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Evaporative air cooler

蒸发式冷风扇

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Table of Contents

Foreword	3
1 Scope	4
2 Normative references	4
3 Terms and definitions.....	6
4 Classification and model naming.....	7
5 Requirements	8
6 Test methods	10
7 Inspection rules	17
8 Marking, packaging, storage, transportation	21

Evaporative air cooler

1 Scope

This standard specifies the terms and definitions, classification and model naming, requirements, test methods, inspection rules, marking, packaging, transportation and storage of evaporative air cooler for household and similar use (hereinafter referred to as "air cooler").

This standard applies to the air cooler which has a rated voltage of single-phase appliance of not more than 250 V, a rated voltage of other appliances of not more than 480 V, cools the air by the evaporative heat absorption principle of water, is used for household and similar places.

This standard does not apply to:

- Air cooler designed only for industrial use;
- Air cooler intended to use in a special environment where corrosive or explosive gases (such as dust, steam or gas) are often generated.

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

GB/T 1019-2008 General requirements for the package of household and similar electrical appliances

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

GB/T 2423.3 Environmental testing for electric and electronic products - Part 2: Testing method test Cab: Damp heat Steady state (GB/T 2423.3-2006, IEC 60068-2:78:2001)

GB/T 2423.17 Environmental testing for electric and electronic products - Part 2: Test method - Test Ka: Salt mist (GB/T 2423.17-2008, IEC 60068-2:11:1981)

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 2828.1-2003, ISO 2859-1:1999, IDT)

GB/T 2829 Sampling procedures and tables for periodic inspection by attributes (Apply to inspection of process stability)

GB/T 4214.1 Acoustics - Household and similar electrical appliances - Test code for determination of airborne acoustical noise - Part 1: General requirements (GB/T 4214.1-2000, eqv IEC 60704-1:1997)

GB 4343.1 Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission (GB 4343.1-2003, CISPR14-1:2000, IDT)

GB 4706.1 Household and similar electrical appliances – Safety - Part 1: General requirements [GB 4706.1-2005, IEC 60335-1:2004 (Ed4.1), IDT]

GB 4706.23 Household and similar electrical appliances - Safety - Part 2: Particular requirements for room heaters [GB 4706.23-2007, IEC 60335 2:30:2004 (Ed4.1), IDT]

GB 4706.27 Household and similar electrical appliances-safety - Part 2: Particular requirements for fans [GB 4706.27-2008, IEC 60335-2: 80:2004 (Ed2.1), IDT]

GB 4706.45 Safety of household and similar electrical appliances - Particular requirements for air-cleaning appliances (GB 4706.45-1999, idt IEC 60335-2-65:1993)

GB 4706.48 Safety of household and similar electrical appliances - Particular requirements for humidifiers (GB 4706.48-2000, idt IEC 60335-2-98:1997)

GB 5296.2 Instructions for use of products of consumer interest - Part 2: Household and similar electrical appliances

GB/T 7725 Room air conditioners (GB/T 7725-2004, ISO 5151:1994, NEQ)

GB 17625.1 Electromagnetic compatibility - Limits - Limits for harmonic current emissions (equipment input current $\leq 16\text{A}$ per phase) (GB 17625.1-2003, IEC 61000-3-2:2001, IDT)

5 Requirements

The air cooler shall meet the requirements of this standard. The air cooler with additional functions shall also meet the requirements of the corresponding national and industry standards, meanwhile be manufactured according to the drawings and technical documents approved by the prescribed procedures.

5.1 Environmental conditions of use

- a) Ambient temperature: 5 °C ~ 43 °C.
- b) The relative humidity of the air is below 95% (at a temperature of 25 °C).

5.2 General requirements

5.2.1 Appearance:

- a) The surface of the plastic parts shall be smooth and even, with uniform color; it shall not have defects such as bubbles, spots, obvious scratches.
- b) The main surface of the electro-plated parts shall be smooth and fine; the color shall be uniform. There shall be no defects such as peeling, bottom exposure, blister, deformation.
- c) The surface of the coated parts is flat and smooth; the coating is firm. There shall be no defects such as spots, pinholes, blisters, falling off.

5.2.2 Anti-rust of electro-plated parts:

After the electroplated parts have been subjected to the salt spray test of 6.7 of this standard, the metal rust spots and rust traces on the plating of main surface are not more than 2 per square decimeter; not more than 4 per square decimeter on the non-main surface; the area of rust spot and rust trace shall not exceed 1 mm². When the surface area of the test piece is less than 100 cm², it is not allowed for rust spot and rust trace.

5.2.3 Firmness of coating:

After the coated parts are subjected to the damp heat test in 6.8 of this standard, the number of air bubbles on the main surface shall be not more than 4 per square centimeter; on the non-main surface shall be not more than 8 per square centimeter. The diameter of the bubbles is not more than 1 mm. No peeling of the coating shall occur at the edges, corners or small holes.

Note: The air cooler is placed in the normal use state; the air flow side and the decorative board are the front surface, then the main surface refers to the surface that can be viewed from the front, the top, the left, the right.

flow of the air cooler.

The following conditions shall be met during the test:

- a) At rated frequency and rated voltage;
- b) All control and regulating components of the air cooler shall be adjusted to the position where the air volume is maximum;
- c) For the lower air outlet type and the upper air outlet type, it is allowed to rotate 90° to facilitate connection of the horizontal air volume measuring pipeline;
- d) The air cooler does not supply water; the evaporation pad is in a dry state;
- e) The distance between any surface of the air cooler and the surrounding obstacles shall not be less than 1.5 times the length of the diagonal line of this surface of the air cooler;
- f) The dry bulb temperature of the inlet is 38 °C and the wet bulb temperature is 23 °C.

6.2 Test of evaporative quantity

Specific test method for evaporative quantity:

- a) The air cooler during the test shall contain all the parts and accessories required for actual use and be filled with water.
- b) The indoor air circulation shall be such that the wind speed at 1 m from the air cooler does not exceed 0.5 m/s.
- c) The size of the test chamber shall be such that the minimum distance from the air cooler to the surrounding wall is not less than 1 m; the minimum distance from the air outlet to the wall is not less than 1.8 m. The test device shall be able to simulate the actual working state of the air cooler.
- d) The method of measuring the dry and wet bulb temperature shall be consistent with the method listed in GB/T 7725. The measurement uncertainty of the dry bulb temperature shall not exceed ± 0.15 °C; the measurement uncertainty of the wet bulb temperature shall not exceed ± 0.2 °C. All the measured values of wet bulb temperature shall be reduced to the thermodynamic wet bulb temperature.
- e) The evaporation pad of the air cooler shall be the same as that during the air volume test and shall be operated at high speed for a sufficient period of time, to ensure stable evaporation of the evaporation pad. The measuring instrument of dry and wet bulb temperature shall have an

m_i - The starting mass of the test, in kilograms (kg);

m_F - The final mass of the test, in kilograms (kg);

t - Measurement time (value: 0.75 h);

t_i - The arithmetic mean of the 10 temperature readings of the dry bulb temperature of air at the inlet, in degrees Celsius (°C);

t' - The arithmetic mean of the 10 temperature readings of the wet bulb temperature of air at the inlet, in degrees Celsius (°C);

15 - Standard difference of dry and wet bulb temperature.

6.3 Test of energy efficiency ratio

It shall measure the energy efficiency ratio of the air cooler while measuring the evaporative quantity.

The dry bulb temperature at the outlet during the test shall be measured in accordance with the method listed in GB/T 7725. The measurement uncertainty shall not exceed ± 0.15 °C.

The measuring instrument shall have an accuracy of not less than ± 0.1 °C. The test shall be performed after the air cooler has reached equilibrium and maintained at this equilibrium for 20 minutes. The measured value shall be read every 5 minutes, totally 10 measurement record shall be made. At the same time, it shall record the measured input power of the air cooler.

The value of the energy efficiency ratio is calculated every time according to formula (2):

$$EER = q_v \rho c_p (t_i - t_o) / W \quad \dots\dots\dots (2)$$

Where:

EER - The energy efficiency ratio of the air cooler, W/W;

q_v - The airflow of the air cooler under rated conditions, in cubic meters per second (m^3/s);

ρ - Air density under rated conditions, in kilograms per cubic meter (kg/m^3) (take $1.13 kg/m^3$);

c_p - The constant pressure specific heat of wet air under rated conditions, in joules per kilogram Kelvin [$J/(kg \cdot K)$] [take $1033 J/(kg \cdot K)$];

t_i - The arithmetic mean of the 10 readings of dry bulb temperature of air at

tank to the highest indicated water level. If necessary, use colored water. Let it stand for 24 hours. Use a filter paper to check the surface of the water-carrying parts that is prone to leak, to check if water seeps out.

6.5.2 Simulated tilt test

According to the instruction manual of the air cooler, add the water to the water tank to the highest indicated water level. If necessary, use colored water. Tilt it 10 degrees in the forward, backward, left and right directions for 5 minutes each time. After the test, use a filter paper to check the surface of the water-carrying parts, to check if water seeps out.

6.6 Use visual inspection or manual test to check whether it meets the requirements of 5.2.1, 5.2.5, 5.2.6 of this standard.

6.7 Anti-rust test of electroplated parts

The electroplated parts are subjected to 24 h of salt spray test according to the procedures and test conditions specified in GB/T 2423.17. Before the test, the electro-plated surface is degreased and washed clean. After the test, take out the specimen. Use a cloth dipped in water to wipe off the salt remaining on the surface. Check the surface rust points on the electroplated layer. After the test, it shall comply with the provisions of 5.2.2 of this standard.

6.8 Coating firmness test

The coated parts of the air cooler shall be subjected to damp heat test of 4 d in accordance with the procedures and test conditions specified in GB/T 2423.3. After the test, it shall comply with the provisions of 5.2.3 of this standard.

6.9 Water drop test

Keep the horizontal blades of the air outlet in the horizontal state, the vertical blades in the vertical state; adjust the wind speed of the air cooler to the highest wind speed. Place a piece of silk paper along the horizontal surface of the tested sample. The silk paper shall exceed the width of the tested sample at each side for at least 200 mm; the length is at least 500mm beyond the height of the sample. Keep the appliance work normally for 30 min. Observe whether the silk paper has obvious water stains.

6.10 Test of trouble-free operation

At the rated voltage and frequency, the test shall be carried out in cyclic manner after the power is turned one for 21 h and turned off for 3 h. After the test, it shall be in accordance with the provisions of 5.10 of this standard.

individual package);

e) Gross mass, kg;

f) Net weight, kg;

g) Dimensions of the package, mm: length × width × height;

h) Marking of considerations: “Avoid rain”, “upward”, “limit of stacking layer” and other words or symbols;

i) Date of manufacture or batch number;

j) Standard followed.

8.2.2 The packaging of the air cooler shall be designed according to the moisture-proof packaging as specified in GB/T 1019-2008 and the shock-proof packaging of the circulation condition 2.

8.2.3 The packaging box shall contain:

a) A full set of air cooler;

b) Use (installation) instructions;

c) Product certification;

d) Electrical circuit diagram;

e) Packing list.

Note: The above can be combined.

8.2.4 Instruction manual

The instruction manual shall be prepared in accordance with the requirements of GB 5296.2. Its contents shall also include:

a) Product name and model number;

b) Manufacturer's name and address;

c) Rated airflow;

d) Rated evaporative quantity;

e) Noise;

f) Energy efficiency ratio;

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