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Endurance test method for adjuster of motor vehicle adaptive front lighting system

汽车自适应前照明系统调光装置耐久性试验方法

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Endurance test method for adjuster of motor vehicle adaptive front lighting system

1 Scope

This standard specifies the durability test method and requirements for the adjuster of the motor vehicle adaptive front lighting system.

This standard applies to motor vehicle adaptive front lighting systems, which are equipped with dynamic adjustment devices and electronically controlled moving/rotating calibration blocks.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document.

GB/T 28046.3-2011 Road vehicles - Environmental conditions and testing for electrical and electronic equipment - Part 3: Mechanical loads

GB/T 30036-2013 Adaptive front-lighting system for motor vehicles

3 Terms and definitions

The following terms and definitions apply to this document.

3.1

Adaptive front lighting system

A lighting device, which provides beams with different characteristics, can automatically adapt to the needs of low beam and high beam (if used) under different conditions, realizes the basic functions that meet the requirements of corresponding requirements. The composition of the system includes "system control" and one or more "input and operating devices" (if configured), as well as the installation units on the left and right sides of the vehicle.

3.2

Front lighting vertical adjuster

4 Symbols, codes, abbreviations

PSD: Power spectral density of the acceleration

5 General requirements

5.1 Applicability

This test method provides a comprehensive systematic test for front lighting systems, which are equipped with dynamic adjustment devices and electronically controlled movement/dynamic adjustment elements.

5.2 General conditions for testing

The test darkroom shall have no light leakage. Its environmental conditions shall not affect the transmission performance of the light beam and the accuracy of the instrument.

Optical detection shall be collected on the screen outside the test distance. The test distance is 10 m or other distances that can ensure that the light pattern is not distorted. The color of the screen shall be convenient for beam aiming and signal collection by the test system; the influence of stray light shall be eliminated during the test.

When detecting the position of the cut-off line, the light type collection of the sample under test shall not be affected by other samples.

5.3 Testing equipment

Testing equipment shall include:

a) Headlight control and lighting device;

b) Optical detection system (digital camera). It is used to collect the position of the cut-off line of the headlight on the screen; it can be saved. The camera settings shall enable the photo to accurately reflect the distribution and brightness of the light pattern; the selection of pixels shall be based on the corresponding image processing software. The position of the cut-off line, which is calculated by the image processing software, shall be accurate to 1 mm (the measurement distance is 10 m);

c) High and low temperature test chamber (with an observation window; the size of the observation window is based on not blocking the transmission of light). The heating and cooling rate shall be greater than or equal to 1 °C/min;

d) Random vibration test system with programmable temperature and humidity test chamber;

Test time: 7 days (see Appendix B.1).

Temperature: 23 °C ± 2 °C.

See Appendix A for the operating mode of the sample.

Connect the sample to the test harness. Load the lighting cycle (see Appendix B.2). According to the operation mode, run the working cycle of vertical adjuster, horizontal adjuster, switcher of low beam and high beam. See appendix B.3, B.4, B.5 for the cycle mode.

Carry out the reference position operation of the vertical adjuster, horizontal adjuster, switcher of low beam and high beam, every 8 hours.

During the test, collect and save the position of the cut-off line of the headlight on the screen, at least once every 1 hour.

6.2.2 Test of cold start performance (before stage 2)

Cold start performance test process:

a) Carry out reference position operation at room temperature; then cut off the power supply;

b) Reduce the temperature to -40 °C; the sample is stored without load for more than 4 hours;

c) Carry out reference position operation for all actuators;

d) Start 9 lighting cycles, as well as the working cycle of the vertical adjuster, horizontal adjuster, switcher of low beam and high beam (see Appendix B). Collect and save the cutoff line position of the first set of samples, in the 1^{st}, 3^{rd}, 5^{th}, 7^{th}, 9^{th} cycle, respectively. Collect and save the cut-off line position of the first set of samples, in the 2^{nd}, 4^{th}, 6^{th}, 8^{th} cycles, respectively;

e) Start to heat up after 20 minutes, from -40 °C to 23 °C within 30 minutes. Run synchronously with the lighting cycle;

f) After 7 cycles, perform reference position operation on all actuators;

g) Continue lighting cycle, until the 9^{th} cycle is completed.

6.2.3 Stage 2: Temperature cycling operation

Test time: 7 days (see Appendix B.1).

Temperature: See Appendix B.6 for temperature cycling.

See Appendix A for the operating mode of the sample.

Connect the sample to the test harness. Load the lighting cycle (see Appendix B.2). According to the operation mode, run the working cycle of vertical adjuster, horizontal adjuster, switcher of low beam and high beam. See appendix B.3, B.4, B.5 for the cycle mode.

Carry out the reference position operation of the vertical adjuster, horizontal adjuster, switcher of low beam and high beam, every 8 hours.

During the test, collect and save the position of the cut-off line of the headlight on the screen, at least once every 1 hour.

6.2.4 Re-test of cold start performance (after stage 2)

Same as clause 6.2.2.

6.2.5 Stage 3: Operation at room temperature

Test duration: 7 days (see Appendix B.1).

Temperature: 23 °C ± 2 °C.

See Appendix A for the operating mode of the sample.

Connect the sample to the test harness. Load the lighting cycle (see Appendix B.2). According to the operation mode, run the working cycle of vertical adjuster, horizontal adjuster, switcher of low beam and high beam. See appendix B.3, B.4, B.5 for the cycle mode.

Carry out the reference position operation of the vertical adjuster, horizontal adjuster, switcher of low beam and high beam, every 10 min.

During the test, collect and save the position of the cut-off line of the headlight on the screen, at least once every 1 hour.

6.2.6 Stage 4: Broadband noise vibration with temperature

Test duration: 3 days (see Appendix B.1).

Vibration direction: Vertical (see Appendix B.1).

The vibration spectrum is as shown in Table 1 and Figure 2.

- Before/after stage 4: ±60 mm.

Allowed horizontal offsets:

- During/after stage 1, stage 2, stage 3: ±1°;

- During/after cold start performance test and retest: ±1°;

- Before/after stage 4: ±1°.

7.2 Out of synchronization of the actuator (stepping motor)

During the test, when the requirements listed in 7.1 are met, out-of-synchronization is allowed.

7.3 Cold start performance

During the running of the cold start test, no hysteresis is allowed AND the requirements listed in 7.1 must be met.

7.4 Fault record items

During the entire test process, no systematic errors that limit the functions of modules or electronic devices are allowed.

7.5 Other indicators

7.5.1 Headlamps are not allowed to be broken, cracked, strongly deformed, loosely connected, peeled off of surface coating; serious changes are not allowed on the surface of electrical contacts; clearly visible thermal deformation, discoloration, blackening, and volatilization are not allowed; shrinkage marks are not allowed in the visible area of the lamp.

7.5.2 The wiring harness is not allowed to have the following:

- The wiring harness is in contact with and restricts the movement of movable elements within the lamp;

- Damage to the wiring harness, resulting in exposed current-carrying wires (insulation is completely peeled off);

- Fraying of the wiring harness, in the area visible to the headlights.

Appendix A

(Normative)

Headlight operating mode

In the durability test, headlamps with adjusters or reflectors can be operated in the following modes:

a) For the horizontal adjuster, vertical adjuster, switcher of low beam and high beam with adaptive function (AFS/ADB),3 kinds of adjusters operate superimposedly.

The test cycle of the front lighting horizontal adjuster, vertical adjuster, switcher of low beam and high beam must run simultaneously with the lighting cycle (See Appendix B.1);

b) For headlamps with dynamic horizontal adjuster and vertical adjuster, the test cycle of horizontal adjuster and vertical adjuster must run simultaneously with the lighting cycle;

c) For headlamps with a dynamic vertical adjuster, the vertical adjuster test cycle must run simultaneously with the lighting cycle;

d) For headlamps with a dynamic horizontal adjuster, the test cycle of the headlamp horizontal adjuster must run simultaneously with the lighting cycle;

e) For headlamps with combined light type functions, the test cycle of the adjuster shall be run simultaneously with the lighting cycle, in accordance with the product-defined mode.

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