.1.1 The outer surface of the metal parts shall not have defects such as shrinkage holes, blisters, cracks or pores; the inner cavity shall not have adhered molding sand.

5.1.1.2 The surface of the plastic part shall not have obvious ripples, weld marks, or obvious scratches, decoration damage and other defects.

5.1.1.3 After installation, the visible surface of the coating and plating shall not have un-plated or uncoated locations. The surface shall be uniform. There shall be no delamination, peeling off, blistering, etc.

rated water replenishment ratio shall not exceed $\pm 5\%$.

5.2.3 Inlet water flow

Under the dynamic pressure of 0.05 MPa, the inlet water flow rate shall not be less than 0.05 L/s. Under the dynamic pressure of 0.5 MPa, the inlet water flow rate shall not be greater than 0.33 L/S.

5.2.4 Tightness

5.2.4.1 Tightness at static pressure

After the test of tightness at static pressure, the rising height of the water level in the flush tank shall not be greater than 8 mm. Meanwhile there shall be no visible drips after the fill valve is closed.

5.2.4.2 Tightness at dynamic pressure

After the test of tightness at dynamic pressure, the rising height of the water level in the flush tank shall not be greater than 8 mm. Meanwhile there shall be no visible drips after the fill valve is closed.

5.2.5 Pressure resistance

After the test of pressure resistance, the fill valve shall be free from leakage, deformation, sweating, or any other damage.

5.2.6 Resistance to thermal denaturation

After the test of resistance to thermal denaturation, the fill valve shall not have leakage, deformation, sweating and any other damage. For the fill valve with the water replenishment pipe, the water replenishment pipe shall not fall off.

5.2.7 Anti-siphon function

5.2.7.1 The permanent CL line mark shall be marked on the fill valve.

5.2.7.2 After the test of anti-siphon function, the position of the marked CL line shall not be higher than the position where the CL line is actually measured.

5.2.8 Reopen function

Carry out the reopen function test. When draining to the specified test height, the fill valve shall be able to automatically open, to fill water; meanwhile, after reaching to the working water level, it shall be able to automatically close. The height difference of the working water level for 5 consecutive water fillings shall not be greater than 5 mm.

deviation is ± 5 mm. For the flushing tank with adjustable water volume, it shall identify at least the maximum rated flushing volume AND its corresponding marking line.

5.4.5 Reopen function

After the reopen test of flush tank, during the test, the fill valve shall be able to automatically open to fill water; meanwhile it shall be able to automatically close after reaching the working water level. The height difference of the working water level for 5 consecutive water fillings shall not be greater than 5 mm.

5.4.6 Load

The tensile load of the chain or traction wire of the flush valve, which is driven by the wrench, shall not be less than 60 N; the fixed load with the valve and wrench shall not be less than 30 N.

5.4.7 Operating force of drive mechanism

The operating force of the drive mechanism shall not be greater than 30 N.

5.4.8 Forward thrust of external flush tank

The external flush tank shall, after undergoing the forward thrust test, not have cracks, failures or irrecoverable permanent deformations.

5.4.9 Flush tank durability

After the durability test, the fill valve and flush valve shall be free from leakage or any other failures. Each part of the flush tank shall be free from leakage. The drive mechanism shall not have any failure.

5.4.10 Special requirements for hidden cisterns

The hidden cisterns shall, in addition to the requirements of 5.4 (except 5.4.1, 5.4.3, 5.4.8), meet the following requirements.

5.4.10.1 Design requirements

The design requirements shall meet:

- a) When the hidden cistern is upright and not moving, it shall be able to adjust and repair its internal components;
- b) Hidden cistern shall adopt internal overflow method.

5.4.10.2 Safe water level

The relative water level of each component of the hidden cistern, after

gasket accessories, etc.

5.5.1.2 Hose: For the hose used to connect the angle valve of the water supply pipeline and the flush device, it shall meet the requirements of GB/T 23448. The hose used shall be easy to replace.

5.5.1.3 Sewage pipe and fittings: They shall be able to resist corrosion; they shall be able to effectively connect and seal the sewage pipe system.

5.5.2 Safety load

The maximum displacement of the front end of the standard test bracket of the support shall not be greater than 10 mm.

5.5.3 Flatness

Except for the pipes and pipe fittings that are fixedly connected to sanitary ware, AND the fixed feet that are fixed to the wall and the ground, FOR the support, all the parts on the support which include the pipe fixing parts, the processed projections of the parts, there shall be no deformation that exceeds 1 mm of the front plane surface of the support, after installation, in any plane within the range of 600 mm × 600 mm.

5.5.4 Corrosion resistance

For the bearing parts used to fix the support AND the metal parts used to fix the sanitary ware, which are inconvenient to replace and maintain after the corrosion resistance test, the appearance level shall meet the requirements of class 6 in GB/T 6461-2002;

For the metal parts on the support which are used to fix the sanitary ware AND can be replaced after decoration, after subjected to corrosion resistance test, the appearance grade shall meet the requirements of class 6 in GB/T 6461-2002.

5.5.5 Fixing strength of piping

5.5.5.1 For all the socket-type pipe fittings which are fixed on the support AND the pipe fittings which are connected with sanitary ware, when they are subjected to a pressure of 200 N as applied in the direction perpendicular to the inside of the support, the pipe fittings and fixing parts shall not be damaged in any way.

5.5.5.2 For the threaded connections used to fix the sanitary ware on the support, they shall be able to withstand a torque of 20 Nm; the threads shall not be slippery or damaged.

Q - Water filling flow, in liters per second (L/s);

L - Water filling volume, in liters (L);

t - Water filling time, in seconds (s).

Measure three times in a row. Take the arithmetic mean as the measured value.

6.9 Tightness of fill valve

6.9.1 Test of tightness at static pressure

Install the fill valve in a standard flush tank. At a static pressure of $0.03 \text{ MPa} \pm 0.002 \text{ MPa}$, fill water, until the fill valve is completely closed. Hold it for 5 minutes; then measure the water level H_0 in the flush tank; observe whether there is dripping. Increase the static pressure to $0.3 \text{ MPa} \pm 0.02 \text{ MPa}$; hold for 5 minutes; then measure the water level H_1 in the flush tank; observe whether there is dripping. Increase the static pressure to $1.0 \text{ MPa} \pm 0.02 \text{ MPa}$; hold for 5 minutes; then measure the water level H_2 in the flush tank; observe whether there is a dripping. The dripping water remaining on the valve body after closing is negligible.

Report the height difference between the lowest water level and the highest water level. Report whether there is dripping after holding pressure for 5 minutes.

6.9.2 Test of pressure at dynamic pressure

Install the fill valve in a standard flush tank. At a dynamic pressure of $0.03 \text{ MPa} \pm 0.002 \text{ MPa}$, fill water to the flush tank, until the fill valve is completely closed; measure the water level H_0 in the flush tank. Empty the water in the flush tank; at the dynamic pressure is $0.3 \text{ MPa} \pm 0.02 \text{ MPa}$, fill water into the flush tank, until the fill valve is completely closed; measure the water level H_1 in the flush tank. Empty the water in the flush tank; at a dynamic pressure of $0.6 \text{ MPa} \pm 0.02 \text{ MPa}$, fill water into the flush tank, until the fill valve is completely closed; measure the water level H_2 in the flush tank. The dripping water remaining on the valve body after closing can be ignored.

Report the height difference between the lowest water level and the highest water level.

6.10 Pressure resistance test of fill valve

Install the fill valve on a pressure test pump OR other pressure device with the same effect. Manually close the fill valve. Pressurize it to $1.6 \text{ MPa} \pm 0.02 \text{ MPa}$. under this pressure, hold for $5 \text{ min} \pm 10 \text{ s}$. Observe whether there are cracks, deformations, water seepage in various parts of the valve body.

of the water level in the flush tank. The measurement accuracy is ± 1 mm.

6.13.2.4 Repeat the above steps 5 times. Record the height difference between the highest water level and the lowest water level.

6.14 Water hammer test

Carry out the water hammer test in accordance with Appendix D.

6.15 Measurement of water inlet noise

6.15.1 Equipment and environmental requirements

6.15.1.1 Instrument: A sound level meter which has an accuracy of not less than 0.1 dB(A).

6.15.1.2 Noise room: It shall meet the requirements of GB/T 3768 AND the ambient noise shall not be higher than 30 dB(A).

6.15.2 Test procedure

6.15.2.1 Install the fill valve on the standard flush tank in the test room. The height of the standard flush tank from the ground is 400 mm. Do not cover the flush tank. Install the sound level meter, so that its probe is 1 m from the front surface of the flush tank AND 1 m above the ground.

6.15.2.2 Adjust the filling water's dynamic pressure to $0.3 \text{ MPa} \pm 0.02 \text{ MPa}$. Open the fill valve. Start measurement after 10 s. Record the highest noise value during the entire water fill process. Repeat 3 times. Report the arithmetic average.

Note: When the flush tank is subject to noise test, directly install the flush tank in the use state AND place it in the test room.

6.16 Durability test

The durability of the fill valve, flush valve, flush tank shall be tested in accordance with the provisions of Appendix E.

6.17 Test of strength of flush valve joint

The strength of the flush valve joint shall be tested in accordance with the provisions of Appendix B.

6.18 Test of self-closing tightness of flush valve

Install the flush valve in the matching flush tank or standard flush tank. Fill water into the flush tank. Adjust the water level to:

automatically.

6.20.2.5 Repeat the above steps three times. Mark the average residual level of the three.

6.20.2.6 After filling the flush tank to the above mark, fill 2.5 L of water to the flush tank; mark this water level as L_2 . Then fill 3 L of water to the flush tank; mark the water level as L_1 . Finally, fill 0.5 L of water to the flush tank; mark the water level as L_0 .

6.20.2.7 Open the flush valve. Record the time when the water level changes from L_1 to L_2 . Divide 3 L by the drain time to get the drain flow. Repeat three times and report the arithmetic average.

Note: For flush tanks which have a water consumption of less than 6 L, if the test is carried out according to 6.20.2.6, when L_1 or L_0 has reached over the flush valve's overflow pipe, it shall block the flush valve's overflow pipe; then fill water to the L_0 position.

6.21 Corrosion resistance test of flush valve seal

6.21.1 Instruments and reagents

The instruments and reagents are as follows:

- Balance: Accuracy 0.01 g;
- Measuring tools: Measuring tools with an accuracy of 0.02 mm;
- Sealable test container;
- Test solution: Prepare a test solution, which has an available chlorine at concentration of 0.5%, by the chemically pure NaClO solution.

6.21.2 Test procedure

6.21.2.1 Disassemble the flush valve. Weigh all seals or other parts that prevent water flow. Measure their key dimensions, such as outer diameter, thickness, etc. If the above components cannot be removed without damage, the whole connection must be tested; the size of each component shall be measured.

6.21.2.2 Reassemble the flush valve. Place it in the test solution. The flush valve shall ensure it is covered by at least 100 mL of solution. Seal the container. Keep it for 42 days. The ambient temperature shall be kept at $20\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$.

6.21.2.3 Take the flush valve out of the solution. Use clean tap water to rinse it. Dry it in the air for $60\text{ min} \pm 10\text{ min}$.

7.3 Type inspection

7.3.1 Inspection items

Type inspection includes all the items in Chapter 5.

7.3.2 Inspection conditions

When one of the following conditions occurs, type inspection shall be carried out:

- a) During trial production, type finalization, appraisal of new products;
- b) After formal production, there are major changes in structure, materials, processes, that may affect product quality;
- c) When the production is restored after suspension for more than half a year;
- d) When there is a big difference between the exit-factory inspection result and the last type inspection result;
- e) Under normal circumstances, at least once a year.

7.3.3 Group-batching rules and sampling scheme

7.3.3.1 Group-batching

Group batches of products of the same type, same type, same model. However, for each component of fill valve, flush valve, flush tank, sanitary ware support that make up the product, they are group batched in case of independent delivery.

Every 200 ~ 500 products form a batch. However, if the quantity is less than 200, it is still counted as a batch.

7.3.3.2 Sampling scheme

From the submitted qualified batches, randomly take samples. The sample size of each inspection item is 1; the acceptance number A_c is 0; the rejection number R_e is 1.

7.3.4 Inspection items, minimum sample size, inspection process

7.3.4.1 Inspection items: The inspection items are as listed in Table 5.

7.3.4.2.5 The minimum sample size of the sanitary ware support is 1. The inspection process is as follows:

Sample 1: 5.1.1→5.5.6→5.5.1→5.5.2→5.5.3→5.5.5→5.5.4.

In the above inspection process, the order of the tests, that are non-destructive AND does not affect other properties, can be adjusted. If the inspection of 5.1.4 fails, no other items will be tested.

7.3.5 Judgment rules

When all items are qualified after inspection, the batch of products is judged to be qualified. However, if one or more items are unqualified, the batch of products is judged to be unqualified.

8 Markings and identifications

8.1 Permanent marking

8.1.1 The trademark shall be marked in an obvious position of the product.

8.1.2 There shall be a CL line mark on the fill valve.

8.1.3 The rated flushing volume and marking line of the flush tank shall be marked on the inner wall of the flush tank OR on the flush valve.

8.2 Product identification

The product or single package shall at least identify the following: product name, specification model, implemented standard, registered trademark, production date or batch number, manufacturer's name, place of origin.

Fill valves for retail use shall be identified with the replenishment ratio on the smallest package.

8.3 Certificates and instructions

The smallest package of the product shall be accompanied by a exit-factory inspection certificate; provide an installation and use manual. Special circumstances can be dealt with as required by the contract.

9 Packaging, transportation, storage

9.1 Each set of products shall be packaged separately. It shall ensure that there is no collision between the products.

Appendix E

(Normative)

Test method of durability

E.1 Scope of application

This Appendix specifies the test methods of durability for the fill valve, flush valve, flush tank.

E.2 Equipment

Test device or other equivalent device for the durability of flushing device.

E.3 Test method for durability of fill valve

E.3.1 Install the fill valve, that has passed the tightness test, in the flush tank of the test device.

E.3.2 Under the condition that -- the inlet water dynamic pressure is not less than 0.48 MPa; when the fill valve is closed, the static pressure is not less than 0.62 MPa -- carry out 100000 water fill cycle tests. The water filling volume of each cycle is not less than 3 L; the water filling time is not more than 1 min and not less than 10 s. During the whole process, it may fill additional water to the flush tank, to speed up the test process.

E.3.3 After the end of the cycle test, increase the static pressure to 0.86 MPa; keep it for 5 minutes. Then, check whether the fill valve has leaks or any other malfunctions.

E.4 Test method of durability of flush valve

E.4.1 Install the flush valve, that has passed the tightness test, in the flush tank of the test device.

E.4.2 Adjust the test device, so that the driving force of the actuator is between 25 N and 30 N, the speed is 50 mm/s $\pm$ 5 mm/s.

E.4.3 Perform 100000 drain cycles for single flush valve. For double flush valves, set the execution action at the ratio of 1 full flush and 3 half flushes, to perform a total of 100000 drain cycles. The time interval between two drains shall be at least 5 s longer than the time it takes for the flush valve to close.

E.4.4 After the cycle test is over, check the flush valve for leakage and any other malfunctions.

E.5 Test method for durability of flush tank

E.5.1 Install the assembled flush tank on the test device.

E.5.2 Adjust the test device, so that the driving force of the actuator is between 25 N and 30 N, the speed is 50 mm/s $\pm$ 5 mm/s. The dynamic pressure of the fill water is not less than 0.48 MPa; when the fill valve is closed, the static pressure is not less than 0.62 MPa.

E.5.3 The single-flush hidden cistern is subjected to 200000 flush cycle tests. The other single flush tanks are subjected to 100000 flush cycle tests. For double flush tanks, set the execution action at the ratio of 1 full flush and 3 half flushes. The time interval between two drains shall be at least 5 s longer than the time it takes for the flush valve to close. Double-flush hidden cisterns are subjected to 200000 flush cycle tests, whilst the other double flush tanks are subjected to 100000 flush cycle tests.

E.5.4 After the end of the cycle test, increase the static pressure to 0.86 MPa $\pm$ 0.002 MPa. Hold for 5 minutes. Then, check whether there is any leakage or any other failures in the fill valve and flush valve; whether there is leakage in various parts of the flush tank; whether the driving mechanism is faulty.

E.6 Considerations

E.6.1 Test water is tap water not exceeding 30 °C.

E.6.2 The water supply volume of each cycle shall ensure that the fill valve can be automatically closed.

E.6.3 The fill valve and flush valve can be installed on the test bench at the same time for testing.

E.6.4 During the entire test process, the machine can be shut down for inspection at any time. If it is determined to be unqualified, it shall stop the test, record the number of tests.

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