GB 2626 - 2006

Respiratory protective equipment

Non-powered air-purifying particle respirator

Contents

Foreword

This standard is mandatory in its entirety.
This standard is proposed by the State Administration of Safety and Production Supervision.
This standard is under the authority of the National Technical Committee for Standardization of Individual Protective Equipment (SAC/TC 112).

1 Scope

This standard specifies the technical requirements, testing methods and marking of self-suction filtered anti-particulate respirators.
This standard is applicable to self-absorption filtered respiratory protection products for the protection of various types of particulate matter.
This standard does not apply to respiratory protection against harmful gases and vapours. This standard does not apply to respiratory protection for anoxic environments, underwater operations, escape and firefighting.

2 Normative references

The provisions in the following documents become the provisions of this standard by reference to this standard. All subsequent revisions (excluding errata) or revisions of dated references shall not apply to this standard, however, parties agreeing to this standard are encouraged to explore the possibility of using the latest version of these documents. The latest version of an undated reference document applies to this standard.

GB/T 2891: Performance test method for filtered gas mask
GB/T 5703: Basic anthropometric project for technical design
GB/T 10586: Thermal test chamber technical conditions
GB/T 10589: Technical conditions of the cryogenic test chamber
GB/T 11158: High-temperature test chamber technical conditions
GB/T 18664-2002: Selection, use and maintenance of respiratory protection

3 Terms and definitions: The following terms and definitions apply to this standard

3.1 Particle
Solid, liquid, or solid and liquid granular matter such as dust, smoke, fog, and microorganisms suspended in the air. [GB/T 18664-2002, definition 3.1.15]

3.2 Dust
Tiny solid particles suspended in the air, generally produced by the mechanical force of solid materials broken. [GB/T 18664-2002, definition 3.1.16]

3.3 Fume
Tiny solid particles suspended in air, generally produced by gas or vapour cooling and usually smaller in size than dust. [GB/T 18664-2002, definition 3.1.17]

3.4 Mist
tiny droplets suspended in air. [GB/T 18664-2002, definition 3.1.18]

3.5 Microorganism
Microscopic organisms in nature that are small, simple in structure, not directly observable by the eye and must be seen under an optical or electron microscope.

3.6 Non-powered air-purifying respiratory protective equipment
Filtered respiratory protection that relies on the wearer's breath to overcome airflow resistance of the components. [GB/T 18664-2002, definition 3.1.3]

3.7 Tight-fitting face mask
A mask that covers the nose and mouth, a mask that is close to the face, or a mask that covers the eyes, nose and mouth, a mask that is close to the head and face. Close fitting masks are divided into half masks and full masks. [GB/T 18664-2002, definition 3.1.5]

3.8 Half face mask
A dense mask that can cover the mouth and nose, or cover the mouth, nose and jaw.

3.9 Full face mask
Close fitting mask that covers the mouth, nose, eyes and jaw.

3.10 Disposable face mask
Mainly by the filter media constitutes the main body of the mask of the non-removable half-mask, with or without an expiratory valve, generally can not be cleaned again, any failure of parts should be discarded.

3.11 Replaceable face mask

A closed face mask with single or multiple replaceable filter elements, with or without a breathing valve, with or without a breathing tube.

3.12 Inhalation valve

A check valve on respiratory protection that allows only respirable gases to enter the mask and prevents exhaled breath from being expelled through it.

3.13 Exhalation valve

The check valve on respiratory protection allows only exhaled gas to exit the mask through it, preventing inhaled gas from entering the mask through it.

3.14 Breathing hose

Soft, air-tight air guide tube for connecting the mask to the filter element.

3.15 Filter element

Filtered respiratory protection used for filtering materials or filtration components that remove harmful substances from inhaled air.

Examples: canisters (per cartridge), dust cartridges, filter media, etc.

[GB/T 18664-2002, definition 3.1.22]

3.16 Filter efficiency

The percentage of particulate matter removed by the filter element under the specified test conditions.

3.17 Total inward leakage

The ratio of the concentration of the simulant leaking into the mask from all mask components, including the filter element, during inhalation by the subject to the concentration of the simulant in the inhaled air, expressed as a percentage, under laboratory prescribed test conditions.

3.18 Inward leakage rate

The ratio of the concentration of simulant leaking into the mask from all parts of the mask other than the filter element to the concentration of simulant in the inhaled air, expressed as a percentage, under laboratory defined test conditions.

3.19 Dead space

The volume of gas re-inhaled from the previous exhalation, expressed as the volume fraction of carbon dioxide in the inhaled gas.

3.20 Head harness

The part used to hold the mask to the head.

4 Classification and labelling

4.1 Classification of masks

The masks are divided into disposable masks, replaceable half masks and full masks according to their construction.

4.2 Classification of filter elements

The filtration element is divided into two categories, KN and KP according to the filtration performance, KN category is only suitable for filtering non-oily particles, KP category is suitable for filtering oily and non-oily particles of filter elements.

4.3 Filter element levels

According to the level of filtration efficiency, the filter elements are graded according to Table 1.

Table 1 Filter elements level

Filter elements class / masks class	disposable masks	replaceable half masks	full masks
KN Type	KN90, KN95, KN100	KN90, KN95, KN100	KN95, KN100
KP Type	KP90, KP95, KP100	KP90, KP95, KP100	KP95, KP100

4.4 Marking

The filter element of disposable and replaceable masks should be marked with the grade, which is marked with the combination of the implementation of this standard number and year number and filter element type and grade.

Example 1: KN90 filter element marked GB 2626-2006 KN90

Example 2: KP00 filter element marked GB 2626-2006 KP100

5 Technical requirements

5.1 General requirements

5.1.1 Materials shall meet the following requirements.

a) Materials in direct contact with the face should be harmless to the skin.

b) The filter media shall be harmless to humans.

c) The materials used should have sufficient strength and should not break or deform during their normal service life.

5.1.2 The structural design shall meet the following requirements.

a) shall be resistant to structural damage and shall not be designed, composed and installed in a manner that poses any hazard to the user.

b) The headband should be designed to be adjustable, easy to wear and remove, should securely fasten the mask to the face, and should be worn without visible compression or pain, and the headband design of the replaceable half mask and full mask should be replaceable.

c) Should have as small a dead space and a large field of view as possible.

d) When worn, the lenses of the full hood should not be subject to conditions that affect vision, such as fogging.

e) Respiratory protection using replaceable filter elements, inspiratory and expiratory valves and headbands shall be designed to be easily replaceable and to enable the user to check the airtightness of the mask to the face at any time and easily.

f) The respiratory catheter should not restrict head movement or the movement of the user, should not interfere with the fit of the mask and should not restrict or obstruct airflow.

g) The disposable mask should be constructed to ensure a close fit to the face and should not be deformed during its service life.

5.2 Visual inspection, Inspection according to method 6.1

The surface of the sample should not be damaged, deformed and have obvious other defects, the material and structure of the parts should be able to withstand the normal conditions of use and the temperature, humidity and mechanical shock that may be encountered, the headband should be adjustable, the headband design of the replaceable mask should be replaceable, and the lens of the comprehensive mask should not appear to fog up when worn and other conditions that affect vision. Parts shall not be dislodged, damaged or deformed after pre-treatment with temperature and humidity and

mechanical strength pre-treatment according to method 6.2. The inspection should also include the logo and various information provided by the manufacturer.

5.3 Filtration efficiency

Class N filter elements are detected with sodium chloride (NaCl) particulate matter and Class P filter elements are detected with dioctyl phthalate (DOP) or equivalent oil particulate matter (e.g. paraffin oil).

Tested according to method 6.3

The filtration efficiency of each sample should always meet the requirements of Table 2 during the assay.

Table 2 Filtration efficiency for different samples

Types and levels of filter elements	Particulate matter detection with sodium chloride	Oil-based particle detection
KN90	≥90.0%	not applicable
KN95	≥95.0%	not applicable
KN100	≥99.97%	not applicable
KP90	not applicable	≥90.0%
KP95	not applicable	≥95.0%
KP100	not applicable	≥99.97%

5.4 Leakability

Tested according to method 6.4

When a respiratory catheter is available, it should be tested as part of the mask.

5.4.1 TIL for disposable masks

The TIL of the disposable mask shall meet the requirements of Table 3.

Table 3: TIL for disposable masks

Media level	TIL of at least 46 out of 50 movements when evaluated on the basis of TIL of each movement (i.e. 10 persons * 5 movements)	Overall TIL of at least 8 out of 10 subjects when evaluated on the basis of overall human TIL
KN90 or KP90	＜13%	＜10%
KN95 or KP95	＜11%	＜8%
KN100 or KP100	＜5%	＜2%

5.4.2 IL for replaceable half masks

When evaluated on an IL per action basis (i.e., 10 individuals * 5 actions), at least 46 of the 50 actions should have an IL less than 5%; and, when evaluated on an overall human IL basis, at least 8 of the 10 subjects should have an overall IL less than 2%

5.4.3 Full hood IL

When evaluated on the basis of IL per action (i.e. 10 persons * 5 actions), the IL per action should be less than 0.05%

5.5 Respiratory resistance

Tested according to methods 6.5 and 6.6.

Total inhalation resistance should not exceed 350 Pa and total exhalation resistance should not exceed 250 Pa per sample.

5.6 Breathing Valves

If there is an expiratory valve, the requirements of 5.6.1 and 5.6.2 shall be met.

5.6.1 Breathing valve air tightness

It shall be tested in accordance with Method 6.7.

Only half masks are detected. Each sample shall be free from the following

a) When the pumping flow rate has reached 500mL/min, the system negative pressure is less than 1180Pa.

b) Breathing valve to return to normal pressure time less than 20s

5.6.2 Breathing valve cover

Tested according to method 6.8.

The mask's exhalation valve cover shall not slip, break or deform when subjected to the axial tension specified in Table 4.

Table 4: Axial pulling force to be applied to the respiratory valve cover

Mask type	Disposable face mask	Replaceable mask
tensile strength	10N for 10S	50N for 10S

5.7 Dead space

Tested according to method 6.9.

When the dead space of the sample is expressed as a volume fraction of carbon dioxide in the inhaled gas, the mean value of the results should be no greater than 1%

5.8 Perspectives

Test according to method 6.10.

The field of view of the mask (including the filter element) shall meet the requirements of

Table 5.

Perspectives	Mask type		
	Half face mask	Window Type of full mask	
		large-eyed window	double-eye window
view from below	≥60°	not applicable	not applicable
general vision	not applicable	≥70%	≥70%
binocular vision	not applicable	≥80%	≥20%

5.9 Headbands

Tested according to the 6.11 method.

Each headband, buckle, and other adjusting parts of the mask shall not slip or break when subjected to the tension specified in Table 6.

Table 6: Tensile force to be applied to the headband

Mask type	disposable	Replaceable mask	Full mask
Tensile strength	10N for 10S	50N for 10S	150N for 10S

5.10 Connections and connecting parts

Test according to method 6.12.
Under the specified testing conditions, all connections and connecting parts between the replaceable filter element and the mask, between the breathing conduit and the filter element and the mask shall not slip, break or deform when subjected to the axial tension specified in Table 7.

Table 7: Axial tension to be withstood by the connection and connecting parts

Mask type	Replaceable half mask	Full mask
Tensile strength	50N for 10S	250N for 10S

5.11 Lenses

The lenses were tested according to method 6.13.
The lenses of each sample should not shatter or crack; the airtightness should then be tested according to 6.14 and the requirements of 5.12 should be met

5.12 Airtightness

Tested according to method 6.14.
Under specified testing conditions, the negative pressure drop in each comprehensive hood should not be greater than 100 Pa within 60S.

5.13 Flammability

Testing according to the 6.15 method.
Parts exposed to the flame should not burn after being removed from the flame, and if they do, the duration of the combustion should not exceed 5S

5.14 Cleaning and disinfection

If the product is designed to be used for more than 1 work shift, the mask material should be able to withstand the manufacturer's recommended cleaning or disinfection treatments. Samples cleaned or disinfected shall meet the requirements of 5.4.

5.15 Information to be provided by the manufacturer

Check according to method 6.1.
The correctness of the information provided by the manufacturer shall be judged by reference to the relevant provisions of GB/T 18664.

5.15.1 The information provided by the manufacturer shall meet the following requirements
a) should be provided with the minimum sales package
b) should have a description in Chinese
c) should include the following information that users must know
1) Scope and limitations of application.
2) For replaceable filter elements, indicate the method of their use with a full single or half mask and, in the case of multiple media, indicate it.
3) The method of assembly of replaceable hoods.

4) Inspection method before use
5) Wearing method and airtightness check method
6) Advice on when to replace filter elements
7) If applicable, maintenance methods (e.g. cleaning and disinfection methods)
8) Storage methods
9) The meaning of any symbols and icons used.
d) Respond to any questions that may be raised during use. For example.
1) Suitability
2) Hair under the closed frame can cause the mask to leak
3) Air quality (pollutants, hypoxia, etc.)
e) The information should be clear, with helpful explanations, part numbers and notations.

5.16 Packaging

Inspection according to method 6.1
The packaging for sale should protect the product from mechanical damage and contamination prior to use.

6 Detection method

6.1 Superficial Inspection

As required by the respective technical requirements (see Appendix A), samples should be visually inspected prior to laboratory performance testing.

6.2 Pretreatment

6.2.1 Temperature and humidity pretreatment
6.2.1.1 Sample size and requirements
2 samples are untreated; or the quantity required by other assays
6.2.1.2 Detection equipment
a) The technical performance of the high-temperature test chamber should meet the requirements of GB/T 11158
b) The technical performance of the cryogenic test chamber should meet the requirements of GB/T 10589
c) The technical performance of the wet heat test chamber shall comply with the requirements of GB/T 10586
6.2.1.3 Detection methods
Note: The pretreatment method used should avoid thermal shock.
The samples are removed from the original packaging and processed in the following order
a) placed (24±1)H at (38±2.5)° C and (85±5)% relative humidity
b) placed (24±1)H at (70±3)° C in a dry environment
c) Placement (24±1)H at (-30±3)° C.
Allow the sample temperature to return to room temperature for at least 4H before performing a follow-up test.

6.2.2 Mechanical strength pretreatment
For replaceable filter elements only.
6.2.2.1 Sample quantity and requirements, 2 samples being untreated; or as required by other assay methods.
6.2.2.2 Detection equipment
The vibration test device is shown in FIG. 1. The device consists of a steel box, a steel platform, a cam and a drive and control system for placing the sample; the steel box is fixed on a vertically movable support, and the steel box is lifted 20mm by the rotation of the cam, and then falls on a steel platform by its own weight to produce a vibration; the mass of

the steel box shall be greater than 10kg, and the mass of the steel platform shall be at least 10 times the mass of the steel box; the cam rotation frequency is 100r/min.

6.2.2.3 Detection methods

Remove the sample from the package and the non-encapsulated filter element should be the minimum sales package.

Place the sample side inside the steel box; place in such a way that the samples in the assay do not come into contact with each other, allowing for a 6mm horizontal movement interval and a free vertical movement distance.

The duration of the vibration detection is about 20 min, making the total number of vibrations about 2000.

After the test is complete, a follow-up test is performed.

Figure 1: Schematic of the vibration test device

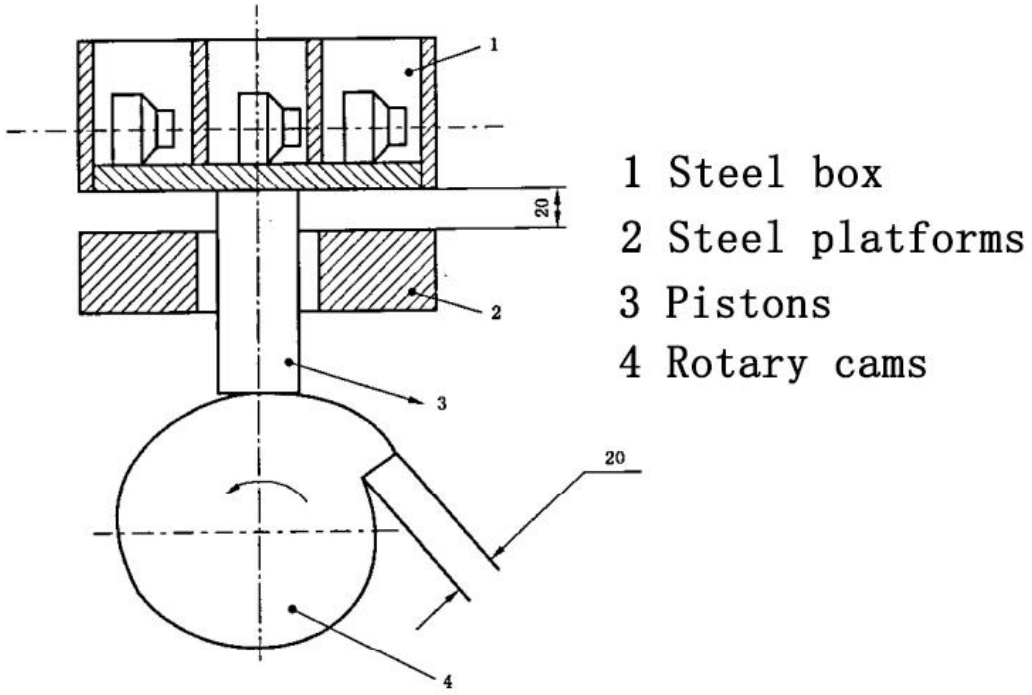


Figure 1: Schematic of the vibration test device

6.3 Filtration efficiency

6.3.1 Sample size and requirements

20 samples of replaceable filter elements and 15 samples of disposable masks. Ten of these shall be untreated samples, five shall be pretreated samples from 6.2.2 (if applicable) and five shall be pretreated samples from 6.2.1 and shall be placed in airtight packagings and tested in 10H.

6.3.2 Detection equipment

6.3.2.1 NaCl particulate matter filtration efficiency detection system

The main technical parameters are as follows

a) NaCl particulate matter concentrations not exceeding 200mg/m^3 with a median count diameter (CMD) of (0.075 ± 0.020)um and a geometric standard deviation of the particle size distribution not exceeding 1.86

b) The dynamics of the particle detector is (0.001~200)mg/m^3 with an accuracy of 1%.

c) The detection flow range is (30-100)L/min with 2% accuracy.

d) Filtration efficiency detection range of 0-99.999%

e) shall have a device capable of neutralizing the charge of the particulate matter as it occurs

6.3.2.2 Oily particulate matter filtration efficiency detection systems

The main technical parameters are as follows.

a) DOP or other applicable oils (e.g. paraffin oil) with a concentration of (50-200)mg/m^3 and a median count diameter (CMD) of (0.185±0.020)um, with a geometric standard deviation of the particle size distribution of not more than 1.60
b) The dynamic range of the particle detector is (0.001~200) mg/m^3 with an accuracy of 1%.
c) The detection flow rate is (30~100) L/min with 2% accuracy.
d) Filtration efficiency detection range of 0-99.999%
6.3.2.3 Testing conditions
The detection temperature conditions for KN type filter elements are (25±5)℃, relative humidity is (30±10)%, and the concentration of NaCl particles should not exceed 200mg/m^3.
The detection temperature condition of KP type filter element is (25±5)℃, the concentration of oily particles should not exceed 200mg/m3.
The detection flow rate is (85±4)L/min, if multiple filter elements are used, the flow rate should be divided equally; e.g., for dual filter element design, the detection flow rate of each filter element should be (42.5±2)L/min; if multiple filter elements may be used separately, the detection condition of a single filter element should be tested.

6.3.3 Detection methods
First adjust the filter efficiency test system to the test state and adjust the relevant test parameters.
Airtightly attach the disposable mask (if an exhalation valve is present, seal the exhalation valve) or filter element to the detection unit with an appropriate fixture. The initial filtering efficiency is recorded after the detection begins. Detection should continue until the filtration efficiency has reached a minimum point, or should continue until the filter media has accumulated on the (200±5)mg of particulate matter until; for KP filter media, if the amount of accumulated particulate matter on the filter media reaches (200±5)mg, but at the same time the efficiency has decreased, the detection should continue until the efficiency has stopped falling. Filtration efficiency results should be recorded continuously.

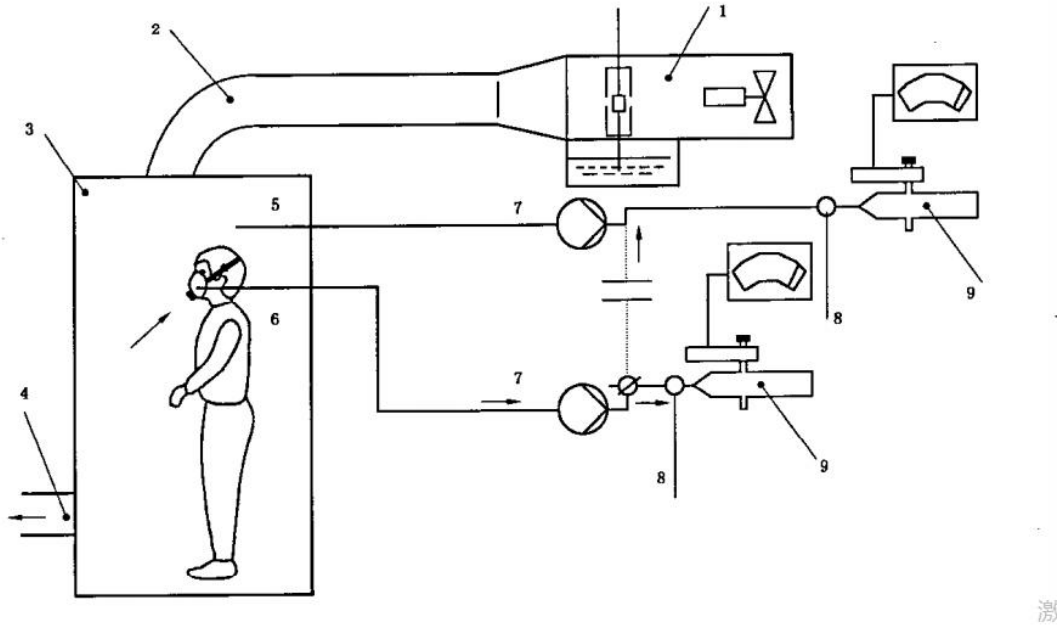
6.4 Leakability

6.4.1 Sample number and requirements
Disposable masks 10 samples; 5 of the samples were untreated and the other 5 were pretreated in accordance with 6.2.1. If the sample under test has a different number, there should be at least two samples per number.
Two samples of replaceable masks; one was untreated and the other was pretreated in accordance with 6.2.1. If the sample to be measured has a different number, each number shall have two samples; one untreated and the other pretreated according to 6.2.1.

6.4.2 Detection equipment
6.4.2.1 A diagram of the detection system is shown in Figure 2.
6.4.2.2 The test chamber shall have an airtight chamber with a large viewing window that is sized to allow the subject to complete the required action; it shall be designed so that the simulant is fed evenly from the top of the chamber and discharged at the lower part of the chamber by an exhaust port.
6.4.2.3 The modelling agent generator shall meet one of the following requirements.
a) NaCl particulate matter occurrence of air volume is not less than 100L/min, particulate matter concentration of (10±2)mg/m^3, in the effective space of the detection bin concentration changes should not be higher than 10%; the aerodynamic particle size distribution of particulate matter should be 0.02um~2um, the median mass warp is about 0.6um.
b) Oily particulate matter should be harmless to the human body, such as corn oil, paraffin oil, etc.; occurrence of air volume is not less than 100L/min, particulate matter concentration of (20~30)mg/m^3, in the effective space of the test chamber concentration changes should not be higher than 10%; particulate matter aerodynamic particle size distribution should be 0.02um ~ 2um, the median mass is about 0.3um. (Not suitable for the use of KN type filter element disposable mask TIL detection.)
6.4.2.4 The dynamic range of the particulate matter detector is (0.001-200)mg/m^3 with an accuracy of 1% and the response time of the detector shall be no greater than 500ms.

6.4.2.5 Sampling pump adjustment range is (0.50~4)L/min.

Figure 2: Schematic of the detection system for TIL and IL



1 Aerosol generator 2 Airway and deflector plate 3 Test chamber
4 Air vents 5 Samples of sampling tubes in the test chamber
6 Sampling tube for sample under test 7 Air pumps
8 Fresh air supplementation 9 Particulate matter detectors

6.4.3 Detection conditions

6.4.3.1 Prior to testing, samples shall be inspected and confirmed to be intact and not dangerous to the subject in accordance with Method 6.1.

6.4.3.2 Persons familiar with the use of such products shall be selected for testing. Ten beard-shaven subjects were selected whose facial shape was representative of the users of the product in question, taking into account differences in facial shape and gender, but should not include those with markedly abnormal facial shapes. The morphological length and width of the subjects were measured and recorded in accordance with GB/T 5703.

6.4.3.3 Particulate matter sampling flow rate should be controlled to (1~2)L/min

6.4.3.4 The sampling location of the particulate matter in the test chamber shall be in the active area of the subject's head; the sampling location of the particulate matter in the sample shall be as far as possible in the centerline of the subject's mouth, and the sampling tube shall be airtightly connected to the sample under test.

6.4.3.5 The subject shall first read the method of use of the sample under test and, if the sample under test has different numbers, select the most appropriate number for the subject as required. Subjects should also be aware of the testing requirements and methods.

6.4.3.6 When testing the leakage rate (IL) of replaceable half and full masks, replace the original filter element of the mask with a filter element of at least Class KP100 with an equivalent resistance.

6.4.4 Detection methods

The sampling tube should be installed as close to the front of the user's mouth and nose as possible; for disposable masks, the necessary measures should be taken to avoid the sampling tube from affecting the position of the mask during the test; if applicable, connect the KP100 grade filter element. Check the detection system to confirm that it is in normal working order.

Introduce the particulate matter into the test chamber so that it is at the required concentration.

The subject wears the sample in a clean air area, checks the airtightness of the wear according to the method of use, then connects the sampling tube to a particle detector, determines the background concentration in the mask when the subject breathes outside the test chamber, measures five data, and takes the arithmetic average as the background concentration.

The subject enters the testing room and connects the sampling tube to the particulate matter detector while avoiding contamination by particulate matter; the subject then completes the following actions in the sequence required by time.
1) Head still and silent for 2 minutes.
2) Turn the head left and right (about 15 times) to see the left and right walls of the test chamber for 2 min.
3) Look up and down (about 15 times) at the top and floor of the test chamber for 2 min.
4) Read a text aloud or speak aloud for 2 minutes.
5) Head still and not talking for 2 min.
The concentration of particulate matter should be measured in both the chamber and the mask at the same time for each action; generally, only the last 100S time zone of the action should be measured to avoid the crossover zone of the action. For each action, five data should be tested and an arithmetic average should be calculated as the result of that action.
The subject is allowed to adjust the mask worn during the assay, but the assay for that action must be redone.
For NaCl particulate matter detection, the total leakage rate and leakage rate are calculated according to formula (1).

$$TIL(IL) = \frac{(C - C_a)1.7}{C_0} * 100 \quad \text{.....(1)}$$

where.
C: Concentration of particulate matter in the mask during each action
Ca: concentration of particulate matter in the mask under test
C0: detect the concentration of particles in the warehouse during each operation
When using oil particulate matter detection, the total leakage rate and leakage rate are calculated according to formula (2).

$$TIL(IL) = \frac{C - C_a}{C_0} * 100 \quad \text{.....(2)}$$

6.5 Inhalation resistance

6.5.1 Sample number and requirements
4 samples, of which 2 were untreated and 2 were pretreated according to 6.2.1. If the sample to be measured has a different number, each number shall have two samples, one untreated and the other 6.2.1 pretreated.

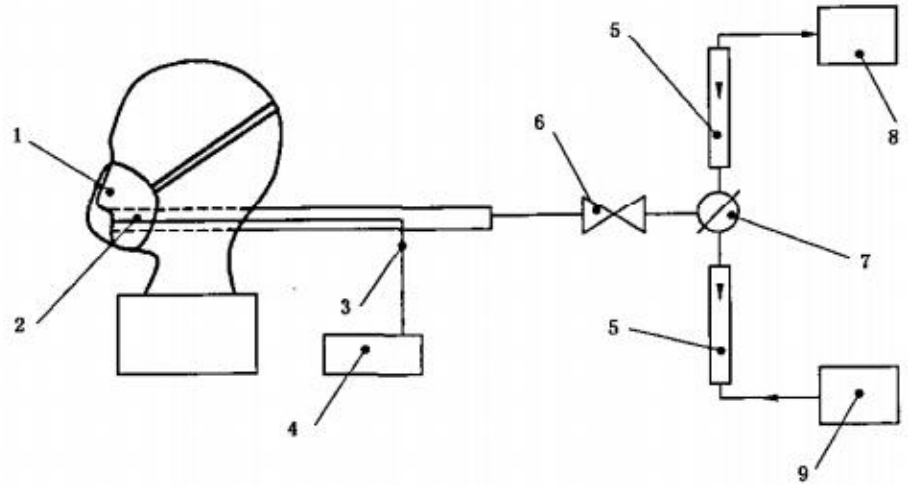
6.5.2 Testing equipment
6.5.2.1 See Figure 3 for an illustration of the inspiratory resistance detection device
6.5.2.2 Flow measurement ranges from 0 to 100L/min with 3% accuracy.
6.5.2.3 Micro-pressure measuring range 0 to 1000Pa, accuracy 1Pa
6.5.2.4 The test head die is equipped with a breathing tube at the mouth of the test head die, the main dimensions shall refer to the requirements of Appendix B, divided into three models: large, medium and small.
6.5.2.5 Pumping capacity not less than 100L/min.

6.5.3 Testing conditions
6.5.3.1 If applicable, the sample to be measured shall contain replaceable filter elements
6.5.3.2 Ventilation volume constant at (85±1)L/min

6.5.4 Detection methods
Check the airtightness and working condition of the detection device. Adjust the ventilation to (85±1)L/min and set the

system resistance of the test device to zero. Wear the sample on a matching test head mold, adjust the wearing position of the mask and the elasticity of the headband to ensure a tight fit between the mask and the test head mold. The ventilation was then adjusted to (85±1)L/min and inspiratory resistance was measured and recorded.

Figure 3 Schematic diagram of the inspiratory and expiratory resistance detection devices



1 Sample to be tested 2 Test head-molded breathing tube
3 Pressure measuring tube 4 Microbarometers 5 Flow meter
6 Control valves 8 Suction pump for inspiratory resistance testing
7 Switching valves 9 Air compressor for breath resistance testing

6.6 Breathing resistance

6.6.1 Sample number and requirements
4 samples, of which 2 were untreated and 2 were pretreated according to 6.2.1. If the sample to be measured has a different number, each number shall have two samples; one untreated and the other 6.2.1 pretreated.
6.6.2 Testing equipment
6.6.2.1 See Figure 3 for an illustration of the breath resistance detection device
6.6.2.2 Flow meter as in 6.5.2.2
6.6.2.3 Micro-pressure meter as in 6.5.2.3
6.6.2.4 Test head module as in 6.5.2.4
6.6.2.5 Air compressor discharge capacity not less than 100L/min

6.6.3 Testing conditions
Same as in 6.5.3

6.6.4 Detection methods
Check the airtightness and working condition of the detection device. Adjust the ventilation volume to (85±1)L/min and set the system resistance of the detection device to zero.
Place the sample on a matching test head mold and adjust the mask position and headband tension to ensure that the mask fits snugly into the test head mold. The volume of ventilation was then adjusted to (85±1)L/min, and inspiratory resistance was measured and recorded.

6.7 Breathing airtight

6.7.1 Sample size and requirements

4 samples, 2 were untreated and 2 were pretreated according to 6.2.1

6.7.2 Testing equipment

6.7.3 A diagram of the breath valve air tightness detection device is shown in Figure 4

6.7.3.1 The volume of the chamber is (150±10)mL

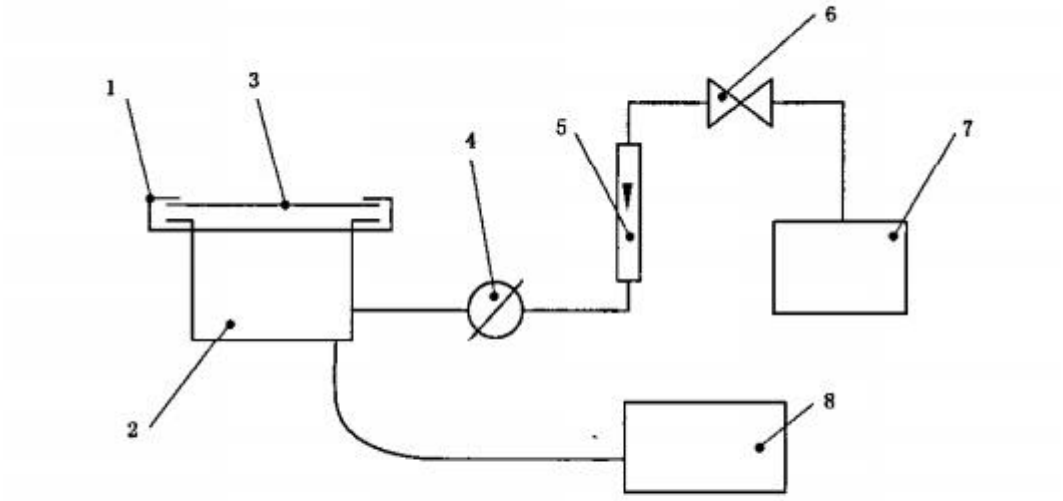
6.7.3.2 Micro-pressure measuring range 0 to 2000 Pa, accuracy 1Pa

6.7.3.3 Flow measurement ranges from 0 to 1000mL/min with 3% accuracy.

6.7.3.4 Timer accuracy of 0.1S

6.7.3.5 The vacuum pump pumping rate is about 2L/min.

Figure 4: Diagram of the airtightness testing device of the expiratory valve



1 Breath valve fixture 2 Fixed cavity

3 Airtight inspection cover 4 Control valves

5 Flow meter 6 Control valves 7 Vacuum pumps

8 Microbarometers

6.7.4 Testing conditions

6.7.4.1 Room temperature, atmospheric pressure, relative humidity should be less than 75%

6.7.4.2 The sample under test shall include the mask section connected to the expiration valve, which shall be kept clean and dry.

6.7.5 Detection methods

After sealing the cavity with an airtight inspection cover, pump the system to a negative pressure of 1180 Pa. No pressure changes should be observed for 2 min after closing the control valve.

Install the sample on the cavity and ensure a tight fit; close the control valve at a pumping rate of no more than 500mL/min to bring the system to a negative pressure of 1250Pa.

Start timing when the system's negative pressure drops to 1180 Pa and record whether the time it takes for the system to return to normal pressure is less than 20S.

6.8 Breath valve cover

6.8.1 Sample size and requirements

3 untreated samples

6.8.2 Testing equipment

6.8.2.1 Material tester measuring range 0~1000N, accuracy is 1%.

6.8.2.2 Clamps have appropriate construction and clamping degrees.

6.8.2.3 Timer accuracy 0.1S

6.8.3 Detection method

Secure the exhalation valve cover and the mask body of the sample to be measured separately with appropriate fixtures (the fixing point should be reasonably close to the corresponding connection). Start the material tester and apply the axial pull specified in Table 4 to record any fractures, slippage and deformation.

6.9 Dead Space

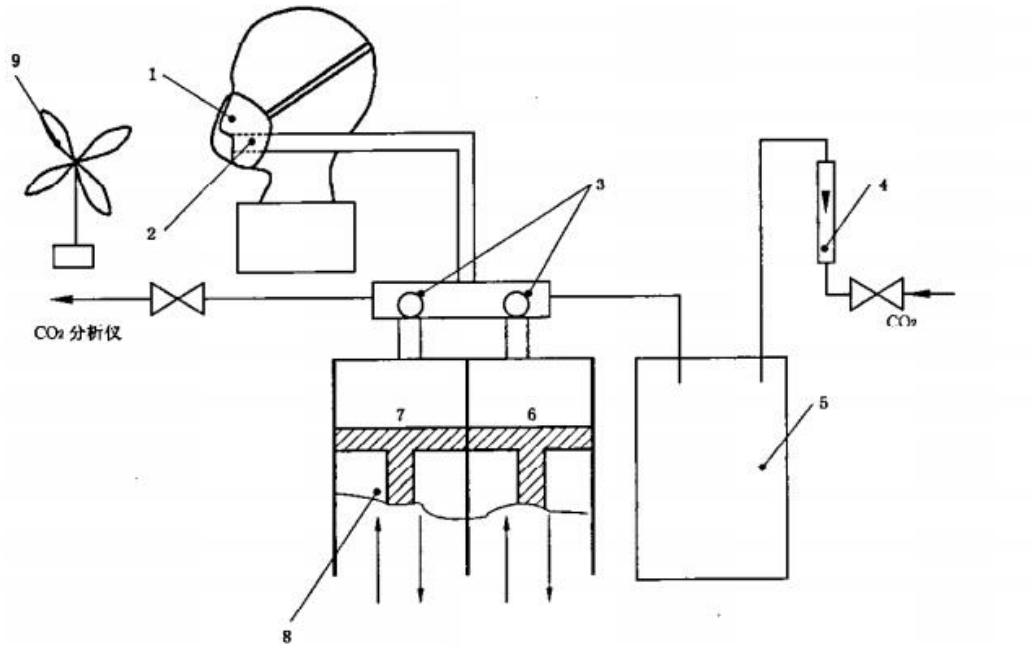
6.9.1 Sample size and requirements

Disposable mask, 3 untreated samples. Half mask or full mask, 1 untreated sample, or 1 untreated sample per number (if applicable).

6.9.2 Testing equipment

A diagram of the dead space (CO_2 content of inhalation gas) detection device is shown in Figure 5. In addition to the respiratory simulator, the total volume of the gas line of the detection device should not exceed 2000mL.

Figure 5: Schematic of a dead space detection device



1 Sample to be measured 2 Test head-molded breathing tube

3 Valves for simultaneous operation 4 CO_2 flowmeter 5 CO_2 gas storage bags

6/7 identical, synchronous moving cylinders

8 Respiratory Simulator 9 Electric fans

6.9.2.1 The test head is the same as 6.5.2.4.

6.9.2.2 The respiratory simulator simulates a respiratory rate adjustment range of (10-40) breaths/min and the simulated respiratory tidal volume adjustment range of (0.5-3.0) L

6.9.2.3 Carbon dioxide (CO_2) gas source CO_2 volume fraction is (5.0±0.1)%

6.9.2.4 CO_2 flowmeter The range is not less than 40L/min and the accuracy is Class 2.
6.9.2.5 CO_2 analytical instruments Range not less than 12% and accuracy not less than 0.1%
6.9.2.6 Anemometers, electric fans, etc.

6.9.3 Testing conditions
6.9.3.1 The test shall be carried out at room temperature; the room temperature range is 16℃ to 32℃.
6.9.3.2 The respiratory rate and tidal volume of the respiratory simulator should be set at 20 breaths/min and 1.5L, respectively
6.9.3.3 Adopt appropriate ventilation to ensure that the CO_2 concentration in the test environment is not higher than 0.1%, and that the detection point of CO_2 concentration in the environment is located approximately 1m in front of the sample under test.
6.9.3.4 If a disposable mask sample is to be tested, an electric fan should be applied to the side of the sample so that the air flow rate from the front of the mask is 0.5m/s.

6.9.4 Detection methods
Check the detection system to confirm that it is in normal working order. Take the necessary measures to wear the sample in an airtight manner on a matching test head die and to prevent deformation of the mask.
Turn on the dead space detector and continuously monitor and record the CO2 concentration in the inhalation gas and the test environment until a stable value is reached.
One test for each of the three samples of the disposable mask and three repeated tests for each sample of the half mask or full mask.
The test is valid only if the CO_2 concentration in the test environment is not greater than 0.1%, and the CO_2 concentration in the test environment should be deducted. The arithmetic average of three measurements of CO_2 concentration in the inhalation gas is taken.

6.10 Perspectives

Testing according to the methods specified in GB/T 2891

6.11 Headbands

6.11.1 Sample quantity and requirements
Two samples, one was untreated and the other was pretreated according to 6.2.1.
6.11.2 Testing equipment
Test equipment is identical to 6.8.2
6.11.3 Test method
Secure the headband (non-free end) and the mask body (reasonably close to the corresponding headband buckle connection) of the sample to be measured separately with clamps. Start the material testing machine and apply the tensile force specified in Table 6 to record any breakage and slippage.
Each end of the sample under test should be tested for band attachment sites and the results recorded.

6.12 Connections and connecting parts

6.12.1 Sample quantity and requirements
Two samples, one was untreated and the other was pretreated according to 6.2.1.
6.12.2 Testing equipment
Test equipment is identical to 6.8.2
6.12.3 Test method
Fix the connection parts of the sample and the mask body separately with appropriate clamps (the fixing points should be

reasonably close to the corresponding connection parts). Start the material tester and apply the axial pull specified in Table 7 to record any fractures, slippage and deformation.
Each connection and connecting part of the sample under test should be tested separately and the results recorded.

6.13 Lenses

6.13.1 Sample quantity and requirements
5 untreated samples
6.13.2 Testing equipment
6.13.2.1 The main dimensions of the test head mould shall refer to the requirements of Appendix B, and shall be divided into three sizes: large, medium and small.
6.13.2.2 Steel balls, 22mm in diameter and approximately 45g in weight, shall have a smooth surface.
6.13.3 Detection methods
The specimen is correctly worn on a matching test head mold, and the head mold is placed and secured with the lens up. Allow the steel ball to drop freely from a height of 1.3m to the centre of the lens and record whether there is a rupture.
Each lens of the sample under test should be tested separately and the results recorded.

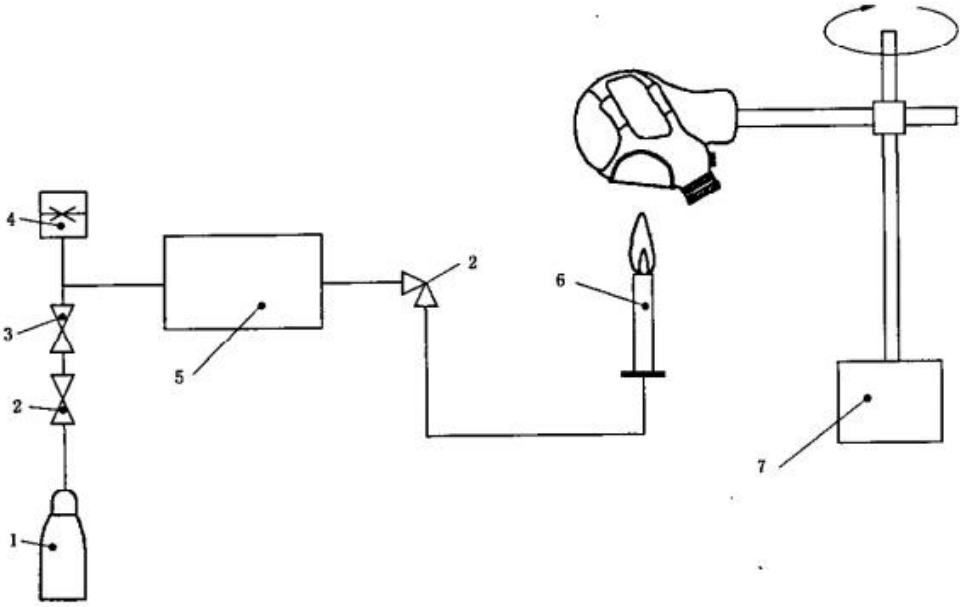
6.14 Airtightness

6.14.1 Sample size and requirements
All untreated samples, or quantities required by other testing methods.
6.14.2 Testing equipment
6.14.2.1 Test head die as in 6.5.2.4
6.14.2.2 Micro-pressure meter as in 6.7.3.2
6.14.2.3 Timer as in 6.7.3.4
6.14.2.4 Vacuum pump as in 6.7.3.5
6.14.3 Test method
Put the mask on the matching test head die, seal the inhalation valve and wet the exhalation que. Start the vacuum pump, make the negative pressure in the mask reach 1000Pa, stop pumping, start timing, observe and record the negative pressure drop in the mask within 60s.

6.15 Flammability

6.15.1 Sample size and requirements
Four disposable masks, two of which were untreated samples and two of which were 6.2.1 post-pretreatment samples.
Three half or full masks, one for the untreated sample and two for the 6.2.1 pretreated sample.
6.15.2 Testing equipment
The flammability detection device is schematically shown in FIG. 6. The detection device includes a metal head die mounted on a support, the height of the metal head die shall be adjustable for horizontal or circular motion, the displacement velocity or line velocity at the tip of the nose of the head die shall be (60±5)mm/s; the head die may pass over a propane burner in motion, the burner flame height shall be adjustable, the height shall be measured using an appropriate gauge, and the flame temperature shall be measured using a thermocouple of approximately 1.5mm diameter.

Figure 6: Diagram of a flammability detection device



1 Propane gas cylinder 2 Control valves
3 Pressure reducing valve 4 Pressure gauge
5 Flame check device 6 Burners
7 Rotary motors and speed controllers

6.15.3 Inspection methods

Place the sample on the metal head die and adjust the height of the die so that the vertical distance between the top of the burner and the lowermost end of the mask is (20±2)mm; then place the die outside the burner burning area.

After igniting the burner, adjust the flame so that the flame height is (40±4)mm and the flame temperature at the top of the burner (20±2)mm is (800±50)℃.

Activate the metal head die motion control to allow the sample to pass through the combustion zone and record the burning of the mask material as it passes over the flame. The inspection should be repeated for all outer surface materials of the mask, which should pass through the flame 1 time for each component.

7 Signage

7.1 Product identification

The product should be marked as follows.
a) Name, trademark or other identifiable manufacturer or supplier.
b) Model and number (if applicable).
c) The implementation of this standard number and year number, the filter element should be marked with the filter media level, the level is marked with the implementation of this standard number and filter element level combination, such as GB 2626-2006 KN90, or GB 2626-2006 KP100.

7.2 Packaging

The following information shall be clearly and persistently marked in Chinese at least on the minimum sales package, or visible through transparent packaging.

a) Name, trademark or other distinguishable manufacturer's or supplier's indication.

b) Mask type, model and number (if applicable).

c) The implementation of this standard number and year number, the filter element shall be marked with the level, the level is marked with the implementation of this standard number and filter element level combination, such as GB 2626-2006 KN90, or GB 2626-2006 KP100.

d) Product licence number.

e) Date of production (at least months and years) or production lot number, storage life (at least years).

f) The words "see information provided by the manufacturer".

g) Manufacturer's recommended storage conditions (including at least temperature and humidity).

Appendix A: Summary of testing requirements (informative appendix)

This appendix summarizes the technical requirements, sample requirements and testing conditions in the standard, as shown in Table A.1.

Test content	Technical requirements clause	Sample number			Sample pretreatment conditions	Conditions of detection clause
		Disposable mask	Replaceable half mask	Full mask		
external inspection	5.2	2	2	2	Pre-treated for temperature and humidity and pre-treated for mechanical strength, respectively.	6.1, 6.2
Filtration efficiency	5.3 and Table 2	20	20 filter elements	20 filter elements	10 untreated samples, 5 temperature-humidity pretreated samples, 5 mechanical strength pretreated samples.	6.3
leakage rate	5.4 and Table 3	10 if different numbers, at least 2 samples per number.	2, if different numbers, 2 samples of each number.	2, if different numbers, 2 samples of each number.	One half of the quantity is untreated samples and the other half is pre-treated samples with temperature and humidity.	6.4
Inhalation resistance	5.5	4, 2 samples of each number if different.	4, 2 samples of each number if different.	4, 2 samples of each number if different.	One half of the quantity is untreated and the other half is pretreated with temperature and humidity.	6.5
Exhale resistance	5.5	4, 2 samples of each number if different.	4, 2 samples of each number if different.	4, 2 samples of each number if different.	One half of the quantity is untreated and the other half is pretreated with temperature and humidity.	6.6
Breathing	5.6.1	4	4	not applicable	One half of the quantity is	6.7

valve air tightness					untreated and the other half is pretreated with temperature and humidity.	
Breath valve cover	5.6.2 and Table 4	3	3	3	3 untreated samples	6.8
Dead space	5.7	3	1	1	untreated sample	6.9
outlook	5.8 and table 5	1	1	1	untreated sample	6.10
Headband	5.9 and table 6	2	2	2	One is an untreated sample and one is a temperature-humidity pretreated sample.	6.11
Connectors	5.10and table 7	not applicable	2	2	One is an untreated sample and one is a temperature and humidity pretreatment sample.	6.12
Lenses	5.11	not applicable	not applicable	5	untreated samples	6.13, 6.14
Airtightness	5.12	All samples	All samples	All samples	Unprocessed samples or samples under other terms	6.14
Flammability	5.13	4	3	3	Disposable masks: 2 untreated samples, 2 temperature and humidity pretreated samples; half and full masks: 1 untreated sample, 2 temperature and humidity pretreated samples.	6.15
Information provided by the manufacturer	5.15	All samples	All samples	All samples	Untreated sample	6.1

Appendix B: Main dimensions of the test head mould (informative appendix)

The main dimensions of the test head die applicable in this standard test are shown in Table B.1.

Table B.1 Main dimensions of the test head die Unit: mm

Size/item	trumpet	medium size	large size
morphological plane	113	122	131
face width	136	145	154
pupil spacing	57.0	62.5	68.0

Appendix C: Comparison of the revised standard with the original standard and some of its alternatives (informative appendix)

This appendix summarizes the main technical aspects of the revised standard as compared with the original standard GB/T

2626-1992 and the replacement standard GB/T 6223-1997, see table C.1 below.

Content Comparison	GB/T 2626-1992	GB/T 6223-1997	GB 2626-2006
Standard name	General technical conditions for self-absorbing filtered dust masks	Self-absorbing, filtered anti-particle masks	Respiratory protection, self suction filtered anti particulate respirator
Scope	Production and sale of all kinds of dust masks, technical requirements, test methods, testing rules.	Various types of self-absorption filtered anti-particle masks, technical requirements, inspection methods, inspection rules.	Self-absorbing, filtered respiratory protection products to protect various types of particulate matter, specifying the technical requirements, testing methods and marking.
Filter element classification	No provision	No provision	KN non-oily particles; KP non-oily and non-oily particles.
Mask classification	Simple; duplex (half mask)	Simple; duplex (half mask)	Disposable half masks. Replaceable half-mask. hood
Filter element level	Simple: ≥90% Duplex: ≥95%	Grade Ⅰ: ≥95% Grade Ⅱ: ≥99%	Disposable masks and replaceable half masks: ≥90.0%; ≥95.0%; ≥99.97% Full masks: ≥95.0%; ≥99.97%
Reagents for detecting filtration efficiency	Medical talcum powder. Suspended particle size less than 5um accounted for more than 90%, less than 2um accounted for more than 70%, concentration (40±10) mg/m^3	Sodium chloride aerosols. Particle diameter of 0.1um~0.5um accounted for more than 90%, concentration greater than 1mg/m^3	Sodium chloride pellets for KN filter media: Counted median diameter (0.075±0.020)um, standard deviation no more than 1.86; (25±5)° C, (30±10)% humidity, charge neutralized to Boltzmann equilibrium, concentration no more than 200 mg/m^3 . Dioctyl ester granules for KP filter media: Counting of the median longitudinal (0.185±0.020)um with a standard deviation not exceeding 1.60; (25±5)° C, charge neutralization to Boltzmann equilibrium at a concentration not exceeding 200 mg/m^3
Filter efficiency testing	30	30	（85±4）
leakage rate	not specified	not specified	Basic adoption of EN standards
Inhalation resistance / Pa	Simple: ≤39.2 Duplex: ≤49 30L/min flow rate	Simple: ≤39.2 Duplex: ≤49 30L/min flow rate	All types of masks ≤ 350 (85±1) L/min detection flow
Breathing resistance / Pa	Duplex and simple with valves: ≤ 29.4 No valves, no requirements. 30L/min flow rate	Duplex and simple with valves: ≤ 29.4 No valves, no requirements. 30L/min flow rate	≤ 250 for all types of masks (including filter elements) (85±1) L/min detection flow

Breathing valve air tightness	In the airtightness tester, 500mL/min pumping volume, pumping reaches 980Pa negative pressure, stop pumping, record the post-valve pressure back to normal pressure time should be ≥10S.	In the airtightness tester, 500mL/min pumping volume, pumping reaches 980Pa negative pressure, stop pumping, record the post-valve pressure back to normal pressure time should be ≥15S.	For half masks only. (150±10) mL of post-valve volume. Pumped to 1180 Pa. The time for recording the post-mask valve pressure return to normal pressure should be ≥ 20S
Breath valve	No provision	No provision	If there is an expiratory valve, the valve cover should be able to withstand the specified axial tension of 10S. Disposable mask 10N; replaceable mask 50N.
dead space	Water injection method, measuring water volume ≤ 180mL	Water injection method, measuring water volume ≤ 180mL	Refer to EN standard, CO2 concentration in inhalation not more than 1% by volume.
outlook	Subjects with visual acuity not less than 1.0, with a bowed field of view of ≥ 60° below when wearing a mask	Subjects with visual acuity not less than 1.0, bowed visual field meter measuring lower viewing angle ≥65° while wearing a mask	Using GB/T 2891 methodology Visibility ≥60° below half mask Total field of view of the full hood ≥70% Full hood binocular vision, large eye window ≥80%, binocular window ≥20%
headband	No provision	No provision	Disposable mask: withstand a 10N pull for 10S. Half mask: withstand 50N pull for 10S Hood: withstands 100N tension for 10S
Connections and connecting parts	No provision	No provision	The replaceable half-mask connection shall be subjected to 50N axial pull of 10S. The full hood connection components should be subjected to a 10S axial pull of 250N.
face mirror	not involved	not involved	Adoption of the EN standard
airtightness	not involve	not involve	Adoption of the EN standard
flammability	not specified	not specified	Adoption of the EN standard
Cleaning and disinfection	not specified	not specified	Adoption of the EN standard

References

[1] EN 1321: 1999 Respiratory protective devices-definitions of terms and pictograms

[2] EN 136: 1998 Respiratory protective devices- Full face masks Requirements, testing, marking

[3] EN 140: 1999 Respiratory protective devices-half mask and quarter mask-requirements, testing, masking

[4] EN 143: 2000 Respiratory protective devices-particle filters-requirements, testing, marking

[5] EN149: 2001 Respiratory protective devices-filtering half masks to protect against particles Requirements, testing, marking

[6] NIOSH 42 CFR84 Subparts K-non-powered Air Purifying Particulate Respirator, 1995