The People's Republic of China

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GB 25991 (2009) (English): Automotive headlamps with LED light sources and/or LED modules

ICS 43.040.20
T38

National Standard of the People's Republic of China

GB XXXX-XXXX

Automotive headlamps with LED light source(s) and/or LED module(s)

(Draft for approval)

Issue Date: XXXX – XX – XX Implementation Date: XXXX – XX – XX

Issued by the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China

Standardisation Administration of the People's Republic of China (SAC)

Foreword

Whilst the contents of the temperature cycling test in this Standard are only recommended, the rest of this Standard is mandatory.

GB 4599, *Motor vehicle headlamps equipped with filament lamps* and ECE R112, *Approval of motor vehicle headlamps emitting as asymmetrical passing beam or a driving beam or both and equipped with filament lamps*, as well as other relevant technical proposals, are used as the references of the main technical requirements of this Standard, such as: general technical requirements, photometric characteristics, light colour, test screen and the contents of the stability test of luminosity performance, etc.

- This Standard is applicable to type M and N motor vehicle LED headlamps, or LED headlamps equipped with LED light source(s) or LED module(s) and emitting passing beam or driving beams. Meanwhile, any relevant contents concerning infrared emission are not included in this Standard.
- The photometric characteristics are adopted from the data requirements of GB4599.
- The colour rendering requirements are adopted from the data requirements of ECE R112 draft; however, according to current test methods in China, the wavelength interval of the sampling is revised as not exceeding 5 nm.
- The temperature cycling test is adopted from the methods established in GB/T10485-2007, but the maximum temperature is adjusted to 50^{o}C, and the test result is determined on the basis of: (1) whether the light source fails; and (2) when the light source does not fail, whether the photometric characteristics qualify.

Appendices A, B, and C of this Standard are all normative annexes.

This Standard shall enter into force on 1 January 2012.

This Standard is proposed by the National Development and Reform Commission.

This Standard is under the jurisdiction of the National Automotive Standardisation Technical Committee.

The following organisations are responsible for the drafting of this Standard:
China Automotive Technology & Research Centre
Tianjin Automobile Lamp Factory
Philips (China) Investment Co., Ltd
Changchun Hella Automotive Lighting Ltd
OSRAM China Lighting Ltd
Tianjin Gongda HIYU Solid-state Lighting Co., Ltd.
Shanghai Koito Automotive Lamp Co., Ltd
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Automotive headlamps with LED light source(s) and/or LED module(s)

(Draft for approval)

1 Scope

This Standard specifies the test methods and inspection rules for the photometric characteristics, light colours and temperature cycling of motor vehicle headlamps equipped with LED light source(s)/module(s) or headlamps containing LED light source(s)/modules.

This Standard applies to LED headlamps of type M and N motor vehicles, or LED headlamps emitting passing beams or driving beams by LED light source(s) or LED module(s).

2 Normative References

The provisions of the following documents become provisions of this Standard after being referenced. For dated reference documents, all later amendments (excluding corrigenda) and versions do not apply to this Standard; however, the parties to the agreement are encouraged to study whether the latest versions of these documents are applicable. For undated reference documents, the latest versions apply to this Standard.

GB 4599-2007 Motor vehicle headlamps equipped with filament lamps
GB 4785 Prescription for installation of external lighting and light signalling devices for motor vehicles and their trailers
GB/T 7922 Methods of measuring the colour of light sources
GB 15766.1 Lamps for road vehicles – Dimensional electrical and luminous requirements

3 Terms and definitions

The terms and definitions established in GB4599-2007 and GB4785 as well as those listed below apply to this Standard.

3.1 Objective luminous flux

The design values of the luminous fluxes of any replaceable light source(s) or light source module(s).

3.2 Light source failure

When LED light source(s) or LED module(s) are under normal service conditions and one or more LED loses luminescence functions, becomes dim or flickers.

3.3 LED module

The light source module(s) which contain LED only.

4 Headlamp types

Headlamps have differences in the following aspects:
4.1 brand names or brand;
4.2 the characteristics of the optical system;
4.3 components of reflection, refraction, absorption and/or deformation when in service to change

the optical effects;
4.4 The types of light beams supplied (passing beam or driving beam, or passing beam and driving beam both);
4.5 Photometric lenses and coating materials;
4.6 The types of LED light source(s)/module(s) and photoelectricity parameters (voltage, power, luminous flux, chromaticity and colour rendering).

5 Requirements

5.1 General requirements

5.1.1 LED headlamps should be designed and produced, under normal service conditions, such that even when they experience vibration they still meet the service requirements and comply with the stipulations of this Standard.

5.1.2 LED headlamps should have good heat dissipation so as to prevent any heat accumulation from the LED light source(s). LED headlamps should provide normal service even in a low temperature or sub-zero environment.

5.1.3 LED headlamps should have good electromagnetic compatibility.

5.1.4 Any headlamp equipped with LED light source(s) or LED module(s) should at all times meet the requirements of this Standard; the photometric characteristics and inspection of any LED headlamp equipped with a filament lamp or HID light source(s) to achieve the functions of driving beam or passing beam should meet the requirements stated in the relevant standards.

5.1.5 Headlamps should be equipped with light beam adjustment devices. When the dipped headlamp and the full-beam headlamp form a combination body, and each is equipped with LED light source(s)/module(s), filament lamp (or light unit), the adjustment device should adjust them individually. These requirements are not applicable to headlamp(s) that are equipped with dipped headlamp(s) and full-beam headlamp(s) which cannot be individually adjusted.

5.1.6 LED headlamps should have labels containing the following information:

- LED headlamp
- Voltage
- Reference centre

5.2 General requirements for LED module(s) and electronic light source control device(s)

5.2.1 LED light source(s) which can produce visible light should be used for LED module(s); any other types of light source(s) must not be applied.

5.2.2 Under normal service conditions, LED module(s) should maintain good working performance. There must be no design or manufacturing shortcomings, and if any one LED light source fails, then the entire module should be treated as failing.

5.2.3 The LED of the LED module(s) should be installed on an appropriate fixed base plate. The fixed base plate should be very strong and stable in order to protect the LED and LED module(s).

5.2.4 The LED module(s) (inside a lamp body) should be precisely located and must be well fixed in order to prevent movement.

5.2.5 With regard to replaceable LED module(s), when replacing the LED module(s), the LED module(s) which comply with the design requirements should be applied; different specification LED modules in the same lamp body are not permitted to replace one another.

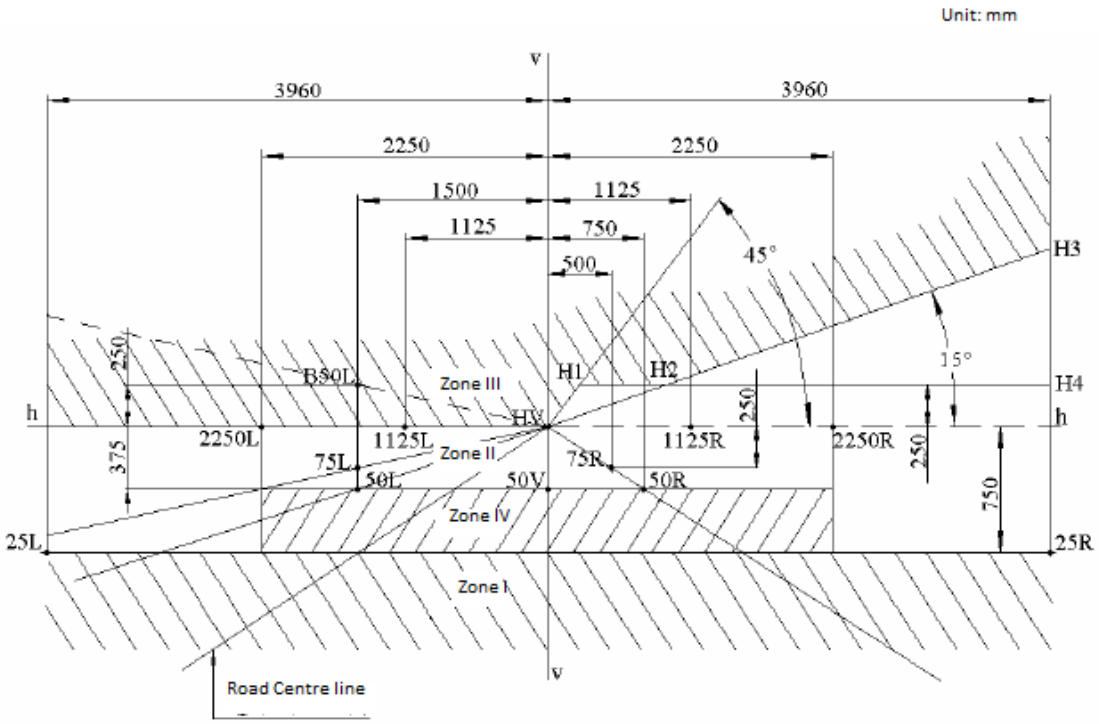
5.2.6 Regardless of whether the electronic light source control device is located inside or outside of the lamp body, it should be treated as part of the LED headlamp.

5.2.7 If a special statement is not provided by the manufacturer, then the LED module(s) should be tested in the headlamp(s) provided by the manufacturer.

5.3 Photometric characteristics

5.3.1 The passing beam of any headlamp should provide sufficient illumination and should not cause dazzling, and the driving beam should provide good illumination. The illumination for bending roads should be achieved by an additional light source, which forms part of the dipped headlamp. If the additional light source fails, the photometric characteristic should still satisfy the passing beam requirements.

5.3.2 Photometric characteristics should be measured on a vertical plane photometric screen which is 25 m in front of the reference centre of the headlamp. The positions of each test point and test zone are shown in Diagram 1.



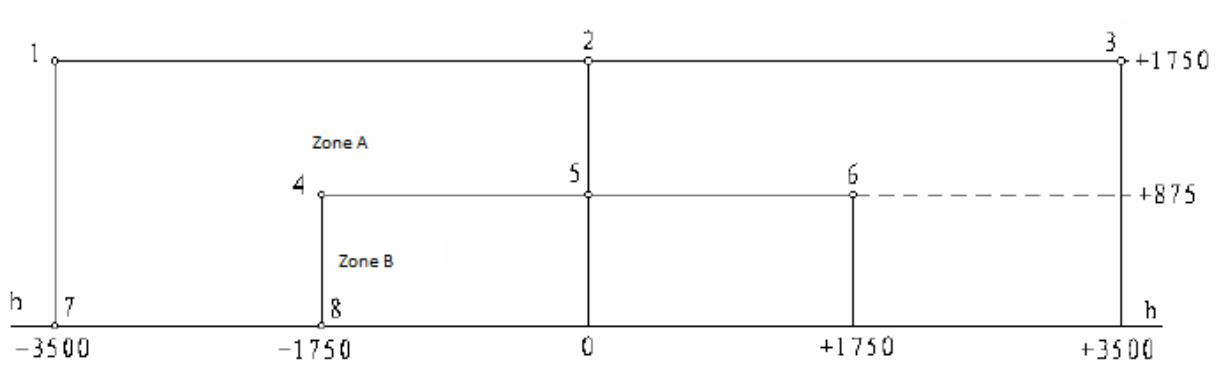


Diagram 1 Photometric Screen

5.3.3 Photometric requirements for the passing beam

5.3.3.1 On the photometric screen, the passing beam should generate a clear cut-off line; its horizontal part should be positioned at the left side of the v-v line, and the right side of the cut-off line should be HV-H2-H3 line or HV-H1-H2-H4 line. Multiple visible cut-off lines are not permitted.

The illuminance limit value on the photometric screen should conform to the specification set out in Table 1.

Table 1

Point, line, zone	Horizontal distance (mm)	Vertical distance (mm)	Illuminance (lx)
HV	0	0	• 0.7
B50L	L 1500	U 250	• 0.4
75R	R 500	U 250	• 12
75L	L 1500	D 250	• 12
50L	L 1500	D 375	• 15
25L	L 1500	D 750	• 2
50V	0	D 375	• 6
50R	R 750	D 375	• 12
25R	R 3960	D 750	• 2
Any point in Zone I			• $2.E_{50R}$[a]
Any point in Zone III			• 0.7
Any point in Zone IV			• 3
E_{50R}[a] is the actual measured illuminance value of 50R.			

5.3.3.2 With regard to any LED headlamp, on a photometric screen the limit illuminance values from test point 1 to test point 8 should conform to the following specification:

Test point 1+2+3 • 0.3 lx;

Test point 4+5+6 • 0.6 lx;

0.7 lx • test point 7 • 0.1 lx;

0.7 lx • test point 8 • 0.2 lx.

5.3.3.3 With regard to any LED headlamp equipped with an adjustable reflector, each service location of the reflector specified by the manufacturer should conform to the specifications set out in 5.3.3.1 and 5.3.3.2.

5.3.3.4 Within zones I, II, III and IV, there should not be any transverse illumination that affects good visibility.

5.3.3.5 If an illumination light beam for bending roads is achieved using the following methods, then the requirements set out in above Table 1 should also be applicable to headlamps providing illumination light beams to bending roads:

5.3.3.5.1 the passing light beam is rotated or the turning point of the cut-off line is moved horizontally;

5.3.3.5.2 one or more optical components of the headlamp is moved, but the turning point of the cut-off line remains static at the horizontal direction.

5.3.3.5.3 one more light source is added, but the turning point of the cut-off line remains static at the horizontal direction.

5.3.4 Photometric requirements for the driving beam

5.3.4.1 The illuminance limit value of the driving beam on the photometric screen should conform to the specifications set out in Table 2.

5.3.4.2 With regard to any LED headlamp equipped with an adjustable reflector, each service location of the reflector specified by the manufacturer should conform to the specifications set out in 5.3.4.1.

5.3.4.3 With regard to any LED headlamp emitting both passing beam and driving beam, the maximum illuminance value of its driving beam should not exceed 16 times the measured illuminance value of 75R of the passing beam.

5.3.5 The effective area of the illuminance measurement on the photometric screen should be within a square of side length 65 mm.

Table 2 Unit: lx

Test point or test zone	Illuminance
E_{max}	• 48 and • 240
HV point	• $0.80E_{max}$
HV point to 1125L and R	• 24
HV point to 2250L and R	• 6

5.4 Light colour

The light colour of all LED headlamps should be white, presented with CIE chromaticity coordinates, the chromaticity characteristics thereof being in accordance with the specifications established in GB4785.

5.5 Light source

LED headlamps should use LED light source(s) or LED module(s) which comply with this Standard; if a headlamp contains any other light source(s), then they must comply with the

specifications established in GB 15766.1 or ECE R37.

The objective luminous flux of any headlamp equipped with LED light source(s) or LED module(s) should not be lower than 1000lm.

5.6 Colour rendering

The colour rendering of any LED headlamp or LED module(s) should meet the minimum requirements on spectrum red light composition:

$$k_{red} = \frac{\int_{\lambda=610nm}^{780nm} E_e(\lambda)\, V(\lambda)\, d\lambda}{\int_{\lambda=380nm}^{780nm} E_e(\lambda)\, V(\lambda)\, d\lambda} \geq 0.05$$

In which:

Ee(•) (unit: w): Spectrum luminescence power

V(•) (unit: I): Spectrum luminescence efficiency

(•) (unit: nm): Wavelength

The calculation of this value should use an interval not greater than 5 nm.

5.7 Stability of the photometric characteristics of LED headlamps

After the photometric characteristics of an LED headlamp have been measured in accordance with the rules of this Standard, the integral lamp should conform to the requirements set out in Appendix A.

5.8 Stability of the illuminance, chromaticity and temperature of LED headlamps

5.8.1 After an LED headlamp been lit for one minute and its illuminance is stable, all of the illuminance values of its test points and test zones should meet the requirements for the maximum value and minimum value. Throughout the entire test process the luminosity output must not be lower than 70% of the initial luminous flux.

5.8.2 After an LED headlamp or an LED module been lit for one minute and its illuminance is stable, the colour of its light should be within the specified range.

5.8.3 See Appendix B for the test methods.

5.9 Plastic photometric lenses and plastic optical components of LED headlamps

5.9.1 The plastic photometric lens of a headlamp after being tested in accordance with 6.7.1 should comply with the requirements set out in Appendix B to GB4599-2007.

5.9.2 LED headlamp anti-UV radiation

5.9.2.1 If any optical unit (including transmission components and reflection components) made of plastic materials is installed inside an LED headlamp, a test should be carried out in accordance with 6.7.2. After the test, the chromaticity of the headlamp should conform to the requirements set out in Article 5.4; no deficiencies such as cracks, deformation, (coating) peeling etc. should appear on the surface of the sample.

5.9.2.2 The test does not need to be carried out on LED headlamps equipped with low UV radiation type LED module(s) or any relevant optical unit of a LED headlamp that uses protection for anti-UV radiation, such as filter lenses.

Low UV radiation type LED headlamps or LED module(s) should meet:

$$k_{UV} = \frac{\int_{\lambda=250nm}^{400nm} E_e(\lambda)\, S(\lambda)\, d\lambda}{k_m \int_{\lambda=380nm}^{780nm} E_e(\lambda)\, V(\lambda)\, d\lambda} \leq 10^{-5}\ W/lm$$

In which: S(•) (unit: l): Spectrum (effect) weighting function

K_m = 683 lm/W: maximum luminous efficacy limit of luminary

See section 5.6 for the meaning of other symbols.

The calculation of this value should use an interval not greater than 5 nm.

The table of UV radiation spectrum weight is based on the wavelength of 270 nm as the representative value (as S(•)=1); for UV radiation spectrum weight values of other wavelength, use the values set out in Table 4 as the substitution:

Table 4 Spectrum weight value of UV radiation

•	S(•)	•	S(•)	•	S(•)
250	0.430	305	0.06000	355	0.000 16
255	0.520	310	0.01500	360	0.000 13
260	0.650	315	0.00300	365	0.000 11
265	0.810	320	0.00100	370	0.000 09
275	0.960	325	0.000 50	375	0.000 077
280	0.880	330	0.000 41	380	0.000 064
285	0.770	335	0.000 34	385	0.000 530
290	0.640	340	0.000 28	390	0.000 044
295	0.540	345	0.000 24	395	0.000 036
300	0.300	350	0.000 20	400	0.000 030

5.10 Temperature-resistance cycling test of LED headlamps

This test should be carried out in accordance with Appendix C. During the lighting in the final period of a cycle, check whether there is any permanent or intermittent failings with respect to the LED module(s). If there are any failings, then the headlamp does not qualify; if there are no failings, then the photometric characteristics should be checked and should conform to the relevant requirements set out in 5.3.

5.11 Reversed polarity and over-voltage of the LED headlamp power source

After the test, there should be no full or part failings by the LED light source(s) and the electronic light source control device of the sample.

6 Test methods

6.1 Test room, devices and facilities

6.1.1 There should be no light leakage into the dark room hen testing. The environmental condition of the dark room should not affect the transmission performance of the light beam and the accuracy of the instruments.

6.1.2 The photometric screen should be sufficiently wide so as to be convenient for checking and adjusting the cut-off line of the passing beam; the colour of the photometric screen should be convenient for light beam aiming, and stray light effects should be removed during the photometric test.

6.1.3 A regulated DC power supply should be used for the photometric test. The accuracy of the electrical instrument should not be lower than Grade 0.2, and a Grade 1 illuminometer as specified by the national verification regulation should be used as the illuminometer (its indication error should not exceed ± 4%).

6.2 The ambient temperature of the photoelectric characteristics test should be 23^{o}C ± 5^{o}C, with relative humidity within the range of 20% ~ 80%.

6.3 Photometric test

6.3.1 Before the test, a 15-hour burn-in should be conducted on the LED module(s) of the headlamp, which should then be cooled to room temperature.

6.3.2 If there are no other instructions, the voltage of the photometric test should be: 13.2V± 0.1V (nominal voltage 24V should be 28.0V ± 0.1V). If any electronic light source control device is used, then a test should be carried out in accordance with the parameters specified by the manufacturer.

6.3.3 When the sample lamp is continuously lit and until the luminosity of the lamp is stable, then the sample should undergo a test in accordance with Appendix B.

6.3.4 Passing beam aiming

6.3.4.1 Vertical direction

The horizontal part of the cut-off line should be located at a distance of 25 cm under the h-h line;

6.3.4.2 Horizontal direction

The turning point of the cut-off line should be located on the v-v line. If the turning point is not clear, then the illuminance values which meet 75R and 50R should be used as the reference.

6.3.4.3 In order for the cut-off line to be easily visible when aiming, then part of the photometric lens is permitted to be covered.

6.3.4.4 To check whether the aiming is correct, perform a visual inspection to check that the cut-off lines are within a range of 5^{o} (219 cm) from both sides of the v-v line as the reference.

6.3.4.5 After aiming has been conducted as stipulated above, if the passing beam does not meet the requirements, then the cut-off line is permitted to be adjusted by 1^{o} (44 cm) left and right and within a range not exceeding h-h line respectively.

6.3.4.6 When the illumination beam for bending roads is achieved by means of rotating the passing beam or horizontally moving the turning point of the cut-off line, the measurement should then be taken after re-aiming of the headlamp is complete (such as using a goniometer).

6.3.4.7 When the illumination beam for bending roads is achieved by means of moving one or more optical components of the headlamp, and the turning point of the cut-off line remains at the

horizontal direction, then the measurement should be taken when these optical components are located at the extreme operating position.

6.3.4.8 When the illumination beam for bending roads is achieved by means of an additional light source and the turning point of the cut-off line remains at the horizontal direction, the measurement should be taken when the light source is connected.

6.3.5 Driving beam aiming

The centre of the maximum illuminance zone of the light beam should be located at the HV point.

With regard to any individually adjustable driving beams, driving beam aiming should be conducted or the passing beam should be used as the aiming reference, which means after the aiming of the passing beam is conducted, other further adjustments must not be permitted when measuring the driving beam.

6.3.6 With regard to any LED headlamps equipped with an adjustable reflector

6.3.6.1 According to the centre of the light source(s) and the connecting line between the HV points of the photometric screen, for each service position on the adjustable reflector find out the correspondomg positions on the test goniometer. Then, in accordance with the provisions specified in 6.3.4 and 6.3.5, move the reflector position for aiming.

6.3.6.2 After initially locating the reflector in accordance with 6.3.4, the passing beam should conform to the provisions set out in 5.3.3 and the driving beam should conform to the provisions set out in 5.3.4.

6.3.6.3 Carry out the additional test in accordance with the following rules

Vertically move the reflector for $\pm 2^{o}$ (or, if the adjustment range of the reflector from its initial position is less than 2^{o}, then the reflector should be moved to its maximum adjustment position), after which use a test goniometer from the opposite direction to carry out re-aiming. The illuminance values of III zone (HV point) and 75R of the passing beam and the illuminance values of E_{max} and E_{HV} point of the driving beam should now conform to the specifications set out in this Standard.

6.3.6.4 If the manufacturer specified the number of the service positions for the reflector, then tests should be carried out at each service position in accordance with the provisions set out in 6.3.6.1 to 6.3.6.3.

6.3.6.5 If the manufacturer did not specify any service positions for the reflector, then tests should be carried out at the average adjustment position of the reflector in accordance with the provisions set out in 6.3.6.1 and 6.3.6.2. The reflector should then be moved to the maximum adjustment position, after which an additional test should be carried out in accordance with the provisions set out in 6.3.6.3.

6.3.7 Use the product of the actual measured photometric characteristic values of the LED headlamp and 0.7 as the illuminance values of each test point/zone.

6.3.8 If any one functional light distribution (driving beam or passing beam) of a LED headlamp is achieved by LED module(s) and filament bulb both, then the sum of each measurement should be taken.

6.4 Light colour inspection

In accordance with the colour measurement methods for illumination light source(s) established in GB/T 7922, after aiming (1 minute or once stable), take the direct measurement at the 50V point of the passing beam and of the HV point of the driving beam. The voltage of the measurement should conform to the test voltage of photometric characteristics.

6.5 The stability of the photometric characteristics of LED headlamp

See Appendix A for the test method.

6.6 Stability of illuminance, chromaticity and temperature of LED headlamps

See Appendix B for the test method.

6.7 Plastic photometric lenses and plastic optical components of LED headlamps

6.7.1 See Appendix B to GB4599-2007 for the tests for photometric lenses, material samples and integral lamps of LED headlamps equipped with plastic photometric lenses. Where light source(s) need to be lit during testing, a headlamp interior illuminant should be used to light the lamp according to the test voltage.

6.7.2 Plastic anti-UV radiation unit of LED headlamp

Use light emitted from LED module(s) to conduct 15 hours of continuous illumination to each type of relevant plastic headlamp sample, or a headlamp sample which contains plastic optical components. If any optical unit is used in the test, then the corresponding positions such as the angle, distance etc. of each type of relevant plastic sample and LED module should be the same as the angle, distance etc. of the sample in the headlamp.

6.8 Temperature-resistance cycling test for LED lamps

See Appendix C for the test method.

6.9 Colour rendering measurements

Use a spectrum analyser to measure the minimum red light composition.

Take the measurements at the 50V point of the passing beam or/and the HV point of the driving beam. The measured result should comply with the provisions of 5.6.

6.10 Reversed polarity and over-voltage of the power source of LED headlamps

6.10.1 Reversed polarity test

With regard to 12V voltage system, apply one minute of 14 ± 0.1V reverse voltage to the input terminal of the product power control device; with regard to 24V voltage system, apply one minute of 28 ± 0.2V reverse voltage to the input terminal of the product power control device.

6.10.2 Power over-voltage test

For a 12V voltage system, apply 60 minutes of 18 ± 0.2V reverse voltage to the input terminal of the product power control device; for a 24V voltage system, apply 60 minutes of 36 ± 0.2V reverse voltage to the input terminal of the product power control device.

7 Inspection rules

7.1 Different types of headlamps should be determined in accordance with the provisions specified in Chapter 4.

7.2 The inspection of a headlamp is divided into type inspection and production conformity inspection. If the inspection results conform to the provisions specified in 7.3 or 7.4, this product should be considered as having passed both its type inspection and production conformity inspection.

7.3 Type inspection

The manufacturer should provide:

- sufficient drawings to identify the type of headlamp in triplicate, the characteristic structure

of the photometric lens or reflector should be indicated in the drawing, the reference axis, reference centre and the installation geometric position on the vehicle, the service position of the reflector and the adjustment range also should be marked in the drawing. With regard to any headlamp specified in 5.3.3.5 which provides illumination of bending roads, the adjustment range should be provided;

- a brief technical instruction, including information such as the specification, dimension, photometric parameter and objective luminous flux of the LED module(s), as well as the power connecting port of the electronic light source control device, etc. If the headlamp contains any filament bulbs, then the type of filament bulb used should be specified;
- two sample lamps.

With regard to the plastic material test of plastic photometric lenses and plastic optical components:

- 14 photometric lenses.

(a) Six of the 14 lenses can be replaced by six material samples with minimum size of 60 mm x 80 mm; the curvature radius of their external surfaces should not be smaller than 300 mm, and in the centre there should be a sufficiently flat area of minimum of 15 mm x 15 mm for the measurement;

(b) Each photometric lens or material sample should be produced by way of batch production.

(c) Each piece of every type of relevant plastic sample in the optical units of the LED headlamp or headlamp containing plastic optical component should have the same appearance, colour and surface treatment characteristics as the lamp undergoing inspection.

(d). Test should be carried out on 13 of the photometric lenses in accordance with the stipulations of Table C.1 of Appendix C to GB4599-2007; one more photometric lens should undergo anti-UV radiation test (where required).

- An integral lamp not equipped with a photometric lens (include reflector).

7.3.1 Characteristic statement concerning the photometric lens and coating materials; if a test has been carried out, a relevant test report should be attached thereto.

7.3.2 Each sample lamp should conform to the provisions specified in 5.1, 5.2 and 5.5.

7.3.3 Carry out the test in accordance with Chapter 6. Each sample lamp should conform to the provisions specified in 5.3, 5.4, 5.6, 5.7, 5.8, 5.10 and 5.11.

7.3.4 With regard to any headlamp which uses a plastic photometric lens and plastic optical components, the headlamp should conform to the provisions specified in 5.9.

7.4 Production conformity inspection

7.4 With regard to any product which qualifies from the type inspection, select sample lamps at random to determine production conformity.

7.4.1 Sample lamps which are selected at random should conform to the provisions specified in 5.1, 5.2 and 5.5 of this Standard.

7.4.2 Carry out tests in accordance with Chapter 6. The photometric characteristics of samples which are selected at random should conform to the following provisions:

7.4.2.1 Select any one requirement from the two passing beam requirements

7.4.2.1.1 In accordance with the provisions specified in 5.3.3.1, ease the illuminance limit of the passing beam by 20%, but among which ease B50L for 0.2lx, ease the III zone for 0.3lx;

7.4.2.1.2 Extend the effective test area of B50L, 75R, 50V, 25R and 25L of the passing beam to

circles with the test points as the circle centres and radius of 15 cm. Reduce the height of IV zone from 37.5 cm to 22.5 cm, the width remains unchanged. Apart from easing B50L for 0.1lx and easing the III zone (HV point) for 0.2lx, other illuminance limits should still conform to the original specifications.

7.4.2.2 In accordance with 5.3.4.1, ease the illuminance limit of the driving beam by 20%, in which case ease the illuminance limit of HV point to $0.75E_{max}$.

7.4.3 The sample lamp should conform to the provisions specified in A.2.3 of Appendix A.

7.4.4 Any headlamp which uses plastic photometric lenses should also conform to the provisions specified in B.3 of Appendix B to GB4599-2007 required in 5.9.1.

Appendix A

(Normative Annex)

Stability tests for the photometric characteristics of LED headlamps

A.1 Stability test of the photometric characteristics

The test should be carried out in dry, still air with a temperature of 23°C± 5°C. The integral lamp should be installed on a stand that can correctly represent the position of the vehicle installation.

A.1.1 Clean headlamp

The headlamp should be lit for 12 hours in accordance with the rules stated below in A.1.1.1, and the inspection should be carried out in accordance with the provisions specified in A.1.1.2.

A.1.1.1 Test method

The headlamp should be lit in accordance with the following rules:

A.1.1.1.1 (i) for full-beam headlamps or dipped beam headlamps, the corresponding filament/LED module(s) should be lit for 12 hours[2] ;

(ii) when the passing beam and driving beam are mixed (dual filament bulb or two filament bulbs/LED module(s)): if the manufacturer specifies that each time the headlamp is used, one filament/LED module should be lit, then successively light the passing beam filament(s)/LED module(s) and driving beam filament(s)/LED module(s) for six hours individually.

Under all other circumstances[2] [3], light the passing beam filament(s) /LED module(s) for 15 minutes, light all the filament(s) /LED module(s) for five minutes, and use this method to light for total of 12 hours;

(iii) for combined illumination functions:

In accordance with (i), light all of the single functions at the same time for the specified time; the mixed illumination function (ii) light method can also be considered in accordance with the manufacturer's instructions.

A.1.1.2 Test voltage

With regard to the LED module(s), in accordance with the provisions specified in 6.3 of this Standard:

Any LED combined headlamp equipped with a filament bulb, adjustment of the voltage of the filament bulbs should be made according to 90% of the maximum power specified in GB15766.1 or ECE R37.

Unless other instructions are specified by the manufacturer, otherwise under all circumstances, the filament bulb power of 12V nominal voltage should be used. In the former situation, the filament bulb with the greatest power should be used for the test.

A.1.1.2 Test results

A.1.1.2.1 Visual inspection

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[2] When the headlamp being tested is combined and/or mixed with a signal lamp, the signal lamp should be lighted during the test. With regard to any turn signal lamp, should be lighted with flickering method, the time comparison between switch on and switch off is nearly 1:1.

[3] When headlamps are flickering, the filaments of two or more than two lamps are lit at the same time, but these are not normal condition of use for filaments.

Once a headlamp has cooled down to the ambient temperature, the photometric lens should be cleaned with a clean wet cotton cloth, and a visual inspection should be performed to check that there is no evident deformation, distortion, cracks or change in colour of the photometric lens.

A.1.1.2.2 Photometric test

In order to conform to the requirements of this Standard, the photometric values of 50R, B50L, HV of the passing beam and the E^{max} photometric value of the driving beam should be checked. This includes the tolerance of the photometric methods; the permitted deviation of the illuminance values between before the test and after the test is 10%.

Because the stand my have heat deformation, aiming adjustment is permitted (changing of the vertical position of the cut-off line should be done in accordance with A.2).

A.1.2 Polluted headlamp

After the headlamp has been tested in accordance with the points mentioned above in A.1.1, the headlamp should be prepared in accordance with A.1.2.1 below; then, in accordance with A.1.1.1, the headlamp should be lit for one hour, after which an inspection should be carried out in accordance with A.1.1.2.

A.1.2.1 Headlamp preparation

A.1.2.1.1 Test mixture

A.1.2.1.1.1 For any headlamp equipped with a glass photometric lens

The composition (weight ratio) of the test mixture used for coating the photometric lens of the headlamp is shown below:

Nine parts particles between 0-100• m silica sand;

One part particles between 0-100• m botanical carbon powder;

0.2 part of NaCMC[3] and a suitable quantity of distilled water (with electrical conductivity lower than 1mS/m).

The validity of the test mixture should not exceed 14 days.

A.1.2.1.1.2 For headlamps equipped with plastic photometric lenses

The composition (weight ratio) of the test mixture used for coating the photometric lens of the headlamp is shown below:

Nine parts particles between 0-100• m silica sand;

One part particles between 0-100• m botanical carbon powder;

0.2 part NaCMC[4];

13 parts distilled water (with electrical conductivity lower than 1mS/m);

(2± 1) parts of surfactant.

The dosage tolerance of surfactant can enable the test mixture to be evenly spread on the entire photometric lens. The validity of the test mixture should not exceed 14 days.

A.1.2.1.2 Test mixture coating

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[4] NaCMC represents Sodium Carboxymethyl Cellulose, normally represented as CMC. NaCMC is used in test mixture; when the temperature is 20°C, the substitution (DS) of its 2% solution is 0.6 – 0.7, the viscosity is 200 – 300cp.

The test mixture should be evenly spread onto the entire light transmission surface of the headlamp. When the coating is dry, re-spread until the illuminance value of the E_{max} of the driving beam, and the illuminance values of the 50R and 50V of the passing beam are reduced to 15%-20% of the initial values.

A.1.2.1.3 Measurement facility

Measurement facilities similar to those used for type inspection should be used. For semi-sealed beam headlamps, standard filament bulbs should be used for measuring the photometric characteristics.

A.2 Test for changing the vertical position of the cut-off line under heat

Under heat, this test is used to inspect whether the offset of the vertical position of the cut-off line of the passing beam exceeds the specified value.

After undergoing the test in accordance with the provisions specified in A.1, under the situations of not taking off from the test stand or not readjusted, a test should be carried out on the headlamp in accordance with A.2.1.

A.2.1 Test

The test should be carried out in dry, still air with a temperature of $23^{o}C\pm 5^{o}C$.

Batch produced LED module(s)/filament bulbs which have undergone at least one hour burn-in should be used. Adjust the test voltage and light the headlamp in accordance with A.1.1.1.2.

With regard to the cut-off line lies between the vv line and through B50L point vertical line, measure the vertical positions when the headlamp been working for three minutes (r_3) and 60 minutes(r_{60}).

In order to ensure accuracy and reproducibility, any methods can be used to measure the changes of the vertical positions of the cut-off line.

A.2.2 Test result

When • $r_I = |r_3-r_{60}|$ • 1mrad, acceptance should be granted.

If 1mrad < • r_I • 1.5mrad, then the second headlamp should undergo a test in accordance with A.2.1. At this time, the passing beam of the headlamp should undergo three timing-cycles of one hour switched on and one hour switched off. The light voltage should be adjusted in accordance with A.1.1.1.2.

After the test, if (• r_I + • r_{II}) /2• 1mrad, then acceptance should be granted.

A.2.3 Production conformity

After undergoing the three continuous timing-cycles in accordance with A.2.2, carry out the test in accordance with A.2.1 above, if • r_I • 1.5mrad, then acceptance should be granted.

If 1.5mrad < • r_I • 2.0mrad, then the second headlamp should undergo the test in accordance with the provisions. When (• r_I + • r_{II}) /2• 1.5mrad, then acceptance should be granted.

Appendix B

(Normative annex)

Stability tests for illuminance, chromaticity and temperature of LED headlamps

B.1 Illuminance

B.1.1 The following test points should be measured for the luminosity of a headlamp when a certain function is lit for one minute. During the measurement, aiming may be carried out approximately, but this aiming position should be maintained until the proportional measurements have been taken.

Test points: Passing beam 50V; driving beam HV

B.1.2 The test lamp should be continuously lit until luminosity is stable: within 15 minutes, the luminosity change value of the test points required in B.1.1 should be smaller than 3%.

When luminosity is stable, record the luminosities of the test points required in B.1.1. In accordance with the requirements specified in 6.3.4 or 6.3.5 carry out aiming, and take the luminosity measurement at all test points.

B.1.3 Calculate the ratio on the basis of the luminosity values of B.1.1 and B.1.2.

B.1.4. This calculation ratio should be applied to all test points. Calculate the luminosities of all test points when lit for one minute.

B.1.5 Both of the measured luminosity values when lit for one minute and after the luminosity is stable should meet the maximum and minimum value requirements.

B.2 Light colour

Take the light colour measurement when lit for one minute and when the luminosity is stable as described in B.1.2; both of the measured light colours should be within the required range.

B.3 The measurement of the objective luminous flux of the LED module(s) of the passing beam should be measured in accordance with the following method:

B.3.1 The shapes of the LED module(s) should conform to the description set out in the technical specification of 7.3. Any secondary optical element should be removed. This procedure and the test conditions described below should be recorded in the test report.

B.3.2 Three units of each type of LED module(s) and their detailed instruction statement(s), together with any light source control device used should be submitted.

B.3.3 When testing, the heat emission state of the modules should simulate the heat emission state when the modules are in the corresponding headlamps.

Before the test, the modules should undergo 72 hours of burn-in as with headlamps under same normal service conditions.

When any integrating sphere is used, the minimum dimension of the integrating sphere is one metre, and should be at least 10 times the largest sized LED module. A goniophotometer quadrature measurement (at room temperature) can also be used to measure the luminous flux.

The LED module should be lit inside a sealed integrating sphere or inside a goniophotometer for approximately one hour.

The measurement of luminous flux should be taken when the LED module/s described in B.1.2 is/are stable.

The average measured values of three LED modules of each type is regarded as the objective luminous flux of this LED module, and the objective luminous flux of each type of LED module

should take the average measured value of three LED modules.

Appendix C

(Normative annex)

Temperature-resistance cycling test of LED headlamps

C.1 Test conditions

C.1.1 Check the photometric characteristics before and after the test.

C.1.2 Before inserting the sample, the airflow in the chamber should be 1m/s ~ 2m/s.

C.1.3 The distance between the sample and the chamber wall should be more than 200 mm.

C.2 Test method

C.2.1 Both samples should be installed on a test stand; when placed inside the test chamber, the reference axis should be parallel to the principal direction of the cooling airflow.

C.2.2 The samples should undergo five high-low temperature cycling tests illustrated in Diagram 5, the duration of each cycle being eight hours. That is:

Test cycling: five;

Duration of each cycle: eight hours;

Temperature curve: in accordance with Diagram 1;

Temperature conversion rate: 0.6°C/min ~ 5.0°C/min;

Cycling start temperature: 20°C;

Low temperature: -30°C / at least two hours;

High temperature: 50°C / at least two hours;

Lighting method: shown in Diagram C.1, light from point “A” until to point “B”, then switch off;

Test voltage: 13.2V ± 0.1V (with regard to 24V nominal voltage LED headlamp, the test voltage should be 28.0± 0.1V).

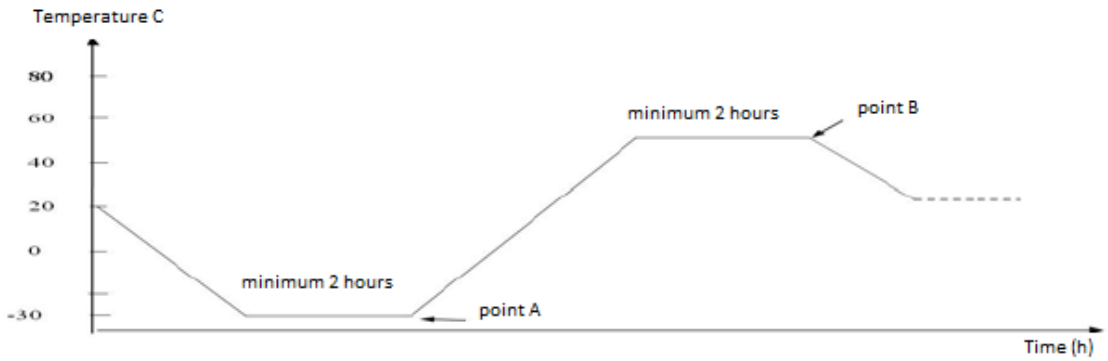

Diagram C.1 Temperature - time curve of temperature cycling test

C.2.3 After the test is complete, remove the samples from the chamber and keep the samples in room temperature, 23°C ± 5°C, and relative humidity of 30% ~ 60% for one hour.