52-2 Headlamps (headlamps of gas-discharge type excluded): Effective date from 2017/1/1

Refer to: R05 02-S7, R31 02-S7, R112 01-S1, R113 00-S10

52-2.1 Effective date and Scope:

52-2.1.1 Effective date from 2017/1/1,the new types of Headlamps (headlamps of gas-discharge type excluded) used in M, N, L1,L2, L3 and L5 vehicles shall comply with this regulation and shall be use bulbs that is conform with ”Filament lamps“ of this Direction, Which were confirmed to “52-1 headlamps (headlamps of gas-discharge type excluded)” regard as conform to this regulation.

52-2.1.2 The applicants applying for low volume safety approval may be exempt from regulation of “headlamps (headlamps of gas-discharge type excluded)” except large passenger vehicle and child-only vehicle.

52-2.1.3 Applying for vehicle-by-vehicle low volume safety approval, the vehicle may be exempt from regulation of “headlamps (headlamps of gas-discharge type excluded)”.

52-2.2 Definitions:

52-2.2.1 Halogen sealed-beam headlamp unit：A headlamp whose components, including a reflector of glass, metal or other material, an optical system and one or more halogen light sources, form an integral whole which is indivisibly joined and cannot be dismantled without rendering the unit completely unusable. The L category vehicle shall not use this categories of headlamp.

52-2.2.2 Asymmetrical-beam headlamp unit：A headlamp emitting an asymmetrical beam, which may incorporate lenses of glass or plastic material and which is equipped with replaceable filament lamp.

52-2.2.3 Symmetrical-beam headlamp unit：A headlamp emitting an symmetrical beam, which may incorporate lenses of glass or plastic material and which is equipped with replaceable filament lamp. The M and N categories vehicles shall not use this category of headlamp.

52-2.2.3.1 It is possible to use two filament light sources for the passing beam and several filament light sources for the driving beam.

52-2.2.3.1.1 In the case of Class A and B, the reference luminous flux of the principal passing beam shall not be equal or greater than 600 lumens.

52-2.2.3.1.2 In the case of Class C and D, the objective luminous flux of the principal passing beam shall not be equal or greater than 2,000 lumens.

The design of the device shall be such that the filament lamp can be fixed in no other position but the correct one.

The filament lamp holder shall conform to the characteristics given in IEC Publication 60061. The holder data sheet relevant to the category of filament lamp used, applies.

52-2.2.3.2 For lamps equipped with (an) LED module(s):

52-2.2.3.2.1 The electronic light source control gear(s), if applicable, shall be considered as being part of the headlamp; they may also be part of the LED module(s);

52-2.2.3.2.2 The headlamp and the LED module(s) themselves shall comply with the relevant requirements specified in paragraph 52-2.11 of this Regulation. The compliance with the requirements shall be tested.

52-2.2.3.2.3 The total objective luminous flux of all LED modules producing the passing beam shall be measured as described in paragraph 52-2.11.5. The following minimum and maximum limits shall apply:

	Headlamps Class C	Headlamps Class D
Passing beam minimum	500 lumen	1000 lumen
Passing beam maximum	2000 lumen	2000 lumen

52-2.2.4 Only one filament light source or one or more LED module(s) are permitted for the principal passing beam. Additional light sources or LED modules are permitted only as follows:

52-2.2.4.1 One additional filament light source or one or more LED module(s) inside the passing beam headlamp according to Regulation may be used to generate bend lighting.

52-2.2.4.2 One additional light source/ one or more LED module(s), inside the passing beam headlamp, may be used for the purposes of generating infrared radiation. It shall only be activated at the same time as the principal light source. In the event of the principal light source fails, this additional light source shall be automatically switched off.

52-2.2.4.3 In the event of failure of an additional light source or one or more LED module(s), the headlamp shall continue to fulfill the requirements of the passing beam.

52-2.2.5 Irrespective of the type of light source (LED module(s) or filament light source(s)) used to produce the principal passing beam, several light sources: either filament light sources listed in Regulation; or LED module(s) may be used for each individual driving beam.

52-2.2.5.1 Electronic light source control gear(s), if applicable, shall be considered to be part of the headlamp; they may be part of the LED module(s);

52-2.2.5.2 The headlamp, if equipped with LED modules, and the LED module(s) themselves shall comply with the relevant requirements specified in paragraph 52-2 11. The compliance with the requirements shall be tested.

52-2.2.5.3 The total objective luminous flux of all LED modules producing the principal passing beam and measured as described in paragraph 52-2 11.5 shall be equal or greater than 1,000 lumens.

52-2.2.6 On headlamps designed to provide alternately a driving beam and a passing beam, or a passing beam and/or a driving beam designed to become bend lighting, any mechanical, electromechanical or other device incorporated in the headlamp for these purposes shall be so constructed that:

52-2.2.6.1 The device is robust enough to withstand 50,000 operations under normal conditions of use. In order to verify compliance with this requirement, the Technical Service responsible for approval tests may:

(a) require the applicant to supply the equipment necessary to perform the test;

(b) forego the test if the headlamp presented by the applicant is accompanied by a test report, issued by a Technical Service responsible for approval tests for headlamps of the same construction (assembly), confirming compliance with this requirement.

52-2.2.6.2 In the case of failure, the luminous intensity above the line H-H shall not exceed the values of a passing beam according to paragraph 52-2 7.1; in addition, on headlamps designed to provide a passing and/or a driving beam to become a bend lighting, a minimum illumination of at least 2,500 cd shall be fulfilled in test point 25 V (VV line, 1.72D). When performing the tests to verify compliance with these requirements, the Technical Service responsible for approval tests shall refer to the instructions supplied by the applicant.

52-2.2.6.3 Either the principal passing beam or the driving beam shall always be obtained without any possibility of the mechanism stopping in between two positions;

52-2.2.7 "Colour of the light emitted from the device." The definitions of the colour of the light emitted given in “The installation of lighting and light-signaling devices” and its series of amendments in force at the time of application for type approval shall apply to this Regulation.

52-2.3 Headlamps (headlamps of gas-discharge type excluded) shall according to suitable types and range of principle are as below：

52-2.3.1 Trade name or mark;

52-2.3.2 Characteristics of the optical system;

52-2.3.3 Inclusion of additional components capable of altering the optical effects by reflection, refraction, absorption and/or deformation during operation;

52-2.3.4 The kind the beam produced (passing beam, driving beam of both);

52-2.3.5 The materials constituting the lens and coating, if any.

52-2.4 Rated voltage and power of headlamp unit

52-2.4.1 Apart from LED module(s), the headlamps shall be checked by means of an uncoloured standard (etalon) filament lamp designed for a rated voltage of 12 V. During the checking of the headlamp, the voltage at the terminals of the filament lamp shall be regulated so as to obtain the reference luminous flux at 13.2V. For the measurements, the flux of this filament lamp may differ from the reference luminous flux at 13.2V. In this case, the luminous intensity shall be corrected accordingly by the individual factor of the standard (etalon) filament lamp (F = phi obj. / phi(Voltage)).

52-2.4.2 In the case of halogen sealed-beam headlamp unit, the wattage shall not exceed 75 watts on the driving beam filament and 68 watts on the passing beam filament when measured at a test voltage of 13.2 volts.

52-2.4.3 LED module(s) shall be measured at 6.3 V, 13.2 V or 28.0 V respectively, if not otherwise specified within this Regulation. LED module(s) operated by an electronic light source control gear, shall be measured as specified by the applicant. The values obtained by the LED module(s) shall be multiplied by a factor of 0.7 prior to check for compliance.

52-2.4.3.1 LED module(s) shall be measured at 6.3 V or 13.2 V respectively, if not otherwise specified within this Regulation. LED module(s) operated by an electronic light source control gear, shall be measured as specified by the applicant. The values obtained by the LED module(s) shall be multiplied by a factor of 0.7 prior to check for compliance.

52-2.4.3.2 LED module(s) shall be measured at 6.3 V or 13.2 V respectively, if not otherwise specified within this Regulation. LED module(s) operated by an electronic light source control gear, shall be measured as specified by the applicant.

52-2.4.4 In the case of headlamps equipped with LED module(s) and filament lamps, the part of the headlamp with filament lamp(s) shall be tested according to paragraph 52-2.4.1. and the part of the headlamp with LED module(s) shall be evaluated according to the provisions of paragraph 52-2.4.3. and then added to the previous result obtained from the filament lamp(s) tested.

52-2.5 Specifications of the measuring screen

52-2.5.1 Figure 1 to Figure 3– for the halogen sealed-beam headlamp units and the asymmetrical beam headlamp units, Figure 4 and Figure 4-1 – for the symmetrical beam headlamp units. (Unit：mm)

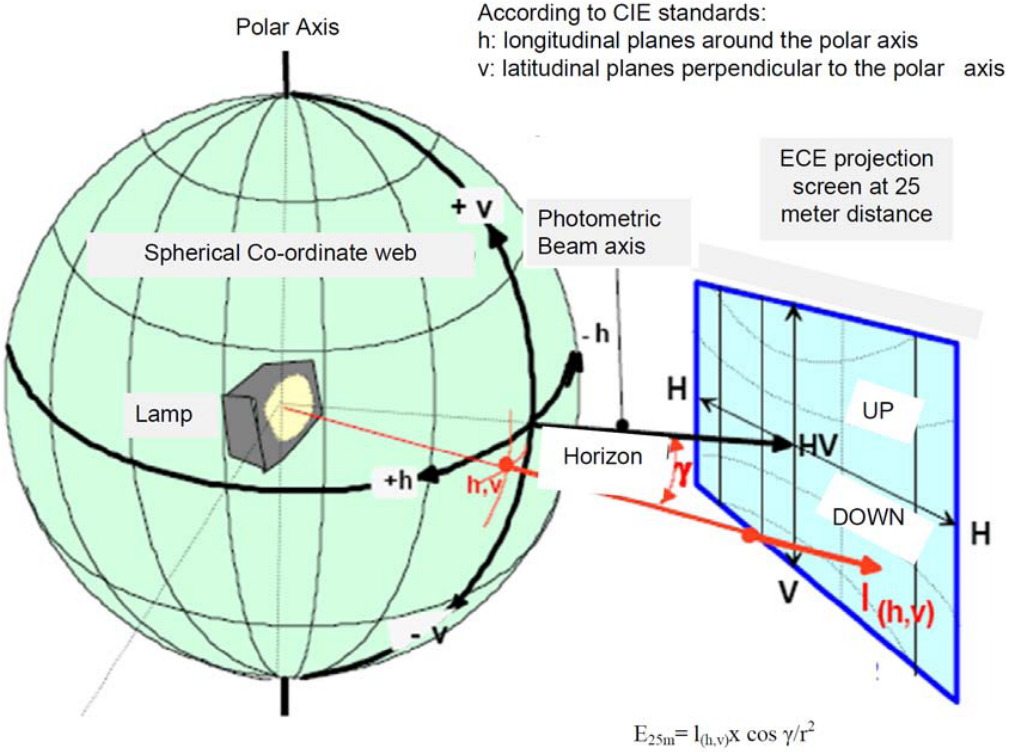
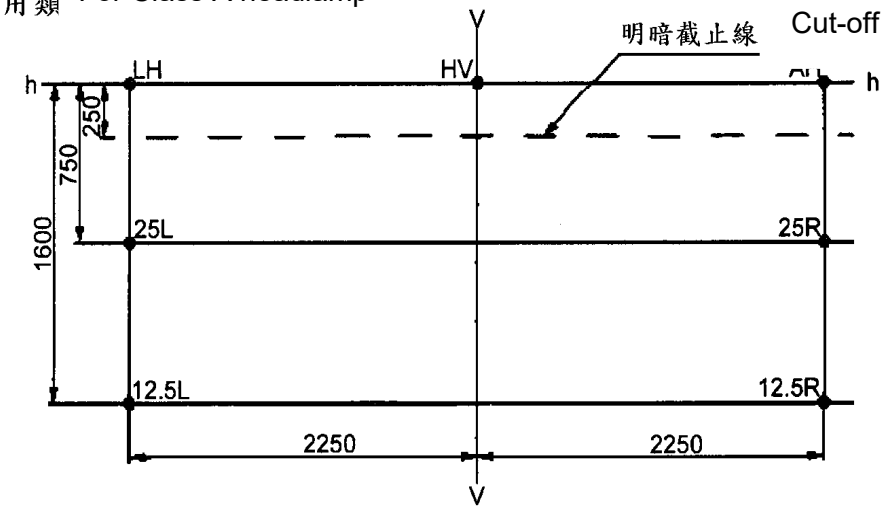
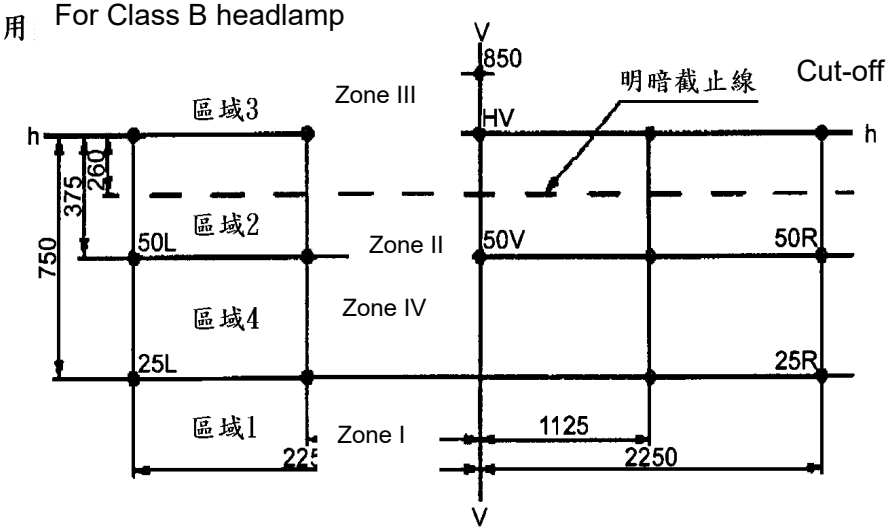


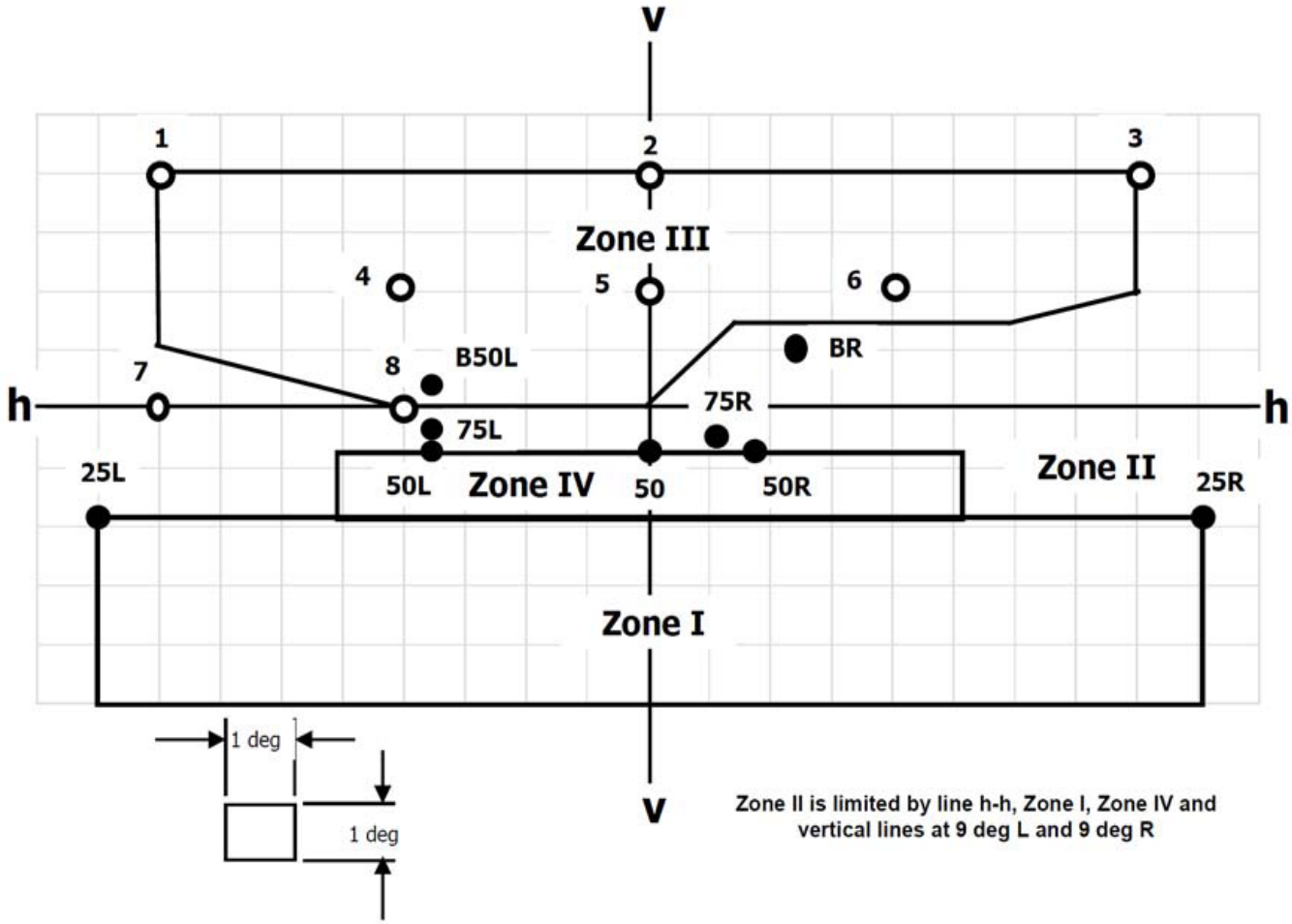
Figure 1、Spherical coordinate measuring system

適用類 For Class A headlamp



適用 For Class B headlamp





h-h = horizontal plane, v-v = vertical plane passing through the optical axis of the headlamp
The test point locations for left-hand traffic are mirrored about the VV line

Figure 2、Passing beam for right-hand traffic

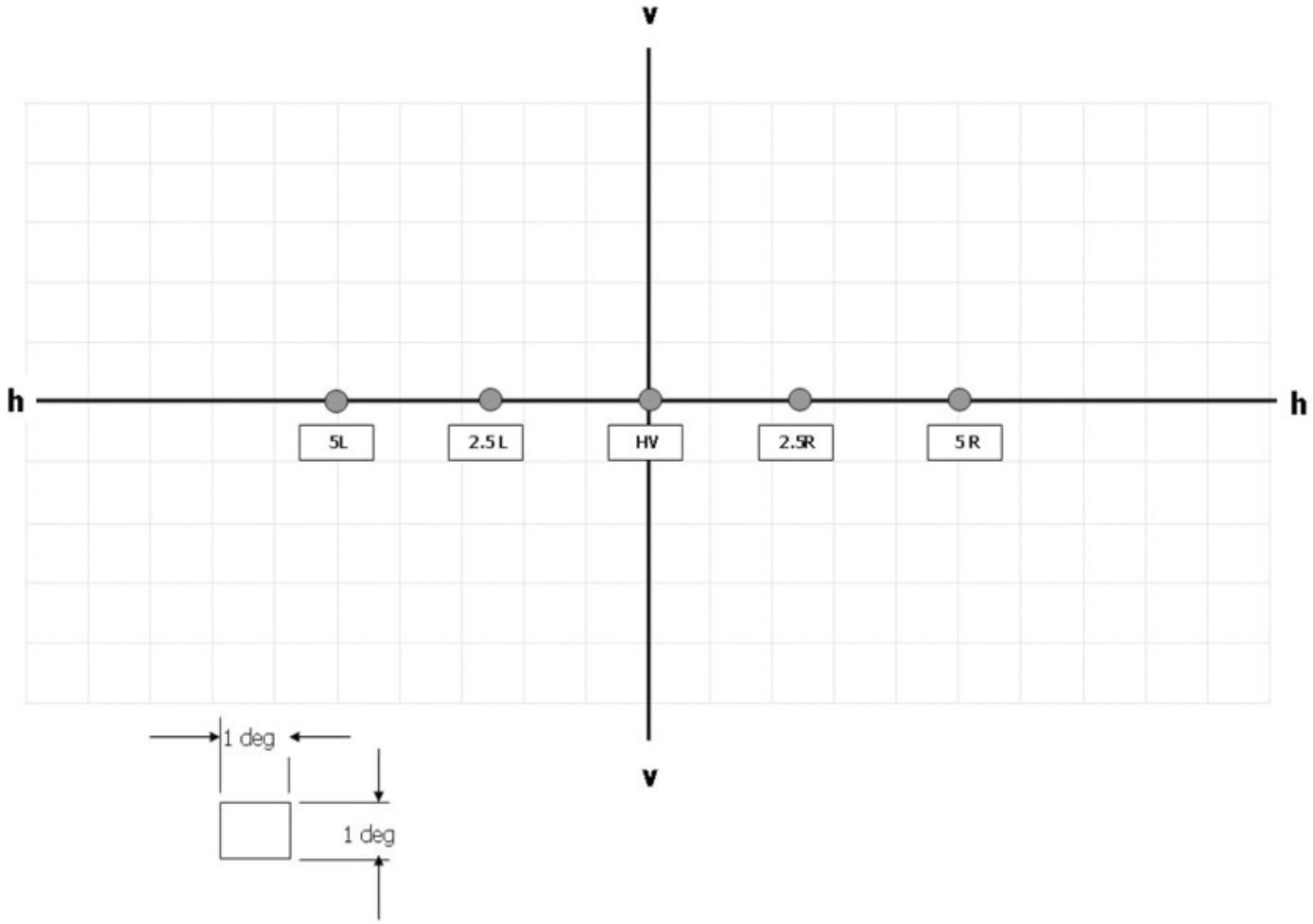


Figure 3、Driving beam test points

For Class C and D headlamps

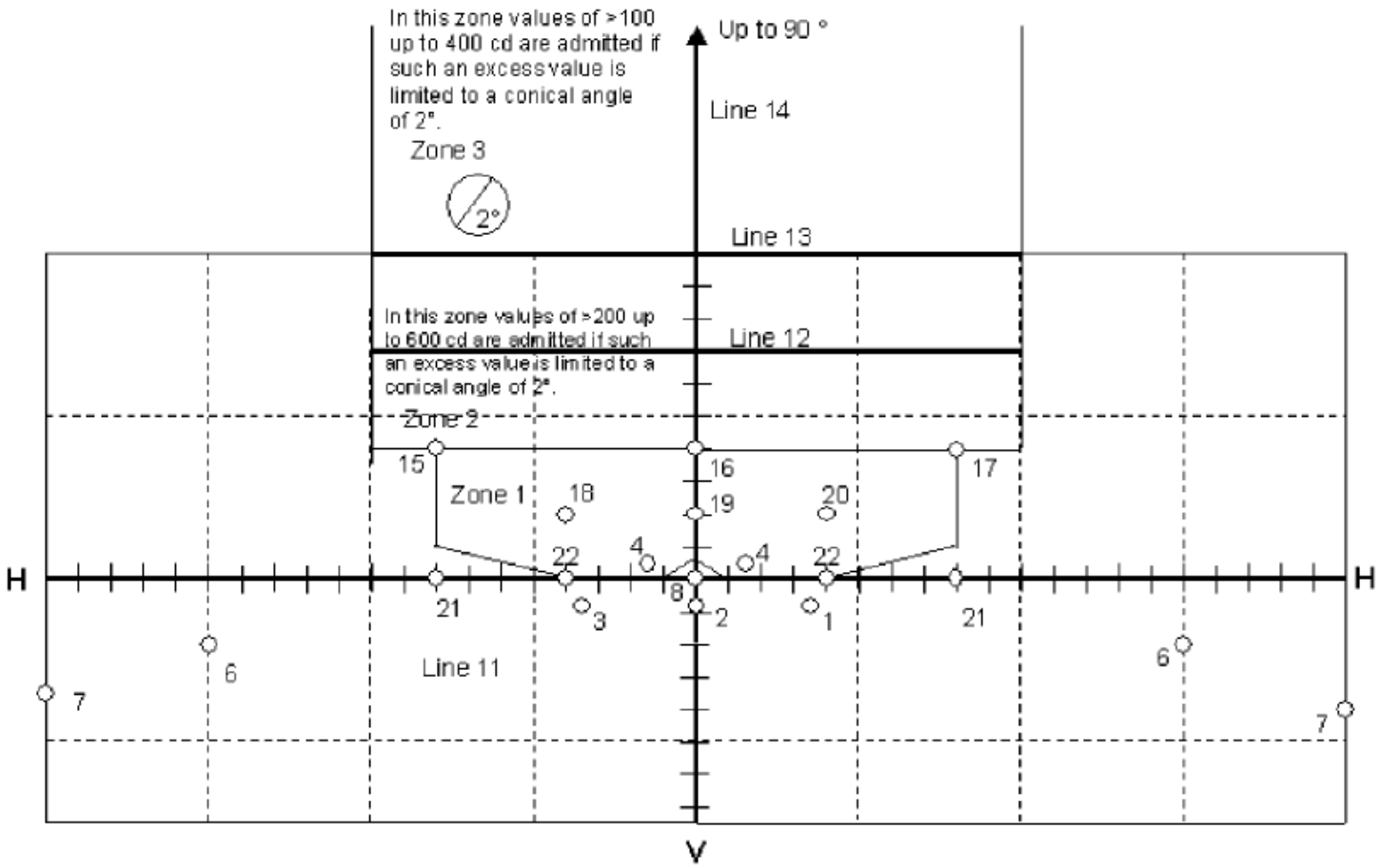
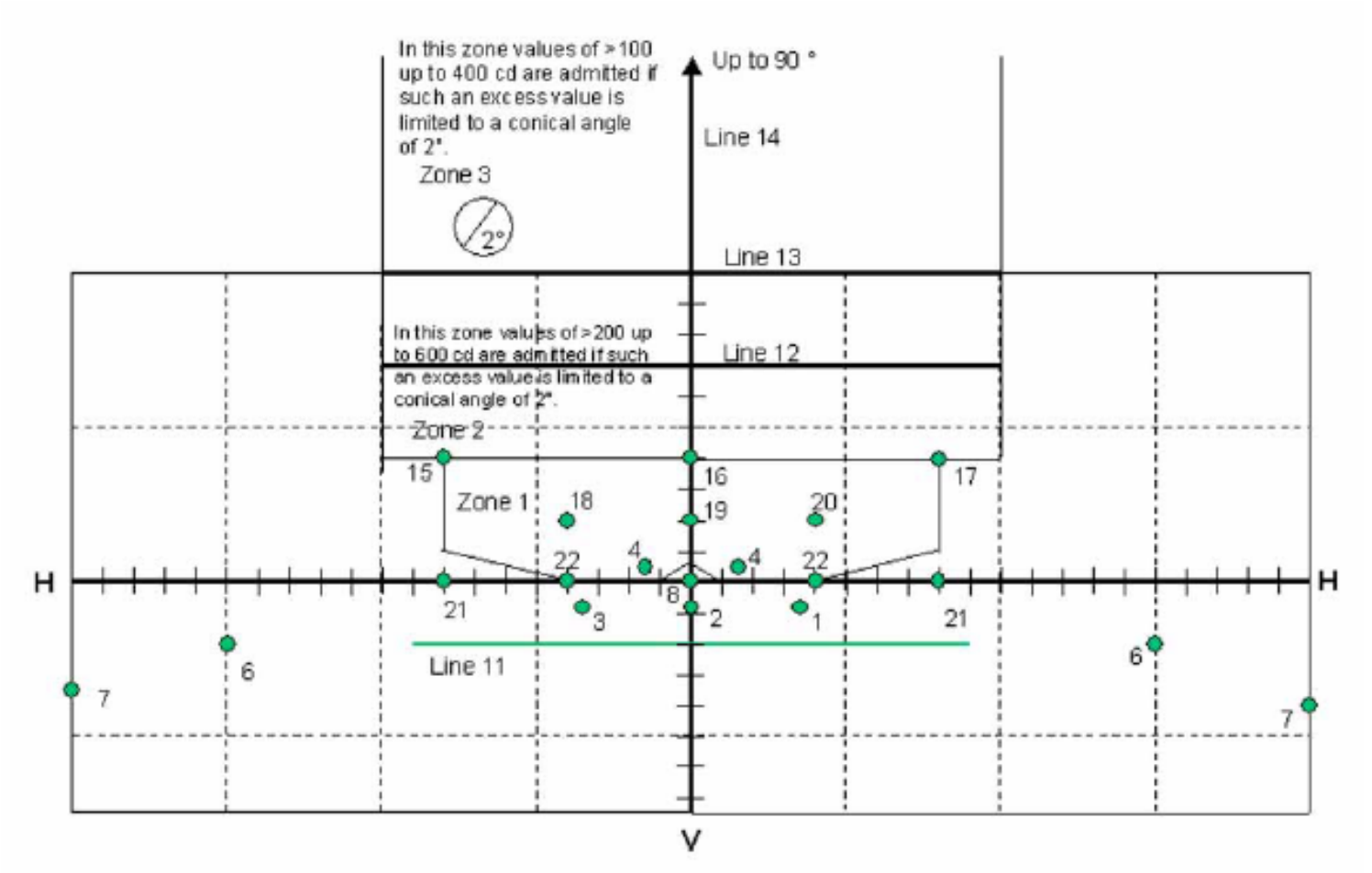


Figure 4. Measuring screen for symmetrical headlamp



Note: The luminous intensity of zones 2 and 3 above are not applied to Class E.

Figure 4-1. Measuring screen for symmetrical headlamp for Class E (Dimensions in mm with screen at 25 m distance)

52-2.5.2 The luminous intensity distribution of the passing beam headlamp shall incorporate a "cut-off", which enables the headlamp to be adjusted correctly for the photometric measurements and for the aiming on the vehicle.

52-2.5.2.1 Halogen sealed-beam headlamp unit：The cut-off shall be a horizontal straight line on the left side of vv-line on measuring screen. On the other side, it shall not extend beyond either the broken line HV H1 H4 formed by a straight line HV H1 making a 45° angle with the horizontal and a straight line H1 H4, 25 cm above the straight line h-h, or the straight line HV H3rence to line v-v.（Figure 4）, inclined at an angle of 15° above the horizontal.

52-2.5.2.2 Symmetrical-beam headlamp unit：The “cut-off” must be substantially horizontal and as straight as possible over a horizontal length of at least ± 3° for Class A、B、C and D headlamps.

52-2.5.2.3 Unsymmetrical headlamps:

52-2.5.2.3.1 The luminous intensity distribution of the passing beam headlamp shall incorporate a "cut-off" (see figure 1-1):

□a□ The left side is "horizontal part".

□b□ The right side is raised "elbow - shoulder" part shall have a sharp edge.

52-2.5.2.3.2 The headlamp shall be visually aimed by means of the "cut-off" as follows:

The aiming shall be carried out using a flat vertical screen set up at a distance of 10 m or 25 m (see figure 1) forward of the headlamp and at right angles to the H-V axis . The screen shall be sufficiently wide to allow examination and adjustment of the "cut-off" of the passing beam over at least 5 degrees on either side of the V-V line.

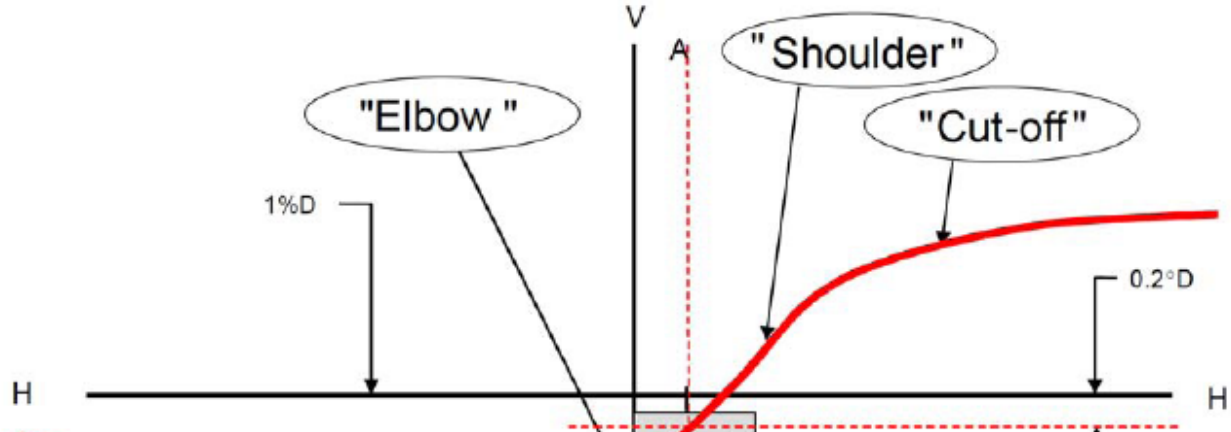
52-2.5.2.3.2.1 for vertical adjustment: the horizontal part of the "cut-off" is moved upward from below line B and adjusted to its nominal position one per cent (0.57 degrees) below the H-H line;

52-2.5.2.3.2.2 for horizontal adjustment: the "elbow - shoulder" part of the "cut-off" shall be moved: for right hand traffic from right to left and shall be horizontally positioned after its movement so that:

□a□ above the line 0.2 degrees D its "shoulder" shall not exceed the line A to the left;

□b□ the the line 0.2 degrees D or below its "shoulder" should cross the line A; and

□c□ the kink of the "elbow" is basically located within +/-0.5 degrees to the left or right of the V-V line; see figure 1-1



The official directions are wr

of gas-discharge type excluded)

Figure 1-1

52-2.5.2.3.3 Where a headlamp so aimed does not meet the requirements set out in paragraphs 52-2.7.1 to 52-2.7.1.2 and 52-2.9.3, its alignment may be changed, provided that the axis of the beam is not displaced: Horizontally from line A by more than: 0.5 degrees to the left or 0.75 degrees to the right, for right hand traffic; or 0.5 degrees to the right or 0.75 degrees to the left, for left hand traffic; and vertically not more than 0.25 degrees up or down from line B.

52-2.5.2.3.4 If, however, vertical adjustment cannot be performed repeatedly to the required position within the tolerances described in paragraph 52-2.5.2.3.3 above, the instrumental method, paragraphs 52-2.6.2.2.3 shall be applied to test compliance with the required minimum quality of the "cut-off" and to perform the vertical and horizontal adjustment of the beam.

52-2.5.3 If bend lighting is conform to paragraph 52-2.4.4 and obtained by:

52-2.5.3.1 Swivelling the passing beam or moving horizontally the kink of the elbow of the cut-off, the measurements shall be carried out after the complete headlamp assembly has been reaimed horizontally, e.g. by means of a goniometer;

52-2.5.3.2 Moving one or more optical parts of the headlamp without moving horizontally the kink of the elbow of the cut-off, measurements shall be carried out with these parts being in their extreme operating position;

52-2.5.3.3 Means of one additional filament light source or one or more LED module(s) without moving horizontally the kink of the elbow of the cut-off, measurements shall be carried out with this light source or LED module(s) activated.

52-2.6 Alignment of headlamp unit before test

52-2.6.1 In the case of halogen sealed-beam headlamp unit shall be aimed so that on passing beam: the horizontal part of the “cut-off” is situated, on the screen, 25cm below the level of the horizontal plane passing through the focus of the unit (h-h line). The “elbow” of the “cut-off” is on line vv. If the beam does not have a “cut-off” with a clear “elbow”, lateral adjustment shall be effected in the manner which best satisfies the requirements for illumination at points 75 R and 50 R. Where a headlamp unit so aimed does not meet the requirements referred to the illumination of driving beam and passing beam, its alignment may be changed, provided that

the axis of the beam is not laterally displaced by more than 1° (= 44 cm) in horizontal direction and over the h-h line in vertical direction. To facilitate alignment by means of the “cut-off”, the unit may be partially occulted in order to sharpen the “cut-off”.

52-2.6.2 In the case of symmetrical-beam headlamp unit, the passing beam of the headlamp shall be so aimed that：

52-2.6.2.1 For horizontal adjustment: The beam is as symmetrical as possible with reference to line v-v;

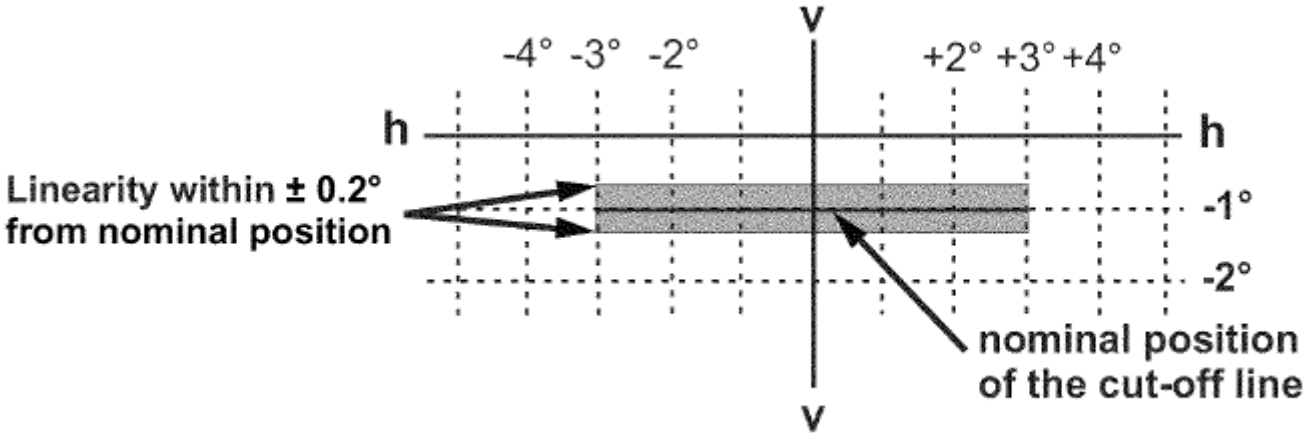


Figure 5：Shape and position of the "cut-off" line

52-2.6.2.2 For vertical adjustment, the headlamp shall be so aimed that the “cut-off” is situated 250 mm below the line h-h. It shall be as horizontal as possible.

52-2.6.2.2.1 Vertical adjustment: After horizontal adjustment of the symmetrical passing-beam headlamp according to paragraph 52-2.6.2.1. above, the vertical adjustment shall be performed in such a way that the beam with its cut-off line is moved upwards from the lower position until the cut-off line is situated at nominal vertical position. For nominal vertical adjustment the cut-off line is positioned on the v-v-line at 1 degree below the h-h line. If the horizontal part is not straight but slightly curved or inclined, the cut-off line shall not exceed the vertical range formed by two horizontal lines which are situated from 3 degrees left to 3 degrees right of the v-v-line at 0.2 degrees for class B and 0.3 degrees for class A, C and D head lamps above and below the nominal position of the cut-off (see Figure 3).

52-2.6.2.2.2 When the vertical adjustments of three different individuals differs by more than 0.2 degrees for class B and 0.3 degrees for class A, C and D head lamps, the horizontal part of the cut-off line is assumed not to provide sufficient linearity

or sharpness for performing visual adjustment.

52-2.6.2.2.3 Measurement of the quality of cut-off:

52-2.6.2.2.3.1 Measurements shall be performed by vertically scanning through the horizontal part of the cut-off line in angular steps not exceeding 0.05 degrees at a measurement distance of 25 m and a detector with a diameter of approximately 30 mm. The measurement shall be considered acceptable if the requirements shall comply with at least one measurement at 25 m.

52-2.6.2.2.3.2 The scanning is performed from its lower position upwards through the cut-off line along the vertical lines at -3 degrees, -1.5 degrees, +1.5 degrees and +3 degrees from the V-V-line. When so measured, the quality of the cut-off line shall meet the following requirements:

52-2.6.2.2.3.2.1 Not more than one cut-off line shall be visible.

52-2.6.2.2.3.2.2 Sharpness of cut-off: if scanned vertically through the horizontal part of the cut-off line along the +/- 2.5 - lines, the maximum value measured for:

$$G = (\log E_V - \log E_{(V + 0.1 \text{ degrees})})$$

is called the sharpness factor G of the cut-off line. The value of G shall not be less than 0.13 for class B and 0.08 for classes A, C and D.

52-2.6.2.2.3.2.3 Linearity: the part of the cut-off line which serves for vertical adjustment shall be horizontal from 3 degrees L to 3 degrees R of the V-V-line. This requirement is deemed to be met if the vertical positions of the inflection points according to paragraph 52-2.6.2.2.1. above at 3 degrees left and right of the V-V-line do not differ by more than 0.2 degrees for class B and 0.3 degrees for class A, C and D head lamps from the nominal position at the V-V-line.

52-2.6.2.2.4 Instrumental vertical adjustment: if the cut-off line complies with the above quality requirements, the vertical beam adjustment can be performed instrumentally. For this purpose the inflection point where d2 (log E) / dv2 = 0 is positioned on the V-V-line in its nominal position below the H-H-line. The movement for measuring and adjusting the cut-off line shall be upwards from below the nominal position.

52-2.6.2.3 When so aimed, the headlamp need, if its approval is sought solely for provision of a passing beam, 9/ comply only with the requirements set out in paragraphs 52-2.7.1.3.below; if it is intended to provide both a passing beam and a driving beam, it shall comply with the requirements set out in paragraphs 52-2.7.1.3. and 52-2.7.2.3.

52-2.6.2.4 Where a headlamp so aimed does not meet the requirements set out in paragraphs 52-2.7.1.3 and 52-2.7.2.3, its alignment may be changed, except for headlamps that have no mechanism to adjust horizontal aim, on condition that the axis of the beam is not displaced laterally by more than 1 degree (= 44 cm) to the right or left 10/. To facilitate alignment by means of

the "cut-off", the headlamp may be partially occulted in order to sharpen the "cut-off". However, the "cut-off" should not extend beyond the line H-H.

52-2.6.3 In the case of asymmetrical-beam headlamp unit, the passing beam of the headlamp shall be so aimed that：

52-2.6.3.1 To determine the minimum sharpness, measurements shall be performed by vertically scanning through the horizontal part of the "cut-off" in angular steps of 0.05 degrees at either a measurement distance of 25 m with a detector having a diameter of approximately 30 mm or 10 m with a detector having a diameter of approximately 10 mm. To determine the maximum sharpness, measurements shall be performed by vertically scanning through the horizontal part of the "cut-off" in angular steps of 0.05 degrees exclusively at a measurement distance of 25 m and with a detector having a diameter of approximately 30 mm.

52-2.6.3.2 The "cut-off" quality shall be considered acceptable if the requirements of paragraph 52-2.6.3.2.1. to 52-2.6.3.2.3. below comply with at least one set of measurements.

52-2.6.3.2.1 Not more than one "cut-off" shall be visible.

52-2.6.3.2.2 Sharpness of "cut-off" The sharpness factor G is determined by scanning vertically through the horizontal part of the "cut-off" at 2.5 degrees from the V-V where:

$$G = (\log E_{\beta} - \log E_{(\beta + 0.1^{\circ})}) \text{ where } \beta = \text{the vertical position in degrees.}$$

The value of G shall not be less than 0.13 (minimum sharpness) and not greater than 0.40 (maximum sharpness).

52-2.6.3.2.3 Linearity: The part of the horizontal "cut-off" that serves for vertical adjustment shall be horizontal between 1.5 degrees and 3.5 degrees from the V-V line (see figure 3-1).

(a) The inflection points of the "cut-off" gradient at the vertical lines at 1.5 degrees, 2.5 degrees and 3.5 degrees shall be determined by the equation:

$$(d^2 (\log E) / d\beta^2 = 0).$$

The maximum vertical distance between the inflection points determined shall not exceed 0.2 degrees.

52-2.6.3.3 Vertical and horizontal adjustment: If the "cut-off" complies with the quality requirements of paragraph 2. of this annex, the beam adjustment may be performed instrumentally.

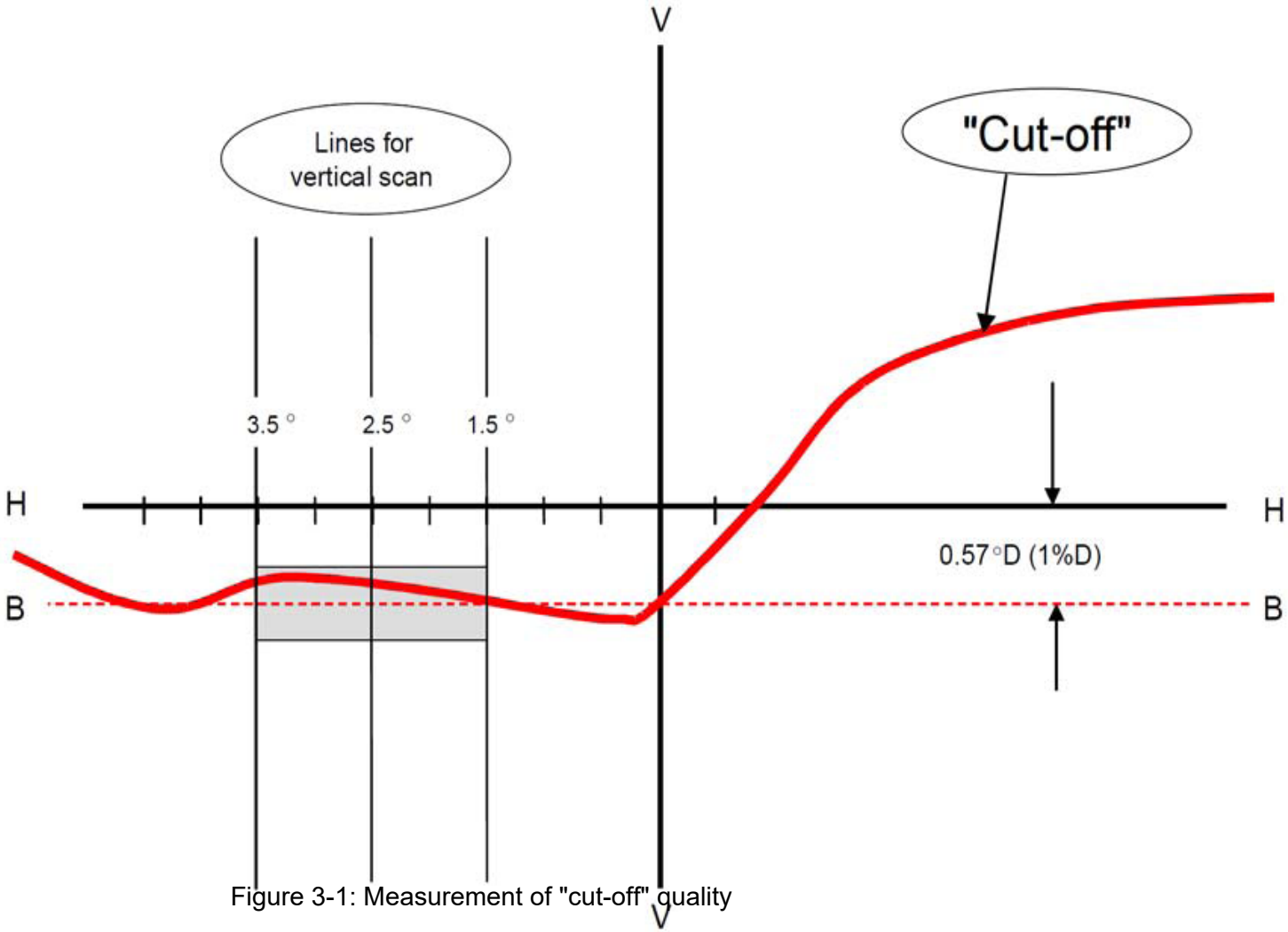


Figure 3-1: Measurement of "cut-off" quality

52-2.6.3.3.1 Vertical adjustment: Moving upward from below the line B (see figure 2 below), a vertical scan is carried out through the horizontal part of the "cut-off" at 2.5 degrees from V-V. The inflection point (where d2 (log E) / dv2 = 0) is determined and positioned on the line B situated one per cent below H-H.

52-2.6.3.3.2 Horizontal adjustment: The applicant shall specify one of the following horizontal aim methods:

(a) The "0.2 D line" method (see figure 2 below): A single horizontal line at 0.2 degrees D shall be scanned from 5 degrees left to 5 degrees right after the lamp has been aimed vertically. The maximum gradient "G" determined using the formula shall determined by the following equation, and shall not be less than 0.08:

G = (log Ebeta - log E(beta + 0.1 degrees))

Where beta is the horizontal position in degrees.

The inflection point found on the 0.2 D line shall be positioned on the line A.

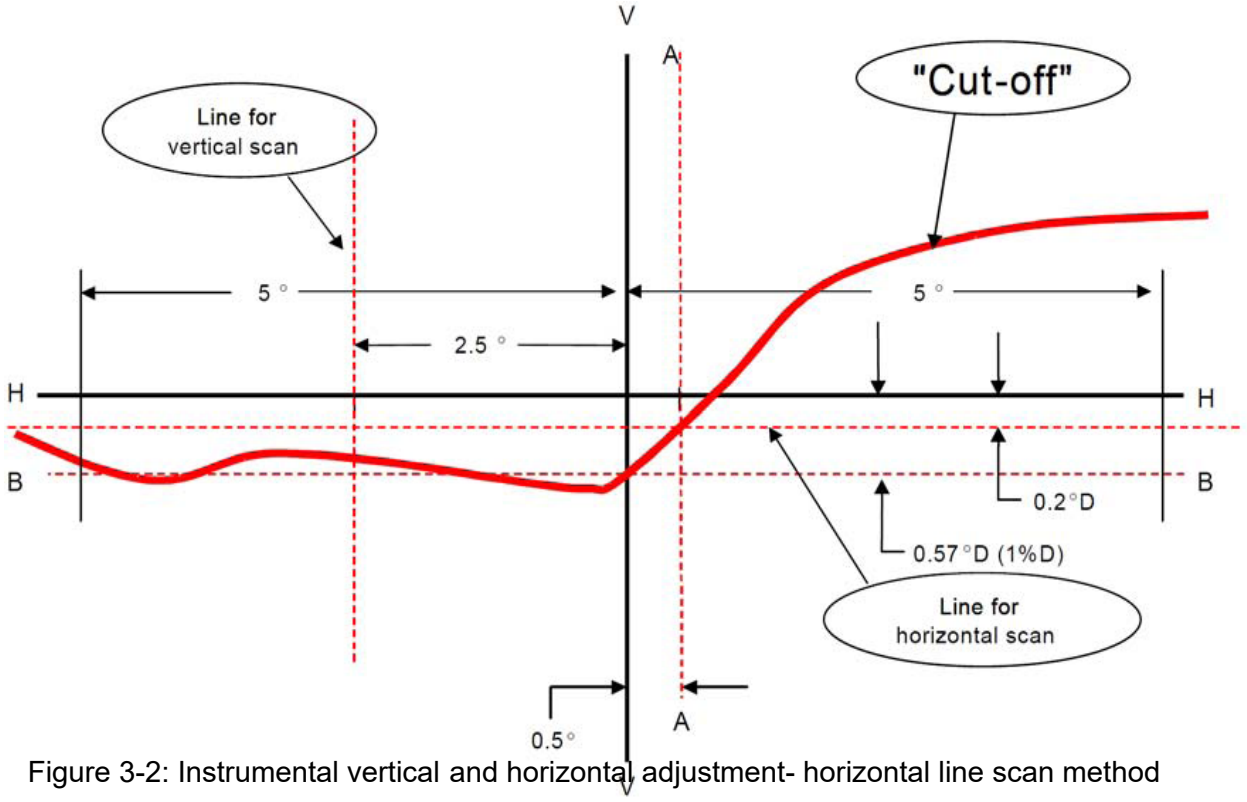


Figure 3-2: Instrumental vertical and horizontal adjustment- horizontal line scan method

(b) The "3 line" method (see figure 3-3)

Three vertical lines shall be scanned from 2 degrees D to 2 degrees U at 1 degree R, 2 degrees R, and 3 degrees R after the lamp has been aimed vertically. The respective maximum gradients "G" determined using the formula shall determined by the following equation, and shall not be less than 0.08.:

$$G = (\log E_{\beta} - \log E_{(\beta + 0.1^{\circ})})$$

Where beta is the vertical position in degrees.

The inflection points found on the three lines shall be used to derive a straight line.

The intersection of this line and the line B found while performing vertical aim shall be placed on the V line.

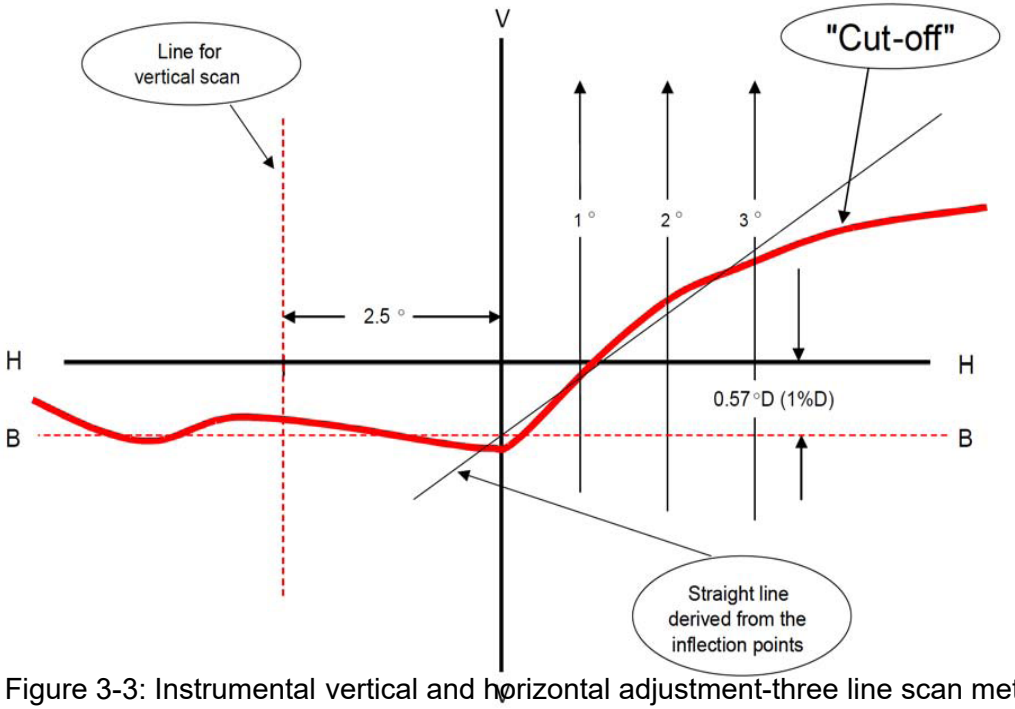


Figure 3-3: Instrumental vertical and horizontal adjustment-three line scan method

52-2.7 Illumination: The illumination produced by the unit shall be checked on a vertical screen set at a distance of 25 m in front of the unit and at right angles to its axis. The screen illumination values shall be measured by means of a photoelectric cell, the effective area of which shall be contained within a square of 65 mm of side. The point HV is the centre-point of the coordinate system with a vertical polar axis. Line h is the horizontal through HV (see figure 1, figure2 and figure3).（see figure 4-1 as well）

52-2.7.1 The illumination produced on the screen by the passing beam shall meet the following requirements：

52-2.7.1.1 Halogen sealed-beam headlamps：The required illumination is indicated in Table 1. The light emitted shall be white.

52-2.7.1.2 Asymmetrical-beam headlamps：

52-2.7.1.2.1 The illumination produced on the screen by the passing beam shall meet the requirements of Table 2 The requirements shall also apply to headlamps designed to provide bend lighting and/or that include the additional light source referred to in paragraph 52-2.2.5 In the case of a headlamp designed to provide bend lighting its alignment may be changed, provided that the axis of the beam is not displaced vertically by more than 0.2 degrees. The illumination values in zones “A” and “B” as shown in Figure 4 shall be checked by the measurement of the photometric values of points 1 to 8 on this figure; these values shall lie within the following limits：

1+2+3 ≥ 0.3 lux , and

4+5+6 ≥ 0.6 lux , and

0.7 lux ≥ 7 ≥ 0.1 lux and

0.7 lux ≥ 8 ≥ 0.2 lux

52-2.7.1.2.2 In case of a passing beam headlamp incorporating a light source or LED module(s) producing the principal passing beam and having a total objective luminous flux which exceeds 2,000 lumen a reference shall be made in communication form. The objective luminous flux of LED modules shall be measured as described in paragraph 52-2.11.5..

52-2.7.1.3 Symmetrical-beam headlamps：

52-2.7.1.3.1 The illumination produced on the screen by the passing beam shall meet the requirements of Table 3.

52-2.7.1.3.2 The light shall be as evenly distributed as possible within zones 1, 2, and 3 for Class C or D headlamps.

52-2.7.1.3.3 The dimensions determining the position of the arc inside the standard gas-discharge light source are shown in the relevant data sheet of「Filament lamps」of “Directions” .

52-2.7.1.3.4 Four seconds after ignition of a headlamp, equipped with a gas discharge light source with the ballast not integrated with the light source, and which has not been operated for 30 minutes or more, 60 lux at least must be reached at point HV of a driving beam and 6 lux at point 2 (0.86D-V) of a passing beam for headlamps incorporating driving beam and passing beam functions, or 6 lux at point point*/ 2 (0.86D-V) for headlamps having only a passing beam function. The power supply shall be sufficient to secure the quick rise of the high current pulse.

Table 1.Required illumination for a passing beam of halogen sealed-beam headlamp

Point on measuring screen			Required illumination (Unit：lux)	
Point B	50	L	□	0.4
Point	75	R	□	12

Point	75	L	□	12
Point	50	L	□	12
Point	50	R	□	15
Point	50	V	□	6
Point	25	L	□	2
Point	25	R	□	2
Any point in Zone III			□	0.7
Any point in Zone IV			□	3
Any point in Zone I			□ 2x (E_{50R} or E_{50L})*	

*E_{50R} or E_{50L}：E_{50R} and E_{50L} are the actually measured values in points 50R and 50L respectively.

Table 2.Required illumination for a passing beam of asymmetrical-beam headlamp

Headlamps for RH Traffic**		Class A Headlamp		Class B Headlamp	
Test Point Designation	Test Point Angular Coordinates - Degrees	Required luminous intensity (cd)		Required luminous intensity (cd)	
		Max	Min	Max	Min
B50L	0.57U, 3.43L	350		350	
BR	1.0U, 2.5R	1,750		1,750	
75R	0.57D, 1.15R		5,100		10,100
75L	0.57D, 3.43L	10,600		10,600	
50L	0.86D, 3.43L	13,200		13,200	
50R	0.86D, 1.72R		5,100		10,100
50V	0.86D, 0				5,100
25L	1.72D, 9.0L		1,250		1,700
25R	1.72D, 9.0R		1,250		1,700
Any point in zone III (bounded by the following coordinates in degrees)		625		625	

8L	8L	8R	8R	6R	1.5R	V-V	4L
1U	4U	4U	2U	1.5U	1.5U	H-H	H-H

Headlamps for RH Traffic**	Class A Headlamp		Class B Headlamp	
Any point in zone IV (0.86D to 1.72D, 5.15L to 5.15R)		1,700		2,500
Any point in zone I (1.72D to 4D, 9L to 9R)	17,600		□2I*	

Note: In the table:
Letter L means that the point is located on the left of VV line.
Letter R means that the point is located on the right of VV line.
Letter U means the point is located above HH line
Letter D means the point or segment is located below HH line
* Actual measured value at points 50R / 50L respectively
** For left-hand traffic, the letter R shall be replaced by letter L and vice versa.

Headlamps for RH Traffic**		
Test Point	Angular Coordinates Degrees	Required luminous intensity - cd Min
1	4U, 8L	Points 1+2+3 190 Points 4+5+6 375
2	4U, 0	
3	4U, 8R	
4	2U, 4L	
5	2U, 0	
6	2U, 4R	
7	0, 8L	65
8	0, 4L	125

Table 3-1.Required illumination for a passing beam of the category A、B of symmetrical-beam headlamp

Class A (Unit：lux)		
Any point on and above the line h-h	□	0.32
Any point on line 25L-25R	□	1.28
Any point on line 12.5L-12.5R	□	0.64
Class B (Unit：lux)		
Any point on and above the line h-h	□	0.7
Any point on line 50L-50R except 50V*	□	1.5
Point 50V	□	3
Any point on line 25L-25R	□	3
Any point in zone IV	□	1.5
* ratio of intensities：50R/50L□0.25		

Table 3-2.Required illumination for a passing beam of the category C、D of symmetrical-beam headlamp

TEST POINT/ LINE/ ZONE	Position in B-beta Grid in angular degrees Vertical beta ** Horizontal B**		Required illumination in lux at 25 m			
			Minimum		Maximum	
			Class D	Class C	Class D	Class C
			> 125cc	≤ 125cc	> 125cc	≤ 125cc
1	0.86 D	3.5 R	2.3		15.4	
2	0.86 D	0	5.8	2.9	-	
3	0.86 D	3.5 L	2.3		15.4	
4	0.50 U	1.50 L & 1.50 R	-		1.08	
6	2.00 D	15 L & 15 R	1.28	0.64	-	
7	4.00 D	20 L & 20 R	0.38	0.19	-	
8	0	0	-		1.92	
Line 11	2.00 D	9 L to 9 R	1.6		-	
Line 12	7.00 U	10 L to 10 R	-		0.3; but 0.96 if within 2 degrees cone	
Line 13	10.00 U	10 L to 10 R	-		0.15; but 0.64 if within 2 degrees cone	

TEST POINT/ LINE/ ZONE	Position in B-beta Grid in angular degrees Vertical beta ** Horizontal B**		Required illumination in lux at 25 m			
			Minimum		Maximum	
			Class D	Class C	Class D	Class C
			> 125cc	≤ 125cc	> 125cc	≤ 125cc
Line 14	10 U to 90 U	0	-		0.15; but 0.64 if within 2 degrees cone	
15*	4.00 U	8.0 L	0.1*		1.08	
16*	4.00 U	0	0.1*		1.08	
17*	4.00 U	8.0 R	0.1*		1.08	
18*	2.00 U	4.0 L	0.2*		1.08	
19*	2.00 U	0	0.2*		1.08	
20*	2.00 U	4.0 R	0.2*		1.08	
21*	0	8.0 L & 8.0 R	0.1*		-	
22*	0	4.0 L & 4.0 R	0.2*		1.08	
Zone 1	1U/8L-4U/8L-4U/8R-1U/8R-0/4R-0/ 1R-0.6U/0-0/1L-0/4L-1U/8L		-		1.08	
Zone 2	>4U to <10 U	10 L to 10 R	-		0.3; but 0.96 if within 2 degrees cone	
Zone 3	10 U to 90 U	10 L to 10 R			0.15; but 0.64 if within 2 degrees cone	

Notes: "D" means under the H-H line. "U" means above the H-H line.
"R" means right of the V-V line. "L" means left of the V-V line.

* During measurement of these points, the front position lamp approved to ECE Regulation No. 50; if combined, grouped, or reciprocally incorporated-shall be switched on.

** 0.25 degrees tolerance allowed independently at each test point for photometry unless indicated otherwise.

Table 3-3：For Class E headlamps:

Test point/ line/ zone	Position in B-beta grid in angular degrees		Required illumination in Lux at 25 m	
	Vertical beta **/	Horizontal beta **/	Minimum	Maximum
1	0.86 D	3.5 R	4	20
2	0.86 D	0	8	-
3	0.86 D	3.5 L	4	20
4	0.50 U	1.50 L and 1.50 R	-	1.08
6	2.00 D	15 L and 15 R	2	-
7	4.00 D	20 L and 20 R	1	-
8	0	0	-	1.92
Line 11	2.00 D	9 L to 9 R	3	-
Line 12	7.00 U	10 L to 10 R	-	1.08
Line 13	10.00 U	10 L to 10 R	-	1.08
Line 14	10 U to 90 U	0	-	1.08
15 */	4.00 U	8.0 L	0.1 */	1.08
16 */	4.00 U	0	0.1 */	1.08
17 */	4.00 U	8.0 R	0.1 */	1.08
18 */	2.00 U	4.0 L	0.2 */	1.08
19 */	2.00 U	0	0.2 */	1.08
20 */	2.00 U	4.0 R	0.2 */	1.08
21 */	0	8.0 L and 8.0 R	0.1 */	-
22 */	0	4.0 L and 4.0 R	0.2 */	1.08
Zone 1	1U/8L-4U/8L-4U/8R-1U/8R-0/4R-0/1R-0.6U/0-0/1L-0/4L-1U/8L		-	1.08
Zone 2	>4U to <10 U	10 L to 10 R	-	1.08
Zone 3	10 U to 90 U	10 L to 10 R	-	1.08

Notes:
"D" means under the H-H line.
"U" means above the H-H line.
"R" means right of the V-V line.
"L" means left of the V-V line.
*/ During measurement of these points, the front position lamp approved to Regulation No. 50, if combined, grouped, or reciprocally incorporated, shall be switched on.
**/ A 0.25 degrees photometry tolerance is allowed independently at each test point, unless indicated otherwise.

52-2.7.2 The illumination produced on the screen by the driving beam shall meet the following requirements：

In the case of a headlamp unit designed to provide a driving beam and a passing beam, measurements of the luminous intensity of the driving beam shall be taken with the same unit alignment and voltage as for measurements under paragraph 52-2.7.1. In the case of a headlamp providing a driving beam only, it shall be so aimed that the area of maximum luminous intensity is centered on the point of intersection HV. More than one light source may be used for asymmetrical-beam headlamps. Where more than one light source is used to provide the driving beam, the combined functions shall be used to determine the maximum value of the luminous intensity (IM).

52-2.7.2.1 Halogen sealed-beam headlamps

52-2.7.2.1.1 The point of intersection HV shall be situated within the isolux 80% of the maximum illumination. This maximum value shall not be less than 48 lux. The maximum value shall not exceed 240 lux; in addition, in the case of a combined passing and driving headlamp unit, it shall in no case exceed 16 times the illumination measured for the passing beam at point 75 R (or 75L).

52-2.7.2.1.2 Starting from point HV, horizontally to the left and right, the illumination shall not be less than 24 lux up to a distance of 1.125 m, and not less than 6 lux up to a distance of 2.25 m.

52-2.7.2.2 Asymmetrical-beam headlamps

52-2.7.2.2.1 The point of intersection (HV) of lines h h and v v shall be situated within the isolux 80 per cent of maximum luminous intensity (Imax).

52-2.7.2.2.2 The maximum value (IM) shall in no circumstances exceed 215,000 cd.

52-2.7.2.2.3 The reference mark (I'M) of the maximum luminous intensity, shall be obtained by the ratio:

I'M = IM /4,300

This value shall be rounded off to the value 7.5 - 10 - 12.5 - 17.5 - 20 - 25 - 27.5 - 30 - 37.5 - 40 - 45 - 50.

52-2.7.2.2.4 Referring to Figure 3 and the table 4-1 below, the luminous intensity distribution of the driving beam shall meet the following requirements:

table 4-1：

		Class A Headlamp	Class B Headlamp
Test point designation	Angular Coordinates Degrees	Required luminous intensity cd	Required luminous intensity cd
		Min	Min
I_{max}		27,000	40,500

H-5L	0.0,5.0L	3,400	5,100
H-2.5L	0.0,2.5L	13,500	20,300
H-2.5R	0.0,2.5R	13,500	20,300
H-5R	0.0,5.0R	3,400	5,100

52-2.7.2.3 Symmetrical-beam headlamps：Except for Class A headlamp, the illumination produced on the screen by B, C, D and E shall meet the following requirements:

52-2.7.2.3.1 The point of intersection (HV) of lines H-H and V-V shall be situated within the isolux 80 per cent of maximum illumination. This maximum value (EM) shall not be less than 32 lux for Class B and C headlamps and 51.2 lux for Class D headlamps. The maximum value shall in no circumstances exceed 240 lux in the case of Class B headlamps and 180 lux in the case of Class C and D headlamps. This maximum value (EM) shall not be less than 70 lux for Class E headlamps. The maximum value shall in no circumstances exceed 180 lux in the case of Class E headlamps.

52-2.7.2.3.2 starting from point HV, horizontally to the right and left, the illumination shall be not less than 12 lux for Class B headlamp to a distance of 1,125 mm and not less than 3 lux for Class B headlamp to a distance of 2,250 mm.

52-2.7.2.3.3 In the case of a Class C, D and E headlamp, the intensities shall conform to the tables 4. Table 4-1 applies in the case where a primary driving beam is being produced with a single light source. Table 4-2 applies in the case where the driving beam is being produced by a secondary driving beam headlamp operated with a harmonized passing beam headlamp or a primary driving beam headlamp.

52-2.7.2.3.4 The maximum intensity (IM) of the driving beam expressed in thousands of candelas shall be calculated by the formula:

$I_M = 0.625\ E_M$

The reference mark (I'M) of this maximum intensity, referred to above, shall be obtained by the ratio:

$$I'_M = \frac{I_M}{3} = 0.280\,E_M$$

This value shall be rounded off to the value 7.5 - 10 - 12.5 - 17.5 - 20 - 25 - 27.5 - 30 - 37.5 - 40 - 45 - 50.

Table 4-2 Primary high beam headlamp

（Refer to figure 6 for details of test point positions）

Test point number	Test point location	Required illumination in lux					
		Class D		Class C		Class E	
		> 125cc		≤ 125cc			
		MIN	MAX	MIN	MAX	MIN	MAX
1	H-V[1]	[1]	---	[1]	---	[1]	---
2	H-3R and 3L	19.2	---	12.8	---	30	---
3	H-6R and 6L	6.4	---	4.16	---	10	---
4	H-9R and 9L	3.84	---	2.56	---	6	---
5	H-12R and 12L	1.28	---	0.8	---	2	---
6	2U-V	1.92	---	1.28	---	3	---
7	4D-V	---	[2]	---	[2]	---	[2]
	MIN luminous intensity of the maximum	51.2	---	32	---	70	---
	MAX luminous intensity	---	180.0	---	180.0	---	180.0

[1] Intensity at H-V shall be equal to or greater than 80 per cent of the maximum intensity in the beam pattern.

[2] Intensity at 4D-V shall be equal to or less than 30 per cent of the maximum intensity in the beam pattern.

Table 4-3 Primary high beam headlamp

（Refer to figure 7 for details of test point positions）

Test point number	Test point location	Required illumination in lux					
		Class D > 125cc		Class C ≤ 125cc		Class E	
		MIN	MAX	MIN	MAX	MIN	MAX
1	H-V[1]	[1]	---	[1]	---	[1]	---
2	H-3R and 3L	19.2	---	12.8	---	30	---
3	H-6R and 6L	6.4	---	4.16	---	10	---
6	2U-V	1.92	---	1.28	---	3	---
7	4D-V	---	[2]	---	[2]	---	[2]
	MIN luminous intensity of the maximum	51.2	---	32	---	70	---
	MAX luminous intensity	---	180.0	---	180.0	---	180.0

[1] Intensity at H-V shall be equal to or greater than 80 per cent of the maximum intensity in the beam pattern.

[2] Intensity at 4D-V shall be equal to or less than 30 per cent of the maximum intensity in the beam pattern.

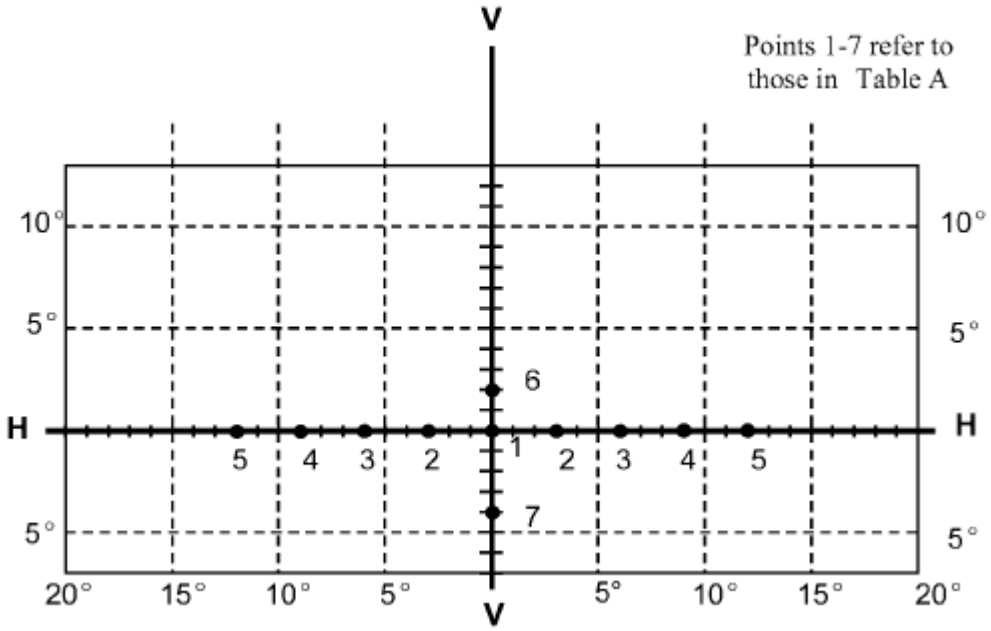


Figure 6
Primary Driving Beam

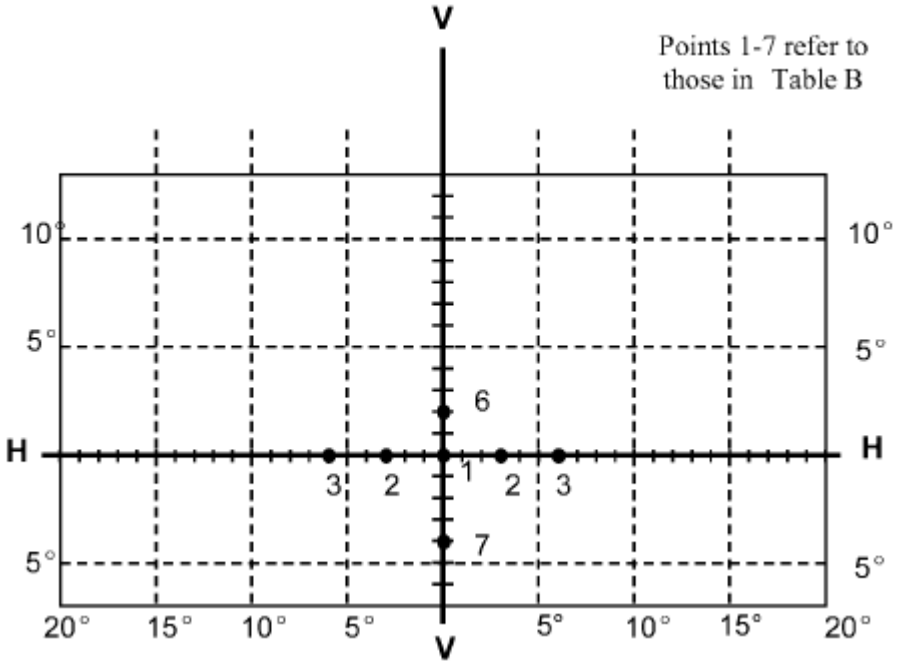


Figure 7
Secondary Driving Beam

52-2.7.3 In the case of asymmetrical-beam and symmetrical-beam headlamp：Additional test are made after the reflector has been moved vertically ± 2° or at least into the maximum position, if less than 2 degrees, from its initial position by means of the headlamps adjusting device. Having re-aimed the headlamp as a whole by means of the goniometer in the corresponding opposite direction the light output in the following directions shall be controlled and lie within the required limits：

52-2.7.3.1 asymmetrical-beam headlamp：

Principal passing beam: points HV and 75 R (75 L respectively);
driving beam: EM and point HV (percentage of EM).

52-2.7.3.2 symmetrical-beam headlamp：

passing beam: points HV and 0.86D-V
driving beam: IM and point HV (percentage of IM).

52-2.8 Color

In the case of sealed-beam headlamp , halogen sealed-beam headlamp, symmetrical headlamp and asymmetrical headlamp the light emitted shall be white defined in “The installation of lighting and light-signaling devices” of “Directions”.

52-2.9 Test for stability of photometric performance: In the case of halogen sealed-beam headlamp, asymmetrical-beam headlamp and symmetrical-beam headlamp by B、C and D shall be comply with following regulations:

(a) In a dry and still atmosphere at an ambient temperature of 23 degrees C +/- 5 degrees C, the test sample being mounted on a base representing the correct installation on the vehicle;

(b) In case of replaceable light sources: using mass production filament light sources, which have been aged for at least one hour, or mass production gas-discharge light sources, which have been aged for at least 15 hours or mass production LED modules which have been aged for at least 48 hours and cooled down to ambient temperature before starting the tests as specified in this Regulation. The LED modules supplied by the applicant shall be used.

The measuring equipment shall be equivalent to that used during headlamp type approval tests.

The test sample shall be operated without being dismounted from or readjusted in relation to its test fixture.

The light source used shall be a light source of the category specified for that headlamp.

52-2.9.1 Clean headlamp

52-2.9.1.1 Test procedure

52-2.9.1.1.1 When the tested headlamp is grouped and/or reciprocally incorporated with signalling lamps, and when headlamp flashing is used:

52-2.9.1.1.1.1 When the tested headlamp is grouped and/or reciprocally incorporated with signaling lamps, the latter shall be lit for the duration of the test. In the case of a direction indicator lamp, it shall be lit in flashing operation mode with an on/off time ratio of approximately one to one.

52-2.9.1.1.1.2 Should two or more filaments be simultaneously lit when headlamp flashing is used, this shall not be considered as being normal use of both filaments simultaneously.

52-2.9.1.1.2 In the case where only one lighting function (driving or passing beam) is to be tested, the corresponding filament and/or LED module(s) is (are) lit for the prescribed time of 12 hours.

52-2.9.1.1.3 In the case of a reciprocal incorporated passing beam and driving beam or in the case of a headlamp with a passing beam and a front fog lamp:

52-2.9.1.1.3.1 The headlamp shall be subjected to the following cycle until the time specified is reached - i.e. 12 hours:

15 minutes, passing filament lit

5 minutes, all filaments lit

In the case of asymmetrical-beam headlamp shall be subjected to the following cycle until the time specified is reached - i.e. 12 hours:

15 minutes, principal passing-beam filament or principal passing beam LED module(s) lit;

5 minutes, all filaments and/or LED module(s) lit.

52-2.9.1.1.3.2 If the applicant declares that the headlamp is to be used with a single filament lit at a time, the test shall be carried out in accordance with this condition, activating each specified function successively for half the time specified- i.e.6 hours.

52-2.9.1.1.4 In the case of halogen sealed-beam headlamps with grouped lighting function, all the individual functions shall be lit simultaneously for the time specified (i.e. 12 hours) for individual lighting functions (a) also taking into account the use of reciprocally incorporated lighting functions (b), according to the manufacturer's specifications.

52-2.9.1.1.5 In the case of asymmetrical-beam headlamp and symmetrical-beam headlamp with a front fog lamp：

52-2.9.1.1.5.1 In the case of a headlamp with a passing beam and a front fog lamp：

The headlamp shall be subjected to the following cycle until the time specified is reached (i.e. 12 hours):

15 minutes, principal passing-beam filament or principal passing beam LED module(s) lit;

5 minutes, all filaments and/or LED module(s) lit.

52-2.9.1.1.5.2 In the case of a headlamp with a front fog lamp and one or more driving beams：

52-2.9.1.1.5.2.1 The headlamp shall be subjected to the following cycle until the time specified is reached - i.e. 12 hours:

15 minutes – front fog lamp lit

5 minutes – all filaments and/or all LED modules lit.

52-2.9.1.1.5.2.2 The applicant declares that the headlamp is to be used with only the front fog lamp lit or only the driving beam(s) lit at a time, the test shall be carried out in accordance with this condition, activating successively the front fog lamp half of the time and the driving beam(s) (simultaneously) for half the time specified (i.e. 6 hours).

52-2.9.1.1.5.3 In the case of a headlamp with a passing beam, one or more driving beams and a front fog lamp：

52-2.9.1.1.5.3.1 The headlamp shall be subjected to the following cycle until the time specified is reached - i.e. 12

hours:

15 minutes – passing beam filament lit

5 minutes – all filaments lit

In the case of asymmetrical-beam headlamp shall be subjected to the following cycle until the time specified is reached - i.e. 12 hours:

15 minutes, principal passing-beam filament or principal passing beam LED module(s) lit;

5 minutes, all filaments and/or LED module(s) lit.

52-2.9.1.1.5.3.2 If the applicant declares that the headlamp is to be used with only the passing beam lit or only the driving beam(s) lit at a time, the test shall be carried out in accordance with this condition, activating successively the passing beam half of the time and the driving beam(s) for half the time specified (i.e. 6 hours), while the front fog lamp is subjected to a cycle of 15 minutes off and 5 minutes lit for half of the time and during the operation of the driving beam;

52-2.9.1.1.5.3.3 If the applicant declares that the headlamp is to be used with only the passing beam lit or only the front fog lamp lit at a time, the test shall be carried out in accordance with this condition, activating successively the passing beam half of the time and the front fog lamp for half of the time specified (i.e. 6 hours), while the driving beam(s) is (are) subjected to a cycle of 15 minutes off and 5 minutes lit for half of the time and during the operation of the passing beam；

52-2.9.1.1.5.3.4 If the applicant declares that the headlamp is to be used with only the passing beam lit or only the driving beam(s) lit or only the front fog lamp lit at a time, the test shall be carried out in accordance with this condition, activating successively the passing beam one third of the time (i.e. 4 hours), the driving beam(s) one third of the time (i.e. 4 hours) and the front fog lamp for one third of the time specified (i.e. 4 hours).

52-2.9.1.1.6 In the case of asymmetrical-beam headlamp ，a passing beam designed to provide bend lighting with the addition of a filament light source and/or all LED modules, this light source and/or all LED modules shall be switched on for 1 minute, and switched off for 9 minutes during the activation of the passing beam only.

52-2.9.1.1.6.1 The headlamp shall be operated following cycle for 12 hours 15 minutes, passing-beam filament lit，5 minutes, all filaments lit.

52-2.9.1.1.6.2 if the headlamp is to be used with only the passing beam lit or only the driving beam(s) lit 3/ at a time, then the passing beam and driving beam are lit for 6 hours in turn，during the time of driving beam(s) light up，

15 minutes, front fog lamp extinct and 5 minutes, front fog lamp lit. in turn.

52-2.9.1.1.6.3 if the headlamp is to be used with only the passing beam lit or only the fog lamp lit 3/ at a time, then the passing beam and fog lamp are lit for 6 hours in turn，during the time of passing beam light up， 15 minutes, driving beam(s) extinct and 5 minutes, driving beam(s) lit. in turn.

52-2.9.1.1.6.4 if the headlamp is to be used with only the passing beam lit or only the driving beam(s) 3/ lit or only the front fog lamp 3/ lit at a time, then the passing beam、driving beam(s) and front fog lamp are lit in turn.

52-2.9.1.1.7 Test voltage：

52-2.9.1.1.7.1 In the case of halogen sealed-beam headlamp, the voltage shall be adjusted so as to supply 90% of the maximum wattage.

52-2.9.1.1.7.2 In the case of asymmetrical-beam headlamp and symmetrical-beam headlamp, the voltage shall be applied to the terminals of the test sample as follows:

52-2.9.1.1.7.2.1 In case of replaceable filament light source(s) operated directly under vehicle voltage system conditions: the test shall be performed at 6.3 V, 13.2 V or 28.0 V as applicable except if the applicant specifies that the test sample may be used at a different voltage. In this case, the test shall be carried out with the filament light source operated at the highest voltage that can be used.

52-2.9.1.1.7.2.2 In case of replaceable gas discharge light source(s): The test voltage for the electronic light source control-gear or the light source in case the ballast is integrated with the light source, is 13. 2 +/- 0.1 volts for 12 V vehicle voltage systems, or otherwise specified in the application for approval.

52-2.9.1.1.7.2.3 In the case of non-replaceable light sources operated directly under vehicle voltage system conditions: all measurements on lighting units equipped with nonreplaceable light sources (filament light sources and/or others) shall be made at 6.3 V, 13.2 V or 28.0 V or at other voltages according to the vehicle voltage system as specified by the applicant respectively.

52-2.9.1.1.7.2.4 In the case of light sources, replaceable or non-replaceable, being operated independently from vehicle supply voltage and fully controlled by the system, or, in the case of light sources supplied by a supply and operating device, the test voltages as specified above shall be applied to the input terminals of that device. The test laboratory may require from the manufacturer the supply and operating device or a special power supply needed to supply the light source(s).

52-2.9.1.1.7.2.5 LED module(s) shall be measured at 6.75 V, 13.2 V or 28.0 V respectively, if not otherwise specified within this Regulation. LED module(s) operated by an electronic light source control gear, shall be measured as specified by the applicant.

52-2.9.1.1.7.2.6 Where signalling lamps are grouped, combined or reciprocally incorporated into the test sample and operating at voltages other than the nominal rated voltages of 6 V, 12 V or 24 V respectively, the voltage shall be adjusted as declared by the manufacturer for the correct photometric functioning of that lamp.

52-2.9.1.2 Test results

52-2.9.1.2.1 Visual inspection：No distortion, deformation, cracking or change in color of either the headlamp lens or the external lens, if any, shall be noticeable.

52-2.9.1.2.2 Photometric test：To comply with the requirements of this Regulation, the photometric values shall be verified in the following points and a 10% discrepancy between the photometric characteristics and the values measured prior to the test is permissible including the tolerances of the photometric procedure:

52-2.9.1.2.2.1 For halogen sealed-beam headlamp and asymmetrical headlamp：

Passing beam ：50R, B50L, HV.

Driving beam：Point of Emax

52-2.9.1.2.2.2 For class B of the symmetrical headlamp：

Passing beam：50R, 50L, B50, HV.

Driving beam：Point of Emax

52-2.9.1.2.2.3 For class C, D and E of the symmetrical headlamp：

Passing beam：0.86D/3.5R - 0.86D/3.5L - 0.50U/1.5L and 1.5R – HV

Driving beam：Point of Emax

Another aiming may be carried out to allow for any deformation of the headlamp base due to heat (the change of the position of the "cut-off" line is covered).

52-2.9.1.2.2.4 Driving beam： Point of maximum photometric value

52-2.9.2 Dirty headlamp test

After being tested as specified in paragraph 52-2.9.1, the headlamp shall be operated for one hour as described paragraph 52-2.9.1, after being prepared as: The test mixture shall be uniformly applied to the entire light emitting surface of the headlamp and then left to dry. This procedure shall be repeated until the illumination value has dropped to 15-20% of the values measured for

each following point: Using a mass production filament lamp or the LED module(s) as submitted with the asymmetrical-beam headlamp and LED headlamp.

52-2.9.2.1 Point of Emax in driving beam, photometric distribution for a driving/passing lamp, Point of Emax in driving beam, photometric distribution for a driving lamp only.

52-2.9.2.2 In the case of the halogen sealed lamp headlamp and asymmetrical headlamp, 50R and 50V for a passing lamp only.

52-2.9.2.3 In the case of class B symmetrical headlamp, passing beam only: B 50 and 50 V.

52-2.9.2.4 In the case of class C, D and E symmetrical headlamp, passing beam only: 0.50U/1.5L and 1.5R and 0.86D/V.

52-2.9.3 Test for change in vertical position of the cut-off line under the influence of heat (applicable to passing beam only)

52-2.9.3.1 The headlamp tested in accordance with 52-2.9.1, shall be subjected to the test, without being moved and readjusted its position.

52-2.9.3.2 Using a mass production headlamp which has been aged for at least one hour or a mass production gas-discharge light source which has been aged for at least 15 hours or the LED module(s) as submitted with the headlamps, which has (have) been aged for at least 48 hours, the headlamp shall be operated on passing beam without being dismounted from or readjusted in relation to its test fixture. The position of the cut-off line shall be verified 3 minutes (r3) and 60 minutes (r60) respectively after operation.

52-2.9.3.2.1 Symmetrical headlamp：

(a) For Class B headlamp:Horizontal part between the vertical lines passing through point 50 L and 50 R.

(b) For Class C, D and E headlamp: Horizontal part between the vertical lines passing through point 3.5 L and 3.5 R.

52-2.9.3.2.2 Other headlamps：

Horizontal part between vv and the vertical line passing through point B50L.

52-2.9.3.3 The result expressed in milliradians (mrad) shall be considered as acceptable when the absolute value Δ rI = $|r3 - r60|$ recorded on the headlamp is not more than 1.0 mrad (Δ rI$\leq$1.0 mrad).

52-2.9.3.4 However, if this value is more than 1.0 mrad but not more than 1.5 mrad, a second headlamp shall be tested as described in paragraph 52-2.9.3.2 after being subjected three consecutive times to the cycle as described below, in order to stabilize the position of mechanical parts of the headlamp on a base representative of the correct installation on the vehicle:

Operation of the passing beam for one hour,

Period of rest for one hour.

The headlamp shall be considered as acceptable if the mean value of the absolute values delta rI measured on the first

sample and delta rII measured on the second sample is not more than 1.0 mrad.

52-2.10 Requirements for lamps incorporating lenses of plastic material -Testing of lens or material samples and of complete.

Fourteen samples of headlamp lenses shall be supplied, numbered and carried out the test pursuant to Table 5. Two samples of complete headlamp shall be supplied, numbered and undergone the test in accordance with Table 6. The test method and the standards for respective test item are indicated below：

52-2.10.1 Resistance to temperature changes

52-2.10.1.1 Three new samples (lenses) shall be subjected to five cycles of temperature and humidity (RH = relative humidity) change in accordance with the following programme:

3 hours at 40 ± 2°C and 85% ~95% RH,

1 hours at 23 ± 5°C and 60% ~75% RH,

15 hours at -30 ± 2°C,

1 hours at 23 ± 5°C and 60% ~75% RH,

3 hours at 80 ± 2°C,

1 hours at 23 ± 5°C and 60% ~75% RH.

52-2.10.1.2 Photometric measurement shall be carried out on the samples before and after the test. These measurements shall be made using a standard lamp, a standard gasdischarge light source and/or LED module(s), as present in the headlamp at the following points：

52-2.10.1.2.1 In the case of halogen sealed-beam headlamp and asymmetrical headlamp, B50L and 50R for the passing beam of a passing lamp or a passing/driving lamp

52-2.10.1.2.2 In the case of symmetrical headlamp, B50, 50L and 50R for the passing beam of a passing lamp or a passing/driving lamp

52-2.10.1.2.2.1 The category of B：B50, 50L, 50R

52-2.10.1.2.2.2 The category of C, D and E: 0.86D/3.5R, 0.86D/3.5L, 0.50U/1.5L and 1.5R

52-2.10.1.2.3 Point of maximum photometric value for the driving beam of a driving lamp or a passing/driving lamp

52-2.10.1.3 The variation between the photometric values measured on each sample before and after the test shall not exceed 10% including the tolerances of the photometric procedure.

52-2.10.2 Resistance to atmospheric and chemical agents

The following readings shall be taken：

Readings	With Sample	With central part of DD (diaphragm baffle)	Quantity represented
T1	No	No	Incident flux in initial reading
T2	Yes (before test)	No	Flux transmitted by the new material in a field of 24°C
T3	Yes (after test)	No	Flux transmitted by the tested material in a field of 24°C
T4	Yes (before test)	Yes	Flux diffused by the new material
T5	Yes (after test)	Yes	Flux diffused by the tested material

52-2.10.2.1 Three samples shall be exposed to an energetic illumination of 1200 W/m^2 ± 200 W/m^2 for a period such that the luminous energy that they receive is equal to 4500 MJ/m^2 ± 200 MJ/m^2. Within the enclosure, the temperature measured on the black panel placed on a level with the sample shall be 50 °C ± 5°C. In order to ensure a regular exposure, the samples shall revolve around the source of radiation at a speed between 1 and 5 1/min. The samples shall be sprayed with distilled water at a temperature of 23 °C ± 5°C in accordance with the following cycle：

Spraying：5 minutes,

Drying：25 minutes

52-2.10.2.2 After the test of resistance to atmospheric agents, the outer face of the samples shall be free from cracks, scratches, chipping and deformation, and the mean variation (∆tm) in transmission ∆t = (T2-T3)/T2 measured on the three samples shall not exceed 0.020.

52-2.10.2.3 Soak a piece of cotton cloth until saturation with the test mixture, and, within 10 seconds, apply it for 10 minutes to the outer face of the sample after being carried out the test in paragraph 52-2.10.2.1, at a pressure of 50 N/cm^2. At the end of the application of the test mixture, the samples shall be dried in the open air and then washed with the solution-detergents at 23 °C ± 5°C. Afterward the samples shall be carefully rinsed with distilled water at 23 °C ± 5°C and then wiped off with a soft cloth.

52-2.10.2.4 After the test of resistance to chemical agents, the samples shall not bear any traces of chemical staining likely to cause

a variation of flux diffusion $\Delta d = (T_5-T_4)/T_2$, whose mean variation (Δd_m) measured on the three samples shall not exceed 0.020.

52-2.10.3 Resistance to detergents and hydrocarbons

52-2.10.3.1 The outer face of three samples shall be heated to 50 °C ± 5°C and then immersed for five minutes in a mixture maintained at 23 °C ± 5°C and composed of 99% distilled water and 1% of alkylaryl sulphonate. At the end of the test, the samples shall be dried in a test chamber at 50 °C ± 5°C. The surface of the samples shall be cleaned with a moist cloth.

52-2.10.3.2 The outer face of these three samples shall then be lightly rubbed for one minute with a cotton cloth soaked in a mixture composed of 70% n-heptane and 30% toluene (volume percent), and then shall be dried in the open air.

52-2.10.3.3 After the above two tests have been performed successively, the mean variation (Δtm) in transmission $\Delta t = (T2-T3)/T2$ measured on the three samples shall not exceed 0.010.

52-2.10.4 Resistance to mechanical deterioration

52-2.10.4.1 The spray gun used with test mixture of silica sand shall be equipped with a nozzle 1.3 mm in diameter allowing a liquid flow rate of 0.24+/-0.02 1/minute at an operating pressure of 6.0 bars -0, +0.5 bar, at a distance of 380 mm+/-10 mm from the nozzle. The jet shall be sprayed almost perpendicular to the surface to be tested. The deterioration shall be checked by means of one or more samples of glass placed as a reference near the lenses to be tested. The mixture shall be sprayed until the variation in the diffusion of light on the sample or samples measured by the method, is such that: $\Delta d = (T5-T4)/T2 = 0.025 \pm 0.0025$.

52-2.10.4.2 After this test, the variations in transmission: $\Delta t = (T2-T3)/T2$ and in diffusion: $\Delta d = (T5-T4)/T2$ shall be measured. The mean value of the three samples shall be such that: $\Delta t_m \leq 0.100$, $\Delta d_m \leq 0.050$.

52-2.10.5 Test of adherence of coatings, if any

52-2.10.5.1 A surface of 20 mm x 20 mm in area of the coating of a lens shall be cut a razor blade into a grid of squares approximately 2 mm x 2 mm. An adhesive tape with a force adhesion of 2 N/cm ± 20%, at least 25mm wide, shall be pressed for at least 5 minutes to the surface. Then the end of the adhesive tape shall be loaded in such a way that the force of adhesion to the surface considered is balanced by a force perpendicular to that surface. At this stage, the tape shall be torn off at a constant speed of 1.5 m/s +/- 0.2 m/s.

52-2.10.5.2 There shall be no appreciable impairment of the gridded area. Impairments at the intersections between squares or at the edges of the cuts shall be permitted, provided that the impaired area does not exceed 15% of the gridded surface.

52-2.10.6 Tests of the complete headlamp

52-2.10.6.1 Resistance to mechanical deterioration (the lens of lamp sample No. 1 shall be subjected to the test)

52-2.10.6.1.1 The lens of lamp sample No. 1 shall be subjected to the test described in paragraph 52-2.10.4.

52-2.10.6.1.2 After the test, the results of photometric measurements carried out on the lamp in accordance with this Regulation shall not exceed by more than 30% the maximum values prescribed at points B 50 L (excluding the symmetrical headlamp) point 75 R、category of B symmetrical headlamp point 50L and 50R，The category of C, D and E symmetrical headlamp point 0.86D/3.5R，0.86D/3.5L not be more than 10% below the minimum values.

52-2.10.6.2 Test of adherence of coating, if any (The lens of lamp sample No. 2 shall be subjected to the test): The lens of lamp sample No. 2 shall be subjected to the test and meet the results described in paragraph 52-2.10.5.

Table 5. Tests on plastic material (lenses or samples)

Samples	Lenses or samples of material										Lenses			
Tests	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Limited photometry											○	○	○	
Temperature change											○	○	○	
Limited photometry											○	○	○	
Transmission measurement	○	○	○	○	○	○	○	○	○					
Diffusion measurement	○	○	○				○	○	○					
Atmospheric agents	○	○	○											
Transmission measurement	○	○	○											
Chemical agents	○	○	○											
Diffusion measurement	○	○	○											
Detergents and Hydrovarbons				○	○	○								
Transmission measurement				○	○	○								

Deterioration							○	○	○					
Transmission measurement							○	○	○					
Diffusion measurement							○	○	○					
Adherence														○
Resistance to light source radiations										○				

Remark：

The samples of material at least 60 mm x 80 mm in size shall have a flat or convex outer surface and a substantially flat area (radius of curvature not less than 300 mm) in the middle measuring at least 15 x 15mm.

Table 6: Tests on complete headlamps

Sample No. / Tests	Complete headlamp	
	1	2
Resistance to mechanical deterioration	○	
Test of adherence of coating		○

52-2.10.7 Resistance to light source radiations (halogen sealed-beam headlamp unit could exempt from this regulation)

52-2.10.7.1 The following test shall be done: Flat samples of each light transmitting plastic component of the headlamp are exposed to the light of the LED module(s). The parameters such as angles and distances of these samples shall be the same as in the headlamp. These samples shall have the same colour and surface treatment, if any, as the parts of the headlamp.

52-2.10.7.2 After 1,500 hours of continuous operation, the colorimetric specifications of the transmitted light must be met, and the surfaces of the samples shall be free of cracks, scratches, scalings or deformation.

52-2.11 Requirement s for LED modules an headlamps including LED modules

52-2.11.1 General

52-2.11.1.1 Each LED module sample submitted shall conform to the relevant specifications of this Regulation when tested with the supplied electronic light source control-gear(s), if any.

52-2.11.1.2 LED module(s) shall be so designed as to be and to remain in good working order when in normal use. They shall moreover exhibit no fault in design or manufacture. A LED module shall be considered to have failed if any one of its LEDs has failed.

52-2.11.1.3 LED module(s) shall be tamperproof.

52-2.11.1.4 The design of removable LED module(s) shall be such that:

52-2.11.1.4.1 when the LED module is removed and replaced by another module provided by the applicant and bearing the same light source module identification code, the photometric specifications of the headlamp shall be met;

52-2.11.1.4.2 LED modules with different light source module identification codes within the same lamp housing, shall not be interchangeable.

52-2.11.2 Manufacturer

52-2.11.2.1 The LED(s) on the LED module shall be equipped with suitable fixation elements.

52-2.11.2.2 The fixation elements shall be strong and firmly secured to the LED(s) and the LED module.

52-2.11.3 Test conditions

52-2.11.3.1 All samples shall be tested as specified in paragraph 52-2.11.4 below. The kind of light sources on a LED module shall be light-emitting diodes (LED) in particular with regard to the element of visible radiation. Other kinds of light sources are not permitted.

52-2.11.3.2 Operation conditions

52-2.11.3.2.1 LED module operating conditions: All samples shall be tested under the conditions as specified in paragraphs 52-2.4.3 and 52-2.4.4 of this Regulation. If not specified differently in this annex LED modules shall be tested inside the headlamp as submitted by the manufacturer.

52-2.11.3.2.2 Ambient temperature: For the measurement of electrical and photometric characteristics, the headlamp shall be operated in a dry and still atmosphere at an ambient temperature of 23 degrees C +/- 5 degrees C.

52-2.11.3.3 Ageing: Upon the request of the applicant the LED module shall be operated for 15 h and cooled down to ambient temperature before starting the tests as specified in this Regulation. (If use of the symmetrical-beam headlamp, shell be aged at least for forty-eight hours)

52-2.11.4 Specific requirements and tests

52-2.11.4.1 Colour rendering: Red content

In addition to measurements as described in paragraph 52-2.8 of this Regulation:

The minimum red content of the light of a LED module or headlamp incorporating LED module(s) tested at 50 V shall be such that:

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

where:

Ee(lambda) (unit: W) is the spectral distribution of the irradiance;

V(lambda) (unit: 1) is the spectral luminous efficiency;

(lambda) (unit: nm) is the wavelength.

This value shall be calculated using intervals of one nanometre.

52-2.11.4.2 UV-radiation

The UV-radiation of a low-UV-type LED module shall be such that:

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

where:

S(lambda)(unit: 1) is the spectral weighting function;

km = 683 lm/W is the maximum value of the luminous efficacy of radiation.

λ	S(λ)
250	0.430
255	0.520
260	0.650
265	0.810
270	1.000
275	0.960
280	0.880
285	0.770
290	0.640
295	0.540
300	0.300

λ	S(λ)
305	0.060
310	0.015
315	0.003
320	0.001
325	0.000 50
330	0.000 41
335	0.000 34
340	0.000 28
345	0.000 24
350	0.000 20

λ	S(λ)
355	0.000 16
360	0.000 13
365	0.000 11
370	0.000 09
375	0.000 077
380	0.000 064
385	0.000 530
390	0.000 044
395	0.000 036
400	0.000 030

This value shall be calculated using intervals of one nanometer. The UV-radiation shall be weighted according to the values as indicated in the Table UV below:

Table UV: Values according to "IRPA/INIRC Guidelines on limits of exposure to ultraviolet radiation". Wavelengths (in nanometres) chosen are representative; other values should be interpolated. See table 7

Table 7 UV: Values according to "IRPA/INIRC Guidelines on limits of exposure to ultraviolet radiation". Wavelengths (in nanometres) chosen are representative; other values should be interpolated.

52-2.11.4.3 Temperature stability

52-2.11.4.3.1 Illuminance

52-2.11.4.3.1.1 A photometric measurement of the headlamp shall be made after 1 minute of operation for the specific function at the test point specified below. For these measurements, the aim can be approximate but must be maintained for before and after ratio measurements.

Test points to be measured:

Passing beam 50 V

Driving beam H – V

52-2.11.4.3.1.2 The lamp shall continue operation until photometric stability has occurred. The moment at which the photometry is stable is defined as the point in time at which the variation of the photometric value is less than 3 per cent within any 15 minute period. After stability has occurred, aim for complete photometry shall be performed in accordance with the requirements of the specific device. Photometer the lamp at all test points required for the specific device.

52-2.11.4.3.1.3 Calculate the ratio between the photometric test point value determined in paragraph 52-2.11.4.3.1.1 and the point value determined in paragraph 52-2.11.4.3.1.2.

52-2.11.4.3.1.4 Once stability of photometry has been achieved, apply the ratio calculated above to each of the remainder of the test points to create a new photometric table that describes the complete photometry based on one minute of operation.

52-2.11.4.3.1.5 The illuminance values, measured after one minute and after photometric stability has occurred, shall comply with the minimum and maximum requirements.

52-2.11.4.3.2 Colour: The colour of the light emitted measured after one minute and measured after photometric stability has been

obtained, as described in paragraph 52-2.11.4.3.1.2, shall both be within the required colour boundaries.

52-2.11.5 The measurement of the objective luminous flux of LED module(s) producing the principal passing beam shall be carried out as follows:

52-2.11.5.1 The LED module(s) shall be in the configuration as described in the technical specification. Optical elements (secondary optics) shall be removed by the Technical Service at the request of the applicant by the use of tools. This procedure and the conditions during the measurements as described below shall be described in the test report.

52-2.11.5.2 Three LED modules of each type shall be submitted by the applicant with the light source control gear, if applicable, and sufficient instructions.

52-2.11.5.2.1 Suitable thermal management (e.g. heat sink) may be provided, to simulate similar thermal conditions as in the corresponding headlamp application.

52-2.11.5.2.2 Before the test each LED module shall be aged at least for seventy-two hours under the same conditions as in the corresponding headlamp application.(If use of the symmetrical-beam headlamp, shell be aged at least for forty-eight hours)

52-2.11.5.2.3 In the case of use of an integrating sphere, the sphere shall have a minimum diameter of one meter, and at least ten times the maximum dimension of the LED module, whichever is the largest. The flux measurements can also be performed by integration using a goniophotometer. The prescriptions in CIE - Publication 84 - 1989, regarding the room temperature, positioning, etc., shall be taken into consideration.

52-2.11.5.2.4 The LED module shall be burned in for approximately one hour in the closed sphere or goniophotometer.

52-2.11.5.2.5 The flux shall be measured after stability has occurred, as explained in paragraph 52-2.11.4.3.1.2 to this Regulation.

52-2.11.5.2.6 The average of the measurements of the three samples of each type of LED module shall be deemed to be its objective luminous flux.