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Automotive solar reflective coated laminated windscreen

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Automotive solar reflective coated laminated windscreen

1 Scope

This document specifies the terms and definitions, product classification, technical requirements, test methods, inspection rules, packaging, marking, transportation and storage for automotive solar reflective coated laminated windscreen.

This document is applicable to automotive solar reflective coated laminated windscreen, and as a reference to automotive solar reflective coated laminated non-windscreen.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the version corresponding to that date is applicable to this document; for undated references, the latest version (including all amendments) is applicable to this document.

GB/T 5137.2, Test methods of safety glazing materials used on road vehicles - Part 2: Optical properties tests

GB/T 5137.4, Test methods of safety glazing materials used on road vehicles - Part 4: Determination of solar characteristic

GB 9656, Safety technical specification for glazing materials used in power-driven vehicles

GB/T 10125-2021, Corrosion tests in artificial atmospheres - Salt spray tests

GB 11555, Motor vehicles - Windshield demisting and defrosting systems - Performance requirements and test methods

GB/T 11942, Test method of chroma for colour building materials

GB/T 44153, General technical requirements for glazing materials used in power-driven vehicles

GB/T 43299, Test methods of electrical heating properties for glazing materials used in power-driven vehicles

JC/T 512, Packaging of automobile safety glass

QC/T 1119, Road vehicles - Safety glazing materials - Vocabulary

boundary ghosting

The state where the boundary of the film layer of the coated glass appears to be too wide, with an uneven transition or yellowing and diffusion.

3.8**electro-magnetic field aperture**

The coating-removed or uncoated area on the solar reflective coated laminated windscreen to realize the vehicle-mounted wireless signal transmission function.

4 Product classification

Automobile solar reflective coated laminated windscreens are divided into heating type and non-heating type according to whether they have heating function; and are divided into Class I, Class II and Class III according to the total solar energy transmittance.

5 Technical requirements**5.1 Thickness deviation, size deviation, fit, overlap, edge quality, marking quality, edge stress, pedestrian impact safety**

Shall meet the requirements of GB/T 44153 or relevant technical conditions.

5.2 Vision safety performance, strength safety performance and environmental durability safety performance

The vision safety performance (visible light transmittance, secondary image deviation, light distortion), strength safety performance (human head model impact performance, penetration resistance, impact resistance), and environmental durability safety performance (wear resistance, heat resistance, radiation resistance, moisture resistance) shall comply with the requirements for laminated safety glass for windscreens in GB 9656.

5.3 Appearance quality

5.3.1 The automotive solar reflective coated laminated windscreen shall comply with the appearance quality requirements of GB/T 44153.

5.3.2 Coated glass shall also meet the requirements of Table 1.

5.9 Electrical attachment pull-out force

For an electrical plug with one end placed inside the laminated glass and in contact with the coated surface, the pull-out force shall not be less than 50 N.

5.10 Overpressure

The circuit shall be turned on after the test, and the power change rate before and after the test shall not be greater than 5%.

5.11 Resistance to low temperature electrical and thermal shock

After the test, the test sample shall not break, and the part beyond 15 mm of the edge of the test sample shall not have visible defects such as discoloration, bubbles, cracks, etc. After the test, the circuit shall be turned on, and the power change rate before and after the test shall not be greater than 5%.

5.12 Moisture resistance

After the test, the test sample shall not break, and the part beyond 15 mm of the edge of the test sample shall not have visible defects such as discoloration, bubbles, cracks, etc. After the test, the circuit shall be turned on, and the power change rate before and after the test shall not be greater than 5%.

5.13 Salt spray resistance

After the test, the test sample shall not have visible defects such as discoloration, bubbles, cracks, etc.

5.14 Resistance to cold, hot and wet cycles

After the test, the part beyond 15 mm of the edge of the test sample shall not have any visible discoloration, bubbling, turbidity, etc.

5.15 Thermal shock resistance

After the test, the part beyond 15 mm of the edge of the test sample shall not have any visible discoloration, bubbling, turbidity, etc.

5.16 Thermal aging resistance

After the test, the part beyond 15 mm of the edge of the test sample shall not have any visible discoloration, bubbling, turbidity, etc.

5.17 Low temperature resistance

After the test, the part beyond 15 mm of the edge of the test sample shall not have any visible discoloration, bubbling, turbidity, etc.

6 Test methods

6.1 Test conditions

Unless otherwise specified, the test shall be carried out under the following conditions:

- a) Temperature: $20\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$;
- b) Relative humidity: 40% ~ 80%.

6.2 Thickness deviation, size deviation, fit, overlap, edge quality, marking quality, edge stress, pedestrian impact safety

Inspection shall be carried out according to GB/T 44153 or the method agreed upon by the supplier and the buyer.

6.3 Vision safety performance, strength safety performance and environmental durability safety performance

Visible light transmittance, secondary image deviation, light distortion, human head model impact performance, penetration resistance, impact resistance, wear resistance, heat resistance, radiation resistance and moisture resistance are tested according to the methods specified in GB 9656.

6.4 Appearance quality

6.4.1 The appearance quality of windscreen laminated glass shall be inspected using the finished product as the test sample in accordance with the method specified in GB/T 44153.

6.4.2 Taking the finished product as the test sample, place it on the inspection rack under an ambient illumination of 1 000 lx or above or outdoor natural light, as shown in Figure 1. Face the outer surface of the test sample to the inspector. The inspector is 300 mm away from the test sample and uses a reading microscope with a graduation value of 0.1 mm to measure the boundary ghosting size; the inspector is 600 mm away from the test sample and observes the sample surface perpendicularly to see if there are stripes, stains, or water stains.

6.12 Resistance to low temperature electrical and thermal shock

Take three products as the test samples, and conduct the test according to the method specified in GB/T 43299. After the test, calculate the power change rate according to Formula (1) in 6.11.

6.13 Moisture resistance

Take three products as the test samples, and conduct the test according to the method specified in GB/T 43299. After the test, calculate the power change rate according to Formula (1).

6.14 Salt spray resistance

6.14.1 Sample preparation

Take the product or a 300 mm × 300 mm flat test piece made with the same structure, same process and same material as the product as the test sample. The distance between the film layer boundary and the glass edge is the same as that of the product. The number of pieces is 3.

6.14.2 Test procedure

Conduct the neutral salt spraying (NSS) according to the method specified in GB/T 10125-2021, with a test period of 720 hours. After the test, treat the sample according to the provisions of 12.2, then observe the changes in the appearance of the sample and record the distance between the film layer boundary and the glass edge.

6.15 Resistance to cold, hot and wet cycles

6.15.1 Sample preparation

Same as 6.14.1.

6.15.2 Test device

For programmable environmental test chamber, the temperature deviation range shall be within $\pm 2^{\circ}\text{C}$, and the temperature uniformity shall be no greater than 2°C ; the relative humidity deviation range shall be within $\pm 4\%$, and the relative humidity uniformity shall be no greater than 4% .

6.15.3 Test procedure

6.15.3.1 Carry out the test for a total of 4 cycles. Each cycle includes the following 7 stages: heating rate [$1^{\circ}\text{C} \sim 3^{\circ}\text{C}$]/min, cooling rate [$0.7^{\circ}\text{C} \sim 1^{\circ}\text{C}$]/min.

- a) Heating stage: the temperature rises from $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ to $90^{\circ}\text{C} \pm 2^{\circ}\text{C}$.
- b) Insulation stage: maintain the temperature at $90^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 4 h.

- c) Cooling stage: the temperature drops to $50\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$, and the relative humidity is 95% ~ 100%.
- d) Insulation stage: maintain the temperature at $50\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$, and the relative humidity at 95% ~ 100% for 4 h.
- e) Cooling stage: when the temperature drops to $-40\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and the relative humidity drops to 30% ~ 40%, no control will be carried out.
- f) Insulation stage: maintain the temperature at $-40\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ for 16 h.
- g) Heating stage: the temperature rises to $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$.

6.15.3.2 In the last cycle, maintain the temperature at $-40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 16 hours before ending the test. Do not increase the temperature any further.

6.15.3.3 After the test, take out the sample and place it at room temperature for 4 hours to observe the changes in the sample's appearance.

6.16 Thermal shock resistance

6.16.1 Sample preparation

Same as 6.14.1.

6.16.2 Test device

For high and low temperature shock environment test chamber, the temperature deviation range shall be within $\pm 2\text{ }^{\circ}\text{C}$, and the temperature uniformity shall not be greater than $2\text{ }^{\circ}\text{C}$.

6.16.3 Test procedure

6.16.3.1 Conduct the test for 4 cycles in total. A single cycle includes two processes, a) and b). The switching time between a) and b) shall be $\leq 30\text{ s}$:

- a) Maintain the temperature at $-40\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ for 2 h;
- b) Maintain the temperature at $80\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ for 2 h.

6.16.3.2 After the test, take out the sample and place it at room temperature for 4 hours to observe the changes in the sample's appearance.

6.17 Thermal aging resistance

6.17.1 Sample preparation

Same as 6.14.1.

Those that comply with the requirements of this document are qualified, and those that do not comply are unqualified.

7.2.4 Comprehensive determination

If all the inspection items listed in Table 3 are qualified, the batch of products is judged to have passed the ex-factory inspection, otherwise it is unqualified.

7.3 Type inspection

7.3.1 General

Type inspection shall be carried out in the following cases, including but not limited to:

- a) When a new product is put into production, a product is finalized and identified, or when production is transferred to another factory;
- b) After formal production, if there are major changes in structure, materials and processes, which may affect product performance;
- c) During normal production, inspection shall be carried out periodically or after a certain amount of production has been accumulated;
- d) When the product is discontinued for more than half a year and the production is resumed;
- e) When the quality supervision department proposes a type inspection requirement;
- f) When the factory inspection results are significantly different from the last type inspection.

7.3.2 Batching

Products of the same process, the same material and the same structure are considered as one batch. When the product batch is greater than 1 200 pieces, samples are taken in batches of 1 200 pieces. If the batch is less than 1 200 pieces, it is considered as one batch.

7.3.3 Sampling

Same as 7.2.2.

7.3.4 Determination rules

7.3.4.1 Single item determination

7.3.4.1.1 Thickness deviation, size deviation, fit, overlap, edge quality, marking quality, appearance quality

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