



# CONSUMER FILTRATION

FILTRATION SCIENCE LABORATORY  
ACHIEVE PRODUCT INNOVATION , ENHANCE COMMERCIAL VALUE

FREUDENBERG FILTRATION TECHNOLOGIES

 **FREUDENBERG**  
INNOVATING TOGETHER

## EXPERIENCED A CENTURY OF INNOVATION

## CREATE PROFESSIONAL TESTING SERVICES

### TESTS EMPOWER INNOVATION

As a global technology group, FFT achieved business success by innovation driven. Starting from the tannery in the Müllheimer Valley in Germany in 1880, FFT has never stopped exploring changes in more than 170-year development.

FFT more than 60-year development in the filtration industry has been accompanied by continuous accumulation of filtration testing.

Since the birth of the first non-woven fabric material in 1936, and it was initiated to apply to air filtration in 1957; then the first activated carbon filter emerged in 1985, it has been a one-stop filtration solution meeting various filtration needs. "Testing" has been playing an important role, during FFT's innovation-driven development.

Thus FFT test center became solid backup for FFT filtration technology development.



## OUR SPIRIT

# FACTS, FIGURES, EFFICIENT

Assisting our customers growing for an outstanding future by facts, figures, efficient.

FFT test center provides all customers with excellent service , accurate testing data and conclusions, and continuous innovation of R&D via professional instruments and equipment, standardized tests and fair-minded attitude.

## BASED ON TECHNOLOGY ACCUMULATION, FOCUSING ON FUTURE DEVELOPMENT

### N-DEPTH TESTING SERVICES

Driven by “ Test empower innovation”, FFT test center is committed to providing customers and partners with a full range of testing, analysis and consulting in the field of air and water filtration. Raw material selection, core formulations verification and optimization of key process parameters in test of core development, help product innovation!

### AUTHORITATIVE TESTING QUALIFICATION

In 2017, FFT test center was the first enterprise in the field of consumer filter passed the CNAS certification.

Relying on professional instruments and equipment, rigorous test and experienced team. FFT test center can fulfill various products, and follow different testing standards of China, USA, Japan, Korea, EU and other countries(regions).

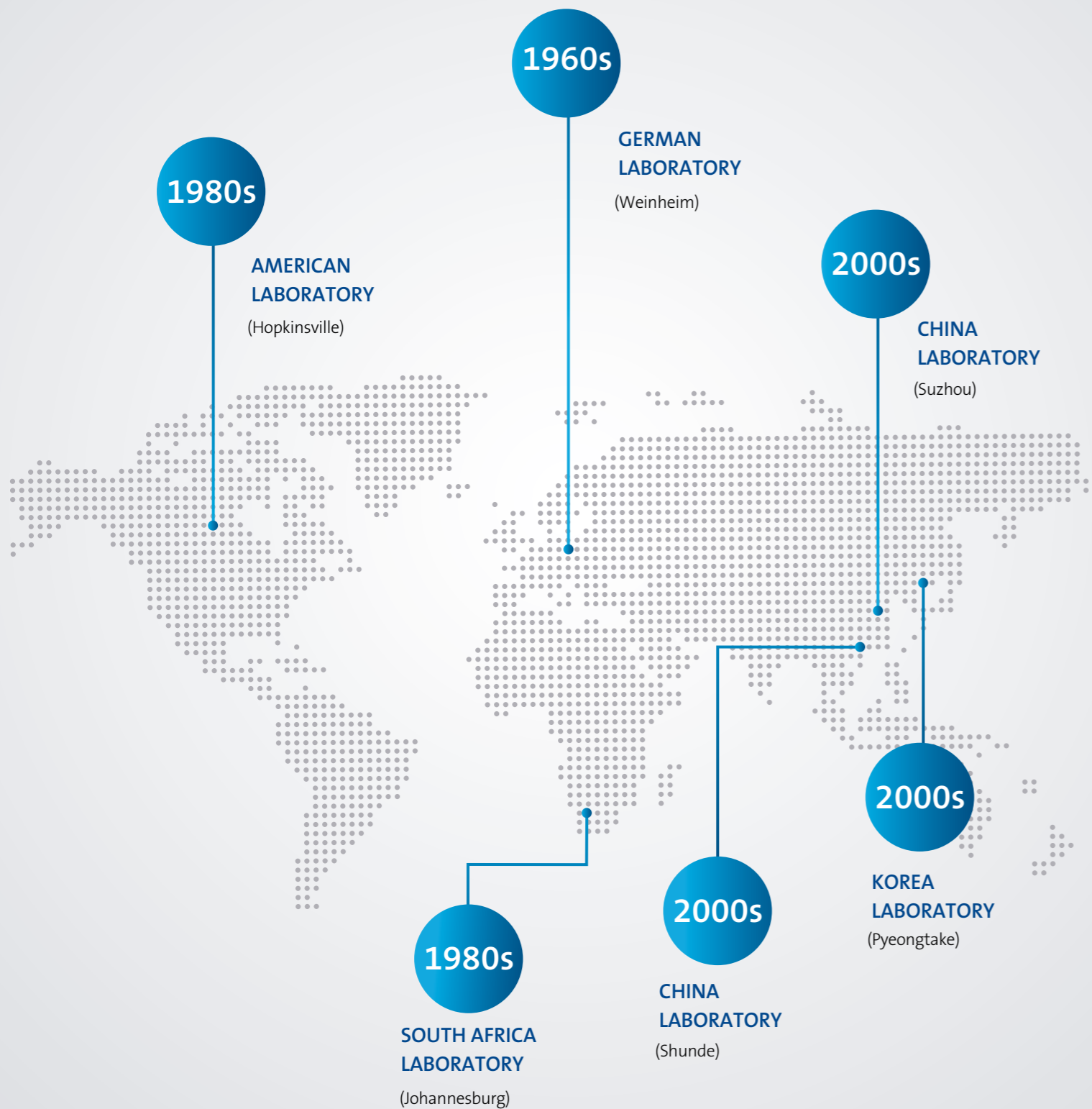
FFT test center participated in the draw up of national standards such as air purifier GB/T 18801 and water treatment equipment GB30307. As a core member FFT test center pushes forward standards, upgrades technology and makes great contributions to filtration industry development.



### RIGOROUS TEST PROCESS

With long-term practical experience, we have formed a rigorous and meticulous test process, and accumulated a wealth of test experience in filter material development and filter technology application.

- Accurate: we always adhere to the principle of mutual restraint and independence of inspection, verification and auditing, in order to keep adequacy and accuracy of data and information, in inspection process.
- Reliable: ensure correctness of the test result, by comprehensive internal quality management, verification between FFT test data and third party, and comparison with authoritative labs.



## SYSTEMATIC TESTING NETWORK

### GLOBAL TESTING NETWORK

FFT test center belongs to the FFT Group. It has 45 professional testers worldwide. There are 6 major labs in Germany, USA, South Africa, China and South Korea, constituting a global service network. Relying on advanced instruments and equipment, we can carry out tests according to relevant standards of China, USA, Japan, South Korea, and Europe according to customers. Additionally, FFT Group as our solid backup, focuses on the research and development of leading technologies.

In China, we have two major testing laboratories in Suzhou and Shunde, covering 4,000 m<sup>2</sup>. Besides air filtration testing including acid-base corrosive gases and other particulate matter, it also has precision testing including nano Substances(or smaller), microorganisms, noise and others.

### WE ARE GLOBAL

- 6 major laboratories covering 5 countries around world
- FFT as technical support
- Professional testing experience in filtration
- Owing advanced instruments and equipment

### WE ARE IN CHINA

- Laboratories in Suzhou and Shunde
- Covering 4,500m<sup>2</sup>
- Consumer Filtration test center locates in Shunde, China

## OUR SERVICE

### QUICK RESPONSE, TOTAL CONSIDERATION

FFT test center always provides customers and partners with testing and consulting services, adhering to quick response and total consideration.

we can help customers grow commercial value by satisfying their innovative needs rapidly, depending on our global filtration test network and systematic life cycle test.

### ACCURATE AND RELIABLE TEST DATA FOLLOW GLOBAL STANDARDS

Standards are critical for production, quality and market competitiveness. A new product must comply with the relevant standards of a region or country. Moreover, importance of standards is even more visible for a export product.

### SYSTEMATIC TESTING SERVICE

With FFT filtration R&D advantages, our services covers every stage of new filtration product development including test on raw material, material development & selection, filter design and Application. All data is accurate and complete. It supports you enhance commercial value while ensuring excellent product quality under the standards.

#### RAW MATERIAL DEVELOPMENT

- Test JIS B 9908
- Test GB/T 21551.2
- Test EN 1822-4
- Test GB/T 32373

.....

(Particle 0.01um-10um in diameter)

#### FILTER SELECTION

- Test GB/T 18801
- Test ISO 16890
- Test DIN71460-1&2
- Test /ANSI

.....

#### FINISHED FILTER

- Test on finished products according to products and regions.

# FOR BETTER QUALITY EMPOWER FUTURE INNOVATION

## FFT TEST SERVICE

Herein all related standards and tests (from filter development, cost to delivery) about consumer filtration products including air and water can be found quickly. Let our professional test services help you for competitive-quality and innovative products.

## QUICK-START QUERY :

1. Get to know the relevant standards and items about your products and regions listed on “ Consumer Filtration Products Test Standard”.
2. You can learn about the test items that FFT can provide listed on “ Consumer Filtration Products Test Standard “. All items in black font are services we can provide, and final reports will be with CNAS mark, and can be CNAS report. \*
3. You can query for the detail Information and background of relevant industrial standard listed on corresponding pages, as well as the details of FFT test items corresponding to the standard.

## CONTENTS

### Finished Filter

- Home Air Treatment	13
- Home Appliance	28
- Household Water Treatment	35

### Filter Selection & Raw Material Development

-Raw material development	45
-Filter selection	58



注意  
注意

FREUDENBERG  
INNOVATING TOGETHER

FREUDENBERG  
INNOVATING TOGETHER

FREUDENBERG  
INNOVATING TOGETHER

Sit down  
Take a seat  
Have a seat  
Be seated



**FINISHED FILTER**

# HOME AIR TREATMENT



## CONSUMER FILTRATION PRODUCTS TEST STANDARD -- HOME AIR TREATMENT

APPLICATION	COUNTRY	STANDARD	TEST	PAGE
Home Air Treatment	China	GB/T 18801 (AIR CLEANER)	Particulate CADR Gas pollutant CADR Particulate CCM Gas pollutant CCM Input power Standby power Purification energy efficiency Noise Microbial removal rate Hazardous substances released	16-18
		GB 36893-2018 (Minimum allowable values of energy efficiency and energy efficiency grades for air cleaners)	Purification energy efficiency	18
		APIAC/LM 01-2015 (Indoor Air Cleaner's Purification Performance Evaluation Requirements)	Particulate CADR Purification energy efficiency PM <sub>2.5</sub> CADR Gas pollutant CADR	19
	USA	AHAM AC-1 2019 Method for measuring performance of portable household electric room air cleaners	Cigarette smoke CADR  Pollen cadr Road dust CADR	20
		AHAM AC-3 2019 Method for measuring performance of portable household electric room air cleaners following accelerated particulate loading	Life cycle	20
	Korea	SPS-KACA002-132:2020 실내공기청정기(INDOOR AIR CLEANERS)	Noisy CADR Harmful gas removal rate Ozone release measurement	21
Japan	JEM 1467-2015 家庭用空気清浄機  (AIR CLEANERS OF HOUSEHOLD AND SIMILAR USE)	Rating power Air volume Noise Deodorization rate Dust removal efficiency Dust removal capacity Deodorant life Dust collection life	22	
		Power consumption Temperature Insulation Wire bending Mechanical strength	23	

\* The standard in black fonts refers to that FFT has testing capabilities.

\* The standard in gray fonts refers to that FFT does not have testing capabilities.



APPLICATION	COUNTRY	STANDARD	TEST	PAGE
Ventilation Purifier	China	QB/T 5580-2020 Household and similar fresh-air air cleaner	Fresh cleaning rate Fresh clean air delivery rate Noise Fresh cumulate clean mass Applicable room size	24-25
			Cleaning energy efficiency	25
Indoor Air Purification (Antibacterial)	China	GB/T 21551.3 Antibacterial and cleaning function for household and similar electrical appliances-Particular requirements of air cleaner	Antibacterial function of air cleaner	26
			WS/T 648-2019 General hygienic requirement for air disinfecting machine	Air disinfection simulating live test Air disinfection live test
		QB/T 5217-2018 Air cleaner for medical environment	Air disinfectant neutralizer identification test	26
			Rated air volume test Air disinfection effect identification test	27
Purification performance test UV lamp test	27			

\* The standard in black fonts refers to that FFT has testing capabilities.

\* The standard in gray fonts refers to that FFT does not have testing capabilities.

## INTRODUCTION OF GB/T 18801 " AIR CLEANER " STANDARD

It is applicable to home air purifiers for and similar. It is the core standard of home air treatment products. The parameter of CADR and CCM specified in the standard are critical for evaluating air purifier.

Drafted by Freudenberg Apollo.

### Particle CADR

Particle CADR is one of the core indicators for evaluating air purifiers. It represents the ability of purifying particle and clean air delivery rate.

### Test ability



FFT test center has three 30m<sup>3</sup> test chambers for Particle CADR.

### Gas pollutant CADR

Gas pollutant CADR is one of the core indicators for evaluating air purifiers. It represents the ability of purifying gas pollutant and clean air delivery rate. The FAFT testing center can perform CADR test of formaldehyde, TVOC, Toluene, ammonia, nitrogen dioxide etc. The tests of Formaldehyde CADR, Toluene CADR and TVOC CADR in FAFT was approved by CNAS, and CNAS reports can be issued.

### Test ability



FFT test center has five 30m<sup>3</sup> test chambers for gas pollutant CADR.

### Particle CCM

Particle CCM indicates the air purifier filter life time of purifying Particle, and indicates the particle CCM when CADR reaches initial 50%. In GB/T 18801-2015, particles CCM of air purifier is divided into 4 range, listed as below:

### Test ability



FFT test center has six 30m<sup>3</sup> test chambers for gas pollutant CCM.

Range	CCM Particle M /mg
P1	3000 ≤ M <5000
P2	5000 ≤ M <8000
P3	8000 ≤ M <12000
P4	12000 ≤ M

Note: Particle M< 3000mg, CCM is not applicable.

## Gas pollutant CCM

Gas pollutant CCM indicates the air purifier filter life time of purifying gas pollutant, and indicates the gas pollutant CCM when CADR reaches initial 50%. The tests of Formaldehyde CCM in FAFT was approved by CNAS, and CNAS reports can be issued. In GB/T 18801-2015, formaldehyde CCM of air purifier is divided into 4 range, listed as below:

Range	CCM Particle M /mg
F 1	$300 \leq M < 600$
F 2	$600 \leq M < 1000$
F 3	$1000 \leq M < 1500$
F 4	$1500 \leq M$

Note: Particle M < 3000mg, CCM is not applicable.

## Test ability



FFT test center has ten 30m<sup>3</sup> test chambers for gas pollutant CCM.

## Input power



The input power states the average power when air purifier is operating, under rating power.

## Standby power

The standby power states the input power of the air purifier in the standby mode. According to standard GB/T 18801-2015, the standby power is not allowed more than 2.0W.

## Purification energy efficiency



Purification energy efficiency refers to average CADR of air purifier at rating condition. According to different subjects, it is divided into particulate purification energy efficiency and gas pollutant purification energy efficiency.

## NOISE



Noise is a general evaluation index for home appliances. GB/T 18801-2015 grades the CADR performance of air purifiers. Listed as below:

CADR (m <sup>3</sup> / h)	LW/ dB(A) ≤
$Q \leq 150$	55
$150 < Q \leq 300$	61
$300 < Q \leq 450$	66
$Q > 450$	70

## Microbial removal rate

Microbial removal rate refers to the sterilization rate of the air purifier can achieve inside testing chamber. The applicable bacteria is Staphylococcus albicans 8032 or other non-pathogenic microorganisms. Tests and requirements Refer to GB 21551.3-2010.

## Hazardous substances released

The hazardous substances include four indicators: ozone concentration, ultraviolet intensity, TVOC concentration, and PM10 concentration. Tests and requirements Refer to Chapter 4 of GB 21551.3-2010 and Chapter 32 of GB 4706.45-2008.

## GB 36893-2018 "MINIMUM ALLOWABLE VALUES OF ENERGY EFFICIENCY AND ENERGY EFFICIENCY GRADES FOR AIR CLEANERS"

It is applicable to home air purifiers for and similar. It is the core standard of home air treatment products. The parameter of CADR and CCM specified in the standard are critical for evaluating air purifier.

Drafted by Freudenberg Apollo.

## Purification energy efficiency

The ratio of the particulate CADR at the rated condition to the purification input power represents the energy consumption of the air purifier. The standard grades the energy efficiency to level 1, level 2, and level 3 based on the energy efficiency ratio.

## APIAC/LM 01-2015 "INDOOR AIR CLEANER'S PURIFICATION PERFORMANCE EVALUATION REQUIREMENTS"

This standard states testing and evaluation methods for the main performance index of air purifiers to improve room air quality, including particle CADR, applicable room size, energy efficiency, particle PM<sub>2.5</sub> and gas pollutant purification ability .

Drafted by Freudenberg Apollo.

### Particle CADR

Particle CADR is one of the core indicators for evaluating air purifiers. It represents the ability of purifying particle and clean air delivery rate. The test herein in FAFT was approved by CNAS, and CNAS reports can be issued.

### Test ability



FFT test center has three 30m<sup>3</sup> test chambers for Particle CADR.

### Purification energy efficiency

The ratio of the particulate CADR at the rated condition to the purification input power represents the energy consumption of the air purifier.

### PM<sub>2.5</sub> CADR

PM<sub>2.5</sub> CADR refers to the removal ability of particle 2.5µm in the air by air purifier. The test herein in FAFT was approved by CNAS, and CNAS reports can be issued.

### Test ability



FFT test center has three 30m<sup>3</sup> test chambers for PM<sub>2.5</sub> CADR.

### Gas pollutants purification efficiency

It refers to the air purifier's purification performance to gas pollutants after one-hour working in the applicable area. It indicates the removal efficiency of gas pollutants in the test chamber after the air purifier is operated for the estimated equivalent test time.

## AHAM AC-1 2019 METHOD FOR MEASURING PERFORMANCE OF PORTABLE HOUSEHOLD ELECTRIC ROOM AIR CLEANERS

This standard was drafted and issued by Association of Home Appliance Manufacturers (AHAM). It is applicable to portable household electrical room air purifiers and specifies the definition and safety features of portable household electrical room air purifiers, and the relative reduction of the particulate in test chamber.

### Tobacco smoke CADR

It represents the ability of purifying particles and clean air delivery rate. The tested subject is US 3R4F research tobacco.

### Road dust CADR

It represents the ability of purifying particles and clean air delivery rate. The tested subject is road dust in Arizona, USA.

### Pollen CADR

It represents the ability of purifying particles and clean air delivery rate. The tested subject is Broussonetia papyrifera pollen.

## AHAM AC-3 2019 (METHOD FOR MEASURING PERFORMANCE OF PORTABLE HOUSEHOLD ELECTRIC ROOM AIR CLEANERS FOLLOWING ACCELERATED PARTICULATE LOADING)

This standard was drafted and issued by Association of Home Appliance Manufacturers (AHAM). It is applicable to portable household electrical room air purifiers in AC-1 and specifies the testing and evaluation methods for particle in air purifiers.

### Loading life time

Use tobacco/road dust to simulate accelerated loading of the air purifier, and evaluate the rate of decrease of the CADR of the air purifier in different loading cycles.

## SPS-KACA002-132:2020 (INDOOR AIR CLEANERS)

It was drafted and issued by the Korea Air Cleaning Association (KACA). This standard is intended for testing and evaluating air purifier used at home, office, classrooms, cars, and room etc, which passed safety performance test. The air purifiers are evaluated and tested, mainly for the performance of dust collection, deodorization etc, under condition of single-phase AC and standard voltage.

### Noise

Noise is a general evaluation index for home appliances. SPS-KACA002-132:2020 grades the CADR performance of air purifiers. Listed as below:

CADR(m <sup>3</sup> /min)	Noise dB
<4	45
4< CADR <8	50
8< CADR <16	55
16 < CADR	60

### CADR

It represents the ability of purifying particle and clean air delivery rate. The tested subject is KCI aerosol particles.

### Harmful gas removal rate

Evaluate air purifier purification efficiency for formaldehyde, ammonia, acetaldehyde, acetic acid and toluene.

### Ozone released

Evaluate the ozone concentration generated from air purifier under rated conditions, and the ozone concentration generated shall not exceed 0.03ppm.

### Inhalable particle sensing ability

During testing the Sensibility to inhalable particles size, the limit of the sensor must be maximum within ±30%, minimum within ±50%, comparing to tested limit under standard.

## JEM 1467-2015 (AIR CLEANERS OF HOUSEHOLD AND SIMILAR USE)

It was drafted and issued by Japan Electric Machine Industry Association(JEM). This standard specifies air purifiers installed in homes, offices and other places for deodorization, dust removal and virus suppression, or the ones only for dust removal.

### Noise

Noise is a general evaluation index for home appliances. JEM 1467-2015 classifies the CADR performance of air purifiers. Listed as below:

CADR(m <sup>3</sup> /min)	Noise dB
<5	50
>5	55

### CADR

JEM 1467-2015 requires that CADR cannot exceed ±15% of the rated.

### Deodorization rate

Evaluate the purification efficiency of air purifiers for acetaldehyde, ammonia, and acetic acid. The tested subject is odor generated by burning MILD SEVEN tobacco Japan.

### Test ability



FFT test center has four test chambers for deodorization ability and life time.

### Dust removal efficiency

It represents the ability of removing particle from tobacco, The tested subject is particle generated by burning MILD SEVEN tobacco Japan.

### Dust removal ability

It represents the ability of purifying particle and clean air delivery rate. The tested subject is particle generated by burning MILD SEVEN tobacco Japan.

### Deodorization life time

Use MILD SEVEN tobacco to simulate accelerated loading of the air purifier, and evaluate cigarette quantity when the deodorizing efficiency reaches the end.

### Test ability



FFT test center has four test chambers for deodorization ability and life time.

### Dust collection life time

Use MILD SEVEN tobacco to simulate accelerated loading of the air purifier, and count the tobacco quantity when the deodorizing efficiency reduces to 50%.

### Test ability



FFT test center has three test chambers for Dust collection life time.

### Rated power / power consumption

The rated power and power consumption of the air purifier must meet the requirements listed below:

Rated power / power consumption W	Tolerance allowed %
<10	+25
10 < W < 30	±25
30 < W < 100	±20
100 < W < 1000	±15

### Temperature

The temperature of each part shall not exceed the limit required in the standard, When the purifier is working continuously.

### Insulation

Insulation resistance must be more than 1M.

### Wire bending

Must be able to withstand voltage.

### Viroplankton removal performance

Evaluate the removal performance for removing viroplankton, to judge the ability of air purifier to remove viroplankton is valid or not.

### Indoor virus inhibition performance

Evaluate the air purifier inhibition performance for Indoor virus, and judge its ability of virus inhibition is valid or not.

## QB/T 5580-2020 (HOME VENTILATION PURIFIER AND SIMILAR)

It specifies the technical index and tests of outdoor pollutants ventilation and CCM of the ventilation purifiers for household and similar purposes. The standard is new for the performance evaluation of ventilation purifier. Currently it is being submitted for approval.

Drafted by Freudenberg Apollo.

### Fresh cleaning rate

Under specified test conditions, the efficiency of the purifier to remove the pollutants (particles or gas pollutants) at one time through ventilation purification is classified as follows:

Grade	Ventilation purification efficiency (%)	
	Outdoor particulate	Outdoor gas pollutants
A	$qF \geq 95$	$qF \geq 80$
B	$90 \leq qF < 95$	$60 \leq qF < 80$
C	$85 \leq qF < 90$	$40 \leq qF < 60$
D	$80 \leq qF < 85$	$20 \leq qF < 40$

### Fresh cumulate clean mass

Under specified test conditions, the amount of the target pollutants treated by purifier when CADR reaches initial 80%, is a parameter evaluating the durability of the ventilation cycle purification. The limit for ventilation CCM listed follows:

Range	Fresh cumulate clean mass $M_f$ / (mg)	
	Outdoor particulate	Outdoor gas pollutants
$qF \geq 1000$	20000	1000
$600 \leq qF < 1000$	12000	500
$400 \leq qF < 600$	8000	300
$200 \leq qF < 400$	5000	200
$qF < 200$	3000	100

### Fresh clean air delivery rate

Under specified test conditions, the clean air delivery rate by purifiers, is a parameter evaluating the purification of Particulate or gas pollutants.

### Noise

Test the remaining chlorophyll content accounts for the percentage of the initial content, after laying vegetable with the tested sample, The noise requirements under different air delivery rates are as follows:

CADR Q / (m <sup>3</sup> /h)	LW/ dB(A)
Q ≥ 1000	≤ 60
600 ≤ Q < 1000	≤ 55
400 ≤ Q < 600	≤ 50
200 ≤ Q < 400	≤ 45
Q < 200	≤ 42

### Applicable area

Under specified conditions, the maximum room size can be applicable to meet purification of the target pollutant (particulate or gas pollutant).

### Cleaning energy efficiency

The clean air generated by unit energy consumption under specified conditions. The energy consumption includes the sample energy consumption (direct energy consumption) and the additional energy consumption caused by the ventilation (indirect energy consumption). The clean air includes the ventilation CADR and inner circulation CADR. Purification energy efficiency is related to test conditions, which are divided into three types: transition season (spring and autumn), winter and summer.

## GB/T 21551.3 (ANTIBACTERIAL AND CLEANING FUNCTION FOR HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES-PARTICULAR REQUIREMENTS OF AIR CLEANER)

Applicable to household and similar air purifiers with sterilization function.

Drafted by Freudenberg Apollo.

### Antibacterial

- (1) Antibacterial (sterilization) rate should be ≥ 50%, after working for 1 hour in simulated and live test conditions.
- (2) The antibacterial performance of the air purifier should meet the relevant requirements in GB21551.2-2010.
- (3) The purification material of the air purifier should be able to be replaced or Regenerate, and purification device should be able to clean and disinfect.
- (4) Tested subject: Staphylococcus albicans

## WS/T 648-2019(GENERAL HYGIENIC REQUIREMENT FOR AIR DISINFECTING MACHINE)

Applicable to air disinfection machines with physical, chemical and others disinfection.

### Disinfection effect

- (1) Simulating live test, test air by spraying microbial aerosol artificially to pollute, to test the minimum safe Dosage that the air disinfection machine is used for air disinfection

Simulating live test of air disinfection by an air disinfection machine, under 20 ~25°C, Rh 50%~70 %, turn it on according to instruction manual.

- (2) Air disinfection live test

At the applicable site keeping people away, use natural bacteria as indicator microorganisms to disinfect or eliminate microorganisms in disinfection places (such as wards, bedrooms, offices and other closed places) to verify the practical disinfection effect of air disinfectors. Under natural conditions on site, use an air disinfectant for air.

- (3) Identification test on Neutralizer used for air disinfection machine. It is determined whether the selected neutralizer is suitable for evaluating air disinfection effect of the air disinfection effect of the air disinfection machine with chemical factors.

## QB/T 5217-2018(AIR CLEANER FOR MEDICAL ENVIRONMENT)

Applicable to medical air cleaners and others with similar purification requirements, including:

- Medical indoor environment, including purifiers in hospitals, nursing homes, rehabilitation centers, blood stations, and precision instrument rooms;
- Purifiers for laboratories, nursing homes, kindergartens, fitness centers and homes with similar purification requirements;
- Ventilator purifier with similar purification function.

### Rated air delivery rate

The measured air delivery rate of the appliance shall not be lower than 90% of the rated.

### One-time air purification efficiency test

The measured one-time purification efficiency of the appliance should not be less than 90% of rated, inside test room at 18 ~28 °C, RH50%-70%.

### Bacteria killing and (or) removal rate

Test the effect of killing and (or) removing of the bacteria in the air in the medical environment, to verify air purifier's disinfection effect in the air. Bacteria killing rate in the air, working for 60 minutes in a 20m<sup>3</sup> laboratory, should meet the requirements below.

### Natural bacteria killing and (or) removal rate

Test the effect of killing and (or) removal of the natural bacteria in the air in the medical environment, to verify air purifier's disinfection effect in the air. Natural bacteria killing rate in the air, working for 60 minutes in largest applicable room, should meet the requirements below.

### UV lamp test

According to GB/T 5080.7-1986, test is adopted set time (set quantity) . The measured air delivery rate of the appliance shall not be lower than 90% of rated.

Item	Level 1	Level 2
Bacteria killing and (or) removal rate (Staphylococcus albicans) ≥	99.9	90
Natural bacteria killing and (or) removal rate≥	95	80

Unit: %

# HOME APPLIANCES



## Standards for consumer filtration products-home appliances

APPLICATION	COUNTRY	STANDARD	TEST	PAGE
Refrigerator	China	GB 21551.4 (Antibacterial and cleaning function for household and similar electrical appliances-Particular requirements of air cleaner)	Microbial removal rate Deodorization Hazardous substances Leakage -ozone concentration detection	30
		ZQJB 010-2016 (requirements and test method of the fresh performance of household and similar refrigerator)	Weightlessness rate Vitamin C retention rate Chlorophyll retention rate	31
Humidifier	China	GB/T 23332-2018(Humidifier)	Humidification Durability Humidification efficiency Noise test Antibacterial and mildew-proof test	32-33
Range hood	China	GB/T17713(Range hood)	Odor reduction Grease separation	33
		HJ 38-2017 (Stationary source emission - -Determination of total hydrocarbons, methane and nonmethane hydrocarbons - Gas chromatography)	Nonmethane hydrocarbons removal rate	34
		GB 18483-2001 (Emission standard of cooking fume)	Fume removal rate	34
	Europe	IEC 61591-2019 HOUSEHOLD RANGEHOODS-METHODS FOR MEASURING PERFORMANCE	Odor reduction Grease separation	34

\* The standard in black fonts refers to that FFT has testing capabilities.

\* The standard in gray fonts refers to that FFT does not have testing capabilities.

### GB 21551.4 (ANTIBACTERIAL AND CLEANING FUNCTION FOR HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES-PARTICULAR REQUIREMENTS OF AIR CLEANER)

It is applicable to technical requirements and tests for household and similar refrigerator with Antibacterial, sterilization and purification functions. The version is revised on the basis of GB 21551.4-2010 and is currently being submitted for approval.

Drafted by Freudenberg Apollo.

#### Bacterial removal rate

It refers to the Bacterial removal rate of the refrigerator freezer. The applicable bacteria are Staphylococcus aureus or Escherichia coli. 24-hour bacterial removal rate is required: ≥90%.

#### Deodorization

During the purification of reducing or removing unpleasant chemical gas inside the refrigerator, 2-hour deodorization requirements: ≥90%.

#### Test ability



FFT test center can execute removal performance test of trimethylamine, methyl mercaptan, hydrogen sulfide, and ethylene.

#### Hazardous substances Leakage -ozone concentration detection

The release of harmful substances includes two indicators: ozone concentration and ultraviolet intensity.

According to ultraviolet photometric method specified in standard GB/T 18883, when refrigerator door or lid is close, take a point from the center point of each door seam(at 5cm vertical distance from door seam), and take the average value. Requirements indicated as below:

HARMFUL SUBSTANCE		STANDARD
Ozone concentration (anywhere 5cm around the appliance)	mg/m <sup>3</sup>	≤ 0.1
UV intensity (anywhere 5cm around the appliance)	uW/cm <sup>2</sup>	≤ 5



## ZQJB 010-2016 (REQUIREMENTS AND TEST METHOD OF THE FRESH PERFORMANCE OF HOUSEHOLD AND SIMILAR REFRIGERATOR)

It specifies the technical requirements and tests for the preservation function (vitamin C/chlorophyll and other nutrients) of household and similar refrigerators.

### Weightlessness rate

After the test vegetables are placed in the test sample for a certain period, the weight accounts for the percentage of initial weight.

### Vitamin C retention rate

After the test vegetables are placed in the test sample for a certain period, the remaining vitamin C accounts for the percentage of the initial content.

### Chlorophyll retention rate

After the test vegetables are placed in the test sample for a certain period, the remaining Chlorophyll accounts for the percentage of the initial content.

No.	Harmful Substance	Tested vegetable	Test time(day)	Standard
1	Weightlessness rate	Spinach	7d	W ≤ 10%
2	Vitamin C retention rate	Green pepper	7d	V ≥ 95%
3	Chlorophyll retention rate	Spinach	7d	C ≥ 85%

## GB/T 23332-2018 (HUMIDIFIER)

It specifies the terms and definitions, classification and model, technical requirements, test methods, inspection rules, signs, packaging, user instructions, transportation and storage of humidifiers. It is applied to household and similar humidifiers. It is also applicable to the humidification performance evaluation of air purifiers or similar products with humidification function.

Drafted by Freudenberg Apollo.

### Humidification

When humidifier working for 1 hour at maximal gear under the standard working conditions, performance of Water mist.

### Durability

Continuous operation without forced convection, at room temperature (25 ± 5°C), RH ≥ 60.

Under normal working conditions, firstly determine the corresponding requirements of the initial humidification. Then continue to work at the maximal gear, stop tests and measure the humidification when sample finishes working according to requirements listed. If result is more than 50% of the initial, test is valid.

DURABILITY	Limit / h		
	Electric heating	Ultrasonic	Others
A	≥ 3500	≥ 5000	≥ 5000
B	≥ 3000	≥ 4500	≥ 4400
C	≥ 2500	≥ 4000	≥ 3800
D	≥ 1500	≥ 3500	≥ 3300

### Humidification efficiency

Under rated working conditions, turn appliance to maximal gear and test the input power, then count the ratio of the tested humidification volume to the power. This is the humidification efficiency.

HUMIDIFICATION EFFICIENCY	Humidification efficiency n [ m / L (h·W) ]			
	Ultrasonic	Evaporative	Electric heating	All-in-one products
A	n ≥ 13.5	n ≥ 14.5	n ≥ 1.9	n ≥ 17.0
B	11.5 ≤ n < 13.5	12.5 ≤ n < 14.5	1.5 ≤ n < 1.9	13.0 ≤ n < 17.0
C	9.5 ≤ n < 11.5	10.5 ≤ n < 12.5	1.1 ≤ n < 1.5	9.0 ≤ n < 13.0
D	7.0 ≤ n < 9.5	8.0 ≤ n < 10.5	0.7 ≤ n < 1.1	6.0 ≤ n < 9.0

Note: Appliances with heating function are classified according to electric heating type.

## Noise test

Noise is a general evaluation index for home appliances. According to the standard GB/T 4214.1-2017, test requirements are listed as below:

Products	Humidification Q / (mL / h)	Noise limit / dB(A)
Ultrasonic	Q ≤ 350	≤ 38
	Q > 350	≤ 42
Evaporative	Q ≤ 180	≤ 45
	180 < n ≤ 500	≤ 50
	500 < n ≤ 1000	≤ 55
	Q > 1000	≤ 60
Electric heating	Q ≤ 300	≤ 50
	300 < n ≤ 500	≤ 55
	Q > 500	≤ 60
Others	Q ≤ 350	≤ 40
	Q > 350	≤ 45

Note: Regarding to multi-function home appliances, louder noise should be taken as test result, which is tested according to higher limit of the function making louder noise, except for indoor unit noise.

## Antibacterial and mildew-proof test

According to the standard GB/T 21551.2, test requirements are listed as below:

Item	Limit
Antibacterial	≥ 90%
Mildew-proof	Class 1

## GB/T17713 (RANGE HOOD)

It specifies the classification, requirements, tests and inspection of home range hoods in kitchen

## HJ 38-2017 (STATIONARY SOURCE EMISSION - DETERMINATION OF TOTAL HYDROCARBONS, METHANE AND NONMETHANE HYDROCARBONS-GAS CHROMATOGRAPHY)

It was issued by the State Environmental Protection Administration. In order to implement the “Environmental Protection Law of the People’s Republic of China” and “The Air Pollution Prevention and Control Law of the People’s Republic of China”, to protect the environment and human health. It standardize the gas chromatography tests of the total hydrocarbons in pollution source , Methane and nonmethane hydrocarbons in fixing polluting.

### Nonmethane hydrocarbons removal rate

According to test condition, total volume of Other gaseous organic compounds After methane deducted from total hydrocarbons, after oil fume purification process, the removed nonmethane hydrocarbons volume accounts for the percentage of the initial.

## GB 18483-2001 (EMISSION STANDARD OF COOKING FUME)

It was issued by the Ministry of Environmental Protection, in order to implement the “Prevention and Control Law of Air Pollution of the People’s Republic”, and prevent the fume pollution of the catering industry’s to the atmosphere and the living environment. It specifies the allowed maximum exhaust concentration of fume in the catering industry and the lowest removal efficiency of oil fume purification equipment. It is applicable to urban built-up areas, not suitable for household oil fume emission.

### Oil fume removal rate

After oil fume purification process, the removed oil fume accounts for the percentage of initial. The standard requires the minimum removal efficiency of large/medium/small range hood should be 85%, 75%, and 60% respectively.

## IEC 61591-2019 HOUSEHOLD RANGEHOODS-METHODS FOR MEASURING PERFORMANCE

It is for International Electrotechnical Commission (IEC) and applicable to household kitchen range hoods with fans with recirculation or suction function.

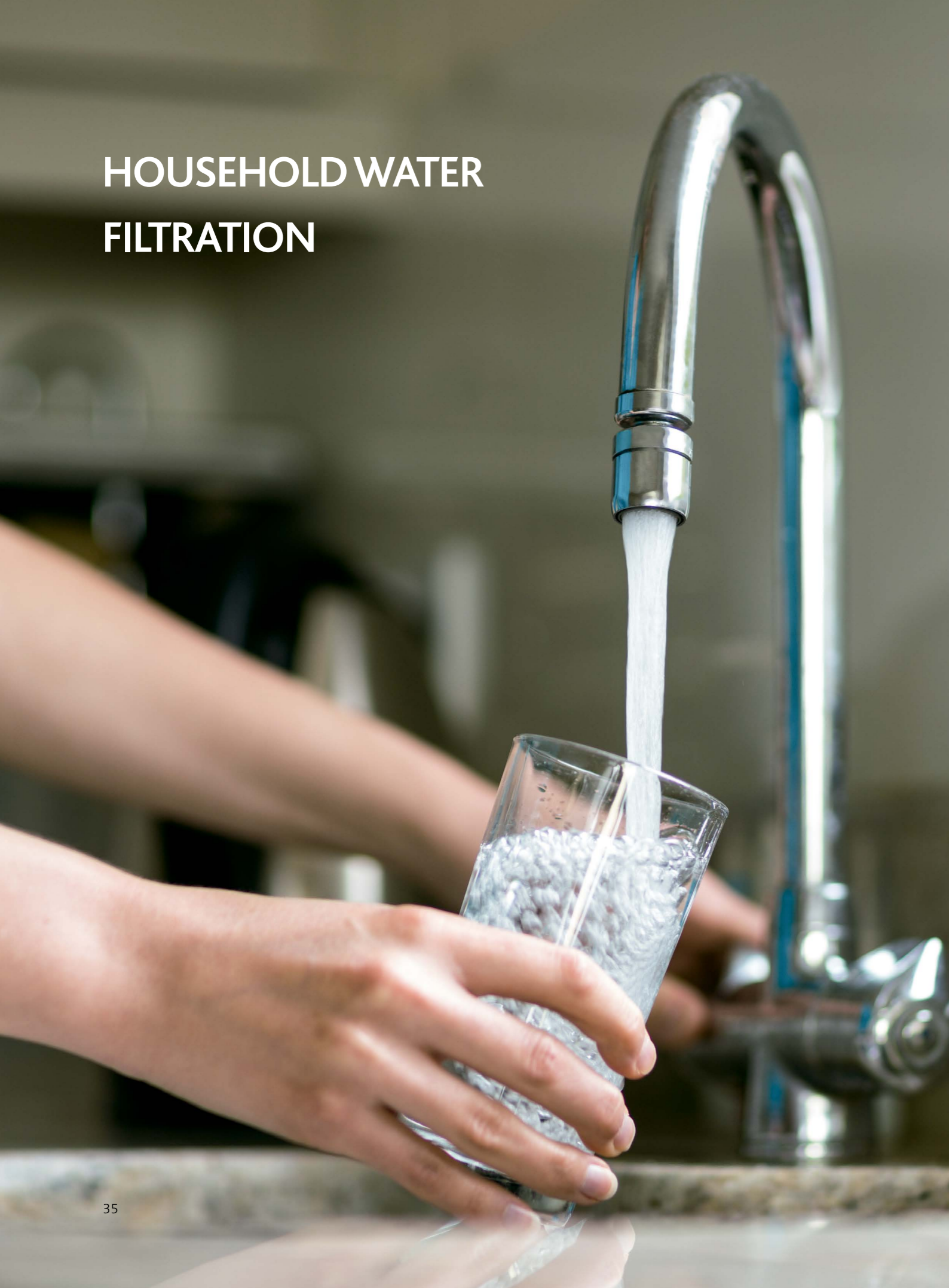
### Odor reduction

Refers to the ability of the range hood to reduce abnormal indoor odors under specified test conditions, it is divided into “regular odor reduction” and “instant odor reduction”. “regular odor reduction” refers to the ability to reduce the unpleasant odor in the room within 30 minutes after turning on the range hood when the unpleasant order is emitting continuously and evenly in the laboratory under the specified test conditions. “ instant odor reduction” refers to the ability to reduce the unpleasant odor within 3 minutes after turning on the range hood when the odor concentration in the laboratory reaches the maximum under the specified test conditions. The standard specifies that “regular odor reduction” of the external exhaust range hood should not be less than 90%, and the “instant odor reduction” should not be less than 50%.

### Grease separation

Refers to the ability of the range hood to separate grease from the fume gas under the specified test conditions. It specifies that the grease separation ability of the external exhaust range hood should not be less than 80%.

# HOUSEHOLD WATER FILTRATION



## Standards for consumer filtration products -Household water filtration

APPLICATION	COUNTRY	STANDARD	TEST	PAGE
Municipal drinking water filtration	China	Standard for Hygienic Safety Evaluation of Equipment and Protective Materials in Drinking Water	Immersion test: chroma, turbidity, odor and taste, eyes visible, pH, total dissolved solids, oxygen consumption, arsenic, cadmium, chromium, aluminum, lead, mercury, chloroform, volatile phenol, iron, manganese, Copper, zinc, barium, nickel, antimony, carbon tetrachloride, silver, tin, styrene, formaldehyde, benzene	40
			Immersion test: phthalates, vinyl chloride, epichlorohydrin, acrylonitrile, total $\alpha$ radio, total $\beta$ radio, total organic carbon	40
		Sanitary Standard for Hygienic Safety and Function Evaluation on Treatment Devices of Drinking Water- General Devices	Immersion test: chromaticity, turbidity, odor and taste, eyes visible, oxygen consumption, lead, cadmium, mercury, arsenic, volatile phenols, total bacteria, total coliforms, fecal coliforms, silver, iodine.  Functional test: Volatile phenols, oxygen consumption, carbon tetrachloride, chloroform, turbidity and total coliforms	40
			Immersion test: chromium (hexavalent)	40
		Sanitary Standard for Hygienic Safety and Function Evaluation on Treatment Devices of Drinking Water- Reverse Osmosis Device	Immersion test: chromaticity, turbidity, odor and taste, eyes visible, oxygen consumption, lead, cadmium, mercury, arsenic, volatile phenols, total bacteria, total coliforms, fecal coliforms  Functional tests: cadmium, Fluoride, lead, nitrate nitrogen, carbon tetrachloride, chloroform	40
			Immersion test: chromium (hexavalent),  function test: arsenic (trivalent), chromium (hexavalent)	40
		Sanitary Standard for Hygienic Safety and Function Evaluation on Treatment Devices of Drinking Water-Mineralizer	Immersion test: color, turbidity, odor and taste, eyes visible, oxygen consumption, lead, cadmium, mercury, arsenic, volatile phenols, total bacteria, total coliforms, fecal coliforms	40
			Immersion test: chromium (hexavalent),total $\alpha$ radio, total $\beta$ radio	40

\* The standard in black fonts refers to that FFT has testing capabilities.

\* The standard in gray fonts refers to that FFT does not have testing capabilities.

APPLICATION	COUNTRY	STANDARD	TEST	PAGE
Municipal drinking water filtration	China	GB/T 30307-2013 Household and similar drinking water treatment units	Noise, purified water flow, total purified water, hygiene and safety  Structural performance: hydrostatic pressure test, cyclic pressure test, burst pressure test  Control performance: pollutant removal performance	40
		GB/T 30306-2013 Household and similar purposes drinking water purification inner core	Electrical safety: protection against electric shock, leakage current and electrical strength, and grounding	40
			Water flow, total purified water, hygiene and safety, functional test: interception rate, softening efficiency, desalination rate	40
		GB 34914-2017 Minimum allowable value of water efficiency and water efficiency grades for reverse osmosis drinking water treatment purifiers	Electrical safety: protection against electric shock, leakage current and electrical strength, and grounding	40
			Purified water delivery rate, purified water flow rate, total purified water, water efficiency limit, water economization evaluation	40
		GB/T 19249-2017 Reverse osmosis water treatment equipment	Water delivery rate, desalination rate, recycle rate	40
			QB/T 4143-2019 Household and similar general water treatment units	Structural performance: purified water pressure test, cyclic pressure test, hygiene and safety, noise, total purified water, purified water flow, purification efficiency of specific substances
		Electrical safety: protection against electric shock, leakage current and electrical strength, grounding, vibration speed		41
		QB/T 4144-2019 Household and similar pure water treatment units	Structural performance: purified water pressure test, cyclic pressure test, hygiene and safety, noise, total purified water, purified water flow, desalination rate, purified water delivery rate, purification efficiency of specific substances	41
			Electrical safety: protection against electric shock, leakage current and electrical strength, grounding, vibration speed	41

\* The standard in black fonts refers to that FFT has testing capabilities.

\* The standard in gray fonts refers to that FFT does not have testing capabilities.

APPLICATION	COUNTRY	STANDARD	TEST	PAGE	
Municipal drinking water filtration	China	T/CAQI 95-2019 Household and similar shower with purification	Structural performance: purified water pressure test, cyclic pressure test, hygiene and safety, purified water delivery rate	41	
		Evaluation specification for the service life of household and similar reverse osmosis filter	Total purified water, purification efficiency	41	
			In preparation	41	
		Household and similar RO water filter with water economization purpose	In preparation	41	
		Household and similar RO filter with water economization purpose	In preparation	41	
		Household and similar pure water treatment units precise purification requirements and test method	In preparation	41	
		Precise purification requirements- Household and similar pure water treatment filter	In preparation	41	
		Household and similar instantaneous heating water dispenser	In preparation	41	
	NSF/ANSI 372 DRINKING WATER SYSTEM COMPONENTS - LEAD CONTENT	Lead content	42		
	USA	NSF/ANSI 42-2018 DRINKING WATER TREATMENT UNITS-AESTHETIC EFFECTS	Toxicological tests: metal elements, organic volatile substances, organic semi-volatile substances	Structural performance: hydrostatic pressure test, cyclic pressure test  Performance test: Residual chlorine reduction test, standard particle reduction test, phenol reduction test, chloramine reduction test, zinc reduction test, high pH and low pH test, antibacterial performance, drainage control, etc.	42
			Performance test: linear alkyl benzene sulfonate reduction test, divalent manganese ion and divalent iron ion reduction test, hydrogen sulfide reduction test, sulfate reduction test, etc.		
			Toxicological test: metal elements, organic volatile substances, organic semi-volatile substances.		
		NSF/ANSI 53-2019 DRINKING WATER TREATMENT UNITS-AESTHETIC EFFECTS	42		

\* The standard in black fonts refers to that FFT has testing capabilities.


\* The standard in gray fonts refers to that FFT does not have testing capabilities.

APPLICATION	COUNTRY	STANDARD	TEST	PAGE
Municipal drinking water filtration	USA	NSF ANSI 401-2019 DRINKING WATER TREATMENT UNITS - EMERGING COMPOUNDS INCIDENTAL CONTAMINANTS	Toxicological tests: metal elements, organic volatile substances, organic semi-volatile substances  Structural performance: hydrostatic pressure test, cyclic pressure test  Performance test: Estrone reduction test, BPA reduction test, etc.	42
		NSF/ANSI 58-2018 REVERSE OSMOSIS-DRINKING WATER TREATMENT SYSTEMS	Toxicological tests: metal elements, organic volatile substances, organic semi-volatile substances  Structural performance: hydrostatic pressure test, cyclic pressure test  Performance test: TDS reduction, recycle rate, rated efficiency test, storage tank capacity, inorganic compound reduction test (lead, cadmium, barium, fluorine, copper, etc.), mechanical filtration statement (turbidity reduction test), VOC reduction test	42
			Replaceable air gap device test, inorganic compound reduction test (arsenic, chromium, mercury, radium, perchlorate, selenium, etc.), mechanical filtration declaration (asbestos reduction test, cyst reduction test, etc.)	42
		NSF/ANSI 177-2019 SHOWER FILTRATION SYSTEMS - AESTHETIC EFFECTS	Structural performance: hydrostatic pressure test, cyclic pressure test  Performance test: residual chlorine reduction test	42

\* The standard in black fonts refers to that FFT has testing capabilities.

\* The standard in gray fonts refers to that FFT does not have testing capabilities.

### STANDARD FOR HYGIENIC SAFETY EVALUATION OF EQUIPMENT AND PROTECTIVE MATERIAL IN DRINKING WATER

It is applicable to the safety evaluation of the transportation Equipment and protective material for drinking Water. It is a test standard required for sanitation license which allows product production and sales. This standard includes 23 tests approved by  CNAS: turbidity , pH, oxygen consumption, arsenic, cadmium, chromium, aluminum, lead, mercury, chloroform, iron, manganese, copper, zinc, barium, nickel, antimony, carbon tetrachloride, silver, tin, residual chlorine, hardness , Conductivity. Tests are with ICP-MS, GC-MS, UV and other equipment.

### SANITARY STANDARD FOR HYGIENIC SAFETY AND FUNCTION EVALUATION ON TREATMENT DEVICES OF DRINKING WATER- GENERAL DEVICES/ RO DEVICE/ MINERALIZER

It is applicable to the safety and functional evaluation of water filters. It is a test standard required for sanitation license which allows product production and sales. It is the core standard of water filters.

#### Test ability

FFT test center has four test systems for removal ability.

Removal ability:

Activated carbon filter: volatile phenols, oxygen consumption, carbon tetrachloride,

Trichloromethane

RO filter: turbidity, total coliforms

Disinfection filter: total coliforms Group and so on

### GB/T 30307-2013 (HOUSEHOLD AND SIMILAR DRINKING WATER TREATMENT UNITS)

It is applicable to household and similar water filters. It is the core standard for water filters-related products. The electrical safety, sanitary safety, structural performance, functional test and other parameters specified in the standard are the core indicators for evaluating water filters.

Edition 202 was drafted by Freudenberg Apollo.

### GB/T 30306-2013 (HOUSEHOLD AND SIMILAR PURPOSES DRINKING WATER PURIFICATION INNER CORE)

It is applicable to filter core of household and similar water filters. It is the core standard for water purifier filter. The electrical safety, sanitary safety, functional test and other parameters specified in the standard are the core indicators for evaluating water purifier filter.

Edition 202 was drafted by Freudenberg Apollo.

### GB 34914-2017 (MINIMUM ALLOWABLE VALUE OF WATER EFFICIENCY AND WATER EFFICIENCY GRADES FOR REVERSE OSMOSIS DRINKING WATER TREATMENT PURIFIERS)

It is applied to RO water filters, the test standard of water efficiency limit and water efficiency grades. It is a national mandatory standard. Level 5 is water efficiency limit, level 2 is standard of water economization.

#### Test ability

FFT test center has four test systems for water efficiency grading.

### GB/T 19249-2017(REVERSE OSMOSIS WATER TREATMENT EQUIPMENT)

It is applied to RO water filters, dividing desalination rate of RO filter into two types: spiral-wound RO and DT-RO.

TEST	Requirements	Index
Spiral-wound RO water treatment equipment	Desalination rate	≥ 95%
DT-RO water treatment equipment	Desalination rate	≥ 90%

## QB/T 4143-2019 (HOUSEHOLD AND SIMILAR GENERAL WATER QUALITY PROCESSORS QB/T 4144-2019 (HOUSEHOLD AND SIMILAR PURE WATER TREATMENT UNITS)

It is applicable to the water filter industry. The two standards are to combine all functional tests of water filters to form an industry standard. It requires all tests above standard.

### Test ability

FFT test center has five test systems above standard.

## T/CAQI 95-2019(HOUSEHOLD AND SIMILAR SHOWER WITH PURIFICATION)

It is applicable to showers. The removal of residual chlorine is the core indicator of the bath filter, and the removal rate is required to reach more than 50%.

## EVALUATION SPECIFICATION FOR THE SERVICE LIFE OF HOUSEHOLD AND SIMILAR RO FILTER

In preparation

Drafted by Freudenberg Apollo.

## HOUSEHOLD AND SIMILAR RO WATER FILTER WITH WATER ECONOMIZATION PURPOSE

In preparation

Drafted by Freudenberg Apollo.

## HOUSEHOLD AND SIMILAR RO FILTER CORE WITH WATER ECONOMIZATION PURPOSE

In preparation

Drafted by Freudenberg Apollo.

## HOUSEHOLD AND SIMILAR PURE WATER TREATMENT UNITS PRECISE PURIFICATION REQUIREMENTS AND TEST METHOD

In preparation

Drafted by Freudenberg Apollo.

## PRECISE PURIFICATION REQUIREMENTS - HOUSEHOLD AND SIMILAR PURE WATER TREATMENT FILTER

In preparation

Drafted by Freudenberg Apollo.

## HOUSEHOLD AND SIMILAR INSTANTANEOUS HEATING WATER DISPENSER

In preparation

Drafted by Freudenberg Apollo.

## NSF/ANSI 372 DRINKING WATER SYSTEM COMPONENTS - LEAD CONTENT

It is applicable to water filters. According to federal regulations, water filtration products must meet low-lead requirements. The weighted average of lead content in the product is  $\leq 0.25\%$ , and the lead content of solder and additives is  $\leq 0.2\%$ .

## NSF/ANSI 42-2018 DRINKING WATER TREATMENT UNITS-AESTHETIC EFFECTS

It is applicable to the taste test after water filters, which is the basic standard for water filters. All water filter types can be certified by this standard.

Generally, it consists of toxicological evaluation, structural test, and functional test. The more popular certified functions are residual chlorine reduction test and particulate reduction test.

### Test ability

FFT test center has two test systems above standard and two particle sizers.

## NSF/ANSI 53-2019 DRINKING WATER TREATMENT UNITS-HEALTH EFFECTS

It is applicable to the taste test after water filters, which is the basic standard for water filters. All water filter types can be tested and according to this standard.

Generally, it consists of toxicological evaluation, structural test, and functional test. The more popular certified functions are residual chlorine reduction test and particle reduction test.

### Test ability

FFT test center has two test systems above standard and ICP-MS, GC-MS etc equipments.

## NSF ANSI 401-2019 DRINKING WATER TREATMENT UNITS - EMERGING COMPOUNDS INCIDENTAL CONTAMINANTS

It is applicable to occasional substance testing of water filters, which is a standard for the healthy use of water filters. All types of water filters can be certified by this standard.

Generally, it consists of toxicological assessment, structural test, and functional test. The more popular certified functions are BPA reduction test and estrone reduction test.

### Test ability

FFT test center has two test systems above standard and ICP-MS etc equipment.

## NSF/ANSI 58-2018 REVERSE OSMOSIS-DRINKING WATER TREATMENT SYSTEMS

It is applicable to RO filters, and has mandatory requirements for TDS. It generally consists of toxicological assessment, structural testing, and functional testing. The more popular certified functions are heavy metal reduction test and organic matter reduction test.

## NSF/ANSI 177-2019 SHOWER FILTRATION SYSTEMS - AESTHETIC EFFECTS

It is applicable to showers. The removal of residual chlorine is the core indicator of the bath filter, and the removal rate is required to reach more than 50%.



**RAW MATERIAL DEVELOPMENT  
AND FILTER SELECTION**

# RAW MATERIAL DEVELOPMENT



## Standards for consumer filtration products- Raw material development

### Raw material development-Air purification

APPLICATION	COUNTRY	STANDARD	TEST	PAGE
Filtering material	China	GB 19083-2010 (Technical requirements for protective face mask for medical use)	Resistance efficiency	48
		GB 2626-2019 (Respiratory protection—Non-powered air-purifying particle respirator)	Resistance efficiency	48
Filter material (anti-bacterial / anti-allergy)	China	GB/T 21551.2-2020 (Anti-bacterial and cleaning function for household and similar electrical appliances-Particular requirements of material)	materials antibacterial performance part and component antibacterial performance of Material mildew-proof performance part and component mildew-proof performance Anti-allergen performance Anti-virus performance	49
		GB/T 20944.1-2007(Textiles - Evaluation for antibacterial activity - Part 1: Agar diffusion plate method)	Anti-bacterial performance (Agar diffusion plate method)	50
		GB/T 20944.2-2007 (Textiles - Evaluation for antibacterial activity - Part 2: Absorption method)	Anti-bacterial performance (Absorption method)	51
		GB/T 20944.3-2008(Textiles - Evaluation for antibacterial activity - Part 3: Shake flask method)	Anti-bacterial performance (Shake flask method)	51
Activated carbon	China	GB/T 7702 (Standard test method for granular activated carbon from coal)	Moisture content Intensity Packing density Methylene blue adsorption capacity Iodine adsorption capacity Carbon tetrachloride adsorption capacity Ash content PH value	51-52

\* The standard in black fonts refers to that FFT has testing capabilities.

\* The standard in gray fonts refers to that FFT does not have testing capabilities.



## Raw material development-water filtration

APPLICATION	COUNTRY	STANDARD	TEST	PAGE
Activated carbon	China	GB/T 12496 (Test method of wooden activated carbon)	Apparent density	54-55
			Particle distribution	
			Ash content	
			Moisture content	
			Carbon tetrachloride adsorption rate	
			PH value	
			Iodine adsorption capacity	
Rubber Ring	China	GB/T 531.1-2008 (Rubber vulcanized or thermoplastic - Determination of indentation hardness - Part 1: Durometer method (Shore hardness))	Hardness	55
RO membranes	China	GB/T 32373-2015 (Test methods for reverse osmosis membranes)	Flow Desalination rate Pressure resistance Thickness uniformity	55
Permeate water guiding/ concentration water feed filter	China	GB/T 24218.1-2009 (Textiles - Test methods for nonwovens - Part 1: Determination of mass per unit area)	Weight(g)	55
		GB/T 24218.2-2009 (Textiles - Test methods for nonwovens - Part 2: Determination of thickness)	Thickness	56
Outer protective film	China	GB/T 7125-2014 "Test method for thickness of adhesive tapes"	Thickness	56
		GB/T 2792-2014 (Measurement of peel adhesion properties for adhesive tapes)	Peeling force	56
		GB/T 4851-2014 (Measurement of static shear adhesion for adhesive types)	Stickiness	56
		GB/T 4852-2002 (Test method for tack of pressure sensitive adhesive tapes by rolling ball)	Initial adhesion	56
		GB/T 30776-2014 (Measurement of break strength and elongate at break for adhesive tapes)	Tensile breaking strength and breaking elongation rate	56
Glue	China	GB/T 2794-2013 (Determination for viscosity of adhesives - Single cylinder rotational viscometer method)	Adhesion	57
		GB/T 2793-1995 (Test method for nonvolatile content of adhesives)	Non-volatile content	57
		GB/13354-2012 (Test method for density of adhesives in fluid form)	Density	57
Metal	China	GB/T 10125-2012 (Corrosion tests in artificial atmospheres - Salt spray tests)	Corrosion resistance	57

\* The standard in black fonts refers to that FFT has testing capabilities.

\* The standard in gray fonts refers to that FFT does not have testing capabilities.

### GB 19083-2010 (TECHNICAL REQUIREMENTS FOR PROTECTIVE FACE MASK FOR MEDICAL USE)

It is drafted and issued by the Beijing Institute Of Medical Device Testing. It is applicable to medical protective masks to filter particles in the air, and self-priming filter medical protective mask for blocking droplets and blood.

### GB 2626-2019 "RESPIRATORY PROTECTION—NON-POWERED AIR-PURIFYING PARTICLE RESPIRATOR"

It was drafted and issued by Sinosteel Wuhan Institute of Safety and Environmental Protection Co., Ltd., Academy of Military Sciences Chemical Defense Research Institute and 3M China Co., Ltd. It is applicable to anti-particle self-priming filter type respirator, specifies the test of the resistance and filtration efficiency.

#### Resistance

Resistance is an important indicator for evaluating the filter material, the resistance of filtering material greatly determines the resistance of the filter.

#### Filtration efficiency

The filtration efficiency is also an important indicator for evaluating the grade of the filter material. At present, NaCl aerosol is used as the test dust source.



## GB/T 21551.2-2020 (ANTI-BACTERIAL AND CLEANING FUNCTION FOR HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES-PARTICULAR REQUIREMENTS OF MATERIAL)

It is applicable to test and effect evaluation of antibacterial, mildew-proof, anti-allergen and anti-viral of parts used in home appliances.

Drafted by Freudenberg Apollo.

### Materials anti-bacterial performance

By quantitatively inoculating bacteria on the tested sample and the compared sample, using a film or other applicable methods to make the bacteria evenly contact the sample. After a certain incubation period, calculate the antibacterial rate and antibacterial logarithmic value, basing on the amount of viable bacteria remaining in the two sets of samples. The antibacterial rate of the material should not be less than 90.0% (the antibacterial logarithm is not less than 1.0).

### Parts & components anti-bacterial performance

By quantitatively inoculating bacteria on specified parts of tested sample, and the compared sample, to make the bacteria evenly contact the sample. After a certain incubation period, calculate the antibacterial rate and antibacterial logarithmic value, basing on the amount of viable bacteria remaining in the two sets of samples. The antibacterial rate of the material should not be less than 90.0% (the antibacterial logarithm is not less than 1.0).

### Material mildew-proof performance

Spray a certain amount of spore suspension on the tested sample and the culture medium, and evaluate the mildew-proof performance by directly observing the mildew growth. The mildew-proof material should be graded into 1 or 0.

### Part and component mildew-proof performance

Spray a certain amount of spore suspension on the tested sample, and evaluate the mildew-proof performance by directly observing the mildew growth. The mildew-proof material should be graded into 1 or 0.

### Anti-allergen performance

By quantitatively inoculating allergen on tested sample, to make the allergen evenly contact the sample. After a certain incubation period, calculate the anti-allergen rate, basing on the amount of allergen remaining in the two sets of samples. The Anti-allergen of the material and components should not be less than 90.0%.

### Anti-virus performance

By quantitatively inoculating virus on tested sample, to make the virus evenly contact the sample. After a certain incubation period, calculate the Anti-virus rate and anti-virus logarithm, basing on the amount of virus remaining in the two sets of samples. The Anti-virus of the material and components should not be less than 90.0%.(the antibacterial logarithm is not less than 1.0).

### Test ability

CNAS can test the anti-bacterial of Escherichia coli and Staphylococcus aureus

### Test ability

CNAS can test the antibacterial properties of Escherichia coli and Staphylococcus aureus

### Test ability

CNAS can test the Anti-allergen performance against Derf1 mite

## GB/T 20944.1-2007(TEXTILES - EVALUATION FOR ANTIBACTERIAL ACTIVITY - PART 1: AGAR DIFFUSION PLATE METHOD)

It specifies to use Agar diffusion plate method to test and evaluate methods the antibacterial performance of textiles. It applies to woven fabrics, knitted fabrics, non-woven fabrics and other plate fabrics. Fiber, yarn, etc. can be implemented by reference.

### Anti-bacterial performance (Agar diffusion plate method)

Anti-bacterial function of products.

### Test ability

CNAS can test the anti-bacterial performance of Escherichia coli/Staphylococcus aureus.

Width of anti-bacterial zone	Bacteria growth on tested sample	Description	Comment
>1	No	Width>1mm, No Bacteria growth	Excellent
0~1	No	Width<1mm, No Bacteria growth	
0	No	Without anti-bacterial zone, No Bacteria growth	
0	A few	Without anti-bacterial zone, only a few colonies, reproduction is almost inhibited	Good

Width of anti-bacterial zone	Bacteria growth on tested sample	Description	Comment
0	Medium	Without anti-bacterial zone, the growth reduced to half compared to another sample	General
0	A lot	Without anti-bacterial zone, the growth reduced slightly compared to another sample.	No effect

## GB/T 20944.2-2007 (TEXTILES - EVALUATION FOR ANTIBACTERIAL ACTIVITY - PART 2: ABSORPTION METHOD)

It specifies the quantitative test and evaluation for measuring the antibacterial performance of textiles by the absorption method. It applies to various textile products such as down, fiber, yarn, fabric and products.

### Antibacterial performance(Absorption method)

The product has the ability to inhibit the reproduction of bacteria. When the antibacterial value > 1 or the antibacterial rate > 90%, the antibacterial effect is valid. When the antibacterial value > 2 or the antibacterial rate > 99%, the antibacterial effect is good.

### Test ability

CNAS can test the anti-bacterial performance of *Escherichia coli*/*Staphylococcus aureus*.

## GB/T 20944.3-2008(TEXTILES - EVALUATION FOR ANTIBACTERIAL ACTIVITY - PART 3: SHAKE FLASK METHOD)

It specifies the quantitative test and evaluation for measuring the antibacterial performance of textiles by the Shake flask method. It applies to various textile products such as down, fibers, yarns, fabrics, and products with special shapes, and is especially suitable for non-dissolvable antibacterial textile.

### Antibacterial performance (Shake flask method)

Textiles have the ability to inhibit the reproduction of bacteria. The standard requires that the bacteriostatic rate of *Staphylococcus aureus* and *Escherichia coli* should be >70%, or anti-*Candida albicans* should be >60%, in order to claim that the sample has an antibacterial effect.

### Test ability

CNAS can test the antibacterial performance of *Escherichia coli*/*Staphylococcus aureus*.

## GB/T 7702(STANDARD TEST METHOD FOR GRANULAR ACTIVATED CARBON FROM COAL)

It was drafted by Shanxi Xinhua Chemical Plant and is applicable to coal-based granular activated carbon. The test standard is divided into 20 sections, 8 sections can be carried out in CNAS. The standard regulates the test method of coal granular activated carbon, the required equipment, measurement procedures, and result processing etc.

### Moisture content

Standardize the measurement of the moisture content determination by coal granular activated carbon, including the required equipment, measurement procedures, and result processing etc.

### Intensity

Standardize the measurement of the Intensity determination by coal granular activated carbon, including the required equipment, measurement procedures, and result processing etc. Under specified conditions, the sample is placed in a drum with steel balls, and the sample is mechanically rotated by the drum. When sample is fray, measure the change of the particle size of sample by using the retained weight accounting the percentage for initial weight. This is sample strength.

### Packing density

Standardize the measurement of packing density by coal granular activated carbon, including the required equipment, measurement procedures, and result processing etc.

### Methylene blue adsorption capacity

Standardize the measurement and principle for the adsorption capacity determination of methylene blue by coal granular activated carbon, including the required equipment, measurement procedures, and result processing etc.

Under the specified test conditions, after the activated carbon fully adsorbs methylene blue solution, when the remaining concentration of the methylene blue solution reaches the specified range, the milligrams of methylene blue absorbed per gram of activated carbon.

The methylene blue adsorption capacity is used to indicate the decolorization ability of activated carbon, and the decolorization ability of activated carbon can be reflected by the methylene blue value.

### Iodine adsorption capacity

Standardizes the measurement for iodine adsorption capacity determination by coal granular activated carbon, including the required equipment, measurement procedures, and result processing etc.

Principle: Under the specified conditions, after a quantitative sample and an iodine standard solution are fully oscillated and adsorbed, the remaining iodine content of the solution is determined by titration, the milligrams of iodine adsorbed by each sample is calculated, and draw an adsorption isotherm. The iodine adsorption capacity of activated carbon is indicated by the amount of iodine adsorbed per gram of sample, when the remaining iodine concentration is 0.02mol/L.

Iodine adsorption capacity is used to indicate the adsorption capacity of activated carbon for liquid substances. That means, the activated carbon with micropores larger than 1.0nm, while the size of the iodine molecule is about 0.6nm, it is also the performance of activated carbon's ability to adsorb small molecule impurities.

### Carbon tetrachloride adsorption rate

Standardize the measurement for the carbon tetrachloride adsorption rate by coal granular activated carbon, including the required equipment, measurement procedures, and result processing etc.

Principle: Under the specified test conditions, a mixed air stream containing a certain concentration of carbon tetrachloride vapor continuously passes through the activated carbon. When the activated carbon reaches adsorption saturation, the amount of the carbon tetrachloride adsorbed by the activated carbon sample accounts the percentage for the initial sample. The percentage is used as the carbon tetrachloride adsorption rate.

The carbon tetrachloride adsorption capacity is used to indicate the adsorption capacity of activated carbon for gas substances. The test of carbon tetrachloride adsorption rate is one of the gas phase evaluation standard for granular activated carbon.

### Ash content

Standardize the measurement and principle of ash content by coal granular activated carbon, including the required equipment, measurement procedures, and result processing etc.

### PH

Standardize the measurement for pH by coal granular activated carbon, including the required equipment, measurement procedures, and result processing etc.





## GB/T 12496 (TEST METHOD OF WOODEN ACTIVATED CARBON)

The series standards for wooden activated carbon test methods are the basis for the detection of activated carbon performance indicators. To make quality standards for activated carbon, there must be corresponding test standards. This standard was drafted by the Forest Products Research Institute of the National Academy of Forestry and is applicable to wooden activated carbon. The test standard is divided into 22 sections, 9 sections can be executed in CNAS. The standard specifies the tests for wooden activated carbon, the required equipment, measurement procedures, and result processing etc.

### Apparent density

Standardize the determination method of measuring apparent density by wood activated carbon, including the required equipment, measurement procedures, and result processing etc.

### Particle distribution

Standardize the measurement method of determining the particle distribution by wood granular activated carbon, including the required equipment, measurement procedures, and result processing etc.

### Ash content

Standardize the measurement method and principle of determining ash content by wood activated carbon, including the required equipment, measurement procedures, and result processing etc.

### Moisture content



Standardize the measurement method of determining the moisture content by wood activated carbon, including the required equipment, measurement procedures, and result processing etc.

### Carbon tetrachloride adsorption rate

Standardizes the measurement method for determining carbon tetrachloride adsorption rate by wooden activated carbon, including the required equipment, measurement procedures, and result processing etc. Principle: same as coal activated carbon

The carbon tetrachloride adsorption value is used to indicate the adsorption capacity of activated carbon for gas substances. The carbon tetrachloride adsorption rate test is one of gas phase evaluation standard for granular activated carbon.

The tested result by this method is actually the gold degree to the pore volume of the activated carbon sample. The test is a method to determine the activation level of activated carbon, therefore it is also an effective method for quality control of gas-phase activated carbon, or a measurement of adsorption efficiency under other operating conditions.

### Intensity

Standardizes the measurement method for determining the activated carbon Intensity by wood activated carbon, including the required equipment, measurement procedures, and result processing etc.

Principle: same as coal activated carbon.

### PH



Standardize the measurement method of determining the PH value by wood activated carbon, including the required equipment, measurement procedures, and result processing etc.

### Iodine adsorption capacity

Standardize the measurement method of determining the iodine adsorption capacity by wood granular activated carbon, including the required equipment, measurement procedures, and result processing etc.

Principle: After a certain amount of sample and iodine solution are adsorbed by shaking, take the filtrate after filtering, and use remaining iodine of 0.02mol/L concentration after titrating the filtrate with sodium thiosulfate solution. The amount of iodine(g) adsorbed by sample is specified as the adsorption capacity.

Iodine adsorption capacity is used to indicate the adsorption capacity of activated carbon for liquid substances. That means, the activated carbon with micropores larger than 1.0nm, while the size of the iodine molecule is about 0.6nm, it is also the performance of activated carbon's ability to adsorb small molecule impurities.

### Methylene blue adsorption capacity

Standardize the measurement method and principle for determining methylene blue adsorption capacity by coal granular activated carbon, including the required equipment, measurement procedures, and result processing etc.

Principle: same as coal activated carbon.

The methylene blue adsorption capacity is used to indicate the decolorization ability of activated carbon, and the decolorization ability of activated carbon can be reflected by the methylene blue capacity.



### GB/T 531.1-2008 (RUBBER VULCANIZED OR THERMOPLASTIC - DETERMINATION OF INDENTATION HARDNESS - PART 1: DUROMETER METHOD )(SHORE HARDNESS)

It is applicable to the evaluation of rubber ring raw materials, and regulates the hardness measurement method of the rubber ring, including the required equipment, equipment verification, and measurement procedures.

### GB/T 32373-2015 (TEST METHODS FOR REVERSE OSMOSIS MEMBRANES)

It is applicable to the evaluation of RO membrane raw materials. The flux, desalination rate, pressure resistance, thickness uniformity test and other parameters specified in the standard are the core indicators for evaluating RO membranes.

#### Test ability

Currently, CNAS has one set of RO membrane testing system.



### GB/T 24218.1-2009 (TEXTILES - TEST METHODS FOR NONWOVENS - PART 1: DETERMINATION OF MASS PER UNIT AREA)

It is applicable to the evaluation of RO membrane raw materials. The flux, Desalination rate, pressure resistance, thickness uniformity test and other parameters specified in the standard are the core indicators for evaluating RO membranes.

#### Test ability

Currently, CNAS has a set of RO membrane testing system.



### GB/T 24218.2-2009 (TEXTILES - TEST METHODS FOR NONWOVENS - PART 2: DETERMINATION OF THICKNESS)

#### PERMEATE WATER GUIDING/CONCENTRATION WATER FEED FILTER

It is applicable to the evaluation of raw materials of permeate water guiding cloth /concentration water feeding filter, regulates their measure method , including the required equipment, measurement procedures, and result processing etc.

### GB/T 7125-2014 (TEST METHOD FOR THICKNESS OF ADHESIVE TAPES)

It is applicable to the evaluation of outer protective film raw materials, and regulates the thickness measurement method of outer protective film, including the required equipment, measurement procedures, and result processing etc.

### GB/T 2792-2014 (MEASUREMENT OF PEEL ADHESION PROPERTIES FOR ADHESIVE TAPES)

It is applicable to the evaluation of the outer protective film raw materials, and it regulates the method for measuring the peeling force of the outer protective film, including the required equipment, measurement procedures, and result processing etc.

### GB/T 4851-2014 (MEASUREMENT OF STATIC SHEAR ADHESION FOR ADHESIVE TYPES)

It is applicable to the evaluation of the outer protective film raw materials, and it regulates the method for measuring the stickiness of the outer protective film, including the required equipment, measurement procedures, and result processing etc.

### GB/T 4852-2002(TEST METHOD FOR TACK OF PRESSURE SENSITIVE ADHESIVE TAPES BY ROLLING BALL)

It is applicable to the evaluation of the outer protective film raw materials, and it regulates the method for measuring the stickiness of the outer protective film, including the required equipment, measurement procedures, and result processing etc.

### GB/T 30776-2014 (MEASUREMENT OF BREAK STRENGTH AND ELONGATE AT BREAK FOR ADHESIVE TAPES)

It is applicable to the evaluation of the outer protective film raw materials, and it regulates the determination method of the tensile breaking strength and breaking elongation rate of the outer protective film, including the required equipment, measurement procedures, and result processing etc.

### GB/T 2794-2013 (DETERMINATION FOR VISCOSITY OF ADHESIVES - SINGLE CYLINDER ROTATIONAL VISCOMETER METHOD)

It is applicable to the evaluation of the glue raw materials, and it regulates the method for measuring the stickiness of the glue, including the required equipment, measurement procedures, and result processing etc.

### GB/T 2793-1995 (TEST METHOD FOR NONVOLATILE CONTENT OF ADHESIVES)

It is applicable to the evaluation of the glue raw materials, and it regulates the method for measuring the Non-volatile volume of the glue, including the required equipment, measurement procedures, and result processing etc.

### GB/T13354-1992 (TEST METHOD FOR DENSITY OF ADHESIVES IN FLUID FORM)

It is applicable to the evaluation of the glue raw materials, and it regulates the method for measuring the density of the glue, including the required equipment, measurement procedures, and result processing etc.

### GB/T 10125-2012 (CORROSION TESTS IN ARTIFICIAL ATMOSPHERES - SALT SPRAY TESTS)

It is applicable to the evaluation of the metal raw materials, and it regulates the method for measuring the corrosion resistance of the metal, including the required equipment, measurement procedures, and result processing etc.



## FILTER SELECTION



## Standards for consumer filtration products- filter selection

APPLICATION	COUNTRY	STANDARD	TEST	PAGE
Filter	China	GB/T 14295-2019 (Air filter)	Resistance efficiency	59
	USA	IEST-RP-CC001.6-2016 HEPA AND ULPA FILTER	Resistance efficiency	59
	/	FAFT standard(drafting)	Odor test	59
	Germany	VDA270(Determination of the odour characteristics of trim materials in motor vehicles)	Odor test	60

\* The standard in black fonts refers to that FFT has testing capabilities.

\* The standard in gray fonts refers to that FFT does not have testing capabilities.

### GB/T 14295-2019 (AIR FILTER)

It was drafted by the China Academy of Building Research, and it specifies the quality requirement and tests for ventilation, air conditioning and air purification systems or equipment with air filter.

Drafted by Freudenberg Apollo.

### IEST-RP-CC001.6-2016 HEPA AND ULPA FILTER

It is recommended by The American Association for Contamination Control(AACC), standardizing the ULPA filters test methods of air filtering efficiency and resistance performance.

#### Resistance

Resistance is an important index to evaluate the filter, It directly affects the performance of PCADR, FCADR, noise, etc. after installed in the machine.

#### Filtration efficiency

The filtration efficiency is also an important indicator for grading a filter. Atmospheric dust is used as the tested dust source. It directly affects the performance of PCADR after installed in the machine.

### FAFT STANDARD(DRAFTING)

It is for FAFT to regulate the odor control of products. It specifies the odor evaluation and control method of filter from the raw material selection to finished product deliver. This standard is applicable to the odor evaluation of incoming materials, semi-finished products and finished filters related to air purifiers, air conditioners, ventilation purifier.

## VDA270 (DETERMINATION OF THE ODOUR CHARACTERISTICS OF TRIM MATERIALS IN MOTOR VEHICLES)

It is applicable to determine the odor emission performance of automotive interior materials under certain temperature and climatic conditions. Odor characteristics are the tendency of odor volatile-substances, under certain temperatures and climates in a certain period.

### Test schemes

Individual test scheme for three types of sampl

SCHEMES	EXAMPLE	CONTAINER SIZE	
		1L	2L
A	Component (small size): such as collet chuck, plug, takeover	(10 ± 1) g	(30 ± 3) g
B	Component (Medium size): such as hand guards, ashtrays, shift lever dust covers, sun visors, etc.	(20 ± 2) cm <sup>3</sup>	(60 ± 6) cm <sup>3</sup>
C	Materials (for the large area): such as thermal insulation materials, films, leather, interlining, Palmer materials, carpets, etc.	(50 ± 5) cm <sup>3</sup>	(150 ± 15) cm <sup>3</sup>

SCHEMES	TEMPERATURE	STORAGE TIME
1	(23 ± 2) °C	(24 ± 1)h
2	(23 ± 2) °C	(24 ± 1)h
3	(80 ± 2) °C	2h ± 10min

### Grading

The odor evaluation standards are divided into 1-6 levels, and situation between the two evaluation levels is allowed

Level 1	Odorless
Level 2	Smell, but not irritating
Level 3	Obvious smell, but not irritating
Level 4	Irritating smell
Level 5	Strong irritating smell
Level 6	Unbearable smell







**FREUDENBERG FILTRATION TECHNOLOGIES CO., LTD. TEST CENTER**

Address: No.9, chaogui road, ronggui national hi-tech park, shunde district,  
foshan city, guangdong province

Tel.: 0757-26380818 +86 139 2912 1362

Fax: 0757-26380812 Post code: 528303

E-mail: Charles.Zhu@freudenberg-apollo.com

