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Power tailgate system for automobile

汽车背门电动开闭系统

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Power tailgate system for automobile

1 Scope

This document specifies the technical requirements, test methods, inspection rules and markings, packaging, transportation, storage of the power tailgate system for category M1 automobile.

This document is applicable to the electric opening and closing system of the tailgate of the automobile, which is driven by electric spindle.

2 Normative references

The content of the following documents constitutes an indispensable clause of this document through normative references in the text. Among them, for dated reference documents, only the version corresponding to that date is applicable to this document; for undated reference documents, the latest version (including all amendments) is applicable to this document.

GB/T 4208-2017 Degrees of protection provided by enclosure (IP code)

GB/T 10125-2012 Corrosion tests in artificial atmospheres - Salt spray tests

GB/T 28046.1-2011 Road vehicles - Environmental conditions and testing for electrical and electronic equipment - Part 1: General

GB/T 28046.2 Road vehicles - Environmental conditions and testing for electrical and electronic equipment - Part 2: Electrical loads

GB/T 28046.4-2011 Road vehicles - Environmental conditions and testing for electrical and electronic equipment - Part 4: Climatic loads

GB 34660 Road vehicles - Requirements and test methods of electromagnetic compatibility

QC/T 413 Basic technical requirements for automotive electric equipment

3 Terms and definitions

The following terms and definitions apply to this document.

4.1.4 The electric opening and closing system of the tailgate shall have an alarm prompt function.

4.1.5 The electric opening and closing system of the tailgate shall have the functions of manual opening and closing, at the same time.

4.1.6 The electric opening and closing system of the tailgate shall have the function of overheating protection.

4.1.7 The electric opening and closing system of the tailgate shall have the anti-pinch function.

4.1.8 The running time of the tailgate's electric opening and closing system, from the closed state to the maximum opening angle OR from the maximum opening angle to the closed state, shall be between 3s and 10s.

4.1.9 The ambient temperature for the normal operation of the tailgate's electric opening and closing system shall be -30°C ~ 80°C; the relative humidity shall be 0 ~ 95%; the voltage shall be 9V ~ 16V.

4.1.10 The quiescent current of the ECU of the tailgate's electric opening and closing system shall not be greater than 0.5mA. The working current of a single electric spindle shall not be greater than 15A; the locked-rotor current shall not be greater than 35A.

4.1.11 The electric opening and closing system of the tailgate shall have the function of vehicle status recognition, to prevent the vehicle from mis-operation under non-safety conditions.

4.1.12 The electric opening and closing system of the tailgate shall have the opening memory function.

4.2 Performance requirements

4.2.1 Basic performance test

The test shall be carried out in accordance with the provisions of 5.2. The electric opening and closing system of the tailgate shall meet the relevant requirements of 4.1.

4.2.2 Durability

Carry out the test in accordance with the provisions of 5.3. The electric opening and closing system of the tailgate shall function normally, without abnormal noise; the rate of change of the anti-pinch force shall not exceed 30%.

4.2.3 Low temperature resistance

Carry out the test in accordance with the provisions of 5.4. The electric opening and closing system of the tailgate shall function normally; the change rate of opening and closing time shall not be greater than 30%; meanwhile it shall meet the requirements of 4.1.8.

4.2.4 High temperature resistance

Carry out the test in accordance with the provisions of 5.5. The electric opening and closing system of the tailgate shall function normally; the change rate of opening and closing time shall not exceed 30%; meanwhile it shall meet the requirements of 4.1.8.

4.2.5 Resistance to temperature cycle

Carry out the test in accordance with the provisions of 5.6. Perform the test, 2h after restoring to room temperature. The electric opening and closing system of the tailgate shall function normally. The change rate of the opening and closing time shall not exceed 30%; meanwhile it shall meet the requirements of 4.1.8.

4.2.6 Vibration resistance

Carry out the test according to 5.7. The tailgate shall not be opened, during the test. After the test, the electric opening and closing system of the tailgate shall not be damaged and function normally.

4.2.7 Resistance to violent shutdown

Carry out the test in accordance with the provisions of 5.8. After the test, the electric opening and closing system of the tailgate shall be free from damage and function normally.

4.2.8 Snow load performance

Carry out the test in accordance with the provisions of 5.9. After the test, the electric opening and closing system of the tailgate shall be capable of electric opening and closing; the hover function shall be normal.

4.2.9 Noise performance

Carry out the test according to 5.10. During the test, the sound pressure level of the tailgate's electric opening and closing system shall not be greater than 60dB (A); there shall be no abnormal noise. The momentary noise of the tailgate, when its lock or buckle locks and unlocks, shall not exceed 80dB (A).

4.2.10 Overvoltage performance

Carry out the test according to the provisions of 5.11. After the test, the electric opening and closing system of the tailgate shall be able to meet the

4.2.18 IP protection level of electric spindle

Carry out the test in accordance with the provisions of 5.19. The motor part of the electric spindle shall reach the protection level of IP67; the water in the non-motor part shall be discharged in time.

4.2.19 Static longitudinal load of ball socket

Carry out the test in accordance with the provisions of 5.20. The ball socket of the electric spindle unit shall not break, when subjected to an axial tension of 3500N.

4.2.20 Static longitudinal load of electric spindle unit

Carry out the test in accordance with the provisions of 5.21. When the electric spindle assembly bears 5000N axial tension, no parts shall come out.

4.2.21 Dynamic longitudinal load of electric spindle unit

Carry out the test in accordance with the provisions of 5.22. After the test, no parts of the electric spindle unit shall come out.

4.2.22 Static lateral load of electric spindle unit

Carry out the test in accordance with the provisions of 5.23. After the test, the electric spindle unit shall be able to work normally.

4.2.23 Drop resistance

Carry out the test in accordance with the provisions of 5.24. After the test, the connection parts of the electric spindle unit shall neither break nor fall out.

5 Test method

5.1 Test conditions

Unless otherwise specified, all tests shall be carried out on flat ground, at 23°C ± 5°C and a relative humidity of 25% ~ 75%.

5.2 Basic performance

5.2.1 Appearance inspection: Visual inspection; the inspection result shall meet the requirements of 4.1.2.

5.2.2 Anti-pinch force test: Use a dynamometer to carry out test, on the stand of the tailgate's electric opening and closing system, that simulates the actual vehicle conditions; record the test results.

stabilizes to room temperature for 2h, perform a functional test. The test results shall meet the requirements of 4.2.4.

5.6 Resistance to temperature cycle

The test is carried out in accordance with the rapid temperature change test method of the conversion time, in GB/T 28046.4-2011. The test result shall meet the requirements of 4.2.5.

5.7 Vibration resistance

Carry out the test in accordance with the test method of QC/T 413. The test result shall meet the requirements of 4.2.6.

5.8 Resistance to violent shutdown

On the bench of the tailgate's electric opening and closing system, that simulates the actual vehicle situation, when the tailgate is at the maximum opening angle, suddenly release a heavy object, which is hanged at the center of gravity of the tailgate AND has the same weight of the tailgate, to allow the tailgate to automatically move to the fully closed position of the tailgate. The test result shall meet the requirements of 4.2.7.

5.9 Snow load performance

Place the tailgate's electric opening and closing system bench, that simulates the actual vehicle condition, in an environmental test box at -30°±2°C. Let it stand for 4 hours. Use a heavy object, which has a weight of not less than 3kg AND is placed close to the center of gravity of the tailgate, to carry out the electric opening and closing tests. The number of tests is 10 times. The test results shall meet the requirements of 4.2.8.

5.10 Noise performance

Place the tailgate's electric opening and closing system bench, that simulates the actual vehicle condition, in the semi-anechoic room. Make the tailgate's electric opening and closing system work cyclically. Use the sound test and evaluation equipment, to measure the noise, at a position 500mm at the middle of the lateral side of the spindle, at a distance equal to the height of the spindle, in the opening and closing process. The test results shall meet the requirements of 4.2.9.

5.11 Overvoltage performance

Perform the test according to the test method of GB/T 28046.2. Heat the device under test DUT to T = (T_{max} - 20°C), in the heating box. Apply a voltage of 18V, to the effective input terminal of the DUT, for 60min. The test result shall meet

the requirements of 4.2.10.

5.12 Insulation dielectric strength

Carry out the test according to the test method of QC/T 413. The test result shall meet the requirements of 4.2.11.

5.13 Slope standing performance

Place the tailgate's electric opening and closing system bench, that simulates the actual vehicle condition, under the 20% of slope condition; energize it to carry out the test. Record the opening and closing time of the tailgate, respectively. The test results shall meet the requirements of 4.2.12.

5.14 Hover function

Place the tailgate's electric opening and closing system bench, that simulates the actual vehicle condition on a level ground and a 20% slope condition. Manually operate the tailgate to stop at any angle, within the set maximum opening range, to test whether it can hover. The test results shall meet the requirements of 4.2.13.

5.15 Electromagnetic compatibility

Carry out the test according to the method specified in GB 34660. The test result shall meet the requirements of 4.2.14.

5.16 Suction force performance

5.16.1 Self-suction door lock's suction force performance: Arrange a reaction force mechanism of not less than 550N, on the tailgate's electric opening and closing system bench, that simulates the actual vehicle condition. Close the tailgate to the incompletely closed position AND perform automatic suction action, of the self-suction door lock. The test results shall meet the requirements of 4.2.15.

5.16.2 Self-suction lock buckle's suction force performance: Arrange a reaction force mechanism of not less than 550N, on the tailgate's electric opening and closing system bench, that simulates the actual vehicle condition. Close the tailgate to the incompletely closed position AND perform automatic suction action, of the self-suction door buckle. The test results shall meet the requirements of 4.2.15.

5.17 Corrosion resistance of electric spindle unit

According to the neutral salt spray test method, which is specified in GB/T 10125-2012, the electric spindle unit shall be subjected to a 240h salt spray test.

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