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Antibacterial and cleaning function for household and similar electrical appliances — Particular requirements of air cleaner

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Foreword

All technical contents in this part are mandatory.

Series of standard GB 21551 "*Antibacterial and cleaning function for household and similar electrical appliances" consist of several parts*. Part 1 is general rule. And the other parts are the special requirements.

This part is Part 3 of GB 21551.

This part shall be read together with GB 21551.1-2008 "*Antibacterial and cleaning function for household and similar electrical appliances - General".*

Appendix A of this part is normative.

This part was proposed by China National Light Industry Council.

This Part shall be centralized by National Household Appliances Standardization Technical Committee (SAC/TC 46).

The drafting organizations of this part: China Household Electrical Appliances Research Institute, Environment and Health Related Product Safety Institute of China Disease Control and Prevention Center, and Beijing Yadu Science and Technology Corporation.

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This part is the first-time release.

Antibacterial and cleaning function for household and similar electrical appliances — Particular requirements of air cleaner

1 Scope

This part of GB 21551 specifies health requirements, inspection methods and marking of antibacterial, sterilization functional aspects for indoor air cleaner (hereinafter referred to as "air cleaner").

This part applies to household and similar use of the air cleaner with sterilizing function.

2 Normative reference document

The provisions in the following documents constitute provisions of this part, through reference in GB 21551. For dated reference documents, the subsequent amendments (excluding corrigendum) or revisions are not applicable to this part. However, all parties who have entered into agreement based on this part are encouraged to study the possibility of applying the latest editions. For the undated reference documents, the latest edition shall be applicable to this part.

GB/T 18801 Air cleaner

GB/T 18883-2002 Indoor air quality standard

GB 19258 Ultraviolet sterilizing lamp

GB 21551.1-2008 General requirement of antibacterial and cleaning function for household and similar electrical appliances

GB 21551.2-2010 Special requirements of antibacterial and cleaning function for household and similar electrical appliances

WS/T 206 Method for determination of inhalable particulate in air of public place — Light scattering method

Technical Standard for Disinfection (Ministry of Health 2002 Edition)

3 Terms and definitions

The following terms and definitions are applicable to this part.

3.1

Air cleaner

In a container, air cleaner is the device that uses of certain technologies or methods (such as filtration, adsorption, degradation) to significantly reduce the air particles, gaseous pollutants.

3.2

5 Inspection methods

5.1 Health and safety inspection

5.1.1 Air cleaner itself may produce harmful factors during testing. The test result value shall be the laboratory testing value MINUS the laboratory environment background concentration value.

5.1.2 Ozone concentration test at outlet of air cleaner shall adopt UV spectrophotometer method as specified in Appendix A of GB/T18883-2002.

5.1.3 Ultraviolet leakage strength of air cleaner shall use the test method as specified in GB19258.

5.1.4 The test of TVOC concentration at outlet of air cleaner shall adopt the thermal desorption/capillary gas chromatography method in Appendix C of GB/T18883-2002.

5.1.5 The test of PM10 particle concentration at outlet of air shall adopt the light scattering method as specified in WS/T 206.

5.2 Functional checkout

Sterilization performance's test method for air cleaner is shown in Appendix A.

6 Marking

6.1 Marking principle

6.1.1 Air cleaner's product marking shall comply with the requirements of Chapter 5 of GB21551.1-2008.

6.1.2 In the product instructions, air cleaner shall specifically indicate that the product possesses the functions, indicators, and cleaning materials replacement OR regeneration cycle and methods - as specified by this part.

6.2 The using of antibacterial (sterilization), air cleaning function marking

6.2.1 Air cleaner with use marking must meet the related health and safety requirements of 4.1;

6.2.2 The air cleaner complying with the requirements of 4.2.2 can use the word "antimicrobial (sterilization)" on the product packaging box and the product nameplate.

Appendix A

(Normative)

Antibacterial (sterilization) function evaluation of air cleaner

A.1 Scope

This Appendix specifies a method to evaluate air cleaner sterilization function.

A.2 Test principle

Within the specified time, respectively determine the bacteria-number's initial value and ending value in the contrast group and the test group. And in accordance with the following 2 formula, calculate the antibacterial and sterilization rate of bacteria and microorganisms in the air.

$$\text{Natural extinction rate (\%)} = \frac{\text{Initial bacteria-number in contrast group - ending bacteria-number in contrast group}}{\text{Initial bacteria-number in contrast group}} \times 100(\%)$$

$$\text{Antimicrobial (sterilization) rate (\%)} = \frac{\text{Initial bacteria-number in test group (1 - natural extinction rate) - ending bacteria-number in test group}}{\text{Initial bacteria-number in test group (1 - natural extinction rate)}} \times 100(\%)$$

A.3 Simulation field test

A.3.1 simulation test chamber

a) Ambient temperature of test chamber is 20°C~25°C; relative humidity is RH 50% ~70%

b) Structural requirements of test chamber: Use a pair of aerosol compartments adjacent to each other. The environment of both compartments (including temperature, humidity, cleanness, light, sealing and ventilation conditions, etc.) shall be consistent. And maintain them stable during the experiment. The design and structure of the test compartments shall ensure that the microbial aerosol is not compromised; the materials used shall be corrosion resistant, and easy to clean.

— Volume of the chamber: (3.5mX3.4mX2.5m=30m^3);

— Envelop enclosure (including wall, ceiling, floor): It shall use low pollution or non-pollution and low-adsorption materials (such as stainless steel, PTFE, tempered glass, etc.);

— The sealing filling materials: Use silicon rubber and glass sealant;

— Air stirring device: Fan;

A.3.3.3 Preparation of bacterial suspension

Staphylococcus albsp suspension is conducted according to *disinfection technology standard* (2002 Edition) 2.1.1.2.

A.3.3.4 Test group prototype installation

According to the installation instructions of the measured prototype, install the prototype at the far-end of the test compartment.

A.3.3.5 The installation of the blank-contrast group prototype

Install one product that is same-model and same-batch as the tested prototype. And remove all components which have antibacterial and sterilization functions; or set the functions of antibacterial and sterilization to be “not working” state.

A.3.4 Test procedures

A.3.4.1 Sterilization: The test vessel used in the test is sterilized.

A.3.4.2 The aerosol compartment’s air is cleaned and sterilized through high efficiency filter. The cleanliness is not less than grade-7 (grade-10000).

A.3.4.3 Adjust temperature and relative humidity of the aerosol compartment. Maintain stability for a period of time (so as to ensure that the entire experiment is relatively constant for temperature and relative humidity). Then seal the aerosol compartment. It must not be opened during the test.

A.3.4.4 Open the air supply device in the operating room. Blow in the circulating air which has been filtered by high efficiency filter, Maintain the air pressure in operating room at positive pressure (15Pa ~ 30Pa), so as to prevent microbial aerosol in test compartment from leakage.

A.3.4.5 Take the test bacterial suspension. Dilute to the desired concentration with nutrient broth. According to with the setting pressure, gas flow rate and spray time of the spraying bacteria device, spray bacteria. It is required to stir with air stirring equipment (such as fans) while spraying. After bacterial spraying is complete, it is required to stir for 10 min. Then stand for 15 min.

A.3.4.6 At the same time, respectively conduct bacterial concentration sampling to the experimental group and contrast group. Sampling time is 1 min ~ 5 min Sampling head shall be upward when sampling. The positive contrast bacteria-number in the air of aerosol chamber is required to be $5.0X10^4$ CFU/m^3 ~ $5.0X10^5$ CFU/m^3. Otherwise, the test is invalid.

A.3.4.7 Operate the tested prototype to the highest antibacterial conditions specified by the manufacturer (if the manufacturer has no relevant specifications, the highest air speed

$$K_t = \frac{V_1(1-N_t)-V_2}{V_1(1-N_t)} \times 100 \qquad \text{(A.3)}$$

Where:

K_t — Antibacterial (sterilization) rate of air-conditioner or air cleaner, in %;

V_1.V_2 — Respectively represent the bacteria content in the air of the test group before-after the test, in CFU/m^3;

N_t — The natural extinction rate of the bacteria in the contrast group, calculated as following formula (A.4):

$$N_t = \frac{V_0 - V_t}{V_0} \times 100 \qquad \text{(A.4)}$$

Where:

V_0.V_t — Respectively represent the bacteria content in the air of the test group before-after the test, in CFU/m^3.

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