JC

BUILDING MATERIAL INDUSTRY STANDARD

OF THE PEOPLE'S REPUBLIC OF CHINA

JC/T 673-1997

Performance test method for electric heating glass of rear auto window

汽车后窗电热玻璃性能试验方法

Issued on: August 05, 1997 **Implemented on: January 01, 1998**

Issued by: State Bureau of Building Materials Industry

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1 Scope

This standard specifies the test methods of transmittance, opacity, resistance to cleaning agents, welding strength of electric inserts, bending resistance of electric inserts, power, defrosting efficiency, over-voltage, hot spot temperature, resistance to electric thermal shock, salt spray resistance, heating wire abrasion resistance, moisture resistance, durability, impact resistance, fragmentation state. It is applicable to performance inspection and design verification of various types of automotive electric heating glass.

2 Normative references

The provisions contained in the following standards constitute the provisions of this standard, through reference in this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision; parties using this standard shall explore the possibility of using the latest editions of the standards listed below.

GB 776-76 General specifications for electrical measuring and indicating instruments

JC/T 632-1996 Road vehicles - safety glazing materials - Terminology

GB 5137.1-1996 Road vehicles - Safety glazing materials - Test methods for mechanical properties

GB 5137.2-1996 Road vehicles - Safety glasses - Test methods for optical properties

3 Terms

3.1 Opacity

The ratio -- of the opaque area on the electric heating glass caused by the electric heating wire TO the area of the entire heating zone.

3.2 Heating zone

A closed surface, which is framed by the uppermost electric heating wire, the lowermost electric heating wire, a bus bar on the left and right.

3.3 Electric insert

A metal sheet, which is welded on the electric heating glass's bus bar AND connected to the power supply.

3.4 Defrosting efficiency

Under the application of a certain voltage, the melting percentage of the frost layer on the surface of the electric heating glass, within a specified time.

3.5 Over-voltage

The ability of electric heating glass to withstand the voltage, which is greater than the rated voltage.

3.6 Hot spot temperature

The highest temperature point on the surface of the electric heating wire or bus bar, during the electric heating process of the electric heating glass.

3.7 Electrical shock resistance

The ability of electric heating glass to withstand electric heating under low temperature conditions.

3.8 Salt spray resistance

The ability of electric heating glass to withstand salt spray corrosion, in a salt spray environment.

3.9 Heating wire abrasion resistance

The ability of the electric heating wire on the surface of the electric heating glass, to withstand the abrasion from cotton yarn and the like.

3.10 Durability

The ability of electric heating glass to withstand the heating, after repeated power-on for a long time.

Other terms, which appear in this standard, are in accordance with the provisions of JC/T 632.

4 Specimens

Unless otherwise specified, the specimens used in this standard are all finished automobile electric heating glass. If a small specimen is used, it must be made of the

$$T_S = (S_2/S_1) \times 100 \quad \cdots\cdots (1)$$

Where:

T_S - Opacity, %;

S_1 - The area of the specimen heating zone, cm^2;

S_2 - The total area of the specimen heating wire, cm^2.

8 Cleaning agent resistance test

8.1 Purpose of the test

Check whether the heating power of automobile electric heating glass still meets the requirements of corresponding product technical conditions, after being cleaned by glass cleaning agent.

8.2 Cleaning agent

50% ethanol solution (water: absolute ethanol = 1:1).

8.3 Test procedure

Continuously soak the absorbent cotton with cleaning agent. Squeeze and scrub the heating wire of the specimen repeatedly for 2 minutes. Then use the absorbent cotton to wipe dry the cleaning agent on the specimen.

8.4 Results presentation

After the specimen is scrubbed with cleaning agent, judge the resistance to cleaning agent, by whether the heating wire is loose or the heating device falls off.

9 Welding strength test of electric inserts

9.1 Purpose of the test

Determine whether the welding strength -- between the electric heating glass insert of the automobile and the glass plate -- meets the requirements of the corresponding product technical conditions, under the action of a certain mechanical force.

9.2 Test apparatus

a) Weight, which is a heavy object with lead particles in a cloth bag. Its weight shall be determined according to the tensile force required for the test. The weight error shall not be greater than ±10 g;

b) Stopwatch;

c) Specimen support frame.

9.3 Test procedure

Fix the specimen horizontally on the support frame. Hang it on the electric plug, using the weight which is required for the test. Use a stopwatch to record the time at the same time. When the time required for the test is reached, stop the test (other equivalent test methods can also be used). If the electric insert falls off the glass plate within the time required for the test, it shall record the time when it falls off.

9.4 Result presentation

The tensile force, which is withstood by the electric insert on the specimen within a certain period of time, is used to represent the welding strength of the electric insert of the electric heating glass of the automobile.

10 Bending resistance test of electrical inserts

10.1 Purpose of the test

Determine whether the bending resistance and the welding strength with the glass plate of the electric heating glass's electric insert of the automobile can meet the requirements of the corresponding product technical conditions, after being subjected to a certain number of specified bending actions.

10.2 Test procedure

Bend the electric insert 120° ± 10°, according to the number of bends required for the test. Check whether the electric insert is cracked. Meanwhile record whether the electric insert breaks or falls off the glass plate, during the test.

10.3 Results presentation

The bending resistance of the electric heating glass's electric insert of the automobile is expressed by the damage degree of the electric insert, after a specified number of bends, AND the welding strength with the glass plate.

11 Power test

11.1 Purpose of the test

Determine whether the heating power of the automotive electric heating glass meets the requirements of the corresponding product technical conditions.

12.3.1 Install the specimen on the holder, according to the actual loading condition. Put it into the low-temperature box, which had been adjusted to the temperature required for the test. Hold for 5 hours.

12.3.2 Use a sprayer to spray water mist on the surface of the specimen. The mouth of the sprayer shall be kept perpendicular to the surface of the specimen, 200 ~ 300 mm away from the surface of the specimen. Move back and forth, left and right. The water spray pressure of the sprayer is 340 ± 20 kPa. Spray 0.06 mL/cm^2 of water gradually and evenly on the surface of the specimen.

12.3.3 Keep the specimen at the temperature required for the test, to make the frost on the surface of the specimen hardened for 30 minutes.

12.3.4 According to the voltage required by the test, energize the specimen for the time required by the test. Take it out quickly. Check the degree of melting of the frost in the heating zone on the outer surface. Record the melting position and area of the frost on the heating zone.

12.4 Results presentation

The defrosting efficiency of the electric heating glass of the automobile is expressed by the percentage of the frost melting area of the heating zone, on the outer surface of the specimen, within a certain period of time.

The defrosting efficiency is calculated according to formula (2):

$$T_D = (D_2/D_1) \times 100 \quad \cdots\cdots (2)$$

Where:

T_D - Defrosting efficiency, %;

D_1 - The frost area in the heating zone on the outer surface of the specimen, cm^2;

D_2 - The area of melted frost in the heating zone on the outer surface of the specimen, cm^2.

13 Over-voltage test

13.1 Purpose of the test

Check whether the power and defrosting efficiency of the automobile electric heating glass still meet the requirements of the corresponding product technical conditions, when it returns to normal operation after being subjected to a voltage exceeding the rated voltage for a certain period of time.

heating glass.

14 Hot spot temperature test

14.1 Purpose of the test

Determine whether the highest temperature point on the surface of the electric heating wire or bus bar of the automobile electric heating glass meets the requirements of the corresponding product technical conditions, during the electric heating process for a certain period of time.

14.2 Selection of test method

This standard specifies the following two optional test methods, which shall be determined by both the supplier and the purchaser when used. In case of dispute, the "Infrared camera method" shall be used as the arbitration method.

14.3 Method I - Infrared camera method

14.3.1 Test equipment

a) Thermal imager, the whole machine of shall meet the following performance indicators: Measurement range: 0 ~ 100 °C; temperature resolution: 0.5 °C; field of view: 20° × 20°; it also includes the following components: power cabinet, camera head, tripod, microprocessor, color TV monitor;

b) Cameras;

c) Liquid nitrogen vessel;

d) DC stabilized power supply: the output voltage range shall not be less than 0 ~ 40 V (continuously adjustable); the maximum output current shall not be less than 40 A;

e) Voltmeter, which complies with the provisions of GB 776; it has an accuracy not lower than grade 1.0.

14.3.2 Test procedure

14.3.2.1 Place the specimen under the environmental conditions, which are specified in Chapter 5, for more than 2 hours.

14.3.2.2 Install the thermal imager, specimens, other equipment, according to Figure 4.

14.4.2.3 When the specimen is energized and heated for the time required for the test, use a semiconductor point thermometer, to measure the surface temperature of the heating wire and bus bar; record the highest temperature value and the location of the hot spot.

14.4.3 Result representation

When the specimen is energized to the specified time, the maximum temperature value on the surface of the heating wire or bus bar is used to represent the hot spot temperature of the automobile electric heating glass.

15 Electrothermal shock resistance test

15.1 Purpose of the test

Check whether the quality of automotive electric heating glass still meets the requirements of corresponding product technical conditions, after being subjected to the thermal shock caused by electrification and heating under low temperature conditions.

15.2 Test equipment

a) Constant low temperature box: The working temperature can reach -40 °C; the sensitivity of the temperature controller can reach 1 °C;

b) DC stabilized power supply: The output voltage range shall not be less than 0 ~ 40 V (continuously adjustable); the maximum output current shall not be less than 40 A;

c) Voltmeter, which complies with the provisions of GB 776; it has an accuracy not lower than grade 1.0.

15.3 Test procedure

15.3.1 Put the specimen into the low temperature box, which has been adjusted to the temperature required for the test.

15.3.2 After the specimen is kept at the temperature required by the test for a specified time, take it out. Place it under the environmental conditions specified in Chapter 5. Immediately energize and heat the specimen for the specified time, according to the voltage required for the test. Record the specimen damage.

15.4 Result presentation

After the specimen is tested, the damage of the specimen is used to indicate the electrothermal shock resistance of the automotive electric heating glass.

16 Salt spray resistance test

16.1 Purpose of the test

Check whether the ability of automobile electric heating glass, to withstand salt spray corrosion in a salt spray environment, meets the requirements of the corresponding product technical conditions.

16.2 Test reagents

16.2.1 Saline solutions

The weight percentage of sodium chloride is (5 ± 0.5) %.

16.2.1.1 Sodium chloride

Anhydrous sodium chloride: The impurity content is not more than 0.2%; the sodium iodide is not more than 0.1%; it shall not contain nickel and copper.

16.2.1.2 Water

Distilled water: The impurity content is not more than 0.02%; the pH value is 7 ± 1.

16.2.1.3 Preparation of saline solution

Weigh five parts of sodium chloride. Dissolve in 95 parts of distilled water. Under the condition of 35 °C ± 1 °C, the density of 5% saline solution shall be 1030 to 1040 kg/m^3; the pH value is 7 ± 0.5.

16.2.2 Compressed air

The air shall be pure (to purify the air, pass it through a clean water filter). At a temperature of 35 °C ± 2 °C, maintain a relative humidity of 85% ~ 90%; deliver it to the sprayer, at a pressure of 100 ± 20 kPa.

16.2.3 Salt spray

Salt spray is determined by the properties of the solution, which is collected in the collector during the test.

16.2.3.1 The intensity of the spray is to collect 2 ± 1 mL of solution per hour, on a horizontal collection surface of 80 cm^2; the minimum working time is based on 16 h.

16.2.3.2 The collected saline solution must meet the density and pH values, which are specified in 16.2.1.3 above.

16.3 Test equipment

16.3.6 Salt mist collector

The salt mist collector is a glass funnel, which has a diameter of 10 cm. The opening area of the funnel is about 80 cm^2. It is fixed on a pierced stopper. At least two collectors shall be placed in the exposed area. One collector is located as close from the sprayer as possible, whilst the other collector is located as far away from the sprayer as possible. In this way, the salt spray that falls directly into the funnel is collected, whilst liquid that runs off the exposed specimen or from any part of the spray chamber is excluded.

16.4 Test procedure

16.4.1 Before the test, clean the surface of the specimen. Place it under the conditions, which are specified in Chapter 5, for more than 2 hours.

16.4.2 Place the specimen on the holder in the spray chamber.

16.4.3 Pour the prepared saline solution into the salt solution vessel. Turn on the equipment, to adjust the temperature in the spray space to 35 °C ± 2 °C; the humidity is 50% ~ 70%. Then start the salt spray test.

16.4.4 After reaching the time required for the test, stop the test and take out the specimen.

16.4.5 According to the test in Chapter 11, give the power value of the specimen.

16.4.6 Clean the specimen. Let it stand for 48 hours, under the environmental conditions specified in Chapter 5.

16.4.7 Place the specimen in a test chamber, which has a relative humidity of 50% ~ 70%. Carry out test according to Chapter 17. Record the damage of the heating wire of the specimen. Give the power value of the specimen.

16.5 Result presentation

After the specimen is subjected to the salt spray test, the salt spray resistance of the automotive electric heating glass is expressed by the power value of the specimen, when it is not cleaned and the power value of the cleaned specimen after the electric heating wire's abrasion resistance test.

17 Abrasion resistance test of electric heating wire

17.1 Purpose of the test

Check whether the heating power of the electric heating wire on the surface of the automobile electric heating glass can still meet the requirements of the corresponding product technical conditions, after being subjected to the friction of cotton gauze for a certain period of time.

specified in Chapter 5, for more than 2 hours;

17.3.5 According to the test in Chapter 11, give the power value of the specimen.

17.4 Result presentation

The measured power after the specimen test is used, to represent the abrasion resistance of the electric heating wire of the automobile electric heating glass.

18 Moisture resistance test

18.1 Test purpose

Determine whether the moisture resistance of the automotive electric heating glass still meets the requirements of the corresponding product technical conditions, after being subjected to the action of atmospheric moisture for a certain period of time.

18.2 Test equipment

a) Constant temperature and humidity chamber: The working temperature can reach 100 °C; the sensitivity of the temperature controller can reach 1 °C; the working humidity can reach 99%; the control sensitivity can reach 1%;

b) DC stabilized power supply: The output voltage range shall not be less than 0 ~ 40 V (continuously adjustable); the maximum output current shall not be less than 40 A;

c) Voltmeter: It complies with the requirements of GB 776; the accuracy is not lower than grade 1.0;

d) Time cycle controller, which shall be able to ensure the alternated cycle of power-on heating and heating-off time.

18.3 Test procedure

18.3.1 Put the specimen into the constant temperature and humidity chamber, which had been adjusted to the temperature and humidity required by the test.

18.3.2 According to the test requirements of the heating time and heating stop time, the specimen is energized cyclically.

18.3.3 After the test reaches the specified cycle time, stop the test. Take out the specimen. Wipe the surface of the specimen clean. Place it under the environmental conditions, which are specified in Chapter 5, for 2 hours.

18.3.4 According to the test in Chapter 11, give the power value of the specimen.

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