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Thermostatic faucets

温控水嘴

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This standard is a revision of QB 2806-2006 “Thermostatic faucets”. Compared with QB 2806-2006, except editorial changes, the main technical changes are as follows:

- CHANGE the nature of this standard to recommended;
- ADD the requirements for the amount of metal contaminant released by the thermostatic faucet;
- MODIFY the material requirements;
- ADD the supporting equipment;
- DELETE the surface quality requirements for rubber parts;
- DELETE the hardness requirements for ceramic valve;
- DELETE the P-type thermostatic faucet;
- ADD the single-handle three-control thermostatic faucet;
- MODIFY the outlet water temperature from 38 °C to 40 °C;
- MODIFY the requirements for surface corrosion resistance;
- ADD the safety requirements for hot-water loss.

This standard was proposed by the China Light Industry Association.

This standard shall be under the jurisdiction of the National Hardware Standardization Technical Committee Construction Hardware Subcommittee (SAC/TC 174/SC 3).

Drafting organizations of this standard: Zhuhai Shulima Temperature Control Sanitary Equipment Co., Ltd., Zhuhai Pulemei Kitchen & Bath Co., Ltd., Ningbo Aimeike Copper Valve Co., Ltd., Guangdong Huayi Sanitary Ware Co., Ltd., Guangzhou Moen Plumbing Equipment Co., Ltd., China Hardware Products Association, Xiamen Songlin Technology Co., Ltd., Taizhou Guoren Temperature Control Sanitary Ware Co., Ltd., Guangdong Hengjie Sanitary Ware Co., Ltd., Rifeng Enterprise Group Co., Ltd., Yading Creative Home Co., Ltd., Ningbo Aoleishi Sanitary Ware Co., Ltd., Zhongyu Building Materials Group Co., Ltd., Shanghai Jianke Inspection Co., Ltd., Foshan Quality Measurement Supervision and Inspection Center, Shanghai Construction Hardware Industry Research Institute Co., Ltd.

Thermostatic faucets

1 Scope

This standard specifies the terms and definitions, classification and naming, conditions of use, materials, supporting devices, requirements, single-handle three-control thermostatic faucets, test methods, inspection rules, marking, packaging, transportation and storage of thermostatic faucets.

This standard applies to the cold-water & hot-water mixed faucet which is at nominal pressure, has an ordinary-water-pressure of not more than 0.5 MPa and a high-water-pressure of not more than 2 MPa, a cold-water temperature of 4 °C ~ 29 °C and a hot-water temperature of 45 °C ~ 85 °C, is mounted on the sanitary facilities in the washroom (toilets, bathroom, etc.), kitchen and so on, whose outlet water temperature is automatically controlled by the pre-selected temperature.

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 2828.1-2012 Sampling procedures for inspection by attributes - Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection

GB/T 5270-2005 Metallic coatings on metallic substrates - Electrodeposited and chemically deposited coatings - Review of methods available for testing adhesion

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/T 7306.1 Pipe threads with 55 degree thread angle where pressure-tight joints are made on the threads - Part 1: Parallel internal and taper external threads

GB/T 7306.2 Pipe threads with 55 degree thread angle where pressure-tight joints are made on the threads - Part 2: Taper internal and external threads

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

GB/T 9286-1998 Paints and varnishes - Cross cut test for films

GB/T 10125-2012 Corrosion tests in artificial atmospheres - Salt spray tests

GB 18145-2014 Ceramic cartridge faucets

GB/T 23447 Shower outlets for bathing

GB/T 23448 Flexible hose for sanitary tapware

JC/T 932 Drainage fittings for sanitary wares

3 Terms and definitions

The following terms and definitions apply to this document.

3.1

Thermostatic faucets

The faucets which, when the inlet water temperature and pressure change within a certain range, automatically adjust the incoming flowrate of cold-water and hot-water, to stabilize the outlet water temperature in a certain range.

3.2

Single handle, double handle

The quantity of handles or handwheels which control the outlet water temperature, flowrate, open-close of the faucets. Single handle refers to using one handle or handwheel to control the outlet temperature or both flowrate and open-close. Double handle refers to using two handles or handwheels to respectively control the outlet water temperature, flowrate and open-close.

3.3

Single handle double control, single handle three control

Single-handle double control refers to using one handle or handwheel to control the outlet water temperature and open-close. Single-handle three-control refers to using one handle or handwheel to control the outlet water temperature, flowrate, open-close.

The thermostatic faucets which are used at the hydraulic pressure of 0.1 MPa ~ 2.0 MPa.

4 Classification and naming

4.1 Classification

4.1.1 According to the number of control handles, it is divided into single-handle and double-handle.

4.1.2 According to the type of temperature control, it is divided into constant-temperature faucet (hereinafter referred to as T) and constant-temperature constant-pressure faucet (hereinafter referred to as TP).

4.1.3 According to the location of use, it is divided into shower, bathtub, washing, basin, electric water heater, solar water heater, pipeline valve and so on.

4.1.4 According to the form of installation, it is divided into exposed-installation and concealed-installation.

4.1.5 According to the use pressure, it is divided into ordinary-water-pressure and high-water-pressure.

4.2 Naming

The name shall include the number of control handles, the type of temperature control, the location of use, the form of installation, the pressure of use.

Example:

The product which has a single control handle, constant-temperature constant-pressure temperature control, is used for bathtub, uses exposed installation and high-water-pressure may be named as single-handle constant-temperature constant-pressure exposed high-water-pressure faucet for bathtub use.

5 Conditions of use

5.1 Working pressure

5.1.1 Ordinary-water-pressure: water supply pressure 0.1 MPa ~ 0.5 MPa. If it exceeds 0.5 MPa, it shall add a relief valve.

5.1.2 High-water-pressure: water supply pressure 0.1 MPa ~ 2.0 MPa. It is recommended for the water pressure for normal use to be 0.3 MPa ~ 1.5 MPa.

5.2 Temperature for use of medium

overflows, shrinkage, warpage, fusion mark.

8.2 Surface performance

8.2.1 Adhesion strength of coating and plating

8.2.1.1 Adhesion strength of coating

The cross-cut test shall be carried out according to 10.2.1.1, it shall reach the requirements of grade-1.

8.2.1.2 Adhesion strength of metal substrate's plating

After the thermal shock test according to 10.2.1.2, there shall be no cracking, peeling or falling off.

8.2.1.3 Adhesion strength of plastic substrate's plating

After the test according to 10.2.1.3, the surface shall be free of cracks, pinholes or looseness.

8.2.2 Surface corrosion resistance

After the acid salt spray test according to 10.2.2, it shall not be lower than the grade-9 appearance rating (R_A) requirements in Table 1 of the GB/T 6461-2002.

8.3 Thread

8.3.1 The external sealing pipe thread of the product shall comply with the provisions of GB/T 7306.1 or GB/T 7306.2. The external non-sealing pipe thread of the product shall comply with the provisions of GB/T 7307.

8.3.2 The surface of the thread shall be smooth and there shall be no obvious defects such as dents and broken teeth.

8.4 Assembly

8.4.1 The assembled handle or handwheel shall be light, stable, free from jamming. The transfer switch shall be light, stable, free from jamming when lifted or pulled. The pull-up part and the lift-up bar of the transfer switch shall be firmly connected. The rotating outlet pipe of the faucet shall be rotated light and free from jamming.

8.4.2 The cold-water and hot-water inlet mark and temperature adjustment mark shall be clear; the mark is firmly combined with the faucet body. Blue or the letter "C" is cold-water, red or the letter "H" is hot-water. When the faucets are horizontally arranged, the cold-water mark is at right side and the hot-water mark is at left side. When the faucets are vertically arranged, the cold-water mark is below the hot-water mark. It may use other easily-identifiable means to

Table 6

Nominal size DN	Change of outlet water temperature / °C	
	Water supply temperature unchanged, pressure changed by 20%	Water supply pressure unchanged, hot-water temperature changes within 55 °C ~ 70 °C
15	$\leq \pm 2$	$\leq \pm 2.5$
20	$\leq \pm 3$	$\leq \pm 3.6$
32	$\leq \pm 3.9$	$\leq \pm 4.4$

8.7.5 Safety

8.7.5.1 Conditions

The inlet water temperature at cold-water end is 15 °C ~ 20 °C, the inlet water temperature at hot-water end is 65 °C ~ 70 °C, the water supply dynamic pressure is (0.3 ± 0.03) MPa, the mixed outlet water temperature is (40 ± 2) °C. It shall comply with the provisions of 8.7.5.2.

8.7.5.2 Safety requirements

8.7.5.2.1 After the cold-water is closed, the outlet water flow within 5 s shall be reduced to ≤ 1.9 L/min, meanwhile the outlet water temperature shall be ≤ 49 °C.

8.7.5.2.2 After the cold-water supply is restored, the deviation between the mixed water outlet temperature and the set temperature within 5 s shall not exceed ± 2 °C.

8.7.5.2.3 After the hot-water is closed, the outlet water flow within 5 s shall be reduced to ≤ 1.9 L/min.

8.7.5.2.4 After the hot-water supply is restored, the deviation between the mixed water outlet temperature and the set temperature within 5 s shall not exceed ± 2 °C.

8.7.6 Maximum outlet water temperature

Under the temperature conditions of use of medium in 5.2, the faucet shall be able to limit the maximum outlet water temperature to ≤ 49 °C.

8.7.7 Service life

After the service life reaches the requirements of Table 7, it shall comply with the requirements of Table 7. After the service life test, the temperature regulator and the flow regulator shall be free from jamming or loss of control.

The test medium is air. First place the faucet in an environment of $(70 \pm 2) ^\circ\text{C}$ for 30 minutes. Take it out. Maintain it at $(15^{+5, 0}) ^\circ\text{C}$ for 15 min. Then place it in an environment of $(-30^{+5, 0}) ^\circ\text{C}$ for 30 min. Take it out. Maintain it at $(15^{+5, 0}) ^\circ\text{C}$ for 15 min. The above process forms one cycle. After 5 consecutive cycles, check the plating surface.

10.2.2 Test of resistance to surface corrosion

The faucet is subjected to 24 h acetate salt spray test according to GB/T 10125-2012. The results are graded according to the standard GB/T 6461-2002.

10.3 Thread

The surface quality of the pipe thread is checked by visual inspection. Visual inspection shall be carried out under natural scattered light or white light without reflected light. The illuminance shall be no less than 300 lx. Pipe thread's accuracy is measured by a thread gauge of the corresponding accuracy.

10.4 Assembly

The faucet assembly is checked by hand touching. The hot-water and cold-water mark are visually inspected, during which the control device is faced.

10.5 Size

The size of the faucet is tested by a gauge of corresponding accuracy.

10.6 Precipitation of metal contaminants

The precipitation of metal contaminants from the faucet is as shown in Appendix B of GB 18145-2014.

10.7 Performance of use

10.7.1 Test of anti-hydraulic mechanical performance

10.7.1.1 Test of anti-hydraulic mechanical performance upstream of valve element

Install the faucet on the test equipment according to the state of use. Close the valve element. Introduce the pressure value (2.50 ± 0.05) MPa from the water inlet. Hold the pressure for (60 ± 5) s. Any parts upstream of the faucet shall be free from permanent deformation.

10.7.1.2 Test of anti-hydraulic mechanical performance downstream of valve element

Install the faucet on the test equipment according to the state of use. Open the valve element. For the faucet whose water outlet is equipped with flow regulator,

flows to the shower. Manually block the shower water outlet of faucet. Let the water outlet of bathtub be opened. Apply a static pressure of (0.40 ± 0.02) MPa at the water inlet of faucet for (60 ± 5) s. Gradually reduce the pressure to the static pressure of (0.05 ± 0.01) MPa. Hold pressure for (60 ± 5) s. Check whether the water outlet of the bathtub has leakage.

For the faucets for multiple shower water outlets, it shall respectively test each water outlet position.

10.7.2.1.3.2 Test of sealing performance of transfer switch for top sprinkler and hand-hold sprinkler

Install the faucet on the test equipment according to the state of use. Adjust the transfer switch to the position where the water flows to the shower. Adjust the top sprinkler and the hand-held sprinkler to the top sprinkler mode. Manually block the water outlet of the faucet which connects the top sprinkler. Let the water outlet which connects the hand-hold sprinkler be opened. Apply a static pressure of (0.40 ± 0.02) MPa to the water inlet of the faucet for (60 ± 5) s. Gradually reduce the pressure to the static pressure of (0.05 ± 0.01) MPa. Hold the pressure for (60 ± 5) s. Check whether the water outlet of the faucet which connects the hand-hold sprinkler has leakage. Then adjust the transfer switch to the hand-hold sprinkler mode. Manually block the water outlet of the faucet which connects the hand-hold sprinkler. Let the water outlet which connects the top sprinkler to be opened. Apply a static pressure of (0.40 ± 0.02) MPa to the water inlet of the faucet for (60 ± 5) s. Gradually reduce the pressure to the static pressure of (0.05 ± 0.01) MPa. Hold the pressure for (60 ± 5) s. Check whether the water outlet of the faucet which connects the top sprinkler has leakage.

10.7.2.1.4 Test of sealing performance of automatic reset transfer switch for bathtub and shower

Install the faucet on the test equipment according to the state of use. Install a liquid resistor which has a flowrate of 0.15 L/s (at the pressure of 0.1 MPa) at the water outlet position of the shower. Adjust the transfer switch to the position where the water flows to the bathtub. Let both the water outlets of bathtub and shower be opened. Apply a dynamic pressure of (0.40 ± 0.02) MPa to the water inlet of faucet for (60 ± 5) s. Check whether the water outlet of the shower has leakage.

Place the transfer switch to the position where the water flows to the shower. Let both the water outlets of bathtub and shower be opened. Apply a dynamic pressure of (0.40 ± 0.02) MPa to the water inlet of faucet for (60 ± 5) s. Check whether the bathtub has leakage. Gradually reduce the pressure to (0.05 ± 0.01) MPa. Hold this pressure for (60 ± 5) s. Check whether the position of the transfer switch is moving and whether the water outlet of the bathtub leaks.

The test method of service life is as shown in Appendix D. The test method of service life of the transfer switch is as shown in Appendix F of GB 18145-2014.

10.7.8 Test of resistance to installation load

The test method of the resistance to installation load of the faucet's connected pipe thread is as shown in 8.6.4 of GB 18145-2014.

10.7.9 Test of resistance to use load

10.7.9.1 The test method of flow regulator's torque is as shown in Appendix E.

10.7.9.2 The test method of temperature regulator's torque is as shown in Appendix F.

10.7.9.3 The normal use torque shall not exceed $1.7 \text{ N} \cdot \text{m}$ if measured by a torque wrench which has a 3% precision reading.

10.8 Single-handle three-control thermostatic faucet

10.8.1 Test of sealing performance

It is tested according to 10.7.2.

10.8.2 Flowrate test

It is tested according to 10.7.3.

10.8.3 Test of temperature stability of outlet water

It is tested according to 10.7.4.

11 Inspection rules

11.1 Classification of inspections

Product inspection is divided into exit-factory inspection and type inspection.

11.2 Exit-factory inspection

11.2.1 Items for exit-factory inspection include 8.1, 8.3, 8.4, 8.7.2.

11.2.2 The unqualified classification and acceptance quality limits of the exit-factory inspection items are as shown in Table 9.

$l_1 = (600 \pm 50)$ mm, $l_2 = (300 \pm 30)$ mm, R is the radius of the center line, which is ≥ 4 times the inner diameter of the water pipe;

P is a pressure gauge, T is a thermometer, Q is a flow meter.

Figure B.1

B.3 Test method

B.3.1 Test methods for T-type products

- a) According to the test conditions of B.2, the hot-water supply pressure is reduced by 20% of the initial test conditions [i.e. the hot-water supply pressure is reduced from (0.30 ± 0.03) MPa to (0.24 ± 0.02) MPa within 1 s], observe and record the temperature change for (25 ± 5) s at T3;
- b) Restore the test conditions of B.2, the hot-water supply pressure is increased by 20% of the initial test conditions [i.e. the hot-water supply pressure is increased from (0.30 ± 0.03) MPa to (0.36 ± 0.03) MPa within 1 s], observe and record the temperature change for (25 ± 5) s at T3;
- c) Restore the test conditions of B.2, the cold-water supply pressure is reduced by 20% of the initial test conditions [i.e. the cold-water supply pressure is reduced from (0.30 ± 0.03) MPa to (0.24 ± 0.02) MPa within 1 s], observe and record the temperature change for (25 ± 5) s at T3;
- d) Restore the test conditions of B.2, the cold-water supply pressure is increased by 20% of the initial test conditions [i.e. the cold-water supply pressure is increased from (0.30 ± 0.03) MPa to (0.36 ± 0.03) MPa within 1 s], observe and record the temperature change for (25 ± 5) s at T3;
- e) Restore the test conditions of B.2, increase the hot-water supply temperature by 13 °C at a temperature-rise rate of (3.0 ± 0.6) K/min, observe and record the temperature change for (25 ± 5) s at T3.

B.3.2 Test methods for TP-type products

First complete the T-type product test according to B.3.1, then complete the following test:

- a) Restore the test conditions of B.2, the hot-water supply pressure is reduced by 50% of the initial test conditions, observe and record the temperature change for (25 ± 5) s at T3;
- b) Restore the test conditions of B.2, the hot-water supply pressure is increased by 50% of the initial test conditions, observe and record the temperature change for (25 ± 5) s at T3;

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