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Portable fire extinguishers

手提式灭火器

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Portable fire extinguishers

1 Scope

This document gives the terms and definitions, classification and models of portable fire extinguishers (hereinafter referred to as fire extinguishers). It specifies the performance requirements, colors and marks, manuals, inspection rules, packaging, transportation and storage of portable fire extinguishers and components. It describes the test methods.

This document applies to the design, manufacture and inspection of portable fire extinguishers and their components used in industrial and civil buildings.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 192, *General purpose metric screw threads -- Basic profile*

GB/T 193, *General purpose metric screw threads -- General plan*

GB/T 196, *General Purpose Metric Screw Threads -- Basic Dimensions*

GB/T 197, *General purpose metric screw threads -- Tolerances*

GB/T 1804, *General tolerances -- Tolerance for linear and angular dimensions without individual tolerance indications*

GB/T 2516, *General purpose metric screw threads -- Limit deviations*

GB/T 2828.1, *Sampling procedures for inspection by attributes -- Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

GB/T 3181, *Colour standard for paint film*

GB 4066, *Powder extinguishing agent*

GB 4396, *Carbon dioxide extinguishing agent*

GB/T 4423, *Copper and copper alloy cold-drawn rod and bar*

GB/T 4968, *Classification of fires*

is 60℃, the effective discharge time shall not exceed the average effective discharge time when the operating temperature is 20℃. The effective discharge time at the lowest operating temperature shall not exceed 2.5 times the average effective discharge time at 20℃.

5.3.2.2 The delayed-action time of discharge of the fire extinguisher shall not be greater than 5 s.

5.3.2.3 The rate of residual extinguishing medium of the fire extinguisher shall not be greater than 10%.

5.3.3 Intermittent discharge performance

The discharging of fire extinguishers shall be interrupted at any time. The delayed-action time of discharge of the first discharging of fire extinguishers shall not be greater than 5 s. The delayed-action time of discharge of subsequent intermittent discharging shall not be greater than 1 s. The rate of residual extinguishing medium of fire extinguishers shall not be greater than 10%.

5.3.4 Post-vibration discharge performance of dry powder fire extinguisher

After the dry powder fire extinguisher has been subjected to the vibration test, it shall be able to operate normally. The delayed-action time of discharge shall not be greater than 5 s. The rate of residual extinguishing medium shall not be greater than 10%.

5.4 Mechanical properties

5.4.1 Impact resistance

After the impact resistance test, the fire extinguisher shall not explode, rupture or have parts ejected.

5.4.2 Vibration resistance

After the vibration resistance test, the fire extinguisher and its components shall not fall off, crack or deform significantly. The effective discharge time, delayed-action time of discharge, rate of residual extinguishing medium and bulk range of the fire extinguisher shall meet the requirements of 5.3.1.

5.5 Sealing performance

5.5.1 Storage sealing performance

5.5.1.1 Gas cylinder fire extinguisher: The annual leakage rate or annual leakage volume of the gas cylinder shall not be greater than the smaller value between 5% and 7 g of the mass of the gas in the cylinder.

6.5.3 Pressure resistance

6.5.3.1 The burst pressure of a discharge hose assembly equipped with a nozzle with a switch shall be greater than or equal to the following values:

- When the test temperature is (20±5)℃, 3 times the maximum service pressure;

- When the test temperature is (60±2)℃, 2 times the maximum service pressure.

6.5.3.2 The burst pressure of the discharge hose assembly of the carbon dioxide fire extinguisher shall be greater than or equal to the following value:

- When the test temperature is (20±5)℃, 1.5 times the maximum service pressure;

- When the test temperature is (60±2)℃, 1.25 times the maximum service pressure.

6.5.3.3 A discharge hose assembly equipped with a nozzle without a switch shall be able to withstand the test pressure of the fire extinguisher for more than 30 s without leakage.

6.5.4 Low temperature bending performance

6.5.4.1 After the low temperature bending performance test, the lining and outer surface of the discharge hose shall not be broken.

6.5.4.2 After the water pressure test, the discharge hose shall not leak.

6.5.5 Requirements for nozzles and horns of carbon dioxide fire extinguishers

6.5.5.1 2 kg and 3 kg carbon dioxide fire extinguishers shall use rigidly connected nozzles. The rigidly connected nozzles shall be able to rotate around the valve joint and stop at any position.

6.5.5.2 The connection between the discharge hose and the horn of 5 kg and 7 kg carbon dioxide fire extinguishers shall be equipped with a handle made of dry hard wood that can withstand low temperatures of -50°C, is heat-insulating and anti-static.

6.5.5.3 After testing, the horn of the carbon dioxide fire extinguisher shall be able to withstand compression and shall not show any cracking or damage.

6.6 Filters for water-based fire extinguishers

6.6.1 The filter of water-based fire extinguishers shall be made of materials resistant to corrosion by fire extinguishing agents.

6.6.2 Water-based fire extinguishing agents shall be discharged through a filter. The filter shall be placed upstream of the smallest section of the discharge channel. The area of each hole in the filter shall be less than the minimum cross-sectional area of the

discharge channel. The sum of the areas of all holes in the filter shall not be less than 8 times the minimum cross-sectional area of the discharge channel. The installation of the filter shall facilitate the maintenance of the fire extinguisher.

6.7 Rubber sealing ring

6.7.1 After aging and heat resistance tests, the rubber sealing ring shall not be cracked or deformed.

6.7.2 After low temperature test, the rubber sealing ring shall not be cracked or deformed.

6.8 Plastic parts

6.8.1 General requirements

A raw material quality assurance certificate provided by the plastic parts manufacturer shall be provided.

6.8.2 Heat resistance

6.8.2.1 After the heat resistance test, the plastic parts used in the fire extinguisher shall not be damaged by cracking, deformation, etc.

6.8.2.2 After the vibration test, the fire extinguisher shall meet 5.4.2.

6.8.3 Fire extinguishing agent resistance

After being soaked in fire extinguishing agent, the attenuation rate of the material deformation force of the siphon tube ring specimen shall not be greater than 40%.

6.8.4 Anti-ultraviolet light aging performance

After the ultraviolet light aging test, the external plastic parts shall not have cracks.

6.9 Fixing bracket

6.9.1 The hook of the fire extinguisher shall be such that the original fire extinguisher can only be removed from the wall after it has moved at least 6 mm in the horizontal or vertical direction. For fire extinguishers with a total mass greater than or equal to 5 kg, the minimum vertical movement is 3 mm.

6.9.2 The fixing bracket shall be able to withstand a static load of 5 times the total mass of the fully charged fire extinguisher, and not less than 45 kg. After the test, the fixing bracket shall not have defects such as breakage and obvious deformation.

accordance with the method in 7.2.1.1.

7.2 Discharge performance test

7.2.1 Discharge performance test at 20°C

7.2.1.1 Effective discharge time, delayed-action time of discharge, rate of residual extinguishing medium

Take 3 fire extinguishers for testing. The fire extinguishers shall be placed in an upright position in a (20±5)°C environment for at least 18 h. Then take out the fire extinguishers. The following tests shall be carried out within 2 min:

a) Fix the fire extinguisher on the discharge test device. Remove the safety device of the fire extinguisher. Wait for the test device to remain stationary for 6 s;

b) Read and record the mass of the fire extinguisher;

c) Start the discharge test device to discharge. Read and record the delayed-action time of discharge and effective discharge time during the discharging process of the fire extinguisher;

d) For gas cylinder fire extinguishers, start the gas cylinder first to release the pressure. After 6 s, start the discharge test device to discharge;

e) For carbon dioxide fire extinguishers and clean gas fire extinguishers, weigh them immediately after discharging. Empty the remaining fire extinguishing agent and weigh them again. Then fill the cylinder with water. Measure the volume of the cylinder. Record and calculate the rate of residual extinguishing medium, filling amount, fill error and fill density;

f) For dry powder fire extinguishers and water-based fire extinguishers, weigh them after discharging. Then empty the remaining fire extinguishing agent. Weigh them again after emptying. Record and calculate the rate of residual extinguishing medium, mass filling amount, and fill error;

g) For water-based fire extinguishers, pre-measure the density of the water-based fire extinguishing agent filled at 20°C. After operating according to f), calculate the volume filling amount and fill error from the mass filling amount.

7.2.1.2 Bulk range

The test shall be carried out in a well-lit room. Use a black background to mark the horizontal distance. Place the fire extinguisher in an environment of (20±5)°C for at least 18 hours. After taking it out, operate according to 7.2.1.1a) within 2 minutes. Then start the device to discharge. When discharging, the nozzle of the fire extinguisher shall be kept horizontal. The center of the nozzle shall be at least 1m above the ground. When

b) Store the two fire extinguishers at the lowest operating temperature ±2℃ for at least 18 h. Within 2 min after taking them out, each fire extinguisher shall be tested in the manner specified in c) and d).

c) Place the fire extinguisher on a hard surface in the following two ways:

- When the fire extinguisher is in a normal upright position, the steel hammer and the valve axis in the vertical direction coincide;

- When the fire extinguisher is in a flat position, the valve pillow is placed on the steel block, so that the steel hammer is located on the vertical line of the valve center.

d) In the above two methods, the steel hammer is allowed to fall vertically freely from a height of h to impact the valve of the fire extinguisher.

e) For gas cylinder type fire extinguishers, the fire extinguisher shall be placed under pressure during the test.

7.3.2 Vibration resistance test

7.3.2.1 The fire extinguisher shall be fixed in the fixture of the vibration table in an upright position. For fire extinguishers with special fixing frames, install the fire extinguisher in the fixing frame. Then fix the fixing frame in the fixture of the vibration table.

7.3.2.2 Fire extinguishers not for vehicle use shall be tested in accordance with the method in 7.3.2.3. Fire extinguishers suitable for vehicle use shall be tested in accordance with the method in 7.3.2.4.

7.3.2.3 For non-vehicle fire extinguishers, change the vibration direction of the vibration table in sequence. The fire extinguisher shall be vibrated along the horizontal, lateral and vertical linear axes respectively. The vibration test in each direction shall be carried out according to the following parameters:

- Frequency is 40 Hz;

- Amplitude is (0.25±0.03) mm;

- Duration is 2 h.

7.3.2.4 For vehicle fire extinguishers, the test shall be carried out in the following manner:

a) Change the vibration direction of the vibration table in sequence, so that the fire extinguisher vibrates along the horizontal, lateral and vertical linear axes respectively. After completing the tests b) and c) in one direction, switch to the other direction for testing;

7.4.1.3 Tracer gas leak detection method

Add 5% helium by mass to the propellant of the fire extinguisher. Use helium leak detection equipment to instantly check whether the fire extinguisher is leaking.

NOTE: The sealing test during the production process adopts methods such as tracer gas leak detection.

7.4.2 Intermittent injection sealing performance test

Three fire extinguishers shall be tested. The test steps are as follows.

a) Store the fire extinguisher at (20±5)℃ for at least 18 h.

b) Take it out and discharge it within 2 min. Fix the fire extinguisher on the discharge test device. Remove the safety device of the fire extinguisher. The pressure test interface of the test device is sealed with the gas core of the fire extinguisher. After the device remains stationary for 6 s, start the device to discharge. When the discharge time reaches half of the average effective discharge time of the same batch of fire extinguishers at 20℃, close the valve to stop discharging.

c) Read and record the internal pressure of the fire extinguisher within 10 s from the valve closing. Read the internal pressure again after 5 min. For carbon dioxide fire extinguishers, change the pressure measurement to weighing.

7.5 Corrosion resistance test

7.5.1 External corrosion test

7.5.1.1 Carry out neutral salt discharge test. The test chamber shall meet the following test conditions.

- Temperature: (35±2)℃.

- Average collection rate of 80 cm^2 horizontal collection area: (1.5±0.5) mL/h.

- Concentration of collected solution: (50±5) g/L.

- pH value of collected solution (at 25℃): 6.5~7.2.

- Test solution: Prepare the specified concentration by dissolving analytically pure sodium chloride in distilled water or deionized water. The pH value of the solution can be adjusted by adding analytically pure hydrochloric acid, sodium hydroxide or sodium bicarbonate as needed.

7.5.1.2 The test shall be carried out according to the following steps:

a) Take 2 samples of one specification from one category of fire extinguishers, or

cycle test. If there is a color change, compare it with the extinguishing agent that has undergone the temperature cycle test. Determine whether the color change is caused by temperature change.

d) Cut the fire extinguisher cylinder into two parts. Observe its interior.

7.6 Fire extinguishing performance test

7.6.1 General

7.6.1.1 Personal protective equipment for firefighters

When firefighters carry out fire extinguishing tests, they shall wear firefighter thermal insulation protective clothing (including clothing, hoods, gloves, and foot covers) that complies with XF 634.

NOTE: In order to protect the health and safety of firefighters, measures shall be taken to prevent the toxic substances and smoke produced by combustion from harming firefighters. When facing repeated tests that last for a period of time, firefighters shall wear respiratory protection equipment.

7.6.1.2 Methods for determining successful fire extinguishing

7.6.1.2.1 Take 3 fire extinguishers and conduct fire extinguishing tests respectively. For Class A, B, and F fires, if 2 fire extinguishing attempts are successful, the fire extinguisher shall be judged to have reached the fire extinguishing level. For Class D fire, if the first fire extinguishing attempt is successful, or if the first fire extinguishing attempt is unsuccessful but the second and third fire extinguishing attempts are successful, the fire extinguisher shall be judged to have passed the fire extinguishing test. The method for judging the success of each fire test shall be as follows.

7.6.1.2.2 Class A fire: The fire is completely extinguished, and there shall be no visible flame within 10 min after the fire extinguisher is fully discharged. If an unsustainable fire occurs during this period, it can be ignored. Unsustainable fire means: the flame height is less than 50 mm and the duration does not exceed 1 min. If the woodpile collapses during the test of Class A fire, the test is invalid and shall be repeated.

7.6.1.2.3 Class B fire: The fire is completely extinguished and the depth of the remaining fuel layer at any point in the oil pan shall not be less than 5 mm.

7.6.1.2.4 Class F fire: During the fire extinguishing process, no burning materials shall splash out. The addition of fire extinguishing agent shall not make the fire bigger. The fire shall be completely extinguished, and within 20 min after the discharging is completed, there shall be no re-ignition or spillage of vegetable oil.

NOTE: The appearance of flames with a height of more than 2 m and a duration of more than 2 s indicates that the fire is getting bigger, as evidenced by video recording.

8.5.1.1 For discharge hose assemblies equipped with nozzles with switches and discharge hose assemblies for carbon dioxide fire extinguishers, the test shall be carried out under the following conditions and procedures:

a) Before the test, store the hose assembly at the test temperature for at least 12 h;

b) Connect the hose inlet to the burst test device. The test water cannot lower the temperature of the hose assembly;

c) After removing the air in the hose, close the hose outlet. Pressurize at a rate not exceeding (2±0.2) MPa/min. Increase the pressure to the minimum allowable burst pressure in a time not less than 30 s. If no rupture occurs, maintain the pressure for 30 s. Increase the pressure again until the explosion occurs;

d) Record the pressure when the hose bursts.

8.5.1.2 For discharge hose assemblies equipped with nozzles without switches, the test shall be carried out as follows:

a) Connect the hose inlet to the water pressure test device. The water temperature shall not be lower than 5℃;

b) After removing the air in the hose, close the hose outlet. Pressurize at a rate not exceeding (2±0.2) MPa/min to the test pressure of the fire extinguisher. Maintain for 30 s Observe whether it leaks.

8.5.2 Low temperature bending performance test

The test shall be carried out under the following conditions and steps:

a) Remove the entire discharge hose from the fire extinguisher. Place it and the hose clamp (diameter is 150 mm, arc is at least 180°) in a temperature treatment box. Store at the lowest operating temperature of the fire extinguisher for 24 h;

b) For hoses with an inner diameter less than or equal to 22 mm, use the hose clamp to bend it 180° immediately after removing the hose. Keep it for 10 s;

c) For hoses with an inner diameter greater than 22 mm, use the hose clamp to bend it 90° immediately after removing the hose. Keep it for 10 s;

d) Observe the appearance of the hose;

e) Perform a water pressure test on the hose in accordance with 8.5.1.2. The water temperature is (20±5)℃.

8.5.3 Test of the horn of a carbon dioxide fire extinguisher

The test shall be carried out according to the following steps:

c) In each group, perform a vibration test on the other fire extinguisher according to 7.3.2.

8.8.2 Fire extinguishing agent resistance test

The test shall be carried out according to the following steps.

a) For fire extinguishers with the same extinguishing agent model, select one specification and take one sample. For fire extinguishers with different extinguishing agent models, test them separately. Remove the siphon from the fire extinguisher and cut it into 13 mm long ring samples. Take 4 sections of the ring specimen for deformation test. Compress (or stretch) at a uniform speed of 5 mm/min. Record the deformation curve.

b) Pour the extinguishing agent in the fire extinguisher into a container and immerse the remaining siphon tube ring sample in it. There shall be no contact between the specimens or between the specimen and the container.

c) Cover the container and place it in an oven. Store it at (95±3)℃ for 120 d.

d) Take out the ring sample. Cool it at (21±2)℃ for more than 24 h.

e) Perform deformation test on the siphon ring specimen. Compress (or stretch) at a constant speed of 5 mm/min. Record the deformation curve.

8.8.3 Anti-ultraviolet light aging performance test

For external plastic parts, the test shall be carried out according to the following steps.

a) Choose one specification from a category of fire extinguishers. Remove its external plastic parts. Perform artificial weathering test for 500 h according to b) or c). Store at (20±5)℃ for 5 h.

b) The ultraviolet light is obtained using two fixed position, enclosed carbon arc lamps. The arc of each lamp is generated between two vertical carbon electrodes. The electrodes are 12.7 mm in diameter. They are located in the center of a movable vertical metal cylinder 450 mm high and 787 mm in diameter. Each arc is sealed in a transparent optical glass lampshade. The sample is held vertically in the movable metal cylinder, facing the lamp. The cylinder is rotated around the fixed lamp at a rate of 1 revolution/min. A discharge system is used to discharge water on each sample in turn while the cylinder rotated. During each working cycle (20 min in total), each sample is exposed to ultraviolet light and water discharge for 3 min. It is exposed to ultraviolet light only for 17 min. During the working cycle, the temperature in the rotating cylinder of the device is maintained at (63±5)℃.

c) Exposure to xenon arc light source for 500 h. Test conditions are as follows: blackboard temperature is (65±3)℃; relative humidity is 50%±5%; discharge

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