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The specifications for personal eye-protectors

个人用眼护具技术要求

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The specifications for personal eye-protectors

1 Scope

This standard specifies the technical performance requirements and test methods of personal eye-protectors.

This standard is applicable to all kinds of personal eye-protectors, except those that are related to nuclear radiation, X-ray, laser, ultraviolet, infrared and other radiation.

2 Normative references

The following normative documents contain the provisions which, through reference in this text, constitute the provisions of this standard. For the dated references, the subsequent amendments (excluding corrigendum) or revisions of these publications do not apply to this standard. However, the parties who agree based on this standard are encouraged to study the possibility of applying the latest editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

GB/T 191 *Packaging - Pictorial marking for handling of goods*

GB/T 2428 *Head-face dimensions of adults*

3 Terms and definitions

For the purpose of this standard, the following definitions apply.

3.1

eye-protector

eye and face protective devices that protect from injuries such as caused by smoke, chemicals, metal sparks, flying debris and dust.

3.2

ocular

light-transmitting parts for preventing harmful factors from damaging eyes.

3.3

4.2 Types of ocular

4.2.1 Inorganic ocular

4.2.1.1 Non-toughened inorganic ocular

4.2.1.2 Toughened inorganic ocular: toughened through physical or chemical methods.

Note: As a result of manufacturing process or post-treatment, the mechanical impact resistance of toughened oculars is better than that of non-toughened ones, and the number of sharp fragments generated by the toughened oculars when broken is less than that generated by non-toughened ones.

4.2.2 Organic oculars

4.2.3 Glued oculars: formed by bonding multi-layer oculars with adhesive.

Note: All types of oculars may be further sub-classified in terms of filter types. Oculars may also be divided into those with correction function and those without such function. It may also obtain other functions by coating on the surface.

4.3 Functions of eye-protectors

The eye-protectors are intended to provide protection and against the following injuries:

-- impact of different intensities;

-- visible light radiation;

-- molten metal splashing;

-- liquid mist-drop and splashing;

-- dust;

-- irritant gas

or any combination of the above. See Annex A for basic technical performance.

5 Technical requirements

5.1 Materials

a) The parts contacting the wearer shall not be made of materials that can cause skin irritation;

b) The material of the protective parts shall meet the needs of the function.

5.2 Structures

a) The surface shall be smooth, without burr, acute angle or other defects that may cause discomfort to eyes and face;

b) It shall have good air permeability;

c) The adjustable parts or structural components shall be easy to adjust and replace.

5.3 Head hoop

For the head hoop, the width of the part contacting the wearer shall be at least 10mm, it shall be adjustable, and the materials selected shall be soft and durable.

5.4 Ocular specifications

a) single ocular: length x width not less than 105 mm×50 mm;

b) double oculars: the diameter of round oculars shall not be less than 40 mm; the horizontal reference length × vertical height of the formed oculars shall not be less than 30 mm×25 mm.

5.5 Appearance quality of ocular

The ocular surface shall be smooth and free from scratches, ripples, bubbles, impurities or other obvious defects that may damage vision.

5.6 Optical property

5.6.1 Refractive power

The mutual deviation of refractive power of ocular shall be $^{+0.05}_{-0.07}D$.

5.6.2 Depth of parallelism

a) The mutual deviation of depth of parallelism of plane ocular shall not exceed 0.125△;

b) For the curved ocular, the mutual deviation of vertical and horizontal depth of parallelism between its center and other points shall not exceed 0.125△;

c) The mutual deviation of depth of parallelism between the right and left oculars shall not exceed 0.18△.

5.6.3 Visible light transmission rate

a) Within the optical central scope, the relative error of visible light transmission rate of the filter shall conform to the range specified in Table 2.

The materials of all parts of the eye-protector providing protection for the eye area shall be non-metallic or treated to prevent the adherence of molten metal and the penetration of hot solids.

a) the material shall be regarded as satisfactory if, when tested according to the method specified in 6.7.1, there is no adherence of molten metal or ocular fracture;

b) the material shall be regarded as satisfactory if, when tested according to the method specified in 6.7.2, complete penetration of the steel-ball does not occur within a period of 7s.

5.13 Protection against chemical droplets

It shall be regarded as satisfactory if, after being tested according to the method specified in 6.10, no staining appears on the test paper in the area within the optical central scope.

5.14 Protection against dust

It shall be regarded as satisfactory if, after being tested according to the method specified in 6.9, the reflectance is greater than 80% of its value before testing.

5.15 Protection against irritating gas

It shall be regarded as satisfactory if, after being tested according to the method specified in 6.10, no staining appears on the test paper in the area within the optical central scope.

6 Test methods for technical properties

6.1 Test methods for optical properties

6.1.1 Refractive power

6.1.1.1 Instrument

Refractive power tester, precision is ±0.01*D*.

6.1.1.2 Test method

Firstly, draw a horizontal and a vertical reference line on the ocular to be tested to determine the center of the ocular, then, test the refractive power at the center, as well as at any point on the horizontal and vertical reference lines of the ocular respectively.

6.1.2 Depth of parallelism

6.1.2.1 Instrument

Tester of depth of parallelism.

where,

H -- the surface wear rate of the ocular, %;

T_e -- the total transmittance, which is the ratio of total transmitted luminous flux to incident luminous flux;

T_d -- the transmittance of scattered light.

The transmittance of scattered light shall be calculated using Formula (2).

$$T_d = \frac{T_4 - T_3(T_2 / T_1)}{T_1} \tag{2}$$

where,

T_d -- the transmittance of scattered light;

T_1 -- the incident luminous flux, %;

T_2 -- the total transmitted luminous flux, %;

T_3 -- the stray light flux caused by the device, %;

T_4 -- the stray light flux caused by the device and oculars, %.

6.5.3 Test conditions

(1) mass of the abrasive shall be 400 g;

(2) falling amount of the abrasive shall be about 60 g~80 g per minute;

(3) the abrasive shall fall vertically onto the center of the ocular and form 45° with the surface of the ocular;

(4) the ocular holder shall rotate at a speed of 5 r/min;

(5) the abrasive shall be artificial carborundum (SiC) with a particle size of 125 μm or finer;

(6) after 10 times of application, the abrasive shall be checked once for particle size to ensure that it meets the specified requirements. The abrasive cannot be used for more than 50 times.

6.6 Test for resistance to high-speed particles

6.6.1 Test device

65%~68%) has been added.

6.10.1.4 Test paper: dip a 180 mm×100 mm white absorbent paper without sulfide into the prepared mercury nitrate solution, and then put it into the test chamber and between the head-form and eye protector.

6.10.2 Test procedure

Cover the head-form with double pieces of absorbent lint, the mass per unit area of which shall be approximately 185 g/m^2. Then fix the test specimen on the head-form as required. Place the test paper between the head-form and the eye protector, and then put it into an exhaust fume chamber. The ammonia quantity in the test chamber is controlled by the test paper. Open the ammonia generator and inject ammonia into the test chamber. When the test paper in the chamber turns brown, close the air inlet of the test chamber and allow the test specimen to be kept in the ammonia for 5 min. After the chamber has been cleared of the gas, remove the test specimen and check the test paper in the test specimen.

7 Packaging, marking, storage and transport

7.1 Packaging

The products shall be properly packaged and must be accompanied by product certificates and operating instructions.

7.2 Marking

The manufacturer's name or trademark shall be indicated at a place where such name and trademark can be obviously found on the surface of the product, and the following marks shall be provided on the package:

1) product name;

2) functional identification;

3) manufacturer’s name;

4) production date.

7.3 Storage and transport

During the storage and transport of products, the following requirements shall be met:

1) The products shall be kept clean, and shall not be in contact with acid, alkali and other harmful substances;

2) The products shall be protected from rain and heavy load, and be handled with care

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