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Specifications for high temperature test chambers

高温试验箱技术条件

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Specifications for high temperature test chambers

1 Scope

This standard specifies the terms and definitions, conditions of use, technical requirements, test methods, inspection rules, markings, packaging, storage related to high temperature test chambers (referred to as test chambers").

This standard applies to test chambers that conduct low-temperature tests for electrical, electronic and other products, parts, materials.

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 191-2008 Packaging - Pictorial marking for handling of goods (ISO 780:1997, MOD)

GB 14048.1-2006 Low-voltage switchgear and controlgear - Part 1: General rules (IEC 60947-1:2001, MOD)

JB/T 9512-1999 Climate environmental testing equipment and cabinet-determination of sound power level of noise emitted

JJF 1059-1999 Evaluation and expression of uncertainty in measurement

3 Terms and definitions

The following terms and definitions apply to this standard.

3.1

Test chamber

An enclosed chamber and space the part of which can meet the specified test conditions.

3.9

Temperature variation

After stabilization, the difference between the average temperature of the center of the working space and the average temperature of other points in the working space in any time interval.

3.10

Temperature extremes

After stabilization, the highest and lowest temperature reached in the working space.

4 Conditions of use

4.1 Environmental conditions

a) Temperature 5 °C ~ 40 °C;

b) Relative humidity: Not more than 85%RH;

c) Atmospheric pressure 80 kPa ~ 106 kPa;

d) There is no strong vibration around;

e) No direct sunlight or direct radiation from other heat sources;

f) There is no strong airflow around: When the surrounding air needs to flow forcibly, the airflow shall not be directly blown onto the chamber;

g) There is no strong electromagnetic field around;

h) There is no high concentration of dust and corrosive substances around.

4.2 Power supply conditions

a) AC voltage: 220V ± 22V or 380V ± 38V;

b) Frequency: 50 Hz ± 0.5 Hz.

4.3 Load conditions

The load of the test chamber shall meet the following conditions at the same time:

a) The total mass of the load shall not exceed 80 kg per cubic meter of

mechanical strength. There shall be no pollution sources that affect the test.

5.2.2 Insulation materials shall have flame retardant properties.

5.2.3 The thickness of the insulation layer shall ensure that the temperature of the accessible parts outside the test chamber is not higher than the ambient temperature + 35 °C.

5.2.4 The heating parts shall not directly radiate on the test sample.

5.2.5 It shall be provided with leading holes.

5.2.6 The door of the chamber shall be well sealed; the sealing strip shall have good resistance to high temperature and easy to replace.

5.2.7 There shall be a sample holder for placing or hanging test samples. The sample holder shall have good heat resistance, oxidation resistance, corrosion resistance.

5.2.8 The appearance coating layer shall be flat and smooth, with uniform color; there shall be exposed bottom, blistering, layering or scratches.

5.3 Safety and environmental protection requirements

5.3.1 Between the power supply terminal and the metal shell of the chamber:

- Insulation resistance value shall meet the following requirements: cold state resistance ≥ 2 MΩ, hot state resistance ≥ 1 MΩ;

- It shall be able to withstand a voltage withstand test of 50 Hz, 1500 V AC voltage and a voltage application duration of 5 s.

5.3.2 The electrical connection and wiring of the protective grounding terminal and the test chamber's shell shall meet the requirements of 7.1.9 in GB 14048.1-2006.

5.3.3 There shall be protection and alarm devices for over temperature, over current, etc.

5.3.4 The A-weighted sound power level of the complete machine noise shall not be greater than 70 dB.

6 Test method

6.1 Main test instruments and devices

6.1.1 Anemometer

6.3.3.9 According to actual needs, evaluate the uncertainty of the measurement results (refer to Appendix B).

6.4 Method of testing the temperature difference between the inner wall of the working chamber and the working space

6.4.1 Location and number of test points

6.4.1.1 Place one temperature sensor at the geometric center of the working space, and one surface temperature sensor at the geometric center of the six inner walls of the working chamber.

6.4.1.2 If there is a leading hole or other device in the center of the working chamber, the distance between the test point and the hole wall or other device shall not be less than 100 mm.

6.4.2 Test procedure

6.4.2.1 Within the adjustable temperature range of the test chamber, select the highest nominal temperature as the test temperature.

6.4.2.2 The temperature at the geometric center point of the working space reaches the test temperature for the first time and is stable for 2 h. The temperature values of all test points are tested every 2 min, for a total of 5 tests.

6.4.3 Calculation and evaluation of test results

6.4.3.1 Correct the measured temperature value according to the correction value of the test instrument.

6.4.3.2 Calculate the arithmetic mean of the temperature of each test point.

6.4.3.3 Substitute the average value of the temperature of the inner wall of the working chamber and the temperature of the geometric center of the working space into the formula (6):

$$A = \frac{|\overline{T_n} - \overline{T_0}|}{\overline{T_0}} \times 100\% \qquad \cdots\cdots (6)$$

Where:

A - The percentage of the difference between the thermodynamic temperature of the working chamber's inner wall and the working chamber;

$\overline{T_n}$ - The average thermodynamic temperature of the test point on the inner wall of the working chamber, in Kelvin (K);

6.8.1 Before and after the tests of 6.3 ~ 6.8 of this standard, it shall be checked each.

6.8.2 Put a 0.1 mm thick, 50 mm wide, 200 mm long paper strip vertically on any part between the door frame and the door sealing strip. After closing the door, pull the paper gently with hands. If it cannot slide freely, it meets the requirements of 5.2.6.

6.9 Test methods of noise

Refer to JB/T 9512-1999 for the test method for the noise of the whole test chamber; the results shall meet the requirements of 5.3.4.

6.10 Test method of safety protection performance

6.10.1 Test of electrical insulation and terminal blocks

6.10.1.1 The withstanding voltage test between the power terminal and the metal shell of the chamber shall be carried out by a 5 kV withstanding voltage tester before the test of 6.3. The results shall meet the requirements of 5.3.1.

6.10.1.2 Tests of insulation resistance and protective grounding terminals shall be conducted by a 500 V insulation resistance measuring instrument which has an accuracy of grade 1.0, each before and after the test of 6.3. The results shall meet the requirements of 5.3.1 and 5.3.2.

6.10.2 Test of safety protection device

6.10.2.1 Within the adjustable temperature range of the test chamber, select 3 temperatures from the temperature range in Table 1 as the test temperature.

6.10.2.2 Set the over-temperature protection and alarm temperature as the test temperature; then rise the temperature. When the temperature at the geometric center point of the working space reaches the set temperature, the over-temperature protection device shall act (stop heating) and send out an alarm signal at the same time, that is, it complies with the requirements of 5.3.3. It is required that this test shall be carried out three consecutive times.

6.10.2.3 Visually check whether there are protection and alarm devices such as overcurrent. During the test, if the alarm and protection device act every time, it meets the requirements.

6.11 Inspection and judgement method of surface coating quality

The test method is visual inspection, which shall be inspected once before and after the test as specified in 6.3 ~ 6.10. The appearance coating shall meet the requirements of 5.2.8.

d) When there is a big difference between the result of the exit-factory inspection and the result of the last type inspection;

e) When the production is stopped for more than one year and resumed;

f) When products are mass-produced, regular random inspections shall be conducted at least once every two years.

7.3.2 Sampling and determination rules

7.3.2.1 For batch-produced test chambers, if the batch size is more than 20 units, 2 units will be sampled for inspection; if it is less than 20 units, 1 unit will be sampled for inspection.

7.3.2.2 All the type inspection items of the samples shall be qualified; otherwise, it shall double the number of unqualified items for random inspection. When the second sampling inspection is qualified, only the unqualified items in the first sampling inspection are returned for repair, which are allowed to exit-factory after passing the inspection; If there is still 1 unqualified sample in the second sampling inspection, the batch of products will be judged as unqualified; if all the samples are qualified in the second sampling inspection, the batch of products will be deemed qualified.

7.4 Exit-factory inspection

7.4.1 Inspection department

The quality inspection department of the manufacturer is responsible for exit-factory inspection.

7.4.2 Inspection conditions

This inspection is carried out under no-load conditions.

7.4.3 Inspection items

7.4.3.1 Inspection items are as shown in Table 2.

7.4.3.2 Except for sampling inspection for temperature gradient and temperature variation, other items shall be inspected one by one; all inspection items shall be qualified.

7.4.4 Sampling and judgement rules

7.4.4.1 The exit-factory sampling quantity of temperature gradient and temperature variation is calculated based on 10% of the product batch, but not less than 2 units.

Appendix B

(Informative)

Evaluation of measurement uncertainty of temperature variation

B.1 The evaluation basis of measurement uncertainty of temperature variation is JJF 1059-1999 "Evaluation and expression of measurement uncertainty".

B.2 The main process of the measurement uncertainty evaluation of temperature variation is as follows:

a) Establish a mathematical model, to determine the relationship between the measured quantity Y and the input quantity X_1, ..., X_n;

b) Find the best value, get the best value y of Y from the best value x_i of X_i;

c) List the sources of measurement uncertainty;

d) Evaluation of standard uncertainty components: Category A evaluation and category B evaluation;

e) Calculate the composite standard uncertainty;

f) Assess the expanded uncertainty;

g) Uncertainty report.

B.3 The main steps for evaluating the measurement uncertainty of temperature variation are as follows:

a) According to the definition of temperature variation, the mathematical model of the measurement process is the formula (4).

b) Find the best value

The best value of T_i is the arithmetic mean value $\overline{T_i}$ of the temperature measurement values at other points in the working space within 30 min, T, the best value of T_0 is the arithmetic mean value $\overline{T_0}$ of the temperature measured values at the center point of the working space within 30 min, which are calculated according to formula (1).

Therefore, the optimal value of temperature variation ΔT is the formula (4).

c) List the sources of measurement uncertainty

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