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**High temperature-resistant test methods for smoke and heat
exhaust ventilators**

消防排烟风机耐高温试验方法

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High temperature-resistant test methods for smoke and heat exhaust ventilators

1 Scope

This standard specifies the test device, the ventilator installation, the test method, the judgement criteria, the test report, etc., of the axial-flow (corresponding centrifugal) smoke and heat exhaust ventilator, which has a machine number of not more than No.18, during the high temperature-resistant test in laboratory. For the axial-flow (corresponding centrifugal) smoke and heat exhaust ventilator, which has a machine number of more than No.18 AND is equipped with electric heating test device, it is only subject to the high temperature-resistant test; it does not measure the aerodynamic performance at high temperature, BUT only measures the aerodynamic performance of the ventilator at room temperature.

This standard is applicable to the high temperature-resistant performance test of smoke and heat exhaust ventilator, which is installed in industrial and civil buildings, civil air defense projects and other buildings, tunnels, subways.

2 Normative references

The provisions in following documents become the provisions of this Standard through reference in this Standard. For the dated references, the subsequent amendments (excluding corrections) or revisions do not apply to this Standard; however, parties who reach an agreement based on this Standard are encouraged to study if the latest versions of these documents are applicable. For undated references, the latest edition of the referenced document applies.

GB/T 1236-2000 Industrial fans - Performance testing using standardized airways (idt ISO 5801:1997)

JB/T 8689-1998 Fan vibration detection and its limited value

3 Terms and definitions

The terms and definitions, which are established in GB/T 1236-2000, as well as the following terms and definitions, apply to this standard.

3.1

Smoke and heat exhaust ventilators

Stationary electric device, which is used to remove smoke, in mechanical smoke extraction systems.

4 Requirements

4.1 Test device

4.1.1 High temperature-resistant test furnace

This standard stipulates that the smoke and heat exhaust ventilator shall meet the requirements of 4.3 and 4.4, AND the high temperature-resistant test shall be carried out on the specified high temperature-resistant test furnace.

The high temperature-resistant test furnace shall be able to control the airflow temperature, through the smoke and heat exhaust ventilator, so that it can keep constant, at any set value, within the range of 150 °C ~ 600 °C (allowable deviation ± 15 °C); meanwhile it can ensure that the temperature in the furnace, within 2 min after ignition, can rise to the selected standard temperature.

The high temperature-resistant test furnace shall have a large enough space; its size shall not be less than 3000 mm $\times$ 3000 mm $\times$ 4500 mm. It shall be possible to test the aerodynamic performance of the smoke and heat exhaust ventilator, in a wind tunnel of specified size (see Figure 1), under high temperature conditions.

Note: For the smoke and heat exhaust ventilator, which has a machine number of greater than No.18, refer to Figure 4 and Figure 5 for the high temperature-resistant test device and installation method.

4.1.2 Temperature measurement and control system

The airflow temperature on the fire-facing surface of the smoke and heat exhaust ventilator is measured, by a K-type armored thermocouple, which has a diameter of $\Phi 0.75$ mm ~ $\Phi 2.30$ mm. The length of the hot end, which protrudes from the stainless steel casing or porcelain casing, shall not be less than 25 mm; the number of thermocouples shall not be less than 6. The thermocouples are evenly distributed on the plane, which is 100 mm away from the air inlet of the smoke and heat exhaust ventilator; the measuring end is 100 mm away from the pipe wall. The average value of the temperature, which is measured by the thermocouples, is the test temperature.

The standard test temperature can be preset within the range of 150 °C ~ 600 °C. The time interval, for recording the test temperature values, shall not exceed 1 min.

4.1.3 In-furnace pressure measurement system

measurement device, of the smoke and heat exhaust ventilator, is as shown in Figure 1 ~ Figure 3.

4.3.2 Fix the collector, the electric air volume control valve, the fan aerodynamic performance test pipe (standardized air duct), the smoke and heat exhaust ventilator and the rear connecting pipe of the smoke and heat exhaust ventilator, on the outside of the high temperature-resistant test furnace. The outlet and inlet of the furnace are communicated with the furnace, so as to form a heat flow cycle, between the smoke and heat exhaust ventilator and the high temperature-resistant test furnace.

4.3.3 The front and rear connecting pipes of the smoke and heat exhaust ventilator shall be made of steel plates, which have a thickness of not less than 4 mm. The size and shape of the standardized air duct shall meet the requirements of GB/T 1236-2000. All air ducts are connected by flanges. In order to prevent air leakage at the connections, sealing materials shall be used to block the flanges. The air duct shall not leak, at the pressure outlet and thermocouple on the standardized air duct.

4.3.4 There shall be no obstacles, within 3 m from the axis of the air duct inlet. The distance, from the outlet of the smoke and heat exhaust ventilator to the obstacles, shall not be less than 3 m.

4.4 High temperature-resistant test requirements for smoke and heat exhaust ventilators

4.4.1 The smoke and heat exhaust ventilator, which is used in the tunnel area, shall run continuously for 60 minutes, when the airflow is not lower than 250 °C, without abnormal phenomenon.

4.4.2 The smoke and heat exhaust ventilator, which is used in subway tunnels, shall run continuously for 60 minutes, when the airflow is not lower than 150 °C, without abnormal phenomenon.

4.4.3 The smoke and heat exhaust ventilators, which are used in other buildings, shall run continuously for 30 minutes, when the airflow is not lower than 280 °C, without abnormal phenomenon.

the smoke fan.

5.2 Check the air tightness of the air duct and the smoothness of the pressure outlet.

5.3 Shutdown the smoke and heat exhaust ventilator. Wait for the high temperature-resistant test.

5.4 Ignite the high temperature-resistant test furnace. At the same time, start the smoke and heat exhaust ventilator, to make it run. Control the furnace temperature, so that the temperature of the airflow, which passes through the smoke and heat exhaust ventilator, reaches the standard test temperature, within 2 minutes. Keep the smoke and heat exhaust ventilator run continuously for 30 min, at this temperature, without abnormal phenomena (for smoke and heat exhaust ventilator in tunnels, subway sections and other places, it shall run continuously, under the corresponding standard test temperature for the specified time, without abnormal phenomenon).

5.5 The standard test temperature shall be selected, according to the high temperature-resistant performance of the smoke and heat exhaust ventilator, which is proposed by the manufacturer. Meanwhile it shall meet the following requirements:

- a) For the smoke and heat exhaust ventilator, which is used in the tunnel segments, the selected temperature shall not be lower than 250 °C;
- b) For smoke and heat exhaust ventilators, which are used in subway tunnels, the selected temperature shall not be lower than 150 °C;
- c) For other smoke and heat exhaust ventilators, which are used in buildings, the selected temperature shall not be lower than 280 °C.

5.6 During the test, if the smoke and heat exhaust ventilator does not conform to the judgment criteria, which is specified in Chapter 7, the test can be terminated.

5.7 During the high temperature-resistant test of the smoke and heat exhaust ventilator, adjust the open-close state of the blades of the electric control valve (simulating paper patch), to control the air volume, which passes through the smoke and heat exhaust ventilator. Measure the aerodynamic performance of the smoke and heat exhaust ventilator, under the high temperature-resistant state. According to the method, which is specified in GB/T 1236-2000, measure the flow rate, pressure, total pressure efficiency of the smoke and heat exhaust ventilator. Measure the vibration of the smoke and heat exhaust ventilator, according to the method, which is specified in JB/T 8689-1998.

Note: The test results of the aerodynamic performance of the smoke and heat exhaust ventilator, during the high temperature-resistant test, are not used as the basis for judgment, BUT only for reference for actual expansion.

5.8 For the smoke and heat exhaust ventilator, which has a machine number of more

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