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# GB/T 18801-2015

**Replacing GB/T 18801-2008**

# Air cleaner

空气净化器



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# Table of Contents

# Foreword

This Standard is drafted according to the rules provided in GB/T 1.1-2009.

This Standard replaces GB/T 18801-2008 “Air Cleaner”.

The main technical differences between this Standard and GB/T 18801-2008 are as follows:

— In Chapter 1 “Scope”, make new provisions for the application scope (including the operating principle of the air cleaner) of this Standard and the use scope of the references; list “small portable air cleaner, air cleaners for passenger vehicles, air duct cleaning device and other similar air cleaning products” in the scope that may be executed by reference to this Standard;

— Supplement the relevant references in Chapter 2 “Normative References”;

— Add the classification description for “target pollutants” in Chapter 3 “Terms and Definitions”; add “rated condition”, “standby condition”, “standby power”, “cumulate clean mass”, “effective room size” and other contents; supplement the explanation for “test chamber” (Annex A) and “cleaning life span”;

— Change “product classification” in the original Chapter 4 to “model and designation”; and make new provisions for the designation method;

— Delete the requirements to “appearance” in Chapter 5; add the requirements to “5.1 Release of harmful substances”, “5.2 Standby power”, "5.4 cumulate clean mass” and “5.7 Removal of microbes”; and adjust the indexes of “5.5 Cleaning energy efficiency” and “6 Noise”;

— Respectively put forward the specific requirements to the tests for the target pollutants of different natures in “5.3 Clean air delivery rate”;

— Add and detail the relevant contents of “6.1 General test conditions” in Chapter 6 “Test Methods”; specify the relevant contents of “6.2 Test equipment” in detail; put forward the requirements for the standard pollutants for testing (see 6.3);

— Add the test methods for the release of harmful substances (see 6.4), the standby power (see 6.5), the cumulate clean mass (see 6.7, Annex D and Annex E), the noise (see 6.9) and the removal of microbes (see 6.10);

— Add the contents of “6.11 Cleaning performance test of air duct cleaning device” and Annex H;

— Respectively list the test method for the clean air delivery rate of different target pollutants into Annex B (Particulates) and Annex C (Gaseous Pollutants); and revise the test methods for the gaseous pollutants (Annex C);

— Supplement the contents of “7.2 Factory inspection” and “7.3 Type test” in Chapter

7 “Inspection Rules”;

— Divide “8.1 Marks” into two parts in Chapter 8, namely, “general marks” and “performance characteristic marks”; and put forward the more specific requirements for the contents involved in the instructions for use for the air cleaner;

— Add the contents of “Annex F Calculation method for effective room size”;

— Add the contents of “Annex G Conversion methods for cumulate clean mass and cleaning life span”.

Please note that some contents of this document may involve patents. The issuing organization of this document does not undertake the responsibility of identifying these patents.

This Standard was proposed by China National Light Industry Council.

This Standard shall be under the jurisdiction of National Technical Committee of Household Electrical Appliances Standardization (SAC/TC 46).

Drafting organizations of this Standard: China Household Electric Appliance Research Institute, Tsinghua University, China Disease Control and Prevention Center, Beijing Yadu Environmental Protection Technology Co., Ltd., Shanghai Institute of Measurement and Testing Technology, Guangzhou Testing Center of Industrial Microbiology, Suzhou Beiang Technology Co., Ltd., Apollo Environmental Protection Equipment Co., Ltd. located in Shunde District, Foshan City, Philips (China) Investment Co., Ltd., Dongguan Uniclear New-Material Co., Ltd., Guangdong Midea Refrigeration Equipment Co., Ltd., Daikin Air Conditioning (Shanghai) Co., Ltd., Broad Air Conditioning Technology Co., Ltd., Lexy Electrical Co., Ltd., Qingdao Haier Air Conditioner Co., Ltd., Panasonic Ecology Systems Guangdong Co., Ltd., Shanghai Sengie Air Cleaning Equipment Co., Ltd., Zhuhai Gree Electric Appliances Co., Ltd., Zhejiang Shaoxing Supor Living Electric Appliances Co., Ltd., Foshan Jinxinghui Electric Appliances Co., Ltd., Zhongshan Weixin Environmental Technology Co., Ltd., Shanghai Povos Electrical Engineering Co., Ltd., Amway (China) Daily Necessities Co., Ltd., Zhejiang Yitianneng Environmental Technology Co., Ltd., Shandong Xuesheng Technology Co., Ltd., Xiameng MAXMAC Air Cleaning Co., Ltd. AND Shenzhen Huiqing Technology Co., Ltd..

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The historical versions replaced by this Standard are as follows:

— GB/T 18801-2002, GB/T 18801-2008.

# Air Cleaner

## 1 Scope

This Standard specifies air cleaner's terms and definitions, model and naming method, requirements, test methods, inspection rues, marks, instructions for use, package, transportation and storage.

This Standard is applicable to the household and similar air cleaners (hereinafter referred to as "cleaner").

This Standard is applicable to but not limited to the cleaners with the following operating principles: filter, absorption, complex, chemical catalytic, photocatalytic, electrostatic, plasma, composite, etc.

Note 1: Composite cleaner refers to the cleaners that adopt two or more cleaning principles and are capable of removing one or more air pollutants.

Note 2: For household electric appliances - such as air conditioners, dehumidifiers, fresh air units - that have function of air cleaning, the evaluation of the air cleaning function may reference to the relevant content in this Standard.

The following products may be implemented by reference to this Standard:

— Small portable cleaners, air cleaners for passenger vehicles;

— Air duct cleaning devices and other similar cleaners.

This Standard is not applicable to:

— Air cleaners that are specially designed for industrial purposes;

— Air cleaners that are used in the special environments with corrosive and explosive gases;

— Air cleaners that are specially designed for medial purposes.

## 2 Normative References

The following documents are indispensable for application of this document. For the dated documents so quoted, only the dated versions apply to this document. For the undated documents so quoted, the latest versions (including all modification sheets) apply to this document.

GB/T191 Packaging - Pictorial marking for handling of goods

### 5.1 Release of harmful substances

The release of harmful substances for the cleaner shall meet the requirements specified in Chapter 4 of GB 21551.3-2010 and Chapter 32 of GB 4706.45-2008.

### 5.2 Standby power

The measured value of the standby power for the cleaner shall not be higher than 2.0 W.

The standby power of the cleaner shall be tested according to the test method specified in 6.5.

### 5.3 Clean air delivery rate

The cleaner's measured value of the clean air delivery rate for the particulates and the gaseous pollutants shall not be lower than 90% of the nominal value.

The clean air delivery rate for the particulate pollutants and the gaseous pollutants shall be tested according to the test method specified in 6.6.

### 5.4 Cumulate clean mass

The cleaner's measured value of the cumulate clean mass for the specific target pollutants shall be within the interval marked on the cleaner.

The cumulate clean mass for the particulates and the gaseous pollutants shall be tested according to the test method specified in 6.7.

Note: See Annex D for the grade of the cumulate clean mass for removing the particulates, and see Annex E for the grade of the cumulate clean mass for removing the formaldehyde.

### 5.5 Cleaning energy efficiency

#### 5.5.1 Basic requirements

The experimental value for the cleaning energy efficiency of the cleaner for the particulates and the gaseous pollutants shall not be lower than 90% of the nominal value.

The cleaning energy efficiencies for the particulates and the gaseous pollutants shall be respectively tested according to the method specified in 6.8.

#### 5.5.2 Grading

The cleaning energy efficiency values of the cleaner for different target pollutants are at qualified grade in Table 1 and Table 2.

The grading of cleaning energy efficiency of the cleaner for the particulates is shown in Table 1.

(25±2)°C, the relative humidity is (50±10)%, without external airflow, strong sunshine and other radiation effect;

b) The test power supply is a single-phase AC sine-wave power supply, and the fluctuation range of voltage and frequency shall not exceed ±1% of the rated value;

c) The tested prototype shall be tested in the rated condition according to the method specified in the instructions for use.

**6.2 Test equipment**

Before test, inspect the pollutant generating, measuring and recording instruments, which shall be in the normal service condition. The performance, uncertainty and range of the test instruments shall meet the following measurement requirements:

a) Except the instruments specifically specified, the precision of the electrical measuring instruments for the type test shall not be lower than grade-0.5; the precision of the electrical measuring instruments for the delivery test shall not be lower than grade-1.0;

b) Thermometer: The uncertainty shall be within ±0.5°C;

c) Hygrometer: The uncertainty shall be within ±5%;

d) Timing instrument: The uncertainty shall be within ±0.5%;

e) The particle size range of the laser particle counter shall include 0.3 μm ~ 10 μm, and the instrument range shall be $10^6$/L (if the range is not able to meet, the suitable diluter shall be configured or the similar measured instrument shall be used);

f) Particulate mass concentration tester: The uncertainty shall be within ±0.001 mg/$m^3$;

g) Gaseous pollutant mass concentration tester: The uncertainty shall be within ±0.01 mg/$m^3$;

The online direct-reading gaseous pollutant mass concentration tester shall be regularly calibrated according to its measurement range. Compared with the data measured by the chemical method or the chromatography, the deviation shall be within ±10%;

h) Spectrophotometer: The uncertainty shall be within ±0.005.

**6.3 Standard pollutants**

The test standard pollutants shall meet the following requirements:

a) Particulate: The tar content of the cigarette smoke (such as HongTaShan classic 150) is 8 mg;

— Clean air delivery rate ($CADR_{target\ pollutant}$);

— Cumulate clean mass of particulate ($CCM_{particulate}$);

— Cumulate clean mass of gaseous pollutant ($CCM_{gaseous\ pollutant}$) (optional);

— Cleaning energy efficiency;

— Noise;

— Effective room size (optional).

Note 1: The corresponding target pollutants shall be indicated for the clean air delivery rate, the cumulate clean mass and the cleaning energy efficiency.

Note 2: For the marking of $CCM_{particulate}$, it is necessary to indicate that $CCM_{particulate}$ is measured with the specific smoke dust particulate as the target pollutant in the laboratory condition, and $CCM_{particulate}$ shall be marked according to the evaluation grade specified in Annex D.

Note 3: For the marking of $CCM_{gaseous\ pollutant}$, it is necessary to indicate that $CCM_{gaseous\ pollutant}$ is measured with the single gaseous pollutant as the target pollutant in the laboratory condition, and $CCM_{gaseous\ pollutant}$ shall be marked according to the evaluation grade specified in Annex E.

### 8.2 Instructions for use

The instructions for use of the cleaner shall conform to the requirements of GB 5296.2-2008, and shall at least include:

a) Name and model of cleaner;

b) Overview (characteristics and main performance indexes) of cleaner;

c) Installation and operating requirements and maintenance precautions;

d) Accessory name of cleaner;

e) List of common faults and handling methods and after-sales services;

f) Name and address of manufacturer;

g) The following precautions and contents shall be described on the cleaner or in the instructions for use of the cleaner:

— Safety precautions;

— Specific cleaning principle;

— Precautions for placing location;

— Precautions for use;

— Precautions for filter net replacement and cleaning;

— Other precautions.

Note 1: “Precautions for use” includes the negative effects which may be generated in the use process of the cleaner, etc.

Note 2: “Precautions for filter net replacement and cleaning” refers to the marking that – aiming to different target pollutants, the test results are obtained through the tests specified in Annex D and Annex E, the calculation of corresponding cleaning life span is compared with the reference example (see Annex G) when the filter medium is required to be replaced or cleaned. The cleaning life span is expressed by day.

### 8.3 Packaging

The packaging of cleaner shall conform to the relevant specifications in GB/T 191 and GB/T 1019.

The cleaner shall be accompanied with the certificate, (the packing list) and the instructions for use for the product.

### 8.4 Transportation and storage

The cleaner shall not be impacted, squeezed, thrown, violently vibrated, exposed in the rain, affected with damp and insolated in the transportation.

The cleaner shall be stored in the dry and ventilated warehouse without corrosive and explosive gases, and shall not be knocked.

# Annex A

## (Informative)
## Test Chamber

### A.1 Overview

This Annex specifies the structure, facility fabrication and configuration requirements of the standard test chamber for the performance test of the cleaner.

### A.2 Structure of test chamber

See Table A.1 for the structure parameters of the test chamber.

**Table A.1**

| Item | Structure Parameters | |
|---|---|---|
| Volume of test chamber | 30 $m^3$ | 3 $m^3$ |
| Inner dimensions of test chamber | 3.5 mX3.4 mX2.5 m, permissible deviation of ±0.5 $m^3$ | 1.4 mX1.4 mX1.5 m, permissible deviation of ±0.1 $m^3$ |
| Frame | Aluminum profile or stainless steel | |
| Wall | Floating flat glass with thickness more than 5mm or stainless steel with thickness more than 0.8mm | |
| Floor | Stainless steel plate with thickness more than 0.8mm | |
| Top plate | Stainless steel plate or similar metal clad plate | |
| Sealing material | Silicon rubber strip and glass sealant | |
| Stirring fan | Diameter: about 1.0~1.5 m, 3-blades | Diameter: about 0.5~1.0 m, 3-blades |
| Circulating fan | 500~700 $m^3/h$, installation position: 1.5 m from ground, 0.4 m from back-wall | None |
| Air tightness | The ventilation rate is not more than 0.05 $h^{-1}$ | |
| Mixing degree | More than 80% | |

Note 1: The air tightness test method, which is the same as the natural decay test for the gaseous pollutant in Annex C, is that carbon dioxide ($co_2$) is used as the tracer gas, and the initial concentration is 2~4 $g/m^3$ to calculate the decay constant, namely, the ventilation rate.

Note 2: test method of mixing degree:

— take carbon dioxide ($co_2$) as the tracer gas, and close the door of the test chamber;

— The test chamber shall be provided with the up-return down-supply (or up-supply down-return) delivery duct and exhaust duct, the air supply rate in the delivery duct is 15 $m^3/h$, and the air output of the exhaust duct is also 15 $m^3/h$;

3 — Air filter (for cleaning the inlet air);

4 — Air supply valve;

5 — Exhaust valve;

6 — Air filter (for cleaning the exhaust air);

7 — Pollutant detection device;

8 — Pollutant generation device;

9 — Sampling outlet and sample sending opening;

10 — Air-tight door;

11 — Air supply of air conditioner (air supply in air exhaust);

12 — Air return of air conditioner (air exhaust).

Note: The insulation design shall be adopted for the exterior of $3m^3$ test chamber. The outer chamber or the insulating layer may be designed.

**Figure A.2 Schematic Diagram for $3m^3$ Test Chamber**

## A.4 Placement of test prototype

### A.4.1 $30m^3$ test chamber

Central position: ground type (on the ground), desktop type (on 700mm tabletop), wall mounted type (1800 mm from lower edge to ground), ceiling type (on 700mm tabletop).

If not specified, the placement type is classified according to the height of the air outlet: place the test prototype on the tabletop if the height of the air outlet is less than 700 mm; place the test prototype on the ground if the height of the air outlet is more than or equal to 700 mm.

Note: If the cleaning function is the auxiliary function, for air conditioner, the dehumidifier, the fresh air unit etc., it shall be tested in complete-product level, however, the relevant components with the cleaning properties are only required to be started, and other components are not required to be started.

### A.4.2 $3m^3$ test chamber

Place the test prototype on the 400mm high tabletop if the height of the air outlet is less than 400 mm; place the test prototype on the ground if the height of the air outlet is more than or equal to 400 mm.

## A.5 Recommended cleaning methods of test chamber and equipment

Daily or frequently clean the optical instruments as required.

Daily clean all horizontal surfaces.

Mop the floor with the wet mop after use for 5 days.

5 — Cigarette;

6 — Cigarette holder;

7 — Air import tube;

8 — Smoke import tube;

9 — Air flow meter.

Note: The supplied air of the cigarette lighter shall be directly imported from the test chamber, so as to prevent the continuous air supply to the test chamber to cause excessive pressure difference.

**Figure B.1 Positive Pressure Cigarette Smoke Generation Diagram**

### B.3 Trial operation

Perform the trial operation after opening the package, and test after ensuring that all functions of the cleaner are normal and steady.

### B.4 Natural decay test of particulates

The natural decay test of the particulate shall be performed according to the following steps:

a) Place the cleaner-under-test into the test chamber as indicated in Annex A (see Annex A.4 for the placement method). Adjust the cleaner to the rated test condition, check for normal operation, and then switch off the cleaner;

b) Arrange the sampling points to keep away from the air inlet and outlet, keep the distance from the wall more than 0.5 m, and keep the height relative to the ground of the test chamber to be 0.5-1.5 m. 1 sampling head is arranged at each sampling point and is connected with the sampler outside the test chamber;

c) Determine the test record document;

d) Start the high efficiency air filter and clean the air in the test chamber, so as to ensure that the particle background concentration of the particulate with the diameter more than 0.3μm is lower than 1000/L. At the same time, start the temperature and humidity control device to ensure that the indoor temperature and the relative humidity reach the specified state;

e) After the particulate background concentration is reduced to the suitable level, record the particulate background concentration, switch off the high efficiency air filter and the humidity control device, and start the stirring fan and the circulating fan. Place the standard cigarette into the cigarette burner, and connect the cigarette smoke outlet with a tube passing through the wall of the test chamber. The exhausted smoke may be caught into the air eddy formed by the agitation of the stirring fan. After reaching certain volume, close the valve of the smoke delivery pipe. The stirring fan agitates for 10 minutes again to cause the particulate pollutants to be evenly mixed. Then switch off the stirring fan. The circulating fan is always switched on in the test.

10 minutes again to cause the gaseous pollutants to be evenly mixed. Then switch off the stirring fan.

The circulating fan is always switched on in the test.

d) After the stirring fan stops rotating, determine the initial concentration $c_0$ of the gaseous pollutants (The corresponding time t = 0 min in the calculation).

The initial concentration is (10±2) times the concentration limit specified in GB/T 18883. For example, the initial concentration of formaldehyde is (1.00±0.20) mg/m$^3$, and the initial concentration of methylbenzene is (2.00±0.40) mg/m$^3$.

e) After the initial sampling in the test chamber is completed, start the test. In the test, sample every 5 minutes. The starting time for second sampling t = 0 min, and the total sampling time is 60 minutes.

Note 1: When the formaldehyde concentration is measured by the chemical absorption method, the recommended sampling speed is 0.5 L/min.

Note 2: When the methylbenzene concentration is measured by the gas chromatographic method, the recommended sampling speed is 0.2 L/min.

f) Record the temperature and the relative humidity in the test chamber in the test.

**C.5 Total decay test of gaseous pollutants**

Perform the total decay test of the gaseous pollutants according to the following steps:

a) Test according to the specifications in C.4a) to C.4d);

b) After the determination of initial concentration (the first sampling point for total decay) in the test chamber, turn on the cleaner-under-test to the rated condition, the turn-on time t = 0 min, and sample for determination. Sample once for every 5 minutes. The longest test time is 60 minutes. After the initial concentration is steady, the test chamber shall be fully enclosed for determination;

Note 1: If the concentration is lower than the limit of sampling point and data specified in the standard GB/T 18883, it is deemed as invalid.

Note 2: If the number of data points is less than 6, the multi-hole crossing sampling method may be used to ensure that there are enough data points used for calculation. See Table C.1.

# Annex D

**(Normative)**

**Test Method for Cumulate Clean Mass of Particulates**

## D.1 Scope

This Annex specifies the test method for evaluating the cumulate clean mass (CCM) of the cleaner for the particulates.

This Annex specifies that the cumulate clean mass (CCM) for the particulates shall be evaluated by the accelerated test method. The accelerated test is performed in 3m$^3$ test chamber.

This Annex is only applicable to the test for the cumulate clean mass of the cleaner for which the clean air delivery rate (CADR) for the particulates is not less than 60 m$^3$/h.

## D.2 Generation conditions of particulates

See Annex B for the generation conditions and mode of the particulates.

## D.3 Test steps

Perform the cumulate clean mass for the particulates according to the following steps:

a) Test the clean air delivery rate of the particulate for the cleaner, and determine its initial value;

b) Light up and introduce a single cigarette in 3m$^3$ test chamber, turn on the stirring fan for 0 minutes, then turn off the stirring fan for standing for 10 minutes, measure and record the effective generation volume of the particulates from the single cigarette;

Note: If the cigarette lighting device is capable of containing multiple cigarettes, the total effective generation volume of the particulates from the cigarettes shall be measured.

c) Place the cleaner into 3m$^3$ test chamber, turn on the cleaner and adjust it to the rated condition, turn on the stirring fan, and close the door of the test chamber;

d) Continuously light up and introduce 50 cigarettes into 3m$^3$ test chamber, turn off the cleaner after the particulate concentration to be monitored is reduced to below 0.035 mg/m$^3$, make the cleaner to stand for at least 30 minutes, and take out the cleaner;

e) Repeat the steps a) ~ d) to respectively obtain the measured values of the cigarette clean air delivery rate for 50 cigarettes, 100 cigarettes, 150 cigarettes, 200 cigarettes, 250 cigarettes... When the measured clean air delivery rate is less than or equal to 50% of the initial value, the test is ended.

# Annex E

**(Informative)**

**Test Method for Cumulate Clean Mass of Gaseous Pollutant**

## E.1 Scope

This Annex specifies the test method for evaluating the cumulate clean mass (CCM) of the cleaner for the specific gaseous pollutant (formaldehyde).

This Annex specifies that the cumulate clean mass (CCM) for the formaldehyde shall be evaluated by the accelerated test method. The accelerated test is performed in $3m^3$ test chamber.

This Annex is only applicable to the test for the cumulate clean mass of the cleaner for which the clean air delivery rate (CADR) for the formaldehyde is not less than 40 $m^3/h$.

Note: The cumulate clean mass for other gaseous pollutant may be evaluated by reference to this Annex.

## E.2 Formaldehyde generation conditions

The continuous injection method or the single progressive injection method may be adopted.

For the continuous injection method, the input mass flow rate shall be controlled at 20 mg/h.

The single progressive injection method shall ensure that the peak concentration in each injection shall not exceed 100 times the concentration as specified in GB/T 18883.

Note: It is necessary to confirm the effective generation volumes by different formaldehyde generation methods prior to the test.

## E.3 Test steps

Perform the test for the cumulate clean mass of the formaldehyde according to the following steps:

a) Make the test evaluation and records for the initial value of the formaldehyde clean air delivery rate for the cleaner in accordance with the specifications in Annex C;

b) Then place the cleaner into $3m^3$ test chamber, turn on the cleaner and adjust it to the rated condition, turn on the stirring fan, and close the door of the test chamber;

c) The single progressive injection method or the continuous injection method may be used according to the formaldehyde generation conditions of E.2 to load the formaldehyde gas into $3m^3$ test chamber. When the formaldehyde is injected by the

# Annex G

## (Informative)

## Conversion Method for Cumulate Clean Mass and Cleaning Life Span

### G.1 Overview

This Annex specifies an approximation method for converting the cumulate clean mass into the cleaning life span when the cleaner removes the particulates and the formaldehyde.

The cleaning life span in this Annex is obtained by the approximation algorithm on the basis of the cumulative accelerated test for the specific smoke particulates and single gaseous pollutant (formaldehyde) removed by the cleaner. It is only used for reference in the actual use.

### G.2 Conversion of cumulate clean mass and cleaning life span for particulates

#### G.2.1 Conversion basis

For the particulate pollutants, the indoor pollution source is ignored. The mass conservation equation (F.1) can be expressed by the Formula (G.1):

$$\frac{dc}{dt} = k_v P_p c_{out} - (k_0 + k_v)c - \frac{Q}{S \times h} \times c \quad \cdots\cdots (G.1)$$

The mass of particulates treated by the cleaner, when working for t hours at the steady state, can be obtained according to the Formula (G.1):

$$m_{AC} = [k_v P_p c_{out} - (k_0 + k_v)c_t] S \times h \times t \quad \cdots\cdots (G.2)$$

Wherein, $c_t$ is the mass concentration of indoor air particulate pollutant at the steady state and shall meet $c_t \leq 35 \mu g/m^3$. When the cleaner is used and the room area S is determined, firstly select the cleaner with the suitable clean air delivery rate according to the Formula (G.3):

$$Q \geqslant \frac{[P_p k_v c_{out} - 35(k_0 + k_v)]h \times S}{35} \quad \cdots\cdots (G.3)$$

At the same time, obtain the particulate mass at least treated by the cleaner when working for t hours, in order to maintain the indoor particulate concentration level below $35 \mu g/m^3$:

$$m_{AC} \geqslant [k_v P_p c_{out} - 35(k_0 + k_v)] S \times h \times t \quad \cdots\cdots (G.4)$$

#### G.2.2 Value, calculation and example

#### G.2.2.1 Value

Parameter value in the Formula (G.4):

— The ventilation rate of building is 0.6 $h^{-1}$;

— The natural settling rate $k_0$ of the particulate pollutant is 0.2 $h^{-1}$;

— The particulate penetrating coefficient of the building is 0.8;

— The operating time t of the cleaner is12 h;

— The ceiling height h is 2.4m;

— The outdoor particulate concentration approximates the mass concentration of the outdoor particulates.

#### G.2.2.2 Calculation

The average daily treatment capacity of the pollutants with different loading concentrations in different usable areas can be calculated by the selection of the above parameters according to the Formula (G.4).

#### G.2.2.3 Example

When the ventilation rate of the room is 0.6 $h^{-1}$, the mass of indoor pollutants is maintained at 35 μg/$m^3$. After 12 hours, the minimum mass of particulates treated by the cleaner is shown in Table G.1.

$C_0$ — Steady concentration of formaldehyde when the cleaner is not in operation and the indoor door and windows are closed, in mg/m$^3$. The mass concentration of the indoor gaseous pollutants in the steady state when the air cleaner is in operation can be obtained according to the Formulas (G.5) and (G.6):

$$c_t = \frac{k_v c_0}{k_v + Q/(S \times h)} \qquad \text{(G.7)}$$

The maximum formaldehyde content of the indoor air shall be lower than the limit specified in GB/T 18883. For the formaldehyde, $c_t \leq 0.10$ mg/m$^3$.

Accordingly, the cleaner with the suitable clean air delivery rate shall be selected according to the Formula (G.8) when the cleaner is used and the room area S is determined.

$$Q \geqslant (10c_0 - 1)k_v \times h \times S \qquad \text{(G.8)}$$

At the same time, the minimum mass of formaldehyde treated by the cleaner, in order to maintain the concentration of the indoor gaseous pollutant (formaldehyde) below 0.1 mg/m$^3$ when working for t hours, can be obtained according to the Formulas (G.5) and (G.6):

$$m_{AC} \geqslant k_v (c_0 - 0.1)\, S \times h \times t \qquad \text{(G.9)}$$

**G.3.2 Value, calculation and example**

**G.3.2.1 Value**

Parameter values in the Formula (G.9):

— The ventilation rate k of the building is 0.6 h$^{-1}$;

— The background concentration $c_0$ of the indoor formaldehyde pollutant shall be measured according to the specifications in GB/T 18883;

— The steady-state concentration $c_t$ of the indoor formaldehyde after the use of cleaner shall meet the requirement of GB/T 18883, being 0.10 mg/m$^3$;

— The ceiling height A is 2.4 m.

**G.3.2.2 Calculation**

The average daily treatment capacity of the pollutants with different loading concentrations in different usable areas can be calculated by the selection of the above parameters according to the Formula (G.9).

**G.3.2.3 Example**

After the cleaner maintains the indoor formaldehyde at 0.10 mg/m$^3$ for 12 hours, the

# Annex H

**(Informative)**

**Test Method for Cleaning Capacity of Air Duct Cleaning Device**

## H.1 Scope

This Annex specifies the testing device, the test method and the test result handling method for evaluating the cleaning effect of the air duct cleaning device.

This Annex is applicable to the modular air cleaner installed in the ventilating duct of the air conditioner.

The target pollutants are particulates, gaseous pollutants and microbes.

Refer to GB/T 2624.1 and GB/T 1236 for the testing device. See Figure H.1 and Figure H.2 for the system diagram of the testing device and the structure diagram of the main components.

The testing device mainly includes 3 parts - air duct system, the pollution source generation device, and the determination device; the structure of the testing device is allowed to be different, but the test conditions shall be consistent with that of this Standard.

## H.2 Terms and definitions

### H.2.1 One-time purification efficiency

Ratio of difference between pollutant concentrations at the upwind and downwind sides to concentration at the upwind side.

Note: The one-time purification efficiency is expressed in %.

## H.3 Test equipment

### H.3.1 General requirements of device

The testing device mainly includes the air duct system, the pollution source generation device and the instrument. The pipe section can be bent or folded, but the straight pipe section at least 3 times the pipe diameters shall be reserved in front of and at the back of the corner to ensure the airflow stability. The structure of the testing device is allowed to be different, but the test conditions shall be consistent with that of this Standard. The test result of the same cleaner-under-test shall be consistent with that of the testing device in this Standard.

See Figure H.1 to Figure H.4 for the system diagram of the testing device and the structure diagram of the main components.

b) When the counting efficiency is determined, the mounting holes of the sampling pipe shall be arranged below the pipe sections 1 and 6 in Figure H.1;

c) The structures of the static pressure ring and the flow straightening grid (12 in Figure H.1) for determining the resistance of the cleaner shall conform to the requirements of GB/T 1236. The air flow shall be ensured to pass through the cleaner-under-test not to cause the air flow short circuit, for example, use the reducer pipe or the closing plate.

**H.3.2.2 Introduction of air for testing**

The introduction of air for testing shall meet the following requirements:

a) The air for testing shall be clean, and the background concentration of the pollutants in air duct shall not exceed 5% of the standard concentration;

b) The air duct shall be provided with the protecting net and the static pressure chamber at the suction inlet. The dimensions of the static pressure chamber shall not be less than 2mX2mX2m, but its volume shall not be larger than 10 $m^3$;

c) The two-stage air filter shall be installed at the inlet of the static pressure chamber to ensure that the air entering the air duct is clean;

d) When the outdoor air temperature is lower than 5 °C or the relative humidity is higher than 75%, the heating mode can be used to increase the temperature or reduce the relative humidity to ensure that the temperature range is 5 °C ~ 35 °C and the relative humidity is 0~75%.

**H.3.2.3 Exhaust**

The exhausted air in the air duct system is exhausted to the outdoor after being treated, or exhausted into the rooms except the suction inlet of the air duct system.

**H.3.2.4 Shock insulation**

The air duct system shall be insulated from the fan or other shock sources in the test room.

**H.3.3 Pollution source generator**

The pollution source generator shall conform to the following specifications:

a) The pollutant generation source for testing shall be capable of steadily generating the pollutants.

b) It is necessary to ensure that the concentration of generated pollutants is about 5 times the standard concentration, and the fluctuation is not more than ±0.1 time the standard concentration.

Different types of pollution source generation device shall meet the following

selection of the sampling pipe orifice, the approximate isokinetic flow condition shall be considered, namely, the suction speed of the sampling pipe orifice shall be approximate to the air speed in the air duct, and the maximum deviation shall be less than ±10%. When the air speed in the air duct is approximate to the speed of the sampling pipe orifice, the sampling pipe shall the type in Figure H.4a); when the air speed in the air duct is lower than the speed of the sampling pipe orifice, the sampling pipe shall adopt the type in Figure H.4b); when the air speed in the air duct is higher than the speed of the sampling pipe orifice, the sampling pipe shall adopt the type in Figure H.4c).

b) Connecting hoses

The connecting hose for connecting the sampling pipe with the air sampler shall be a clean joint-less hose. The connecting hose shall be as short as possible, its length is not be more than 1.5 m, and the length of the horizontal section is generally not more than 0.5 m;

c) Air samplers

The chemical pollutants are generally sampled with the constant flow air sampler which has the sampling range of 0.1 ~ 10 L/min and is continuously adjustable. The biological pollutants are generally sampled with the impact type air microbe sampler (with the capture rate higher than 95%) which has the sampling flow of 28.3 L/min and the adjustable accuracy lower than 5%.

**H.4 Test conditions**

The relative humidity of the air for testing is lower than or equal to 75%, and the air temperature (of the heating humidity control system, AHU) is higher than or equal to 5°C. After treatment, the test conditions shall conform to the specifications in H.3.2.2.

The concentration of chemical pollutants for testing shall conform to the specifications in H.3.3.

**H.5 Test method**

**H.5.1 Determination of air flow and resistance relation**

**H.5.1.1 Determination of air flow**

The air flow is generally determined by using the throttling device and the conventional method (see H.3.4), and the dimensions of the air duct shall conform to the specifications in Figure H.2.

**H.5.1.2 Determination of resistance**

Connect the static pressure rings on the pipe sections 1 and 3 in Figure H.1 to the micro-pressure gauge for determination. The resistances of the unused cleaner-under-test shall be determined at least at the rated air flows of 50%, 75%, 100% and 125% to obtain the

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