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Motor vehicle headlamps equipped with filament lamps

汽车用灯丝灯泡前照灯

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Motor vehicle headlamps equipped with filament lamps

1 Scope

This Standard specifies the light distribution performance, test methods and inspection rules of motor vehicle headlamps equipped with filament lamps and sealed beam headlamps.

This Standard applies to various types of headlamps (excluding the headlamps equipped with gas-discharge source) for Class M and N vehicles.

2 Normative references

The terms in the following documents become the terms of this Standard by reference to this Standard. For dated references, all subsequent amendments (not including errata content) or revisions do not apply to this standard. However, parties to agreements that are based on this Standard are encouraged to study whether the latest versions of these documents can be used. For undated references, the latest edition applies to this Standard.

GB 4785, Prescription for installation of the external lighting and light-signaling devices for motor vehicles and their trailers

GB 15766.1, Lamps for road vehicles - Dimensional, electrical and luminous requirements (GB 15766.1-2000, idt IEC 60809:1995)

ECE R37, Uniform provisions concerning the approval of filament lamps for use in approved lamp units on power-driven vehicles and of their trailers

3 Terms and definitions

Terms and definitions determined by GB 4785, and the following ones are applicable to this Standard.

3.1

light distribution

Distribution of luminosity (illumination or luminous intensity, etc.) of the visible light emitted by the lamps.

3.2

-- parts whose optical effect is changed through reflection, refraction, absorption and/or deformation during operation;

-- type of light beam provided (passing beam, driving beam, bend lighting or driving-and-passing beam);

-- materials of lens and its coating;

-- type of the filament lamp;

-- for sealed beam headlamp, rated voltage, rated wattage and filament shape are also included;

-- for headlamp with replaceable filament lamp, other classes are also included.

5 Technical requirements

5.1 General requirements

5.1.1 The headlamp shall be designed and manufactured to meet the requirements of use and comply with the provisions of this Standard even if it is subjected to vibration under normal use conditions.

5.1.2 The headlamp shall have a beam adjustment device. When the passing beam and the driving beam form a combination and each is equipped with a filament lamp (or beam unit), the adjustment device shall be able to adjust them separately. These requirements do not apply to the headlamp unit whose passing beam and driving beam cannot be adjusted individually; the following requirements of 5.7.5 apply to this type of combination.

5.1.3 The filament lamp of the headlamp with replaceable filament lamp shall be able to be installed in the correct position even in the dark.

5.1.4 The inserts of the sealed beam headlamp shall be firm and connected firmly.

5.1.5 In case of failure of the headlamp, the illuminance value above the h-h line in Figure 1 shall not be greater than the limit of passing beam specified in Table 3 of 5.7.4.2; also, the headlamp whose passing beam and/or driving beam are designed to provide bend lighting must meet the requirement that the 25 V point (v-v line, 75 cm below the h-h line) illuminance is not less than 5 lx.

5.2 The headlamp shall have a light color of white, and its chromaticity characteristics shall meet the requirements of GB 4785.

5.3 The headlamp with replaceable filament lamp shall use filament lamps that meet the requirements of GB 15766.1 or ECE R37. The types, as well as optical and electrical requirements, of some filament lamps are shown in Table 1.

6.4.2 Driving beam aiming

The center of the maximum illuminance area of the beam is located at the HV point.

For the driving beam that can be adjusted separately, it is necessary to perform the driving beam aiming; otherwise, use the passing beam as the aiming reference, that is, after the passing beam aiming, no adjustment is allowed when measuring the driving beam.

6.5 Headlamp with replaceable filament lamp with an adjustable reflector

6.5.1 With respect to the line connecting the center of the light source to the HV point on the measuring screen, know the position on the test goniometer corresponding to each position of use of the adjustable reflector. After that, perform aiming according to the regulations in 6.4.1 and 6.4.2 by moving the position of the reflector.

6.5.2 After initially positioning the reflector according to the provisions of 6.5.1, the passing beam shall comply with the provisions of 5.7.4, and the driving beam shall comply with the provisions of 5.7.5.

6.5.3 Carry out additional tests according to the following provisions:

Move the reflector vertically by ±2° (or to the maximum adjustment if the reflector is adjusted less than 2° from its initial position); then, re-perform aiming by using the test goniometer in the opposite direction. At this time, the illuminance values of passing beam area III (HV point) and 75R, as well as driving beam E_{max} and E_{HV} point shall comply with the provisions of this Standard.

6.5.4 If the manufacturer stipulates that the reflector has several use positions, carry out the test according to the provisions of 6.5.1 to 6.5.3 in each use position.

6.5.5 If the manufacturer does not specify the use position of the reflector, the test shall be carried out in accordance with the provisions of 6.5.1 to 6.5.2 at the average adjusted position of the reflector. Afterwards, when the reflector is moved to the maximum adjustment position, carry out an additional test according to the provisions of 6.5.3.

6.6 Chromaticity inspection

6.6.1 Standard light source A (color temperature 2 856 K) shall be used for the headlamp with replaceable filament lamp.

6.6.2 For sealed beam headlamps, the inspection shall be carried out under the test voltage.

7 Inspection rules

7.1 The different types of headlamps shall be judged according to the regulations in Chapter 4 of this Standard.

7.2 Type inspection and production consistency inspection shall be carried out for headlamps. If the corresponding provisions in 7.3 or 7.4 below are met, the product is considered passing the type inspection or consistency inspection.

7.3 Type inspection

7.3.1 The manufacturer shall provide:

7.3.1.1 Drawings, in triplicate, sufficient to identify this type of headlamp, where the characteristic structure of the lens or the reflector, as well as the datum axis, reference center and geometric position installed on the vehicle, shall be indicated.

For headlamp with replaceable filament lamp with an adjustable reflector, the use position and adjustment range of the reflector shall be marked.

For headlamps that provide bend lighting according to 5.7.2, the adjustment range shall be provided.

7.3.1.2 A concise technical specification. In the case of headlamp with replaceable filament lamp, the type of filament lamps used shall be specified.

7.3.1.3 Two sample lamps (filament lamps are included in headlamp with replaceable filament lamp).

7.3.1.4 Plastic material test for plastic lenses:

7.3.1.4.1 13 lenses:

a) Among them, 6 lenses can be replaced by 6 material samples with a minimum size of 60 mm × 80 mm, where the radius of curvature of the outer surface is not less than 300 mm, and there is an area, flat enough, with a size of at least 15 mm × 15 mm in the middle, for measurement;

b) Each lens or material sample shall be manufactured using mass production methods.

7.3.1.4.2 One complete headlamp without lens (including reflector).

7.3.2 Description of the characteristics of the lens and the coating material; if the test has been carried out, the relevant test report shall be attached.

7.3.3 Each sample lamp shall comply with the provisions of 5.1, 5.3 or 5.4 of this Standard.

Appendix A

(Normative)

Stability test of light distribution performance of headlamp

A.1 Stability test of light distribution performance

The test shall be carried out in dry and still air at a temperature of 23 °C ± 5 °C, and the complete headlamp shall be installed on a bracket that can correctly indicate its loading position.

A.1.1 Clean headlamps

The headlamps shall be illuminated for 12 hours according to the provisions of A.1.1.1 below, and inspected according to the provisions of A.1.1.2.

A.1.1.1 Test method

A.1.1.1.1 Headlamps shall be lit in the following manner (see Appendix G):

a) For single-function driving beam, passing beam or front fog lamps, the corresponding filament shall be illuminated for 12 hours[2].

b) For a headlamp consisting of a passing beam and a driving beam or multiple driving beams, or a headlamp consisting of a passing beam and a front fog lamp:

If the manufacturer stipulates that one filament[3] is lit each time the headlamp is used, the passing beam filament and the driving beam filament are lit in turn for 6 hours each. In all other cases[2,3], the passing beam filament is lit for 15 minutes, and all the filaments are lit for 5 minutes, for a total of 12 hours in this way.

c) For a headlamp consisting of a front fog lamp and a driving beam:

According to the provisions of a), light up all the individual functions simultaneously for the specified time; according to the manufacturer's regulations, the lighting method of the mixed lighting function b) can also be used.

1) The headlamps shall be lighted for the specified time according to the following cycle:

The front fog lamps are lighted for 15 minutes; all filaments, for 5 minutes.

[2] When the headlamp to be tested is combined with, and/or mixed with, the signal lamp, the signal lamp shall be illuminated during the test. As for the turn signal lamp, it shall be lighted in a flashing manner, and the time ratio of lighting and extinguishing is approximately 1:1.

[3] When the headlamps work in flashing mode, the filaments of two or more lamps are lighted up at the same time, which, however, is not the normal use of the filaments.

2) If the manufacturer states that when the headlamps are used, only the front fog lamps or only the driving beams shall be lit each time[3], the test shall be carried out under this condition: according to half the time specified in A.1.1 above, light up sequentially[2] front fog lamps and driving beams.

d) For headlamps with passing beam, one or several driving beam(s) and front fog lamps:

1) The headlamps shall be lighted for the specified time according to the following cycle:

The passing beam filaments are lighted for 15 minutes; all filaments, for 5 minutes.

2) If the manufacturer states that when the headlamps are used, only the passing beam or only the driving beam[3] is turned on each time, the test shall be carried out under this condition: according to half the time specified in A.1.1 above, turn on[2] passing beam and driving beam in turn; at the same time, during the driving beam working period, the front fog lamps shall be turned on for half of the specified time according to the following cycle, that is, turned off for 15 minutes and on for 5 minutes.

3) If the manufacturer states that when the headlamps are used, only the passing beam or only the front fog lamps[3] shall be turned on each time, the test shall be carried out under this condition: according to half the time specified in A.1.1, light up[3] sequentially passing beam and front fog lamps; while the passing beam is working, the driving beam shall be turned on for half of the specified time according to the following cycle, that is, off for 15 minutes and on for 5 minutes.

If the manufacturer states that when the headlamps are used, only the passing beam, or the driving beam[3], or the front fog lamp, shall be lit each time, the test shall be carried out under this condition: according to one third the time specified in A.1.1 above, light up sequentially the passing beam, the driving beam and the front fog lamp.

e) When the passing beam is designed to realize bend lighting through an additional light source, during the lighting process of the passing beam, the additional light source shall be cycled for 1 minute and then turned off for 9 minutes.

A.1.1.1.2 Test voltage

For headlamps with replaceable filament lamp, the filament lamp voltage shall be adjusted according to 90% of the maximum power specified in GB 15766.1 or ECE R37.

-- 0.2 parts of NaCMC[4] and an appropriate amount of distilled water (whose conductivity is less than 1 mS/m).

The validity period of the test mixture shall not exceed 14 days.

A.1.2.1.1.2 For headlamps with plastic lens

The composition (mass ratio) of the test mixture coated on the headlamp light distribution lens is as follows:

-- 9 parts of silica sand with a particle size 0 μm ~ 100 μm;

-- 1 part of vegetable charcoal powder with a particle size 0 μm ~ 100 μm;

-- 0.2 parts of NaCMC;

-- 13 parts of distilled water (conductivity less than 1 mS/m);

-- (2±1) parts of surfactant.

The amount of surfactant used is tolerated so that the test mixture can be spread over the entire lens. The validity period of the test mixture shall not exceed 14 days.

A.1.2.1.2 Test mixture application

The test mixture shall be evenly coated on the entire light-transmitting surface of the headlamp, and then reapplied after drying until the illuminance values of driving beam E_{max}, passing beams 50R and 50V drop to 15% ~ 20% of the initial value.

A.1.2.1.3 Measuring equipment

Measuring equipment similar to that used for type inspection shall be used. For headlamp with replaceable filament lamp, standard filament lamps shall be used for light distribution performance measurement.

A.2 Change test of the vertical position of the cut-off line under the influence of heat

This test is used to check whether the vertical position deviation of cut-off line exceeds the specified value under the influence of heat.

The headlamp, which has been tested according to A.1 of this Appendix, shall be tested, without being removed from the test stand or readjusted, according to the provisions in A.2.1 below.

A.2.1 Test

[4] NaCMC means sodium carboxymethyl cellulose, which is usually expressed as CMC. NaCMC used in the test mixture has a degree of substitution (DS) of 0.6 ~ 0.7, and a 2% solution viscosity of (200 ~ 300) cP at 20 °C.

Appendix B

(Normative)

Requirements for headlamps with plastic lens – lens or material sample and complete headlamp test

B.1 General requirements

B.1.1 The samples provided according to the provisions of 7.3.1.4 of this Standard shall meet the following provisions of B.2.1 to B.2.6.

B.1.2 The two sample lamps and plastic lenses provided according to the provisions of 7.3.1.3 of this Standard shall meet the following provisions of B.2.7.

B.1.3 The provided plastic lenses or material samples shall be tested in accordance with the order of Table C.1 in Appendix C.

B.1.4 If the luminaire manufacturer can prove that it has passed the tests specified in the following B.2.1 to B.2.6, only the tests specified in Table C.2 of Appendix C are required.

B.2 Tests

B.2.1 Temperature resistance test

B.2.1.1 Test method

In accordance with the following order, three new lens samples shall be subjected to five cycles of temperature and humidity change tests:

40 °C ± 2 °C, R.H. 85% ~ 95%: 3 h;

23 °C ± 5 °C, R.H. 60% ~ 75%: 1 h;

-30 °C ± 2 °C: 15 h;

23 °C ± 5 °C, R.H. 60% ~ 75%: 1 h;

80 °C ± 2 °C: 3 h;

23 °C ± 5 °C, R.H. 60% ~ 75%: 1 h.

Before the start of the above test cycle, the sample shall be stored at least 4 hours in an environment of 23 °C ± 5 °C and R.H. 60% ~ 75%.

Note: 23 °C ± 5 °C/1 h includes the transition time required to avoid thermal shock effects from one temperature to another.

B.2.1.2 Result

Before and after the test, for each sample, the illuminance value changes on the passing beams B50L, 50R and driving beam E_{max} shall not exceed 10%.

For headlamp with replaceable filament lamp, a standard filament lamp shall be used for measurement.

B.2.2 Light source irradiation test

B.2.2.1 Test method

Three new lenses or their material samples shall be subjected to the light source irradiation test. The spectral energy distribution of the light source is equivalent to a black body of 5 500 K ~ 6 000 K. In order to minimize the influence of radiation with wavelengths less than 295 nm and greater than 2 500 nm, corresponding filters shall be placed between the light source and the sample. The irradiance of the sample is 1 200 W/m^2 ± 200 W/m^2, and the radiation energy received during the test is 4 500 MJ/m^2 ± 200 MJ/m^2. In the test chamber, the temperature of the black plate at the same level as the sample is 50 °C ± 5 °C. The sample rotates around the light source at a speed of 1 r/min ~ 5 r/min, and sprays distilled water with a conductivity less than 1 mS/m (at 23 °C ± 5 °C) in the following cycle, namely: spray for 5 minutes, dry for 25 minutes, until the end of the test.

B.2.2.2 Result

After the test, the outer surface of the sample shall be free from cracks, scratches, chips and deformation. The average value Δt_m of the transmittance change $\Delta t = (T_2 - T_3)/T_2$, when measured on three samples according to the method specified in Appendix D, shall not be greater than 0.020 (i.e., $\Delta t_m \leq 0.020$).

B.2.3 Chemical resistance test

B.2.3.1 Test method

After the light source irradiation test, the outer surfaces of the three samples shall be tested using the following test mixture.

The volume percentage composition of the test mixture is as follows:

61.5% n-heptane, 12.5% toluene, 7.5% tetrachloroethane, 12.5% trichloroethylene and 6% xylene.

During the test, put the cotton cloth soaked in the above mixture on the outer surface of the sample within 10 seconds, and apply a pressure of 50 N/cm^2 (equivalent to applying

Three new lens samples shall be subject to mechanical wear test according to the method specified in Appendix E.

B.2.5.2 Result

After the test, for the sample transmittance change $\Delta t = (T_2 - T_3)/T_2$, and the diffuse transmittance change $\Delta d = (T_5 - T_4)/T_2$, when three samples are measured, according to the method specified in Appendix D, in the specified area of 7.3.1.4.1a) of this Standard, the average value shall be: $\Delta t_m \leq 0.100$, $\Delta d_m \leq 0.050$.

B.2.6 Adhesion test of lens coating

B.2.6.1 Test method

On the surface area of 20 mm × 20 mm of the lens coating, use a blade or a sharp needle to carve into a grid of about 2 mm × 2 mm, and the force shall penetrate the coating.

Use an adhesive tape with a width of not less than 25 mm to press on the above grid area for at least 5 minutes. The adhesive force measured under the standard conditions specified in Appendix F shall be 2 N/cm (width of the adhesive tape) ± 20%.

Then, at one end of the adhesive tape, apply a force that is balanced with the adhesion force perpendicular to the surface, and tear off the adhesive tape at a uniform speed of 1.5 m/s ± 0.2 m/s.

B.2.6.2 Result

After the test, the grid area shall show no visible damage. Grid intersection and scratch damage shall not exceed 15% of the grid area.

B.2.7 Complete headlamp test of plastic light distribution lens

B.2.7.1 Mechanical wear test

The No. 1 sample lamp shall be subjected to the mechanical wear test of the lens according to B.2.5.1 above.

After the test, the illuminance values at B50L and HV point shall not be greater than 30% of the specified maximum value, and the illuminance value of point 75R shall not be less than 10% of the specified minimum value.

B.2.7.2 Adhesion test of lens coating

Sample lamp No. 2 shall be tested according to the provisions of B.2.6 above.

B.3 Production consistency inspection

As far as lens materials are concerned, their production consistency shall meet the requirements of this Standard under the following circumstances:

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